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ELECTRONIC TEXTBOOK IN LMS MOODLE

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Abstract. Moodle is the software used as a tool for on-line distance learning as well as a support for face-to-face teaching. The article outlines the structure of electronic textbook for LMS Moodle and the ways in which it can be utilised in training prospective elementary mathematics teachers under conditions of Prešov's Faculty of Education.

1. On-line Electronic Textbook

An Electronic textbook can be developed on-line (accessible via net, most frequently www) or offline (accessible on CD or DVD medium). On-line access to curricular resources is made possible by software environment referred to as LMS (Learning Management System). LMS indicates a software package which enables development, management and delivery of contents of electronic courses and textbooks. It offers tools for communicating, testing, valuation, administration and archiving of academic results. There is a range of open source LMS: Moodle, LRN, ATutor, Bodington, Claroline, Dokeos, OLAT, Sakai Project and VClass. Currently, in the area of higher education the most popular e-learning platform is Moodle (Modular Object-Oriented Dynamic Learning Environment). It is a software package used for supporting education in both full-time and distance learning, offering on-line courses accessible on www. More detailed information on Moodle can be obtained on http://moodle.com/.

When developing the electronic textbook we drew on the methodology of M. Turčáni [6]. Based on its principles, students were given access to studying texts presented in the form of lecture. Each chapter is introduced by formulation of study unit objectives. Explication (theoretical part of the chapter) looks upon real life situation and is elaborated on the basis of it. The chapter ends with a list of recommended further references.

One of the key elements of the self-study course is providing student a feedback on their progress in the subject area. This part of education is elaborated in the electronic textbook by means of the following study units: EXCERCICES, TESTS and DISCUSSION FORUM. The main idea of the electronic textbook is not merely to supplant traditional print version textbooks but, employing hypertext links and multi-media files, offer the learners new and attractive environment for stress-free way of self-study that each learner volunteered for when taking up electronic support of e-learning via Moodle. Study unit EXCERCICE contains the list of recommended tasks with instructions for their solution. Study unit TEST adopted the form of self-corrective test. The outlined form of control provides students with feedback on the level and quality of their study, with respect to the problem area they dealt with, having an advantage of being accessible on-line. Tutor does not have to laboriously correct and revise each test, yet s/he can get an overview of overall success rate and the progress in each test item. Tutor is informed of the number of students who took the test, time and proficiency level, and is able to follow those participants who in their pace of study have not arrived to the test yet (could be warned of time lag). Each student, after submitting the elaborated test, is immediately informed about the level of acquired knowledge and skills. When assessing each task's item solution students are presented with further recommendation on how to remove flaws in tackling particular problem area. Apart from recommendations resulting from the solutions, students can make use of DISCUSSION FORUM as well. It provides space for on-line discussion with fellow students and tutor. It is important though, to formulate correctly the problem area, so as tutor and other participants can properly react on it. Such discussion is then, to a degree, a replacement for consultation or seminar session; regular instruments in the full-time form of study.

2. Experience with Electronic Textbook

In the 2006/2007 academic year we monitored part-time students of Pre-school and Elementary Education. Among our primary focus was students' interest in electronic support of learning mathematical disciplines. The following courses were surveyed: Introduction into Study of Mathematics and Creating Early Mathematical Concepts I. These disciplines are taught in the first year, scheduled as 1 unit (45 min.) of lecture and 2 units of seminar per week.

The content of Introduction into Study of Mathematics builds up on mathematical curriculum of basic and secondary school. It aims at refining mathematical phrasing and building homogenous and comprehensive terminology.

Creating Early Mathematical Concepts I concerns knowledge of geometry in the perspective of developing geometrical concepts of pre-school aged child, and designing activities aimed at introducing and reinforcing basic geometrical concepts. B. Tomková [5] informs in more detail on one specific methods of working applied in this course.

In 2006/2007 academic year the number of full-time students enrolled for the introductory mathematical discipline taught in winter term was 180. Electronic support of Moodle was utilised by 87 students (48,3%) of which 43 (23,9%) delivered us self-corrective tests. In the part-time form of study 99 students enrolled for the course of Introduction into Study of Mathematics. 85 students (85,9%) opted for an electronic support of Moodle of which 57 (57,6%) performed self-corrective tests.

Creating Early Mathematical Concepts was taught in the ensuing summer term. The number of students enrolled for the course in both forms of study was 249 (162 full-time student and 87 part-time students). Almost all students of both forms of study registered for Moodle environment support. Preliminary test was delivered by of 152 full-time students (93,8%) and 76 part-time students (87,4%).

From the increased interest in exploiting the electronic textbook in the second term of study in its both forms we can assume that provision of electronic support of study in the outlined modification was tenable and beneficial for students.

As for the form of consultations in Moodle environment students could use synchronous form of communication (chat) or asynchronous form (discussion forum, internal e-mail). However, the interest in such form of discussion was almost negligible. Only 3 full-time students (1,7%) and 16 part-time students (18,4%) resorted to it. This finding indicates greater dependency of part-time students on more detailed consulting of the examined topics.

Upon completion of the second term, the students were given an option to comment on their utilisation of e-learning support during their first academic year in the form of questionnaire. The questionnaire was administered among the students of full-time and part-time forms of study. 157 full-time students and 84 part-time students joined the survey.

One of the survey items was listed in order to get overview of the variety of information sources used by students during their study of mathematical disciplines. The survey's outcomes are presented in the following table.

The above survey has proved that students of both forms of study make use of more traditional information sources during their training in mathematics. Dominant source of information was direct learning contact (lecture and seminar). Use of printed textbook was less frequent than utilisation of

its on-line version in Moodle. This statement is also supported by our monitoring of students access to Moodle environment. We identified students need for further consultations of their study related problems. In this respect, students contacted their fellows, colleagues specialising in mathematics (in-service elementary teachers, part-time students) and family members (under Other Sources section).

Information Source	Mean Use of Particular Information Source	
	Full-time Students	Part time Students
Seminars and Lectures	90,45%	97,62%
Textbook	70,70%	86,90%
Electronic Textbook in Moodle	78,98%	96,43%
Discussion with Fellow Students	68,15%	80,95%
Consultation with Tutor	10,83%	14,29%
Consultation with In-service Teacher from Elementary or Secondary Stage	9,55%	26,19%
Other Sources	8,28%	23,81%

The second question was formulated as follows: "Had I been given an option to utilise all indicated information sources, in which order would have I used them?Śtudents were asked to rank the information sources on the basis of their importance to studying mathematical disciplines. The following table indicates the sources offered and mean order of their preference on the scale of 1 to 7.

Information Source	Mean Order of Information Source Preference	
	Full-time Students	Part time Students
Seminars and Lectures	2,08	1,67
Textbook	2,47	2,63
Electronic Textbook in Moodle	2,99	2,64
Discussion with Fellow Students	4,06	4,60
Consultation with Tutor	4,13	4,58
Consultation with In-service Teacher from Elementary or Secondary Stage	5,76	5,48
Other Sources	6,50	6,40

The above survey has proved that for the purpose of mathematical training of prospective elementarist it is appropriate to combine it with electronic support accessible through the net. E-learning as a supporting element of face-to-face teacher training thus opens more room for delivering an efficient mathematical education.

3. Conclusion

In the course of their study, students have accepted the provision of lectures with hypertext links to multimedia applications, animations, web sites and other software products (e.g. Geonext for learning Geometry). Such accompaniment (or its complex replacement) of lectures and seminars is a suitable tool for stimulation of study. Self-corrective tests serving as an immediate feedback on quality of study were also frequently employed. Analogous experiences with Moodle as an electronic support of study are also presented in [1], [2], and [3].

Moodle is a convenient tool for designing methodological materials for in-service teachers. Electronic textbook is a resource offering broader scope of utilities than printed textbook. Traditional textbooks on Didactics of Mathematics usually do not contain samples of pupils' solutions. However, electronic textbook of didactics of Elementary Mathematics can provide enough space for analysing samples of pupils' solutions of particular tasks [4]. Its potential is also in transferring knowledge to larger number of recipients.

References

[1] Ľ. Gerová, P. Klenovčan. Rozvíjanie matematickej gramotnosti budúcich učiteľov - elementaristov. Vyučování matematice z pohledu kompetencí žáka a učitele 1. stupně základního vzdělávání. Plzeň, Západočeská univerzita, 48-53, 2007.

[2] P. Hanzel, T. Stehlíková. Skúsenosti s elearnigovým kurzom v aritmetike. Vyučování matematice z pohledu kompetencí žáka a učitele 1. stupně základního vzdělávání. Plzeň, Západočeská univerzita, 54-58, 2007.

[3] A. Prídavková. Experiences with teaching course of "Fun Mathematics". Scientific Issues of Jan Długosz University of Częstochowa, Mathematics XII, 251–257, 2007.

[4] I. Scholtzová. Matematická edukácia v primárnej škole na Slovensku a v Čechách - pohľad druhý. Vyučování matematice z pohledu kompetencí žáka a učitele 1. stupně základního vzdělávání. Plzeň, Západočeská univerzita, 157-161, 2007.

[5] B. Tomková. Induktívna cesta v matematike.Vyučování matematice z pohledu kompetencí žáka a učitele 1. stupně základního vzdělávání. Plzeň, Západočeská univerzita, 176-180, 2007.

[6] M. Turčáni. Didaktika vytvárania e-Learning kurzov a materiálov. http://www.mcmb.sk/ESF/tvorba ekurzov.htm

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