

CADMOS: A learning design tool for Moodle courses

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Abstract

This paper presents CADMOS, a graphical learning design tool that allows a practitioner to easily create lesson plans. One of the main innovative features of CADMOS is that a lesson plan can be exported so that it can be deployed and enacted in a Moodle platform.

Keywords

CADMOS, learning design tool, Moodle

Motivation

The learning design process, normally, involves a number of steps such as: the specification of the learning activities need to be performed by human actors (e.g. learners, tutors) in order to achieve the learning objectives, the orchestration of the learning activities, i.e. the sequence of the specified learning activities as well as the identification of the learning resources and services that need to be used in order to support the learning activities (Koper, 2005). The output of this process is called learning design or lesson plan or learning script. Since this process is iterative, learning designers, mostly teachers, need to easily modify, update or enhance their designs in order that to achieve the required level of learning effectiveness (Tattersall et al., 2005).

Learning designs are usually documented either in a narrative format (usually called lesson plans) or using specifications and graphical notations. According to Conole (2008) the learning design approach should “act as a means of eliciting designs from academics in a format that can be tested and reviewed by others involved in the design process, i.e. a common vocabulary and understanding of learning activities”. Narrative forms cannot easily meet this requirement since designers do not use a standard/common template and such designs are often quite extensive in order to fully describe the learning flow. On the other hand, graphical learning design tools allow designers to create their designs by "dragging and dropping" activities, putting them in a sequence and linking them to learning resources and tools can help (Neumann and Oberhuemer, 2009). The ASLD website (<http://www.ld-grid.org/resources/tools>) contains a list of quite popular learning design editing tools such as WebCollage, CompendiumLD, OpenGLM, CADMOS, LAMS. Also several reviews of such tools have recently been made (e.g. Katsamani & Retalis, 2011).

Perhaps the most popular learning design tool is LAMS (Dalziel, 2007). It is not only provides a simple and intuitive user interface that allows the designer to drag and drop learning activities and services into a workspace and organise them into a learning workflow but also to execute the created learning design in a proprietary learning environment or in a LAMS enabled learning management system such as .LRN or Sakai. All the other tools allow the designer to export the learning design in IMS LD specification which can be executed in a simulated learning environment via an IMS LD player.

Nevertheless, most teachers use Moodle or Blackboard which are the well-known learning management systems (LMS). Till now, there is no learning design tool that allows a teacher to create a learning design which can be deployed into these LMSs. The goal of this paper is to present CADMOS graphical learning design tool. CADMOS is the only graphical learning design tool which allows a teacher to design an online course which can be transferred to Moodle for enactment. This paper will show an example of how CADMOS can aid in bridging the gap between the design and deployment in Moodle of a learning design.

CADMOS by example

Overview

CADMOS is a user friendly IMS LD level A & B compliant graphical learning design tool addressed to novice learning designers, i.e. practitioners/teachers with basic computer skills and knowledge of learning standards (Katsamani & Retalis, 2011). CADMOS enables a practitioner to design a learning script in layers (see Figure 1): first by specifying the learners and teachers activities and the associated learning resources and services required thus creating a learning activity conceptual model, and then by orchestrating the activities per human actor and adding rules and constraints using the metaphor of swim lanes which are all depicted in the learning activity flow model. Thus, not only can a practitioner determine in which order the students should perform the activities but also to specify conditions, preconditions or rules that will be associated to these activities, i.e. a student must study the theory before doing a self-assessment or the student must score at least 70% before proceeding to another activity.

The output of the learning design process using CADMOS can have three forms: i) a learning design codified in its own format in order to be re-used and modified at some point later on; ii) a learning design package that conforms to the IMS LD level A & B specification; and iii) a package for Moodle which could be uploaded onto a Moodle server and used for “restoring” it as a Moodle course.

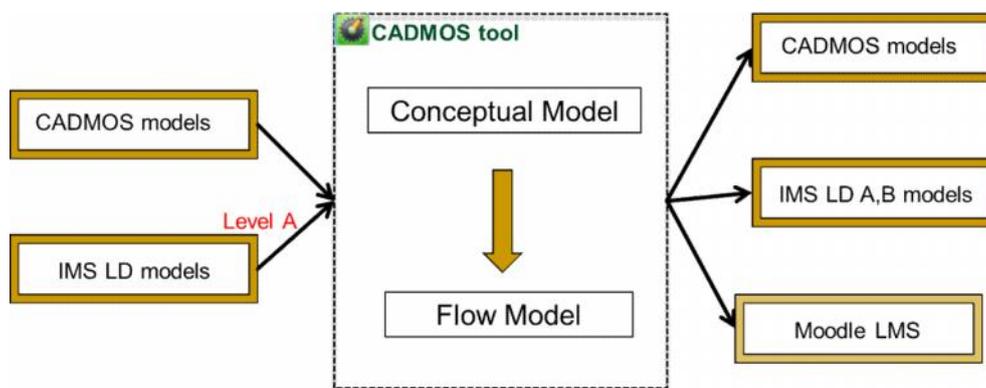


Figure 1: CADMOS learning design process

CADMOS also allows a designer to reuse existing learning designs that conform to IMS LD level A specification. It is the only graphical learning design tool that offers this feature.

Furthermore, the most innovative feature is that CADMOS tries to bridge the gap between the design of a learning script and its deployment into Moodle. It enables a learning designer to export the learning script as a Moodle package thus allowing its enactment in the Moodle learning platform. Thus, it can become a user friendly learning design tool for Moodle courses.

Creating a learning script for Moodle with CADMOS

Figure 2, 3 and 4 show screenshots of CADMOS learning activity conceptual model, learning activity flow model and the Moodle version of a learning script that promotes high school students’ acquisition of collaborative inquiry learning skills in understanding the importance of the waterlands from environmental point of view.

At first students study the theory of environmental importance of the waterlands and afterwards they watch an interview in the form of a video about the proper ways of waterlands’ exploitation from tourist point of view given by an officer responsible for tourism development at the Municipality Avdiron, Prefecture Xanthi in Greece. Then each student must do a self-assessment exercise i.e. answer multiple choice questions. Then the teacher divides the students in pair-groups and asks them at first to visit a number of sites about the Porto Lagos Waterland for studying related material and then to collaboratively create a Google doc about the significance of this waterland as well as possible ways of its exploitation. Finally, the teacher grades the assignments submitted by the groups, gives feedback and closed the lesson with a summary about the importance of the waterlands from environmental point of view.

We created 1 composite learning activity and 6 simple learning activities in this scenario:

Composite Activity 1

Learning Activity 1 Each student studies theory about the waterlands from the view of an environmental expert (type theory)

Learning Activity 2 Each student watches a video interview given by an officer responsible for tourism development at the Municipality Avdiron, Prefecture Xanthi in Greece (type theory)

Learning Activity 3 Each student performs a self-assessment quiz (type assessment)

Learning Activity 4 The teacher shares a worksheet with the creation of pair groups and the outline of the exercise (type informative)

Learning Activity 5 Each pair group accesses specific sites on the internet about the waterland of Porto Lagos (type theory)

Learning Activity 6 Each pair group creates the “googledoc” exercise (type assessment)

Learning Activity 7 The teacher grades the exercises and sends feedback to the groups (type feedback)

Learning Activity 8 The teacher summarizes (type theory)

Figure 2 shows the conceptual model of the learning scenario “Waterlands-The Waterland of Porto Lagos”. For each simple activity we define metadata (title, description, learning goal, prerequisite, type, role), which are not shown in the figures. Specifying the types of the activities, gives the opportunity to the designer to get an overall idea of the nature of the learning design (e.g. more emphasis is given on theory or students have to do a lot of assessment and no collaboration, and so on) by clicking on the “Statistics” button of the tool.

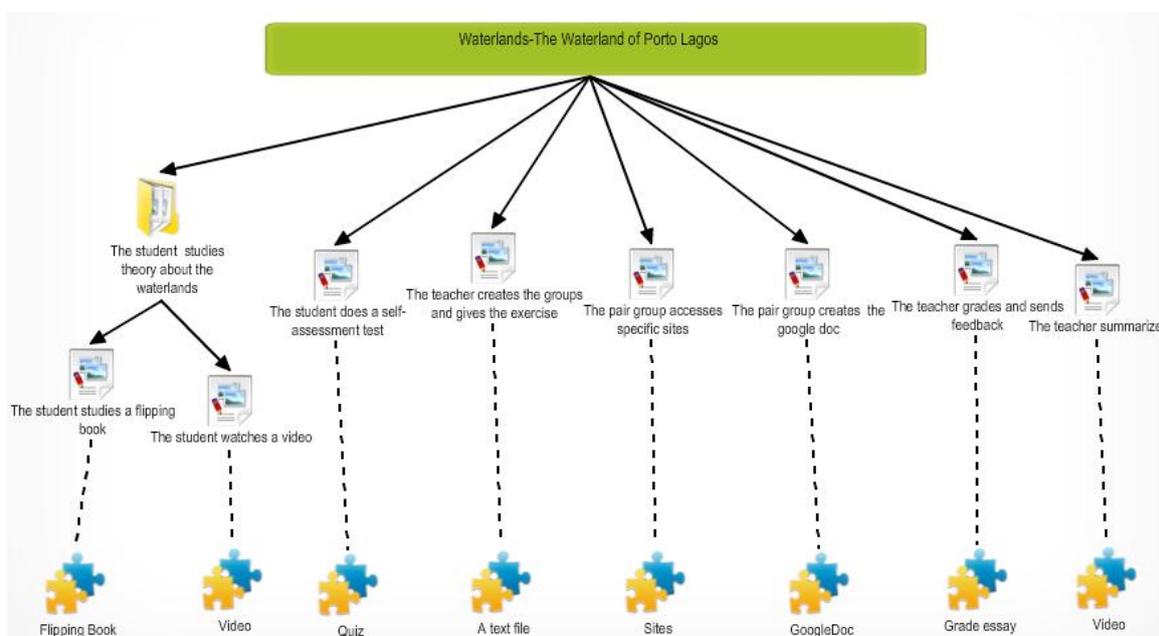


Figure 2: Conceptual Model of the “Waterlands-The Waterland of Porto Lagos”

As we can see in Figure 2, every simple activity is linked to a resource. For every resource we also define metadata (title, author, description, type, copyright, resource file), which are not shown in the figures. In the suggested scenario we define the following type of resources, as shown in Table 1 below.

Table 1: Activity’s resource types in CADMOS

Activity	Type of Resource
1	hypertext
2	video
3	quiz
4	hypertext
5	hypertext
6	hypertext
7	hypertext
8	video

Figure 3 shows the flow model of the scenario. In this model we see three different swim lanes, one for each role i.e. student, teacher, group. The activities are set in the vertical axis, according to their chronological order. The model is divided into three different phases: Phase 1: Study Phase, Phase 2: Practice Phase, Phase 3: Closure Phase. In the student’s swim lane the first two activities are grouped inside a rectangular in order to show that they belong in a composite activity, as it was specified at the conceptual model. Also the self-assessment has a time-limit rule that specifies that this activity should end after 1 hour and 20 minutes.

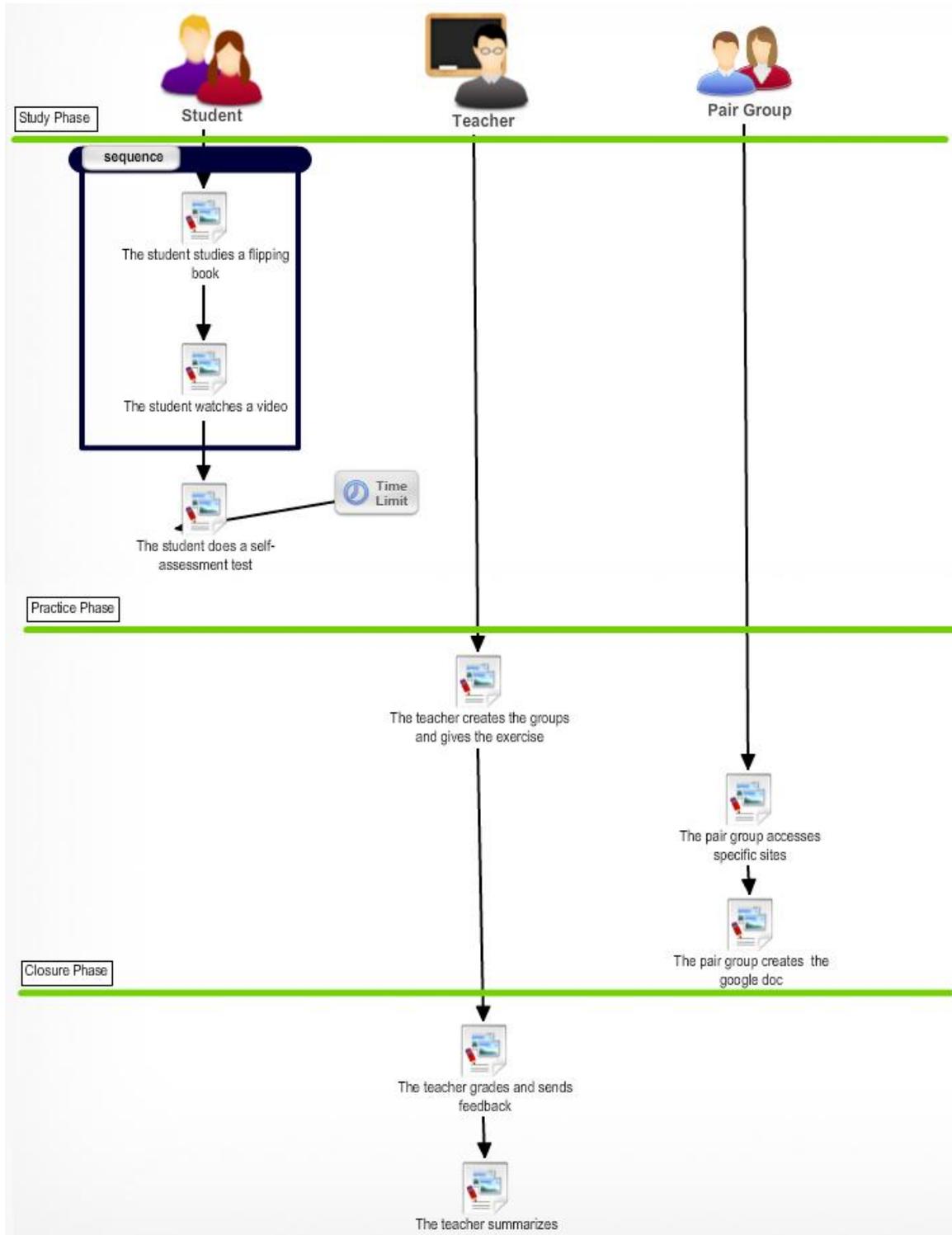


Figure 3: Flow Model of the “Waterlands-The Waterland of Porto Lagos”

Figure 4 shows the Moodle preview function of CADMOS tool. With this function CADMOS converts the learning script into a Moodle course ready to be deployed by converting CADMOS tasks/activities to Moodle resources/activities, phases to Moodle topics etc. according to a mapping schema that is explained in Figure 5. The mapping schema between the CADMOS resources and the Moodle course resources/activities is shown in Figure 6.

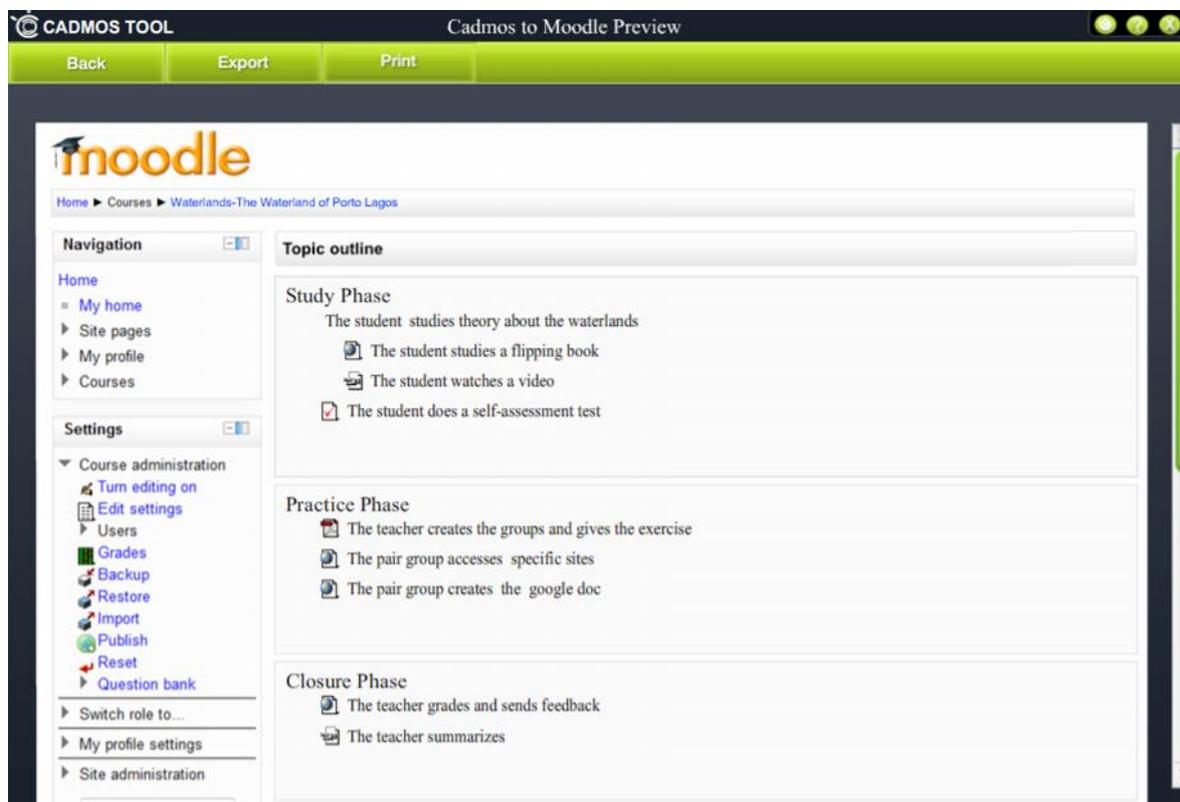


Figure 4: Preview of the collaborative inquiry learning script, as it will be deployed in Moodle.

The learning script is now ready to be exported as a Moodle course and be deployed in a Moodle platform for enactment. The exported file is Moodle course backup file (.mbz) and can be imported in Moodle through the course restoration process. The deployed Moodle course will allow teachers to evaluate their learning scripts during the educational process and make adjustments if needed directly in Moodle or in CADMOS.

Table 2: Activity’s resource types from CADMOS to Moodle

Activity	Type of Resource	Moodle Resource
1	hypertext	url resource
2	video	file resource
3	quiz	Moodle quiz
4	hypertext	file resource
5	hypertext	url resource
6	hypertext	url resource
7	hypertext	url resource
8	video	file resource

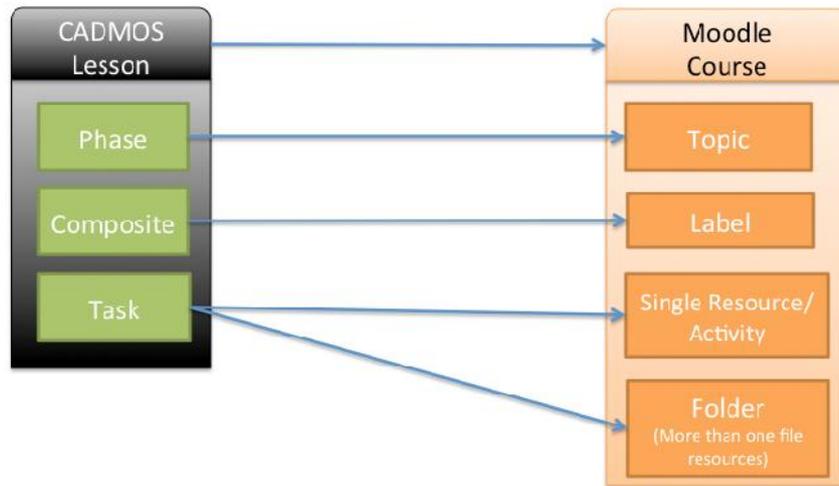


Figure 5: CADMOS to Moodle Structural Model

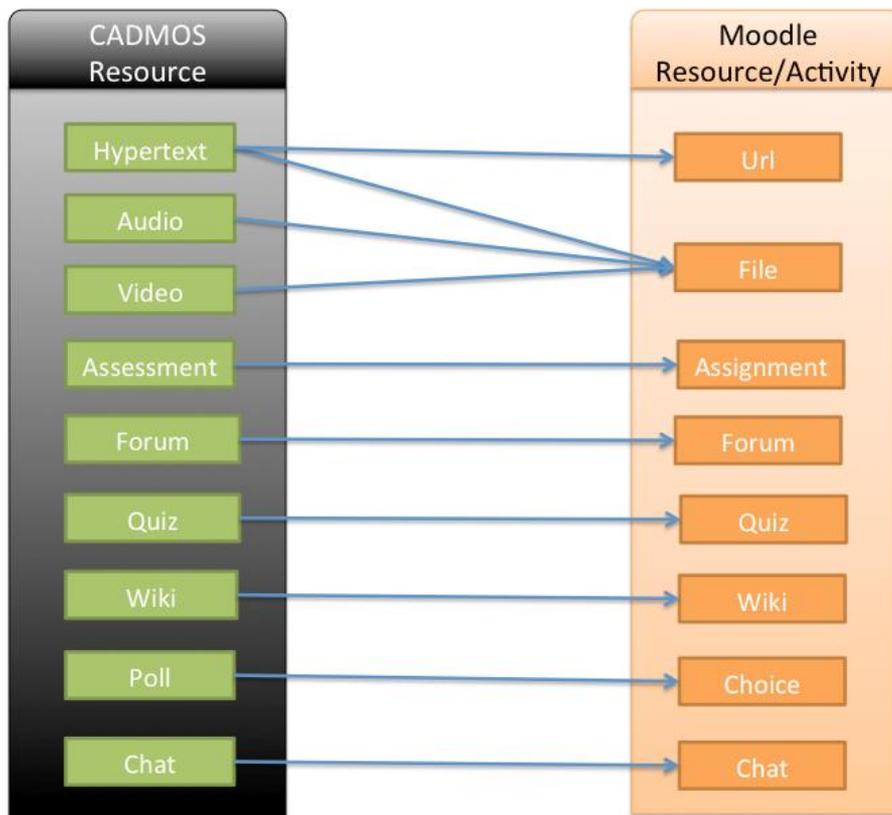


Figure 6: CADMOS to Moodle Resources/Activities Mapping

CADMOS Evaluation

17 out of 30 students, who attended an Msc course on e-learning technologies, which is being organized from the Faculty of Primary Education of the University of Athens in collaboration with the Department of Mathematics of the Technical Institute of Piraeus, voluntarily participated in a usability evaluation case study of the CADMOS tool (v.1.9). Fifteen (15) of these participants were teachers (9 of them were primary school teachers and 6 of them were high school teachers). Nine of them didn't have experience in learning design,

while the rest of them had used one learning design tool at least. All students had used CourseLab, Moodle and QuickLesson.

The evaluation study was organized in two phases:

Phase 1: During this phase the philosophy of the CADMOS design method as well as the functionality of the tool was explained in a laboratory. Students had a hands-on experience since they were called to create lesson plan using CADMOS which was given in a narrative format. The lesson plan was about a topic of environmental education in high school and it is suggested by the Greek Pedagogical Institute. This phase lasted almost three hours and the research group made observations about the students' usage of the tool and wrote down the students' questions and first reaction.

Phase 2: During this phase the students were given the CADMOS tool v.1.9 and another prescribed lesson plan in a narrative format taken from the curriculum of history of the last grade of primary school (also a suggestion by the Greek Pedagogical Institute). This lesson plan concerned the historic facts about Alexander the Great which was familiar to all participants. Participants were asked to design this lesson plan using the CADMOS and deploy it as a Moodle course. The duration of this phase was one week. During this week participants could pose questions or make comments about the software via a web forum.

After the completion of these phases, participants were called to answer an on-line questionnaire of 31 questions. 24 close type questions of this questionnaire were related to i) the user friendliness of the CADMOS enabled design approach and ii) the usability criteria of the CADMOS tool. Six questions were open type that allowed participants to express themselves about the CADMOS tool and the CADMOS supported design method.

In general the comments were positive. 94,11% of the participants declared that they can easily understand the philosophy of the tool and the two different models. 94,12% of them argued that the use of CADMOS is very simple to use while 52,94% said that they likes the tool a lot. 64,71% mentioned that were satisfied from the guidance that the tool offers them. 76,47% of the participants claimed that the graphical representation of a learning design in CADMOS is more illustrative, easy to create and to understand than the usual narrative form. Some of the questions were about the Moodle course deployment feature. The majority of the participants (58,82%) claimed that with CADMOS they could design easily a course for Moodle. 64,70% of the participants stated that they could easily understand how to design a Moodle on-line course using CADMOS, while 64,71% of them said that they agreed with the way the Moodle elements had been mapped to CADMOS conceptual elements. Very important remark was that 58,82% of the participants claimed that the way that the course was represented in Moodle was in full accordance with the two models of CADMOS design. In general, from the observation of the research team and the analysis of the submitted lesson plan, participants were satisfied by the CADMOS and hugely appreciate the fact that there is a tool that can help them design and deploy a Moodle course.

Conclusions and Future plans

This paper presents the CADMOS tool which is a stable, user friendly learning design tool (as the various case studies show) that allows an educational practitioner to create a learning script which can be deployed to Moodle. There are several issues need to be further explored when using CADMOS as a learning design tool. For example, although in its current implementation CADMOS offers a specific taxonomy for describing the learning and support activities. CADMOS taxonomy is definitely smaller than other taxonomies such as the DialogPlus (Bailey et al., 2006). Still, validation by teachers and experienced designers is needed in order to make sure that all activities can be appropriately characterized keeping CADMOS taxonomy rather small. The same issue is related to the metadata (especially the "type" element) of the learning resources. As we can see in the above example the provided options cannot sufficiently characterize learning services such as file sharing or online document creation.

Moreover, using CADMOS as a learning design tool for Moodle courses is quite challenging. First, CADMOS needs to offer flexibility to a designer on how to create a learning script in terms of the way to orchestrate the activities, the rules need to be added, the types of activities that students should perform, etc. As an effect, a learning design in CADMOS might have adaptation rules that Moodle cannot support such as the option to change the order of execution of the learning tasks in a composite activity from sequence to free selection. There are also other rules that Moodle can support but the current version of CADMOS does not allow a designer to include them in the export package of a learning script that will be deployed in Moodle. Although a

designer can add rules using CADMOS, the way to codify them and “package” them into a learning script in order to be deployed in Moodle needs further investigation. For example, a learning script might include a self-assessment activity where the next activity to be performed by a learner depends on the assessment score -a learner might need to repeat an activity if the score is below average or skip an activity if the score is high. Although both CADMS and Moodle can support this rule, more experiments are needed to be made on how CADMOS should “package” them in order to be fully compliant with Moodle’s restoration mechanisms.

Moreover, CADMOS should make sure that the mappings between its learning design elements and the Moodle’s elements are correct and comprehensible from both semantic and functionality point of view. Such case is the “phases” element. In its current implementation, CADMOS suggests that each phase is mapped to a “topic” element in Moodle. However, Moodle offers another way of structuring an online course which is the weekly structure. Mapping a “phase” to a “week” is feasible but also a bit tricky since CADMOS allows a designer to assign time limits to each learning task. So, “weekly structure” by default imposes a time limit to each learning activity, which might not be what a designer had originally in his/her mind.

As an effect, further experimentation with learning designers and design experts are needed in order to reach to create usable learning design tool that meets their needs. The immediate plan is to release the current version of the CADMOS tool to the Moodle community and ask users to give feedback.

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Acknowledgements

This work has been partially supported by the SAILS project that has received funding from the European Union’s Seventh Framework Programme (<http://www.sails-project.eu/>). Special thanks to the ITisART.com.gr official Moodle partner company for the valuable technical advices and support as well as to Mr Aris Polyzos for the discussions about the mapping of the CADMOS and Moodle elements. CADMOS can be downloaded from the website: <http://cosy.ds.unipi.gr/cadmos/>.