

DIDACTICAL AND TECHNOLOGICAL ISSUES DURING THE DEVELOPMENT PROCESS OF E-LEARNING COURSES

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Abstract: *The paper focuses on some problems concerning didactical and technological issues during the design process of e-learning courses. A didactical model that comprises all the entities of an e-learning course has been developed. This model represents the educational activities, the interactions between learners and instructors, basic characteristics of educational objects, educational resources etc. The underlying technologies being applicable to the implementation of e-learning courses have also been summarized.*

Key words: *e-learning, didactics.*

INTRODUCTION

In today's global and competitive environment which is marked with the event of the Information society, e-learning becomes a widely accepted way of training because of the flexibility, cheapness and standardization of the overall educational process it offers. There are quite different definitions of the concept 'e-learning'. Let's analyze some of them.

Definition 1: *"The process of formal and informal learning and training activities, processes, communities and events via the use of all electronic media like Internet, intranet, extranet, [CD-ROM](#), video tape, TV, cell phones, [personal organizers](#) et cetera."*[6]

Definition 2: *"The use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration"*. [7]

Definition 3: *"Broad definition of the field of using technology to deliver learning and training programs typically used to describe media such as CD-ROM, Internet, Intranet, wireless and mobile learning. Some include Knowledge Management as a form of e-learning. Took awhile for the right term to come about, circa 1995 it was all called "Internet based Training", then "Web-based Training" (to clarify that delivery could be on the Inter- or Intra-net), then "Online Learning" and finally e-learning, adopting the in vogue use of "e-" during the dot com boom. The "e-" breakthrough enabled the industry to raise hundreds of millions from venture capitalists who would invest in any industry that started with this magic letter."*[8]

Taking into account these definitions it can be mentioned that all of them comprise the combination and interaction of the following basic components: learning activities and teaching via different electronic media. That is why it becomes very important to be aware of some didactical and technological aspects during the development process of any e-learning course. In this context the main goal of our research is to study these aspects mentioned above.

In this paper we present our effort to analyze and summarize the obtained results during the development of several e-learning courses. Section 2 deals with the didactical structure of an e-learning course. The basic steps the development process follows are briefly discussed. In Section 3 we present the underlying technologies used to develop and maintain the e-learning courses. Finally we summarize our findings.

II. DIDACTICAL OUTLINE AND PLANNING OF AN E-LEARNING COURSE

E-learning concerns the various training possibilities highly facilitated by the underlying technologies being time and place independent.

The e-learning could be implemented in different forms of the formal and informal education like distance education, open education, part-time or support of some activities in full time education. Therefore during the planning and development processes of an e-learning course the first key point is to clarify the didactical structure. On Fig.1 our model

of the didactical structure of an e-learning course is presented. This didactical structure is applied during the development of the system Didacta@Net [5] for the needs of the Department of Computer Science at South West University of Blagoevgrad. The proposed didactical model extends over all basic activities and components in any e-learning course.

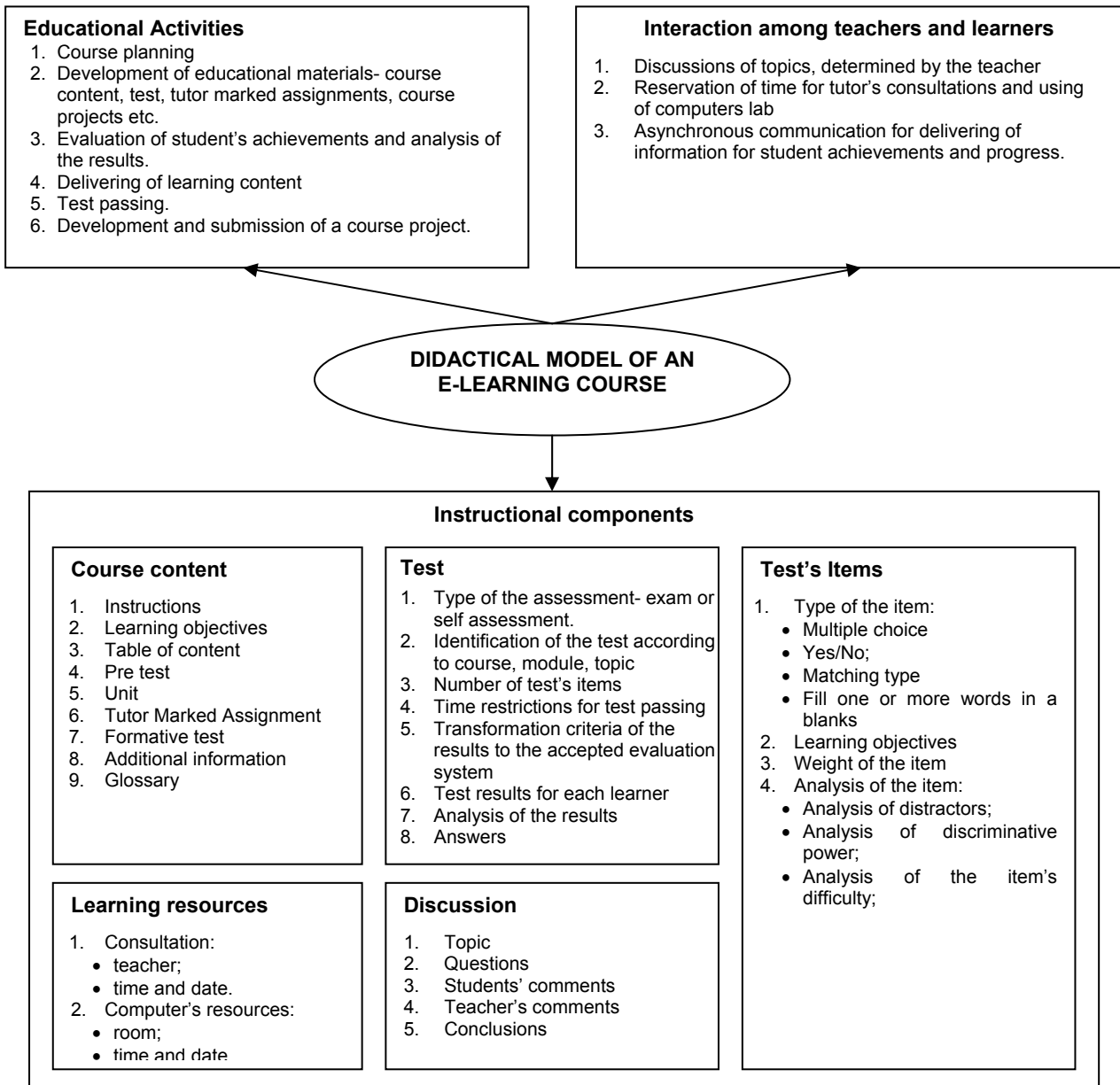


Fig1. Didactical model of an e-learning course

In an e-learning course, depending of the purpose one or several of the following learning activities could be realized:

1. Course planning taking into account the current curriculum and syllabus in the case of formal education.
2. Planning and developing of the course content - topics, concepts, procedures, principles, assessment, tutor marked assignments (TMA), course projects etc.
3. Evaluation of the learner's achievements.
4. Delivering of learning materials for self - training.
5. Passing of the test.
6. Development and submission of TMA or course projects by the learners.
7. Evaluation of TMA or course projects.

8. Discussion on the some learning topics. The discussions could be between teacher and learner or among learners and learners.
9. Delivering of the information concerning the learner's achievements and progress.

These activities can be classified in three groups according to the performing persons:

1. Teacher's activities.
2. Learner's activities.
3. Teacher's and learner's activities.

During the planning process of an e-learning course the following stages are to be outlined:

1. Analysis of the target group.

This stage is very important because the achieved results influence strongly on the course content as well as on the choice of the instructional methods, the way of problem solving, and the multimedia and interactive course components. The following characteristics of the learners should be gathered: basic age, abilities and skills in IT, motivation to take this course.

2. Determination of the learning objectives.

In any educational course a set learning objectives should exist. This also holds and even it is obligatory for any e-learning course. Particular methods to determine the learning objectives are based on the taxonomy Bloom [1] and Merrill's performance dimension [4]:

- Cognitive levels in Bloom's Taxonomy and description of the objectives: knowledge, comprehension, application, analysis, synthesis, evaluation.
- Merrill's performance dimension. The performance dimension comprises remembering, using, finding, and generalities.

3. Planning of the course content

3.1. The course structure

Any e-learning course follows a flexible modular structure according to the concept of "Learning Activity Packages" (LAP). Each module is composed from several topics and subtopics. The basic components of a topic are given on Fig.2. Instructors could combine some of these components in their own way that permits the design of courses with a flexible structure.

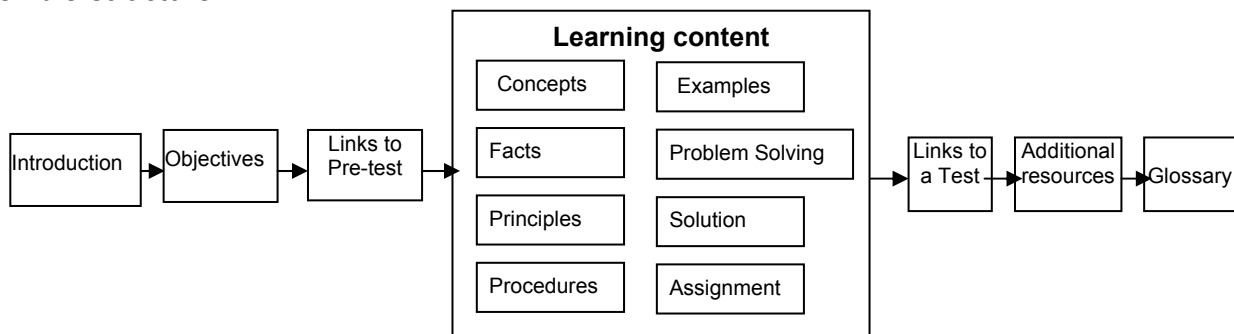


Fig.2 An exemplary structure of an e-learning course

A brief description of module components follows:

- Introduction and instructions how to go through to the course;
- Educational objectives e.g. according to the Bloom's taxonomy (knowledge, comprehension, application, analysis, synthesis and evaluation). The objectives should be set for the whole course and for the each of the modules in the course.
- Links to the pre-test (not obligatory);
- Learning content that could be build from different components by the teacher:
 - New knowledge- facts, concepts, principles, procedures;

- Exercises and examples for mastering of knowledge, abilities and skills;
- Relevant system of the problem solving with the real practical applications. The choice of the problems in the system depends from the learners characteristics like- age, professional directions etc.;
- Help and solutions of some of the problems;
- Assignments.
- Links to a test;
- Additional recourses;
- Glossary of terms.

3.2. Plan and preparation of the test.

Any test could be described with:

- Assessment type - exam or self assessment;
- Content consisting of subject, topic, subtopic;
- Measured educational objectives and content defined by the teacher in the Table of specifications according to Bloom's taxonomy or Merrill's performance dimension.
- Time for testing;
- Grade Scale to transform student's marks;
- Feedbacks;
- Table of answers.

Any test's item is determined by:

- Basic Types:
 - Multiple choice with one or more answers and floating number of distracters;
 - True- False questions;
 - Matching types;
 - Fill in of one or several words;
- Educational objectives measured by the item (according to the Bloom's Taxonomy or Merrill's performance dimension). The determination of educational objectives is a milestone in planning the test items and tests.
- Learning content that corresponds to the item- subject, topic, subtopic;
- Weight.

4. Planning of the interactivity and multimedia effects.

From implementation point of view it is important to specify multimedia effects and interactivity components. Often developers of e-learning courses include animated graphical objects, which have a negative influence on the learner's perceptions and the mastering of learning content. In most cases these effects deflect and distract learner's attention generating a cognitive overload.

To realize the basic didactical principles, i.e. visualization and accessibility, the interactive and multimedia components should be included in the points where they will increase the efficiency of the learning.

5. Planning of the time for learning activities.

- Recommended deadline to make a study of each module;
- Deadlines and appointments with tutor for consultations- online or face- to face;
- Deadlines for the submission of TMA and final course project.

6. Choice of the technological tools for development and realization of the e-learning course.

This choice basically depends from the finance opportunities of the educational institution and purpose of the course.

III. TOOLS FOR DEVELOPMENT AND SUPPORT OF E-LEARNING COURSES

From an Internet/Intranet point of view there are a lot of tools and technologies used for the development and support of e-learning courses.

1. Tools for developing and delivering of learning content

A general classification of these tools is proposed on Fig.3:

A **Web authoring tool** is a HTML editor (WYSIWYG or pure text) with (optionally) web site management possibilities.

An **Authoring tool** is software used to produce interactive learning materials that bring together all components of a course- as text, graphics, tracking, and links.

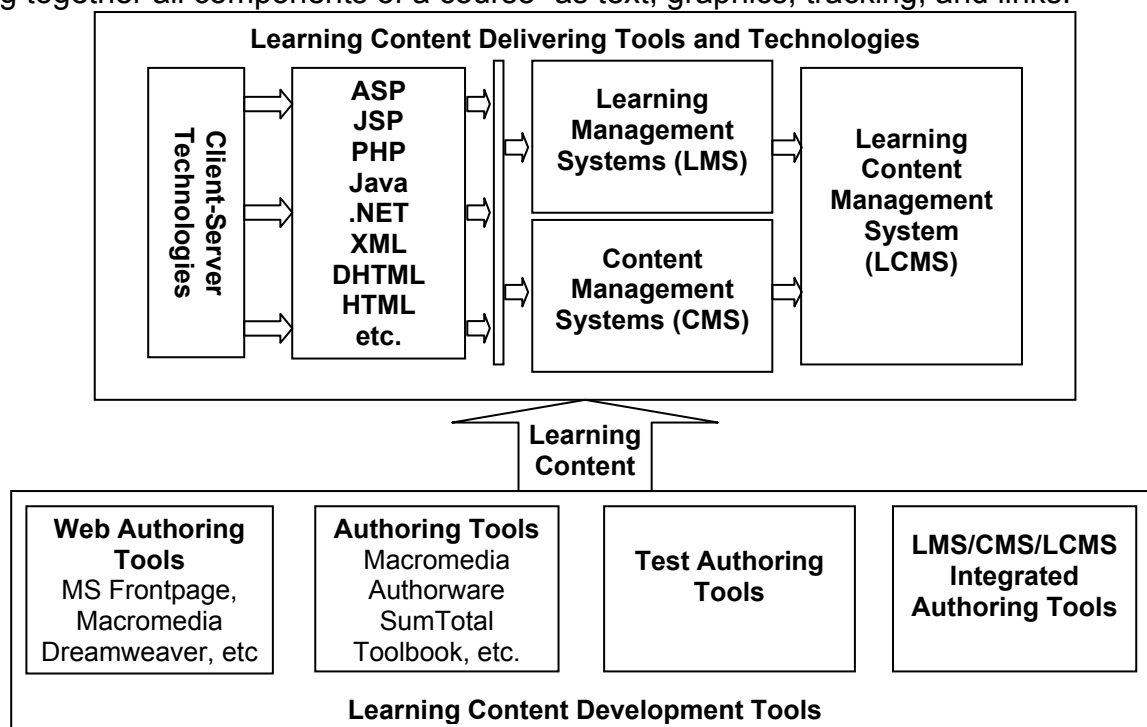


Fig. 3 Tools for development and delivering of learning content

A **Learning Management System (LMS)** is software that automates the administration of training events. All LMS's manage the log-in of registers users, manage course catalogs, record data from learners, and provide reports to management. [2].

A **Content Management System (CMS)** is software, which is developed to handle the content for huge web sites. These CMSs have functionalities like version handling, workflow and publishing. They are very suitable to be used with a big team of people who are creating and publishing content. Although CMSs are also used within the e-learning field they do not meet all the needs. They are more suitable for e.g. news sites [6].

A **Learning Content Management System (LCMS)** is an environment where developers can create, store, reuse, manage and deliver learning content from a central object repository, usually a database. LCMS's generally work with content that is based on a learning object model. These systems usually have good search capabilities, allowing developers to find quickly the text or media needed to build training content [2]. A LCMS combines the learner administration capabilities of a LMS with the content creation and storage capabilities of a CMS. [6]

A **Learning object** is "...any entity, digital or non-digital which can be used, re-used or referenced during technology supported learning" [3].

2. Tools for testing and self-testing.

3. Communication tools for learners, tutors and administrative staff:

- Asynchronous- E-mail, discussion groups;
- Synchronous- IRC, ICQ.

Obviously the main didactical functionalities should be part of every e-learning course. However every course may be developed from a different perspective by using various tools and environments. In this way e-learning courses differ a lot.

The simplest way to build an e-learning course is to use static HTML pages, developed by classic HTML editor or authoring tool, standard communication tools like e-mail and dedicated software system for testing and self-testing of knowledge. However with the advances in technology, the implementation of integrated e-learning environments that are LMS, CMS or LCMS – centric can be observed. The main issue in the development of LCMS is the adherence to e-learning standards to assure the flexibility, interoperability, reuse of learning objects or even overall courses. Tracking out the standards a strong trend to implement didactical issues in learning objects descriptions can be noticed.

CONCLUSIONS AND FUTURE WORKS

The proposed didactical model of an e-learning course does not depend on the chosen technological tools to be used during its implementation. This justifies our opinion that a didactical model should represent the kernel of any e-learning course. The strong expectations that high level technological tools will increase the quality of any e-learning course often follow to an underestimation of the educational objectives being set. According to our experience the crucial question is not “What technological tools are to be used during the development process of e-learning courses?” The core problem is “How to design and plan an e-learning course that ensures the achievement of the educational objectives?” For that reason we escape to argue for any high level technological tool.

We are convinced that a technological solution, whatever it is, represents only the shell while a didactical model is the most important part of an e-learning course. The technological and didactical issues concerning the development of an e-learning course should be considered together with no superiority between them.

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