Virtual Communities Adapted to the EHEA in an Enterprise Distance e-Learning Based Environment

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Abstract. This paper describes the e-learning architecture of the National Spanish Distance Learning University of Spain (UNED). The UNED has more than 200,000 users of e-learning systems (most of them, students) so it needed an enterprise architecture in order to ensure the performance of the virtual campus. The core of virtual campus is aLF (active learning framework) supported by dotLRN/OpenACS open source framework that provides the e-learning core services. aLF is was modified to support the EHEA learning model, based in activity curricula, providing full integration with the evaluation model of aLF and three new tools to focus on the student tasks planning.

Keywords: e-learning, virtual classroom, activity curricula, EHEA, activity focused training.

1 Introduction

The UNED [1] is the largest public distance education university in Spain with over 200,000 students, 1400 lecturers and 2000 administrative staff. It has been in existence for more than 30 years. Since it is a distance education university students do not come to a central campus to receive their teaching. They attend regional study centres. There are currently over 60 of these study centres distributed throughout Spain and Europe. As well as the lecturers the university also has 6900 tutors working in these study centres. The tutors are an important figure in the teaching process because quite often they are the main contact the student has with the university. They provide the students with support in many ways, for example, giving taught classes, feature leading laboratory sessions, and helping to resolve any problems the students may have with the subject being studied.

One of the key features that set the UNED apart from other distant universities is it consistent commitment to innovation, both methodological and technological. As such, it is evident that ICT has always had an important role within the UNED. Over

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the years its use has grown and currently forms an important part of all of the university's activities. As well as the online teaching activities it is also used as part of the administration process (where the UNED is moving towards the position of being a paperless university), admissions (where more than 90% of student admissions are being undertaken by Internet), and examinations (where the exams are no longer transported to the local study centres on paper but as encrypted electronic files). However, without a doubt the most important application of ICT in the university has been the development of our own online community-based learning platform, aLF [2], for use in our virtual campus.

When the UNED's virtual campus was started in the year 2000, a commercial e-learning platform was initially used. With time it became evident that this system was not sufficiently flexible for the university's needs, and hence the platform aLF (a system being developed by researchers in the School of Computer Science) was gradually introduced as a substitute. With the appearance of the EHEA, modifications were required for aLF, but represented only part of ongoing development activities, and did not by any means imply a drastic restructuring or rebuild of the platform or its tools.

These days it is very common for standard face to face universities, and other academic institutions, to offer forms of e-learning. As such, they are able with very little work, to configure existing online systems to provide the technological infrastructure for these taught courses. Since the student numbers in these cases are typically very small, and the online teaching is typically complementary to their main teaching activities, it is not important that the underlying technological infrastructure is used or not enterprise by nature. In the UNED, however, due to its very distance education-based nature, all ICT used has to be EIS (Enterprise Information Systems). Any EIS should by definition be robust, scalable, OS portable, and interoperable with other systems. The currently popular PHP-based e-learning platforms do not fulfil these requisites, and hence, any application for large student numbers requires custom ad hock solutions, which is far from perfect. Since aLF is built over dotLRN [3], which is an EIS, it is inherently robust, scalable, etc., as any system of this type should be. Since the university's main Information Systems are housed in an external data centre, machine capacities and network bandwidth are guaranteed, and can be easily extended as new teaching initiatives require. In the rest of this article the platform aLF and its tools and services are detailed.

2 aLF Services

The priority of the work undertaken on aLF has been to give support to learning communities more than courses. This conceptualization comes from the general notion of virtual community [4] and is intended to potentiate the fundamental aspects underlying this type of work group: namely, reputation, confidence and intimacy [5]. Furthermore, emphasis is also placed upon other elements that are essential for the success of such groups, including the way in which users: (i) have an objective, some interests or a common activity, (ii) are frequently involved in active interactions, (iii) have access to shared resources, (iv) are provided with communication services for the interchange of information, and (v) are given a behaviour and communication protocol is published [6].

The foundation of the work undertaken on aLF had two pillars: firstly, the technical collaborative development of open and flexible tools. Secondly, the experience acquired during the four years in which support was given to the development of courses undertaken by large number of students, in which the scaling factor was a crucial aspect, and where the needs didn't always coincide with the tools provided by the majority of tools present in the majority of e-Learning platforms.

Finally, another of the premises on which aLF is supported is the shared development undertaken with so many other prestigious universities and research groups. It was therefore established from the beginning that a didactic environment would be developed, called aLF1, whose nucleus was based on one of the most advanced applications at the time, particularly in applications of e-Business, ACS (Arsdigita Community System). Subsequently, the nucleus of ACES (ACS Educational Solution; especially conceived for educational applications, which evolved into the current software dotLRN; supported by Open ACS, the current open version of ACS) was used in the development of aLF2 [7]. The UNED has 8 years of experience of using this type of nucleus, and given the objective of unifying efforts to work on the nucleus.

2.1 Usage Scenarios and Workspaces

In order to provide a customized solution to the university, the development of aLF was focused on two aspects: the addition of collaborative interaction tools (first problem) and to provide several workspaces where to share information from different groups, classes or communities (second problem). So, from the user's viewpoint, aLF provides a large variety of tools organized around three clearly distinguished workspaces: a personal one, the communities (to which the user belongs) and the courses (being undertaken by the user). The services offered, therefore, depend on the environment in which the user's interaction takes place:

- Communities: the organization of different types of work groups (teaching teams, research projects, various associations, departments, faculties, etc.) is made possible. To this end, several communication tools are offered (forums with notification services in e-mail and news), work management (documents shared with version and access right control, links of interest to the group and surveys) and task sequencing (agenda with appointments and weekly task planning).

Courses: apart from the general services already mentioned for the communities, the following are included: document management (tasks, summaries, notes, course guides, and FAQs), activity planning (weekly planning integrated with the course tasks) and several resources (links and shared course files, inclusion and edition of web pages with the course contents, exams, management of students and marks, etc.).

Users: all aLF users have an agenda, a space for documents, links of interest and personal pages in the work area of any user/teacher/student which integrates with the rest of the services offered in the different communities or courses to which the user belongs. Furthermore, tools are offered for different types of users. Hence, the administrators and teachers have specific tools for following the work undertaken by each user and for each type of user. For example, statistics can be accessed by value and by user in each community or course.

In each case, when a user enters aLF, he first accesses his personal workspace ("my portal"), from which he can efficiently access all the novelties that have taken place in any of the communities and courses to which he may belong. In fact, one of the most highly valued aspects by users is the possibility of efficiently accessing any novelty, i.e., a new file added in such groups, the new lines in the agenda, the messages in the forums, the tasks and notes in the courses, the news, etc. Another question related to the management of novelties is the fact that the aLF forums can be managed through automatic response notification services. This allows the user to be warned of any novelty sent to the forum, without the need to be connected to the platform. Furthermore, the user can choose whether to receive news sent by a specific user (e.g., the teacher) about a certain subject and/or to receive an instant warning or report of the novelties that have taken place in the last few days.

Finally, aLF facilitates the organization of the interconnections between the different workspaces, both those related to the personal and collaborative work in the different communities and courses, and those related to the groups and subgroups defined in such communities and courses.

As has be seen above, aLF provides several advantages: customization adapted to the UNED methodological model; a robust and scalable solution focused in corporative environments; and an integrated portal environment for virtual communities (classes and work groups). There are several systems used in different institutions. Maybe two are the most referenced: WebCT [8] and Moodle [9]. The UNED has been using WebCT since 2000. WebCT supports big institutions (like the UNED) and it is a consolidated solution for enterprise environment. Moodle is an open software solution which has a great projection, but it does not have implementations on big systems (the UNED has nearly 200,000 users). Furthermore, both of them solutions are based upon the concept of course with no interaction between courses and group works, and no sharing of educational services between courses. aLF provides these features, sharing all the objects available in the groups (calendar entries, tasks, assessments, news and so on) publishing them in different group targets (for example, from a personal space it is possible to share, not to copy, owned documents to a class, allowing to rich the learning environment [10].

3 EHEA Activities Based Tools

The EHEA directives declare the evaluation of personal and group activity as the main feature of an EHEA e-learning space. So, a professor must do a planning model of course based on autonomy worked tasks and collaborative activities between students. The first feature consists in provide a organizer tool to declare the course mode, so from this organizer the student has a clear view of his/her objectives and whom is going to make collaborative work in order to achieve a good academic performance. In aLF, this feature is providing for the planning tool. The planning tool is a user-friendly interface for thematic or weekly blocks that allows to present in an organized way the different resources of the e-learning platform.

Another problem is how to provide a unified view of content and activities, avoiding the use of hyperlinks (written by professors, so mistakes are common) from content to activities. The idea is to have a navigation model from didactical units (like e-books) easy to define and use. This didactic units have activities sections in order to

add platform resources, so for a professor is easy to declare the planning of course and add it own content integrated with the platform resources (activities, assessments, forums, chats and so on). In order to provide this feature, a new tool called Content was developed to fulfill the requirements. In the following sections these tools will be explained.

3.1 The Planning Tool

In order to achieve the EHEA requirements, a didactic guide based on activity items (assessments, tasks, forums discussion, etc.) must be produced by teachers in order to describe the overall work that students have to do in the course. To support that, it has been created an organization and planning system by blocks where information (resources and activities) can be added by teachers from many sources and ordered in any way. The blocks (organizational unit) can have a topic or weekly format, and a summary is available for each block to describe the contents on that topic or week. For each block new and already created resources and activities can be included, so reusable activities can be defined in order to help teachers in every term (one planning, several terms).

The planning interface [11], see Figure 1, becomes the Community/Course home and is organized in blocks. There are currently two formats for the blocks:

- Weekly Format: Each block represents a week, the week start the day the community starts, this value is set in the Course Settings of the Blocks View.

The current week is highlighted.

- Topics Format: Each block represents a topic, all the activities and resources in this block are related to the topic, in this format the start date of the community is not relevant.

This format lets the teacher select the current topic and highlights that topic automatically until the teachers mark it as not selected or another topic is selected, only one topic can be selected at a time. This option is available for all communities inside the admin panel, there's a link to enable/disable this view, when the view is enabled a default empty block is created inside the community (this initial block it is always

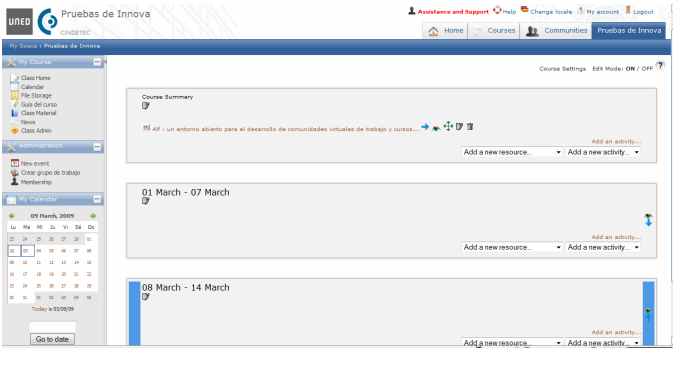

Fig. 1. Planning tool based on organizational units called “blocks”

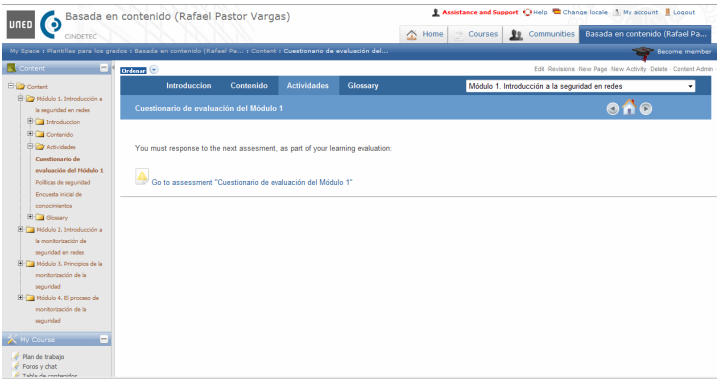

Fig. 2. Content tool: Activities section of a didactic unit

shown on top with no format), it adds the navigation bar to the master section inside that community and it automatically mounts the resources needed (evaluation, assessment, forums, content, pages, chat, etc.) on the community. Each course has many tools available, inside each block there is an option to add a resource/activity, the supported packages are: evaluation, assessment, forums, file-storage, content, pages and chat. All the location actions are dragged based, so all the items in a block can me moved over the same block or others.

3.2 The Content Tool

The Content tool [12] is a simple and easy tool for content creation in an educational context. It focuses on the teacher that wants to create the content of a course in a simple way with a navigation and presentation that will be easy for the student to use. This tool helps the user focus only in the content and text rather than in the presentation, order and navigation that is already done and organized.

The Content tool is fully integrated with the e-learning platform template, see Figure 2, so the navigation menu is always present to the user. This provides an easy layout focused in the didactic unit defined for an EHEA course space.

The content tool has several functionalities, so the four most important are detailed here.

3.2.1 The integration of Activities

A course in .LRN has many tools available to be linked to the content base. In order to simplify the process of linking activities, a new interface was created to guide the teacher with the process. The process of linking activities has several steps, which is why this new interface was designed to guide the user through those steps, since a multi-step process can confuse the user. This interface works mostly with javascript using visual effects for each step in order to improve usability. The functionality of the interface, see Figure 3, is divided into two main steps with the option to go back and forth between them, when possible. The first step is selecting the activity (there is a section with the information about all the activity types), after selecting “select the activity type”, the current activities of that type along with the option to create a new

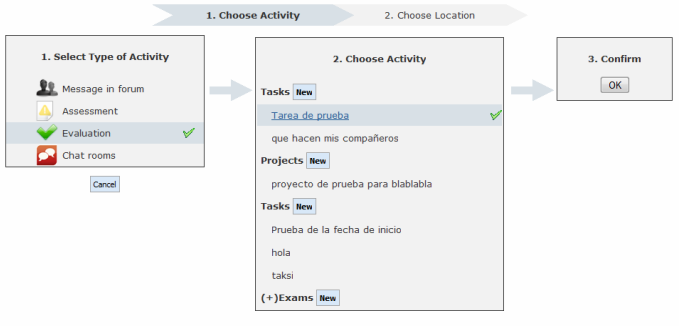

Fig. 3. Step one of linking activities process

activity of that type are shown in an emerging section, after an existing or new activity is selected, the third sections appears with the OK option to confirm the selection and continue to the next step. If another activity type is selected after the third section is open then the third step is closed. This will force the user to select an activity from the type selected (the current selection is not lost but simply not shown until the same activity type is selected again).

The second step, see Figure 4, is to set the details of that activity, a location for the page (where the activity is going to showed) and an optional description for that activity to be displayed in the page. If the selection was an existing activity the interface will add a link to the activity selected. If however, the selection is to create a new activity, then the interface will redirect to the activity type context in order to create the new item, after which, the item is created and automatically added to the content page (but the user will remain within the new activity context in order to be able to configure the activity). The use of these steps gives the user the option to go back one step without having to start all over again. In this interface the user always knows how long the process is going and can focus only on the current action. Each activity is

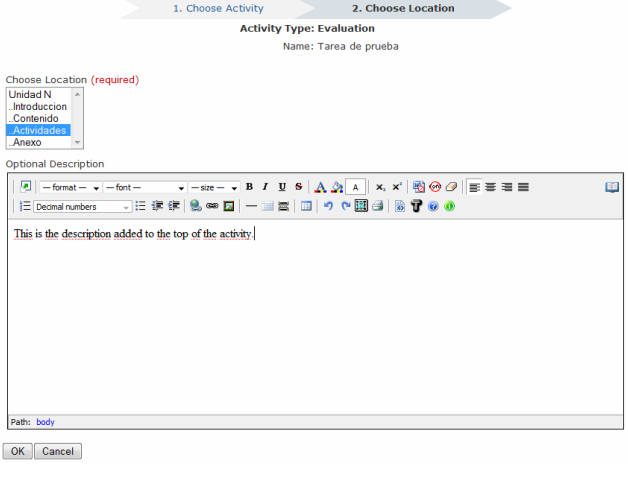

Fig. 4. Step two of linking activities process

displayed inside the content of a page, where the title of that page is the same as that of the activity created (and the optional text is shown above the activity link). The link for the activity shows a message according to the type of the activity, and some validations are done before presenting the link, to be sure that the activity is published (if it is not the case, the message has no link).

3.2.2 Navigation Issues and Group Template

The Content tool displays the content of every course with a template that is dynamically generated. Multiple templates for content sections are an additional option for the teachers to change the way in which the content is displayed to the users in each course; there is a set of templates available to choose.

The whole template is divided into the following parts:

- Sections: an unordered list with the links to the first page of each section.
- Sub-sections: an unordered list with the links to the first page of each subsection.
- Units: a combo-box with all the units available.
- Navigation: three links with an image to navigate left, right or to go to the unit's first page.
- Order section: two links with an image to move the page up or down in the list.

3.2.3 Content Glossary

A glossary is a very useful tool for the teachers to provide a better learning experience for the students. In every page of the content, words can be marked to have a glossary definition by an interface provided inside the rich text editor. A plugin for the xinha rich text editor was created to provide an interface where the terms and definitions are inserted, updated or removed. This plugin has a main javascript file which handles the startup of the plugin and related validations, a dialog is open when the plugin is activated, the dialog has 3 areas, the term, the definition and the existing words. The plugin works by selecting a portion of text to add a definition to, and a dialog opens with the text selected in the term field in editable mode. A definition needs to be added for that text and all the current definitions in the course are shown in the interface, where, depending upon the selected text for the term, the definitions are ordered as being related or not related. In every page the glossary words are links with different color and a tooltip property. If the mouse is placed over a word, the definition is shown in a popup. If the link is clicked it will take the user to the glossary page with all the terms. In the content interface there is an entry for the glossary as an extra section in each unit. This glossary section has one page that shows all the glossary entries, and each entry has a counter that shows how many times the word is being used in all the pages. There is also an option to edit the word on a separate page and an option to delete individually or by group. This page is related to the unit where it was opened from. The navigation tree is focused on the glossary of that unit and the template shows all the sections of that unit.

3.2.4 Automated Copy of Content between Courses

In the content tool there is an automated option to import/export group (course/community) content pages (activities are course-based and are not exportable). The export is done by taking care of the sections/subsections related to the

content and the files inside the content pages. The import is undertaken normally, following which, the import of each page is mapped to the sections/subsections, and for each activity page, a new empty entry is added to the activities table. This will allow the system to treat the pages as if they were activities and link a new activity to them (the glossary word count entries are also added for the target content instance).

4 Conclusions and Future Work

In this article the way in which the UNED's e-learning platform aLF, an EIS, has been developed to support virtual communities, adapted to the EHEA, has been presented. It has been argued that any e-learning platform that underlies these communities in such a fundamental way, has by its very nature to be an enterprise system, due to its robust nature, scalability, etc. While other types of architecture (not EIS) such as the currently popular PHP e-learning platform can be made to support high student numbers (using imaginative clustering techniques), their inherent lack of scalability and other EIS characteristics, unnecessarily complicates their overall performance.

The services provided by aLF have been seen to have been developed to give support virtual learning communities. As such, the way in which groups are formed within communities and how their members can interact has been potentiated. This work has been based upon two underlying pillars: firstly, the technical collaborative development of the necessary online tools, and secondly, previous experience gained by working with these communities (with large student numbers) over the years. To provide users with different views of the way in which they can work with the platform, communities are separated from courses and individual user files. Emphasis has been given here to the flexible interconnection of sources from the different views. Hence, the user is able to access course details from different communities and vice versa.

It has been noted that for the EHEA, two new tools have been developed, namely the planning and the content tools. The former presents the structure of a course to the student as a series of blocks, where each block represents a study module. These blocks are by default presented structurally but can also be presented temporarily, in terms of the calendar dates when they should be studied. The advantage of this way of presenting a course to students is that they can see easily what work has to be done and what the sources they have at their disposition to undertake the work. The fundamentally sequential nature of each block provides a sequencing of activities for the students. For example, a student can see that initially they have to read a text, enter into a forum to discuss it, undertake a practical activity based upon it, and finally, undertake some kind of online evaluation. The latter, the content tool, provides an easy way for users to structure online educational content. It provides an easy way to import or generate new hypermedia content, interrelated structurally. Content manipulation is essentially template-based, where templates may be developed individually or provided at an institutional level. Once a content block has been developed it can be exported to other courses. Finally, it should be noted that the content package includes a glossary where new entries can be added very easily by manipulating existing content entries.

As was noted at the beginning of this article, innovation is a standard ongoing activity within the UNED. As such, the development of aLF over the next few years will continue in the current direction, expanding the possibilities of online distance education, making it more ubiquitous. In basic market terms, as traditional face-to-face universities are increasing their use of virtual communities on online teaching, the UNED must extend its online teaching model to become more "face to face", in the sense of using both the synchronous and asynchronous capabilities of aLF and its tools to shorten distances and enable students to access the tools and educational resources they need to undertake their studies. As such, the future work being contemplated at present, is envisaged to focus on providing a better user experience: copying items and organizing sections, automatic show/hide functions for temporal planning, integration of didactic guides elaborated by professors from other scenarios, SCORM support for the content tool (allowing users to publish and author SCORM objects) and marking up content pages for users (to provide visual tracking of content views).

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