

BEST: New Lessons Module Logic¹

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Abstract: *Most of the known e-Learning environments do not have means for modelling the structure of the learning lessons, i.e. for representing the logical order in which the concepts are presented to the learners. In this direction, in the frame of the BEST project, a research for extending the functionality of the Moodle concept "Lesson module" is carried out. The paper presents the basic ideas and results of the research. The BEST project for development of a virtual learning environment focuses on didactic approach to e-learning. It is based on the following principles: learning is a goal-directed process (teachers have opportunity to define the lesson logics on the basis of its learning objectives and the possibility to monitor and measure the quality of the learning process); learning is embedded in a conceptual context, etc.*

Key words: *E-learning, Conceptual approach, Moodle, LAMS, Lesson module, Clusters*

INTRODUCTION

On our point of view, the topic of the day for the e-learning researches could be expressed with the concept 'e+learning'. The term 'e+learning' is used by us to denote e-learning principles, technologies, means and tools but with potentialities to be applied in a wide spectrum of subject domains and according to different pedagogical strategies.

The e+learning is the focus of the project Bulgarian Educational Site (*BEST*). The *BEST* implementation regards the learning as a management process and is based on the standard Moodle concept 'Lesson module'. The goal is to realise the e+learning idea or in other words – to give a possible answer to Koper's question 'where is the learning in e-learning?' [5].

According to the proposed approach, an e+learning platform should provide:

- *for the teacher* – tools for expressing the above didactic principles according to different pedagogical strategies, appropriate for the regarded subject domain, teacher's preferences, learners' profile, etc.;
- *for the learner* – possibilities for personalized, adaptive and active learning according to his/her knowledge level, learning results and preferences related with time, way, psychometrics characteristics, etc.;
- *as a whole* (for all players in the e-learning process) – comprehensive and complete support for the e-learning process during the whole life cycle, including portability and reuse of materials and courses.

E+LEARNING PRACTICES

The necessity of modeling of the learning process ensues from the following observation: the learning process does not consist only of "absorption" of learning content; learners that are not active in the learning process do not learn well; therefore the adequate modeling of the teaching/learning process, in all its completeness and variety, is essential for the success of the e-learning. In the last years a number of projects related to the e+learning approach are performed, for example, EML [5], Moodle [1, 2, 3], LAMS [6], PeU (Plovdiv electronic University) – ver. 1.0 and 2.0 [8, 9, 10].

EML (Educational Modelling Language) is a semantic notation of complete units of study developed as a mean for expressing various pedagogical models in order to support reuse and interoperability. *Moodle* is an open source course (and content) management system in which activities are at the heart of the system. It is very important issue to capture current educational practices in e-learning. Unfortunately, more advanced 'learning design logic' capabilities are needed than are provided by the Lessons module of Moodle 1.6. (Fig. 1.).

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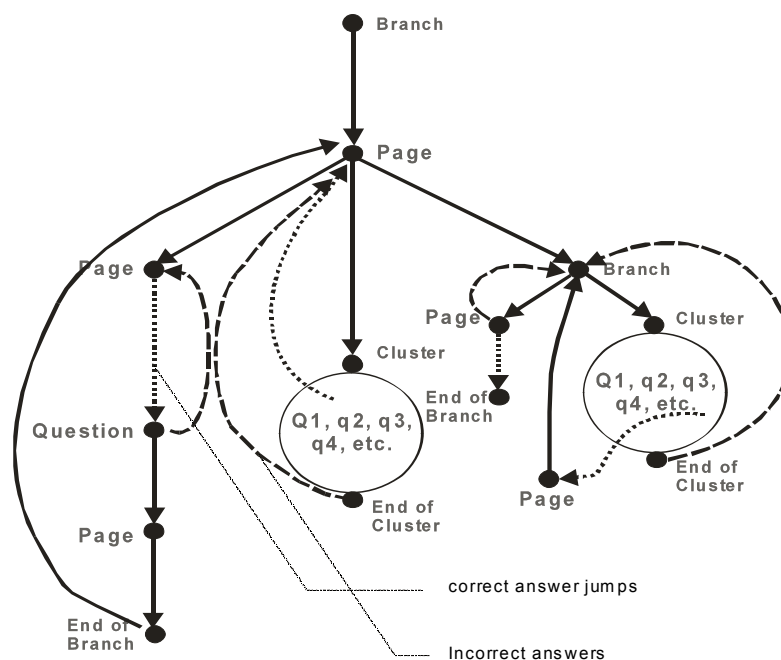


Figure 1. Example: Five pages lesson diagram in Moodle 1.6

LAMS (the Learning Activity Management System) is a software tool for designing, managing, and delivering online collaborative learning activities. The system is based on the concept of Learning Design theory. *LAMS* has an intuitive interface with a visual authoring environment that allows users to create sequences of learning activities with very little effort. *LAMS* offers lecturers a structure on which to build their lessons.

The *PeU* (Plovdiv Electronic University) is an innovative e-learning platform for cooperative development of learning materials, dynamical generation of courses and automated learning, managed by the plan of the learning process. The special graph representation of the learning process allows expressing appropriately the learning process according to different didactic methods. In the *PeU* learning plans, activities are specified as means of expressing the "learning flow" including decision-points, sequences, choices, etc. For example, performance in one activity determines the next learning sequence. Plans could be considered as dual specifications, specifying the both – didactic logic and learning content.

THE LESSON MODEL IN BEST

The BEST model of the lesson is based on the *PeU* methodology. So, the BEST 'pedagogical meta-model' allows lessons to be created for different didactic methods. This feature expresses the key difference from some e-learning systems offering content-centric learning models and is the merit to call the *BEST* approach 'pedagogically-driven'. The high level of abstraction and flexibility makes the BEST a very powerful tool for expressing very different learning lesson scenarios, including personalized learning. The structure and content of the Lesson module, included in BEST, are modelled with branches, conditional jumps, logical blocks (and, or), clusters, grading blocs, etc. A lesson delivers content in a flexible way. It consists of a number of pages. Each page normally ends with a question and a number of possible answers. Depending on the student's choice of answer they either progress to the next page or are taken back to a previous page. Navigation through the lesson can be straightforward or complex, depending largely on the structure of the material being presented.

The BEST software system is realized on the basis of three systems (*Moodle*, *LAMS* and *PeU*) and is fully integrated with *LAMS* (in relation of activity and course format, web-services, database, *LAMS* repository etc.). The experiments with the beta-version of the BEST, are encouraging¹ and confirm the correctness of the project decisions.

¹ The Bulgarian versions of the abovementioned systems are realized too [4].

Structure of the lesson is created as linear series of pages which can be presented like a slide-show or non-linear branching manner, or as combination of the both and conditional jumps. There are two basic modes: a flash card mode and a presentation mode. Lesson module has needed functionality to support question clustering, password protection and time constraints. The jumps have been divided into three types – relative, absolute and conditional jumps. The default navigation uses the *relative jump*. *Absolute jump* defines the actual page to point the next page by specifying the page's Title. *Conditional jump* uses constraints based navigation not only in current lesson frame (actually this is an external wrapping logic). On this way, the new lesson module has logical blocks, loops and a non-linear structure.

Types of test items available within a lesson are multiple choice, multiple answer, short answer, true/false, matching questions, numerical question and essay. An ontology of test question types is under construction (see the implementation and experiments carried out in *PeU 2.0*, where the test subsystem supports 37 types of e-test assignments including drag-and-drop matching questions types [8, 9]. There are no problems to add more types of questions, but there will not be standardized types (not automatically exportable/importable).

Grading mechanism in lessons module is based on earned points by the user, which is divided by the total points. So, the point values associated with each of the user's answers are added up. The result is divided by the total of the maximum points that the user could have earned for each page answered. This number is then scaled by the so-called 'grade parameter' of the lesson. From pedagogical point of view, the Lesson module is mainly applicable as a subsystem to get across subject domains and concepts [8, 9].

The Lesson module is very flexible tool. A lesson can be used as a formative assignment, imparting some knowledge while at the same time making some demands on the learners. A learner can take a lesson more than once. Another type of lesson is the flash card lesson. It can be used as a type of assignment. There are two very similar variants of flash card behaviour: "Show an unseen page" never shows the same page twice; "Show an unanswered page" which shows the student pages that may have appeared before but only if they answered the associated question wrongly.

Branch tables are pages with a set of links (pointers) to other pages in the same lesson. Branches are applicable to organize sets of questions around different topics or concepts in course [2, 3]. Typically a lesson may start with a branch table which acts as a table of contents. Each link in a branch table has two components, a description and the title of the page to jump to. The most basic lesson structure is branching quiz. Each branch of the quiz leads to a linear series of pages and test questions and then returns to the main branch. The main-branch page acts as a table of contents for the lesson (Fig. 2.)

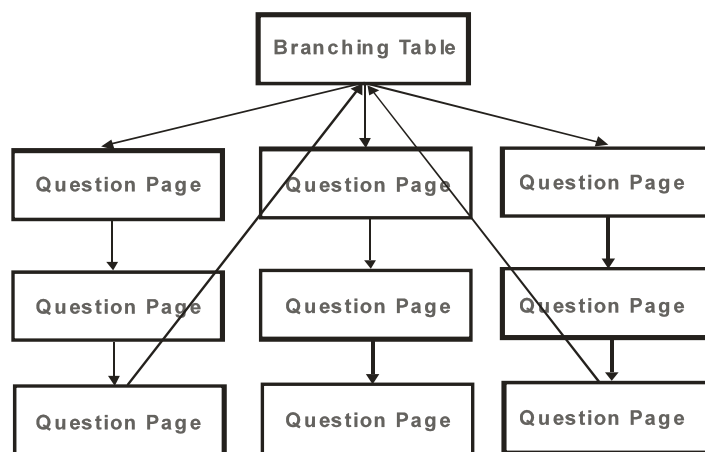


Figure 2. Example: Branching quiz

A branch table effectively divides the lesson into a number of branches (or sections). Each branch can contain a number of pages (probably all related to the same topic). The end of a branch is usually marked by an *End of Branch* page. This is a special page which,

by default, returns the student back to the preceding branch table. The 'return' jump in an *End of Branch* page can be changed, if required, by editing the page. There can be more than one branch table in a lesson. Branch tables can also be used to hold content in the lesson.

The 'Jump-to' link (Fig. 3) can be either relative or absolute transfer between lessons pages. Examples of *relative links* are 'This page' and 'Next page'. 'This page' means that the student will see the current page again. 'Next page' will show the page which follows the current page in the logical order of pages. The relative *Next page Jump-to link* may point different pages after pages have been moved. The *Absolute page link* is specified by choosing the page's title.

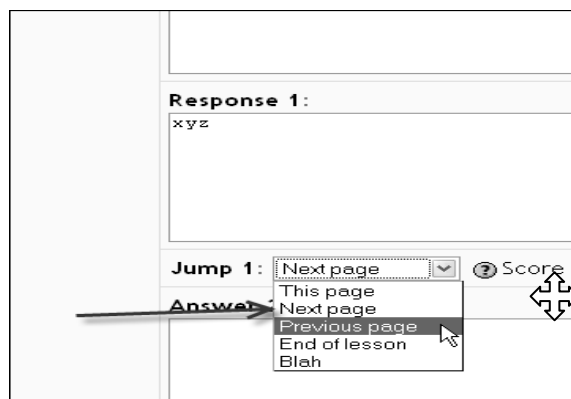


Figure 3. Example: Lesson next/ previous page jump

Special jumps link to a randomly chosen unseen question (an attempt is a criterion) between the current branch table and the *End of the Lesson* or the next *End of the Branch*.

A cluster represents a set of questions from which one or more may be randomly chosen. Clusters should be completed with an *End of Cluster page* for best results and can contain sub-clusters by using *Branch Tables* and *End of Branches*. Questions within a cluster are randomly selected as a jump. Questions within a cluster may either link to the *End of Cluster* to exit the cluster, or jump to an unseen question within the cluster. This has been done for the important reason to enable the creation of scenarios with a random element. A cluster in the lesson works as if it had a random question quiz inside the lesson. For example, if the teacher would like each student to go through only two of a set of pages with questions inside the lesson, then he can use Cluster to arrange that.

The realized logic allows the current lesson to be dependent upon a student's performance in another lesson from the same course. If the performance requirement(s) is not met, then the student will not be able to access this lesson.

The **dependency condition** includes (Fig. 4.):

- *Time Spent* (the student must spend this set amount of time in the required lesson);
- *Completed* (the student must complete the required lesson);
- *Grade better than* (the student must earn a grade in the required lesson that is better than the one specified here; any combination of the above can be used if needed).

Access control

Password protected lesson: No

Password: (Leave blank to keep current password)

Conditions

Dependent on: None

Condition(s) for the dependency:

Time Spent (minutes)	Completed	Grade better than (%)
<input type="text" value="0"/>	<input type="checkbox"/>	<input type="text" value="0"/>

Available from: 1 April 2006 - 14 40

Deadline: 10 May 2006 - 16 40

Figure 4. Example: Dependency condition in BEST lesson

The *New tabs* help teachers to navigate around, add consistency and unity to the different Lesson pages. The tabs (Edit, Preview, Reports, Grade Essays and High Scores) are a step towards integration of the question type classes. *Edit tab* has sub-tabs Collapsed and Expanded. *Collapsed* is equivalent to *Lesson's Tree view* setting and expanded is the original view for editing a Lesson. *Preview tab* is the equivalent of the *Check Navigation link*. *Grade Essays tab* is the only tab that will not displayed if the user do not have teacher-editing privileges. It is used to access essays to be graded. *Reports tab* has sub-tabs *Overview* and *Detailed Statistics* and on hover displays the number of attempts that have been made on the lesson. *High Scores* tab only appears if high scores are turned on in the lesson settings. This is a new way to access pages/views. A *new layout editor* has been added to the lesson module and now there are opportunities to copy lessons between courses.

CONCLUSIONS AND FUTURE WORK

A new functionality was added to Moodle 1.6. The experiments show the hidden potential in the lessons module that makes it much more flexible for realization of pedagogical strategies. The research shows how we can take advantage of the ability of each answer in a question page to link to any other page and how we can create branching choose our own adventure-style simulations or case studies. Lessons can be an interesting change of pace for teachers to manage and to model the learning process. The new functionality has been added to the Lesson module in order to make question clustering, password protection, time limits, conditional jumps, grade criterion, logical blocks, teacher control blocks, solves the problem with goal-directed process and learning design logic, etc. The corresponding visual editor interface is under development.

A new format for the BEST course is planed. In this course format the learning is built on the base of concepts and relations between them (see the PeU implementation). The concepts can be presented in different pages of lessons or clusters [2]. Each concept, and therefore the lessons connected with it, has characteristics, called resources. Learners, teachers, administrators and other subjects have own functionality and operate with different interfaces depending on the model of the learning process.

The functionality and content flow of the lessons will be modelled with a directed graph (similar to one used in [6, 8]), whose nodes are sets of learning materials (resources and assignments or groups of them) or controlling ones, and the edges – relations of type *predecessor_of* (Fig. 5).

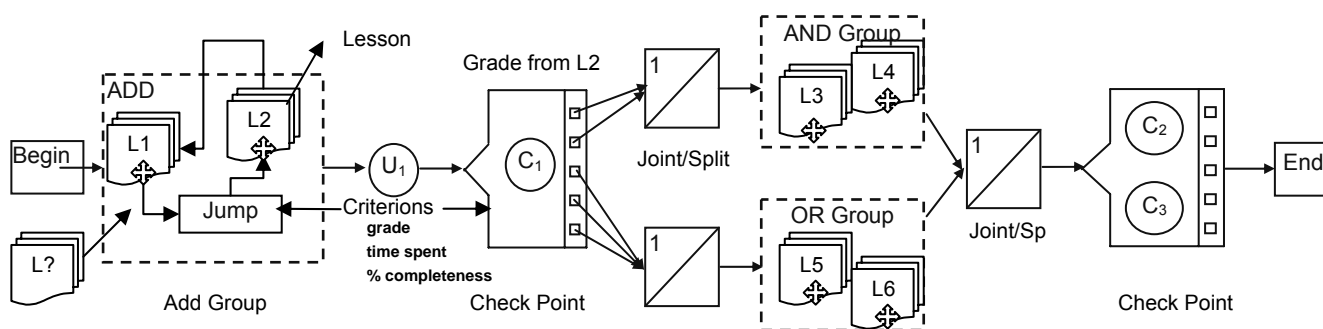


Figure 5. Example: BEST course in Lesson module environment

REFERENCES

- [1] Alison S., Lesson – improvement strategy, <http://moodle.org/mod/forum/discuss.php?d=42843>.
- [2] Category "Lesson", Moodle Documentation written by the Moodle community, <http://docs.moodle.org/en/mod/lesson/index>.
- [3] Category "Clusters", Moodle Documentation written by the Moodle community, <http://docs.moodle.org/en/Clusters>.
- [4] Denev D., A. Boichev, P. Nedelchev, Multilingual Support of e-Learning Systems: The Bulgarian Contribution, CompSys'06 (presented).
- [5] Koper R., Modeling units of study from a pedagogical perspective the pedagogical meta-model behind EML, 2001, <http://eml.ou.nl/introduction/docs/ped-metamodel.pdf>.
- [6] LAMS Users Guide v1.0.1, <http://lamsfoundation.org/>, 2005.
- [7] Penney M., M. Nielsen, Lesson module Forum in Moodle, <http://moodle.org/mod/forum/view.php?f=333>.
- [8] Totkov G., E. Somova, M. Sokolova, *Modelling of e-Learning Processes: an Approach Used in Plovdiv e-University*, Proceedings of the Intern. Conf. of Computer Systems and Technologies (e-learning), CompSysTech'2004, Rouse, Bulgaria, 19-20 June, 2004, IV.12-1 – IV.12-6.
- [9] Totkov G., M. Sokolova, R. Doneva, *Organization and Организация и провеждане на тест in e-Learning Environment PeU 2.0*, Proceedings of the 24th Conference of UMB, Borovetz, 6-9 April 2005, 396-400.
- [10] Totkov G., *Virtual Learning Environments: Towards New Generations*, Proceedings of the Intern. Conf. of Computer Systems and Technologies (e-learning), Sofia, Bulgaria, 19-20 June, 2003, P.2-1 – P.2-9.

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