EXTENDING DOKEOS LE FOR ADAPTIVE E-LEARNING

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Abstract: This paper describes how the Dokeos e-learning system was installed and implemented, and then extended to enable highly-interactive adaptive e-learning, where students are heavily involved in creating multimedial learning materials, which are adapted in accordance with student targeted knowledge level and student interests for various topics.

Keywords: E-Learning environment, Open source technologies

1. INTRODUCTION

A LMS (Learning Management System) is a software application for administrating, documenting, tracking, reporting and delivery of e-learning education courses. A LMS can be a simple application for educational records or complex software for delivering online courses over the Internet. Most LMSs are Web-based, enabling access via Internet to learning materials and administration. Today, almost every educational institution in the world has some kind of distance learning portal, where learning materials and some kind of checking student knowledge is available. E-learning has many advantages but also disadvantages [1-4].

Typically, e-learning systems are created as Web-based Learning management systems (LMS). LMS systems enable a wide range of activities, for all users: teachers and students and management (see fig.1). The main disadvantage of e-learning systems is a loss of direct communication between students and teachers. Also, learning materials should be adapted in accordance with student individual characteristics, eg. targeted knowledge level, different interests for various topics [5-7] . Many existing LMS use either simple text files (eg. PDF) or static Web-pages. However, today, interactive multimedial materials can be easily used on the Web, and there is a trend, of course, to implement this technology as much as possible for e-learning.
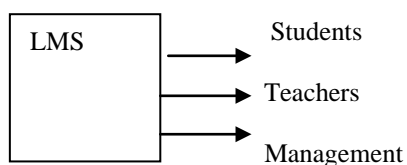

Fig.1: LMS

This paper describes how the Dokeos e-learning system (e-learning environment, e-LE) was extended to enable highly-interactive adaptive e-learning, where students are highly involved in creating multimedial learning materials, which are adapted in accordance with student targeted knowledge level and learning interests. This paper explains how to implement an extended Dokeos e-LE for creating adaptive e-learning lectures. The extended

Dokeos is able to create an individual learning scenario for each student, by combining available learning materials in accordance with student characteristics.

2. DOKEOS E-LE

Dokeos is an open-source e-learning system (e-learning environment), where one of the components is the AUTHOR component, used to make e-learning material,. The LMS component within Dokeos e-LE enables interaction with learners, and the EVALUATE component is used for assessment. Dokeos enables so-called rapid learning and authoring, i.e. it enables creating courses rapidly, typically using slides in PowerPoint and recording narration on top of slides, and finally using some tests for assessing student learning results. Dokeos users had made many extensions in order to extend Dokeos capabilities.

The following components are available within Dokeos:

- AUTHOR (for online authoring of web-pages, enabling rapid learning)
- DOCUMENTS (creating Word, PDF, PowerPoint, Flash documents)
- SCENARIOS (for organizing lectures, chapters, weeks, activities)
- QUIZZES (online learning quizzes)
- PODCASTS (publish images, audio and video materials)
- SOCIAL (organize videoconferences enabling students to learn from each other)
- ADMIN (manage users, courses)
- SCORM (import third party materials)
- REPORTING (tracking progress, printing certificates)
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A great advantage of Dokeos is that it is an open source software solution. The opportunities for extensions and advancements are unlimited. The Web-page www.dokeos.com/en/community includes instructions for development of various plug-ins. Also it includes an online forum for discussions and exchanging experiences.

Dokeos enables using various multimedial files within a lecture, including recorded video lectures. Various tools

are available on the Web for creating various multimedial files. For example, NVU is an HTML Editor for [1]producing lectures in the form of Web-pages. Or, the HotPotatoes tool offers creating tests which can be imported within Dokeos e-LE.

3. INSTALLING AND USING DOKEOS E-LE

Installing Dokeos:
In order to build an e-learning system based on the Dokeos platform, we can use an open-source software infrastructure, and the following components are needed:

- Server operating system - Ubuntu Server 12.04.2 LTS
- Relational database – MySQL Server 5.5.31
- Web server – Apache 2.2.22
- Server side language – PHP 5.3.10

First, it is necessary to install Ubuntu Server, which can be obtained for free from http://www.ubuntu.com/download/server. After this installation, the next step is to install and configure MySQL, PHP and Apache packages. This can be done by the following command:

```
sudo apt-get install lamp-server
```

In this way, by this command, we can download installation packages from Ubuntu repository, but it is necessary of course to have an Internet connection. In this way we can install all the needed components mentioned above. Alternatively, we can install each component separately, by using the following commands:

```
sudo apt-get install apache2
apt-get install mysql-server mysql-client
mysql-uroot-ppassword
sudo apt-get install php5 libapache2-mod-php5 php5-mysql
sudo service apache2 restart
```

Also, it is useful to install PHPMyAdmin web interface, and this can be done by the following commands:

```
Sudo apt-get install phpmyadmin
Sudo apt-get install  ftpd
```

After these preparation steps, we can do the installation itself, by starting the installing process by accessing the address: http://192.168.02/dokeos/main/install/. Then, it is necessary to check the server configuration, input the parameters for database access, and confirm the installation at the end.

Using and administrating Dokeos:
After installing Dokeos, we can use it, and first step is to register ourself . On the other side, a system administrator can login by using administrator credentials, defined by the installation configuration, and then he/she can use Administration>Configuration, or Administration>Add user, or Administration> Create a course, etc. During creating a course activity, it is necessary to define a

course category, eg. IT (Information technologies), SE (Software Engineering), etc. For every course, it is necessary to define the course title and its category. Every course can have several modules.

There are several types of users: administrators, teachers, students. Students and teachers can use a whole list of tools. Teachers use Authoring tools (tools for creating lectures, tests, etc.) and Interaction tools are used by both teachers and students. Interaction tools (for communications between students/teachers) include Chat, Forum, Wiki, Calender, etc. Authoring tools include Documents, Modules, Announcements. Also, there is a set of administration tools: Administration (Settings, etc.)

Dokeos is a LMS environment and web-application in PHP, which uses MySQL as a database, enabling e-learning activities and other activities within an educational institution: distributing e-learning materials, tracking, live communicating (Chat), etc. It is simple to use and it is flexible. Many tools are available:

- Documents (creating documents, memorizing and organizing files)
- Modules (creating modules)
- Dropbox (students can submit their assignments instead to use e-mail)
- Announcements (important messages for students)
- Etc. (eg. Groups, Calendar,….)

Every user can create his/her profile by using the following steps:
Social>Home>Edit Profile
Student page include a list of courses, and every document is presented by an icon.

4. EXTENDING DOKEOS FOR ADAPTIVE E-LEARNING

The existing Dokeos e-learning system is nonadaptive, ie. it creates learning materials which are fixed for every student ("one-size-fits-all"). Here we describe how Dokeos was extended (modified) in order to become adaptive, which means that this new (adaptive) Dokeos e-learning system creates learning materials which can have different content

- Different learning material (content)
- Different learning scenario

depending of different student learning goals and different learning interests.

The adaptive Dokeos e-learning system creates a student learning model, based on some input parameters provided by questioning students about their targeted knowledge level (targeted mark) and preferred way of presenting learning materials. After creating student model, this model enables producing adaptive learning materials, designed to fit a particular student, depending of student characteristics: goals and preferences.

Every lecture is created as a list of "smaller" (relatively small) documents (topics, ie. "learning objects"), and this list is adaptive, some documents can be in or out, depending of student characteristics. This adaptive (variable) list of documents created differently for every student for every lecture, represents the adapted learning path, which is not fixed, it is made variable by removing some documents from the complete list of documents. For example the following list of documents:

Doc1, Doc2, Doc3, Doc4, Doc5, Doc6, Doc7, Doc8

is the complete (completely available) list of documents, and the following list is created for a student who wants to achieve a lower knowledge level (for this particular lecture) and who is not interested in every topic in the lecture:

Doc1, Doc2, Doc4, Doc5.

So, every lecture is adaptive, and every document within a lecture can be in or out depending of student model characteristics. The student model represents the information about what documents within every lecture are chosen by the particular student to be included in his own learning path (learning scenario).

In order to build this extended Dokeos e-learning system, it was necessary to create an additional SQL database, called DokeosDB_smart. Also a new module was needed, called Syrvey_smart which is built as an extension of existing module called Survey (see Fig. 2). The existing Survey module enables asking questions to the students. The new Survey module enables additional questions, in order to create the student learning model, and by using this model it is possible to create a list of documents for every lecture which is not fixed but it is adaptive, ie. it varies depending of student model parameters.
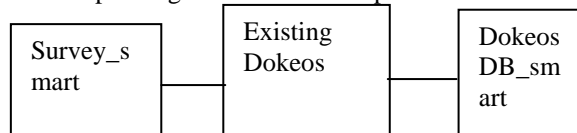

Fig.2: The structure of the extended Dokeos e-LE

5. USING EXTENDED DOKEOS FOR ADAPTIVE E-LEARNING

Creating adaptable paths of learning by teachers:
The following slides illustrate creating an adaptable path of learning by a teacher. Fig. 3 shows how the teacher chooses a course, e.g. "CS321 Java programming". Fig. 4 shows creating questions/explanations for students, and instructions to the system for various answers (this is created by the teacher for any of documents within a lecture). Finally, Fig. 5 presents a lecture as a set of 8 icons, where this lecture has 8 documents, and every of these documents are offered to students, and they can choose or reject any of them, and in this way they can create their own adapted path of learning. Also, they can change the sequence (ordering) of the documents if they want.
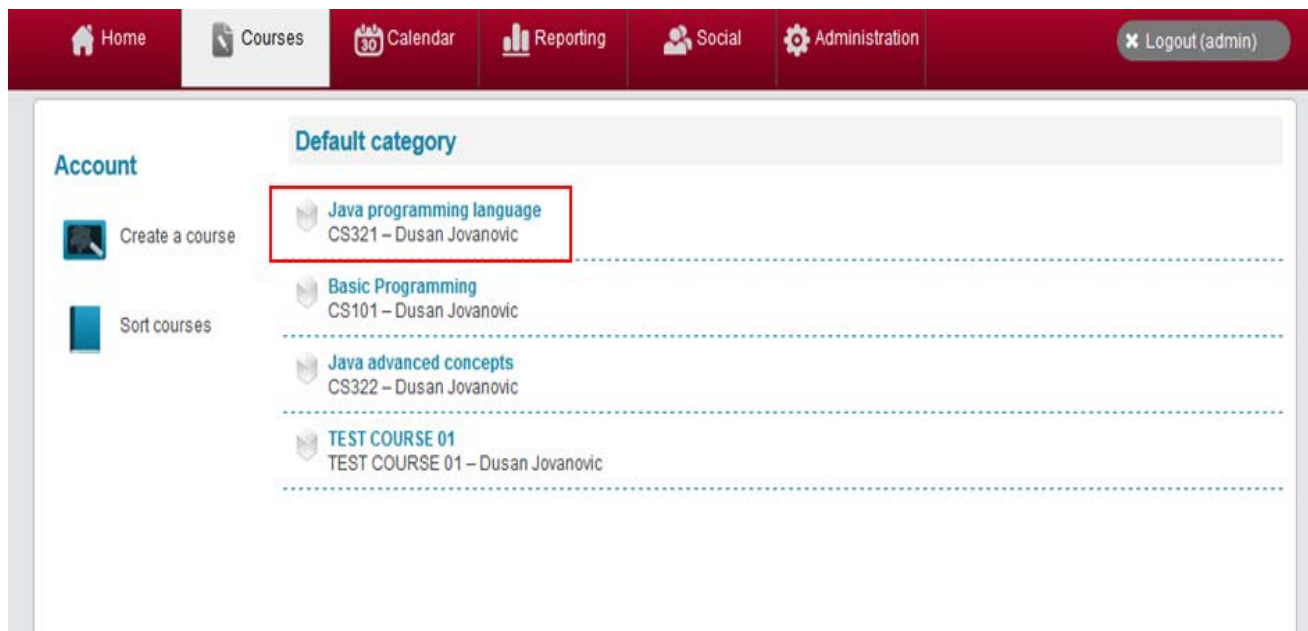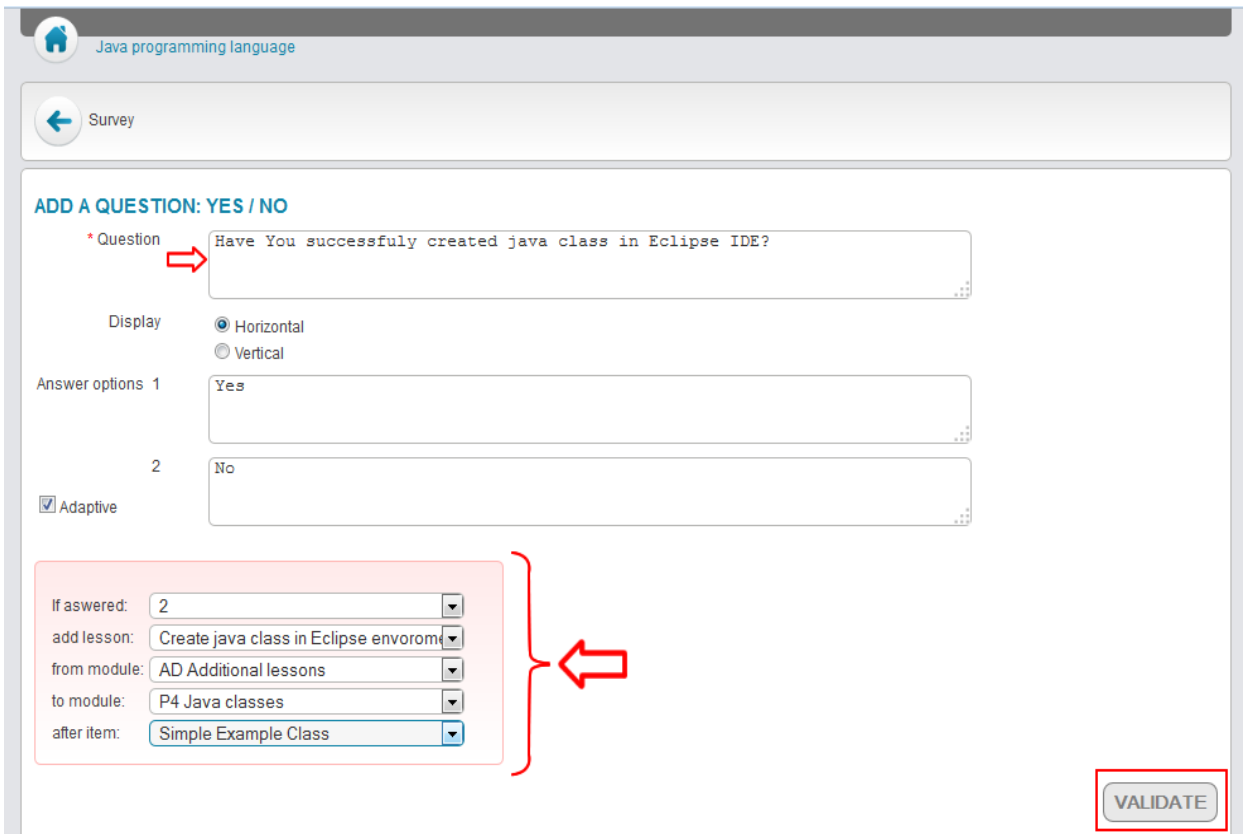

Fig. 3: Choosing a course

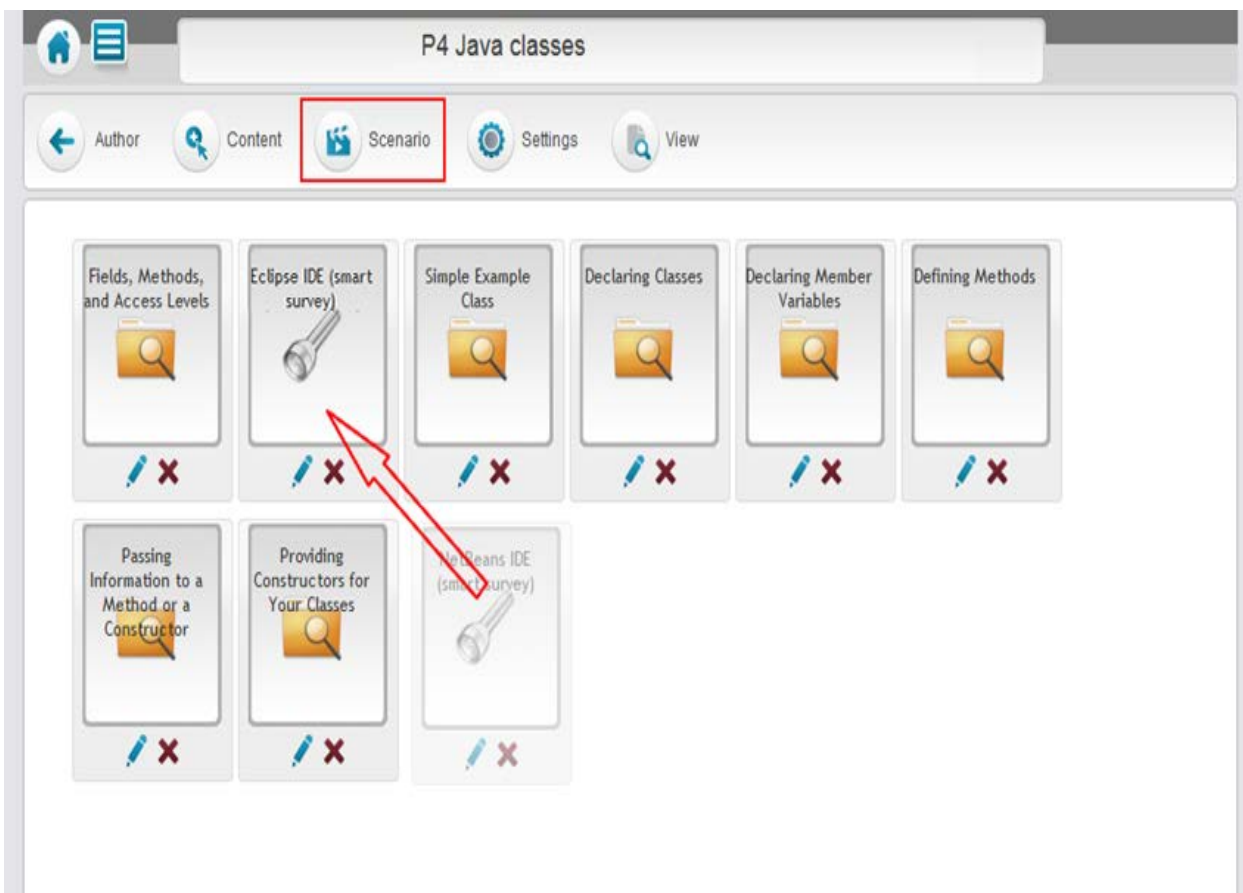Fig.4: Creating student questionary and instructions to the system

Fig. 5: A lecture composed of 8 topics (8 learning objects, i.e. 8 "smaller" documents)

Creating adapted paths of learning by students:

A student can choose one of available documents within a lecture in order to decide about including or not including (rejecting) that particular document in his/her adapted path of learning for a particular lecture (he/she can answer "yes" or "no"). If result was "no", this document would not be included in the learning path.

6. CONCLUSION

This paper explains how Dokeos LE is extended to enable adaptive e-learning. The extended Dokeos LE enable creating adapted paths (scenarios) of learning, adapted for every student depending of his/her characteristics:

- Targeted knowledge level (targeted mark)
- Student interests for various topics

Each path of learning consists of a certain number of "smaller" (relatively small) documents (different learning objects, describing different topics within the same lecture) within each lecture (eg. 5-10 documents), and by questioning a student, the system will create adapted path of learning by including or rejecting any of the proposed documents.

This extended Dokeos e-learning environment is an highly-interactive e-learning system (e-learning application) for adaptive e-learning. It uses open-source code in Dokeos LE, and in this way it enables a quick and easy solution for adaptive e-learning purposes. An additional module (Survey_smart), and an additional database (DokeosDB_smart) were required, compared to the standard Dokeos LE.

Adaptive e-learning has significant advantages compared to nonadaptive e-learning, eg. it is more efficient and more attractive for students, and its interactivity is motivating for students. The proposed extended DokeosLE offers to the students to choose by themselves what knowledge level and what interesting topics they want to be included in their learning materials, ie. to choose their own learning path (scenario).

ACKNOWLEDGMENT

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