MIGRATING FROM A WEB SITE TO A MOODLE BASED CMS

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This paper presents the results of a work done to demonstrate the advantages of adopting a course management system versus a pure web site for teaching aid. It presents the lessons learned during the process of migrating already existing web contents to learning objects organized in SCORM content packages. The adoption of MOODLE as a concrete free CMS for publishing the migrated contents is reported. Finally, the use of the system for continuous students' performance evaluation and other teaching activities are mentioned.

1. Introduction

Nowadays Information Technologies constitute a valuable instrument to develop and experiment new forms/strategies of teaching and managing course activities, having always in mind the increase of students' success and consequently the improvement of the overall level of satisfaction. During the past few years, the authors have adopted the use of multimedia technologies assembled in a web site to constitute the main learning base for an introductory course to electronics. Starting practically from the scratch, the web site was built resorting to public domain tools for developing interactive applets, video clips and filling forms. The site was continuously improved and worked as the main resort for the course support. It can be visited at the address presented in [1].

The main lesson learned is the approach based on a web site works only in one direction, i.e. it feeds information for the students but it doesn't give (or at least it is hard to implement for any non web specialist) any information to the teacher about the students developed activities. Additionally, the teacher had facilitated the way it supplies input to students, but in reverse it was a hard rush to process on time the materials turned back by the students like, small quizzes, homework, etc.

Recently, in the context of the Cita'2 project [2], the authors had the opportunity to contact with the efforts made by the e-learning communities and decided to adopt MOODLE [3] for the implementation of a Course Management System (CMS). This decision has three main goals in sight: i) to solve the problems of bi-directional communication between teacher/student and to take advantage of the computer aiding facilities available; ii) to attract other teachers to adhere to the initiative and promote the proliferation of the platform inside the Department; and iii) to start the dissemination of documentation production according to the SCORM [4,11] standard, starting the encouragement for the teaching materials resources sharing.

The paper presents the work done by the authors during this migration process as well as presents the results achieved, namely: the process of transforming the resources already available [1] in learning objects able to be loaded in any LMS; the development of online interactive quizzes; and finally, the teaching performance results achieved because the new system is simultaneously used for the support of the ongoing semester.

2. Former course web page

The course we are reporting is an introductory course to electronics. Its main goal is to unify the students' knowledge on electronics by the time they start coursing the graduation. The course syllabus and supporting labs works stabilised a long time ago, however the students' performance has been decreasing. After some cause effect analysis it was concluded that one of the main reasons for

performance falling is due to students' inability to read the supporting texts or they were not willing to spend the required reading time. It was also realised they like to surf the net and play computer games. These two conclusions led to the decision of setting up a web page to support the course contents resorting to interactive and simulation tools as much as possible. This page has been in operation during last years and also updated according the experience got along the time. The URL for the mentioned web page is given in reference [1].

The page navigation was structured in order to offer several ways of presentation: i) week syllabus and lab activities; ii) theory index by topics and iii) exercises index. To motivate students' work, most of the proposed exercises are interactive. According to some particular information, like the individual student's number, the system can generate the same type of questions, but involving different final results. In this environment the student is immediately informed about the correctness of its answer. This kind of web page is not difficult to build if we use proper JavaScript tools, java applet software or video clips. Additionally this approach can be followed to interactively exemplify the physical models under study. Figure 1. presents an example of interactive applet to exercise the principle of a current divider based on two resistors *R1* and *R2*. The student can change the value of these two resistors and also arbiter the input current *i*. The applet calculates the two currents i_1 and i_2 according to the formulas given. Similarly this applet can be adapted to evaluate the student knowledge by reversing the roles. In this case the system arbitrates the resistors' values as well as the input current and the student is asked to input the resulting currents i_1 and i_2.

The results of this new approach are encouraging, however there are some aspects the system doesn't support: i) the information flows only in one direction; ii) the system works fine to publish text, exercises' lists, but does not offer efficient tools to evaluate the individual work of each student. It is considered important to renew the student's work since it encourages its continuous work, however this system does not help to log students' activity.
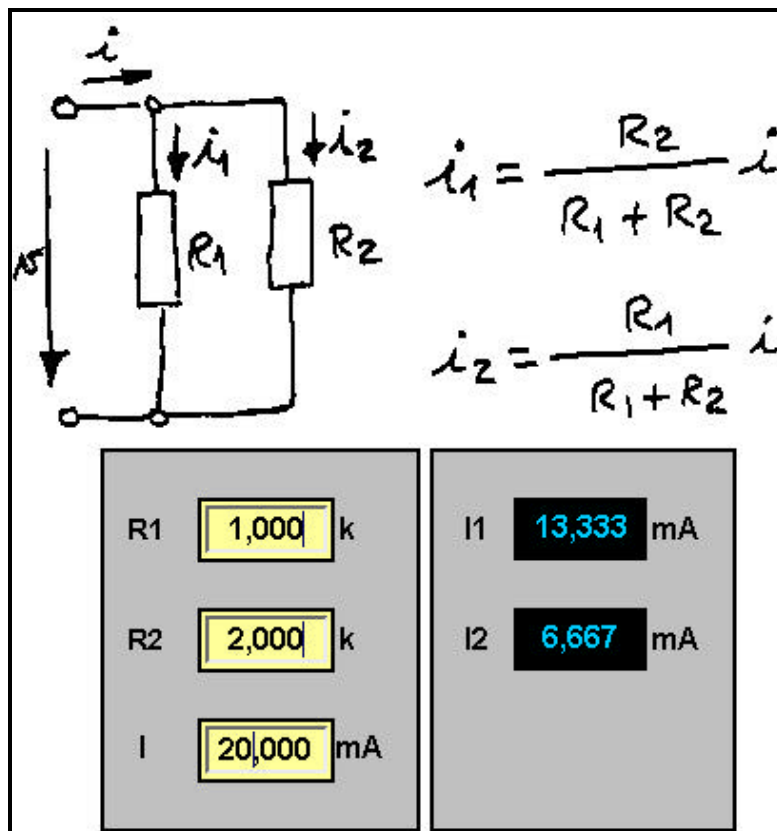

Figure 1. Example of an interactive applet used to study the current divider.

Other relevant aspect to be mentioned is related with the personal involvement of each teacher with the setup and maintenance of the course web page. There is a daily need to update the page and this can be a problem for those that do not manage well the web authoring and administration tools. Additionally, best practices for web based teaching aid materials are needed in order to encourage and promote the continuous development and improvement of course web contents.

As a conclusion of this experience, a more powerful infrastructure is needed like a course management system.

3. Why Moodle

Actually there are a lot of commercial course management platforms, however a decision was made to adopt one based on open and free software: Moodle. As already previously mentioned the authors contacted with Moodle in the context of their participation in the Cita2 project [2]. After doing a search for previous experiences in Moodle, we found out a lot of reports describing the success of their experiences. One example of such reports describes detailed the evaluation made at the University of Dublin [8]. This evaluation considered all aspects, like those related with pedagogy and virtual course management, user friendship features, authors' learning curve and an economic analysis comparing the exploitation costs using Moodle versus other non-free platforms. Additionally Edutech at the University of Fribourg [7] publishes a web page containing the main competing products and for each one presents a table of strong and week points, Moodle is in a comfortable position. These results corroborated our opinion when contacting Moodle for the first time.

Another aspect concerning our decision is related with the open source issue. We would like to invest in a system that offers guarantees of being available for a long period of time. If we get the software project source, and if it is well structured, then it will not be difficult for us to maintain it, correct particular problems and as well as contribute to its enrichment by adding new modules or functionalities. This last aspect is important mostly for us, because we had already started the installation of students' administrative management tools and we would like to integrate Moodle in order to use the students authentication system already existing.

Moodle offers an easy and user friend interface. Teachers, not being expert in computer technologies, can easily interact with it to do daily work namely the production of contents like quizzes, assignments, etc. The supporting infrastructure is also simple and platform independent. In fact the Appache web server, the PHP for html page script and MySql for database, constitute a set of powerful tools available for any common computer platform at free cost. Their installation and setup were made very easy and quick. Finally Moodle can also import and integrate courses structured according to the IMS and SCORM standards. This last aspect is also an important strategic feature since it does not oblige to develop all the courses' material from scratch but on the contrary, we can reuse existing documents as much as possible.

4. Course migration to Moodle

Migrating a course from a web page to a course management system, at first impression, seems to be an easy task. In fact it is; if we are not willing to take advantage of the new possibilities offered by the learning management system (LMS) available, it is just a matter of moving the web links from one place to another. However our goal is much more ambitious: we would like to migrate the existing materials, refine them, develop new ones and always make them available according to the actual standards for containment publication that are independent of the adopted platform. To achieve this goal we decided to reorganise all texts in learning objects elements (LO) [6] and after define the course structure as a sequence of LO.

At this phase, a question arose: how difficult is the restructure of existing texts according to the LO organization? The answer to this question is easily answered after having read existing literature and in particular the text in [6] written by Stephen Downes. We found out that it will not be difficult but it will require a relative work of transformation/reorganization. Additionally, the reorganization in LO packed as SCORM packages, is more dependent on the available tools for SCORM editing than on

the containment production tools. In fact a LO object can be built in any media technology available for the web, ranging from pure HTML pages to java applets or a flash presentation. For SCORM editing, we adopted the open source set of tool developed by the RELOAD project. There are several commercial tools available in the market however for our objectives, the functionalities offered by the RELOAD tools are satisfactory.

When migrating resources organized in a set of related web pages, the main work is to isolate the pages in atomic self-contained sets and remove any cross-reference hyperlink. The result of such work leads us to a possible organization of the contents in a set of learning objects. One question arises again: do the objects obtained by this way comply with the definition of learning object? In our opinion they do, because the definition of learning object does not contain any restriction related with the size of the composing materials. In [10] the following definition for learning object is given: *a learning object is defined as any entity -digital or non-digital- that may be used for learning, education or training*. This is one of the several definitions we can find in the literature, but in our opinion it is one of the most objective that can be found and our approach is in line with it.   To make the work more consistent, the following general guide lines were identified and followed: i) organize a learning object as a small unit of learning where the typical time required ranges from 2 to 15 minutes; ii) avoid or do not use at all hyperlinks – a learning object is self containing; iii) use navigation sequences outside the learning object – SCORM offers sophisticated mechanisms to support sequencing; iv) supply the meta-data as much complete as possible – metadata is important for facilitating the sharing, usage and retrieving of the learning objects. However this last guide rule related with the learning objects' meta-data, by the time this paper is written, was not taken into consideration. There are two main reasons for taking this decision: i) extra work must be done in order to study and evaluate existing ontologies; ii) once it is mostly important for archiving learning objects in a digital library, metadata information filling can be delayed for a later phase.
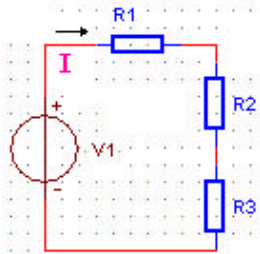

Figure 2. Interactive applet used to evaluate Ohm's law.

In general, the migration process is seamless. Even, the interactive examples work fine after being encapsulated in learning objects. However what was considered satisfactory when published in a web page, it is not any more when published in a learning management system (LMS). In fact, to take advantage of the new facilities like automatic track and evaluation of the interaction by the LMS, it is necessary to incorporate in the learning object's resources the interaction with the LMS application programming interface (API). This API is composed by eight java script functions for establishing the link between the content displayed and the LMS; for a detailed description please read reference [12]. Through these functions it is possible to program the learning object's resources in order to collect the learner's name, the learner's ID, scores on quizzes, time spent in an activity, etc. In the SCORM model, content initiates all communication. When it is launched, it tells the LMS it has started. When it wants something from the LMS, it asks for it. When it wants to update learner information, it tells the LMS the relevant data to save/update. And when it is finished, it tells the LMS it is finished. This passes control back to the LMS, and the LMS decides which SCO will be delivered next.

In figure 2 is presented an applet used for evaluating the skills of the student about the Ohm's law. This applet was used as it is presented in our former web page. The student enters three data values: its ID number, its group number and the calculated current. The applet based on the students ID (20001 this case) and group's number (101 this case) generates the values for V1, R1, R2 and R3. After the student entered its answer the applet verifies if it is correct or not and gives a classification of *right* or *wrong*. In a web page there is no easy way to get log about the student's activity unless it returns to the teacher a printed page. When we transformed this applet in a learning object and loaded it in Moodle, the object worked fine, however it did not communicate activity information to the system. The reason is simple; the former programmed behaviour must be altered in order to communicate with the LMS API. This alteration can be a big problem if specialised tools were used to generate the programmed logic. That was exactly our case. We developed the programmed logic using an excel worksheet and a conversion tool to translate it to HTML with embedded JavaScript. The only way to integrate the applet with the LMS API is to manually alter the generated JavaScript code in order to communicate with the LMS the activity's results. This constitutes a problem for those that do not have programming skills. For now we decide to let the applet work just for training and use the alternative tools offered by Moodle for evaluation.

Considering the material related with students' evaluation and exercises lists, the migration process was not done directly to SCORM packages. Moodle owns an excellent module to develop quizzes. Using Moodle's interface for quizzes development is easy and intuitive, and it also includes the possibility of importing questions form external sources. In the reported work, existing exercises were manually translated and integrated using the Moodle's quiz module tools. This decision was mainly based on the urgency we have to get the materials online and ready for use.

Finally we would like to remark an important aspect related with the tools we select to produce learning objects' resources: select those that are already adapted to use the LMS API. If not, you will have a long way to run until you get your objects developed properly for taking advantage of the services offered by an LMS. Actually most of these tools are commercial products and some efforts must be done in the free open source community towards the development of this kind of tools.

5. Teachers' adhesion and students reaction

The course with the environment described in this paper, occurred for the first time in the spring semester of 2006. It was taken by a small set of students, about forty, that failed the subject last autumn semester. These students had the opportunity to contact with both systems and their final comparative evaluation expressed a preference in favour of Moodle. The main aspect they mentioned was the fact of being informed immediately about their performance. By the time this paper is written, the final evaluation process has not finished yet, and a final comparative evaluation of results cannot be presented. However, we have the intermediary results that when compared with those obtained in previous courses, we expect an increase of 20% to 30% in the number of successful cases. The performance increase is due to the fact of the system is continuously monitoring the students' activities as well as permanently keeps the student informed about the work to be done and due dates. This aspect is important especially for first year students that have not developed yet a self-control

attitude. The Moodle system was made available by the department to those teachers interested in evaluating and useing it by their own effort. Two kinds of reaction were evidenced: those teachers related with computer subjects rapidly adhered and decided to use Moodle to manage the daily activities of their students in the context of their classes; those that didn't feel comfortable with computers were not interested at the beginning to use it for direct interaction with students, but decided to start learning how to use it. When they started they were more interested in learning how to build quizzes, exercises and assignments rather than in how to produce learning objects and SCORM packages. They learned it by their own, asking us for help on some particular aspect they could not solve. A special mention shall be made to our colleagues teaching maths for their enthusiasm and engagement in producing maths' activities. We really wish them a great success in the battle of students' motivation for maths.

As a conclusion, we consider the experience went beyond our initial expectation in the sense that much more important than starting the production of learning materials in the form of learning objects packed as SCORM packages, is the setup of a course management system, for substitution of web pages sites. Of course SCORM, is an emerging technology and soon it will get importance, mostly after this phase has been reached and consolidated.

6. Conclusions

In this paper we described the work done for the migration of web resources for the support of an introductory subject on electronics to a course management system. The motivation for this work was mainly because we realised that information flew only in one way: from teacher to student. The reverse path was not supported by the web site and it has to be done manually.

The reasons leading to the adoption of Moodle as a CMS are presented. We also found out that Moodle fulfilled our expectations and constitutes a good alternative offered by the free and open software community even when compared with the most relevant commercial platforms.

It is also reported our experience in the work of migrating course information written for a web page to learning objects packed in SCORM packages. We conclude that the migration process is not complex, even for those cases where interactivity is used. However a draw back exists when migrating interactive material aimed to evaluate the student: it is not immediate the integration of this material and the LMS API. For these cases it is better to redesign the material using updated tools that incorporate the interaction with the LMS.

Finally we reported the results and impacts of the experience in our university department. The results are encouraging, once we feel good acceptance for the system by both teachers and students. Actually, by the end of this trial phase, there are more than 600 students registered and using the system.

References
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