OIKODOMOS TECHNOLOGICAL PLATFORM

Leandro Madrazo[1], Paul Riddy[2], Álvaro Sicilia[1]

[1]ARC Enginyeria i Arquitectura La Salle (SPAIN)
[2]LATEU, University of Southampton (United Kingdom)
madrazo@salle.url.edu, p.j.riddy@soton.ac.uk, asicilia@salle.url.edu

Abstract

This paper introduces a learning platform which has been developed for the OIKODOMOS Virtual Campus. The purpose of this platform is to support the open-ended learning activities that are generated around a blended-learning model based on design studio teaching. The platform is composed of two environments, one to support case-based learning and a second one for project-based learning. The platform has been successfully applied during the learning activities conducted for two years with the participation of four European schools of architecture and urban planning.

Keywords: blended learning, design studio education, collaborative learning, constructivism, educational design, elearning evaluation

1 INTRODUCTION

OIKODOMOS (http://www.oikodomos.org) is an educational research project financed by the Lifelong Learning programme (2007-2009) carried out by higher education institutions and research centres from Belgium, France, Slovakia, Spain, Switzerland and the United Kingdom. The goal of the project is to create a virtual campus to promote the study of dwellings at a European scale, integrating online and offline activities (blended learning). With this purpose in mind, we have developed, implemented and tested an educational framework which focuses on the learning activities carried out in the online environments specifically created for the project, as well as in the courses and seminars being held at participating institutions. In this paper, we introduce the technological platform and its underlying pedagogic model based on the collaborative construction of learning sequences [1]. The results obtained through using the implementation of the model in the learning activities carried out collaboratively by the architecture and urban schools participating in the project are also discussed.

2 OIKODOMOS VIRTUAL CAMPUS

The purpose of the OIKODOMOS Virtual Campus is to create a space of collaboration among schools of architecture and urban planning where they can design and implement innovative learning models in the field of housing studies which overcome the boundaries between formal and informal education, promoting the interaction between academia and professional organizations and seeking the participation of citizens and adult learners.

The educational activities developed in the Virtual Campus are based on the design studio model which is at the core of architectural and urban planning education. These activities are structured as sequences of tasks which are developing in an open-ended manner as the learning process progresses, following a constructivist approach. The learning processes adhere to two basic models: case-based learning, where students collect and elicit knowledge from precedents; and project-based learning, where students develop a project with the support of tutors. Learning activities have taken place in the virtual environments, in design studios, as well as in the joint workshops carried out each semester at the participating schools.

3 TECHNOLOGICAL PLATFORM

Nowadays, there exist a variety of web-based tools to support the learning activities carried out in a Virtual Campus context. Learning management systems (LMS) such as Moodle, Sakai and Blackboard, learning environments to support learning processes such as LAMS (Learning Activity Management System), as well a whole range of social web tools (socialware) such as MySpace,

Facebook, FlickR, Wikies, and GoogleDocs are being used by educators at the different levels, from primary school to university, in both formal and informal settings [2].

At the outset, one of the first decisions we had to adopt when we started the OIKODOMOS Virtual Campus in October 2007 was to choose the appropriate technological platform which would suit the pedagogic framework we started to envision. A basic tenet of the virtual campus was that the pedagogic model and the platform should be closely interwoven. Our goal was not so much to translate established educational spaces (classrooms, lectures, design studios) or contents (lectures, syllabi, tutorials) to the virtual space as to create new learning spaces and models which are born from the capacities that the new medium offers: construction of knowledge in collaboration; interrelation of contents overcoming disciplinary boundaries; collaboration between learners; and communication of ideas by exploiting the capacities of multimedia.

After evaluating the pros and cons of using the existing tools, we concluded that it was necessary to develop a new platform which would suit the pedagogic model to be developed in the project. The main reason for this decision was the need to reinforce the links between the technological platform and the educational methodology in order to facilitate their integration by developing both in parallel. Even though existing LMSs would have provided a ready-to-use environment to set up courses, what we needed was a simple-to-use platform that would facilitate the design and implementation of open-ended learning activities such as those generated around the design studio. This required a learning environment focused on the learning activities themselves –designing them, executing them in multiple ways– and not so much on the management of the learning as it is the case with LMSs. Even though the approach adopted by LAMS came close to our needs, we needed a less formal approach to model the learning processes in a design studio-based education.

4 OIKODOMOS PLATFORM

The OIKODOMOS platform consists of two environments: Workspaces and Case Repository (Figure 1). The former supports project-based learning activities, such as the development of a project –architectural and/or urban planning– in a collaborative manner. The latter is a digital repository of housing case studies, which is also constructed collaboratively by learners. Each environment has a distinct technological infrastructure so that they can be used independently, although they can also be used in combination in some of the learning activities (for example, generating a report in the Case Repository from an analysis of the cases and using it as input in a learning process in the Workspaces).

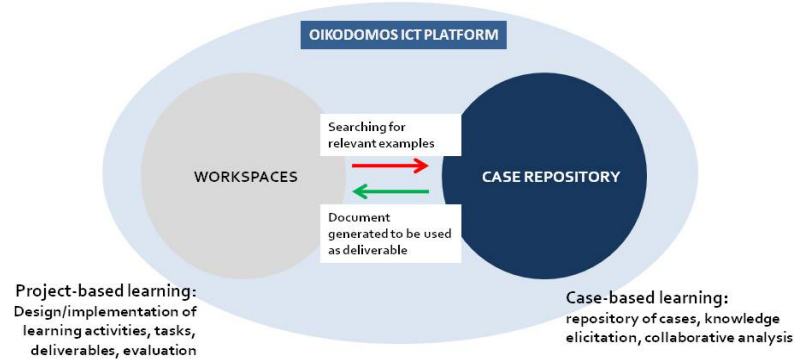

Figure 1. Structure of the OIKODOMOS platform

4.1 OIKODOMOS Workspaces

OIKODOMOS Workspaces is a web-based learning environment which facilitates collaboration among distant learners who are performing joint learning activities in different settings, both physical and virtual: design studios, seminars and courses.

A Learning Workspace is the space where the shared learning activities are designed and executed It is set up by teachers from different institutions who agree to examine a common topic for a certain period of time. It is composed of Learning Activities, which in turn are made up of Tasks which can be either single or grouped in sequences. Sequenced tasks can be constrained to a single Learning Activity or span different ones (Figure 2). This learning structure is flexible and neutral enough to support different kinds of activities – from the collaborative developments of a design to course assignments – which can be carried out in multiple ways – by students working individually or in groups, at a school working independently or in collaboration with others.

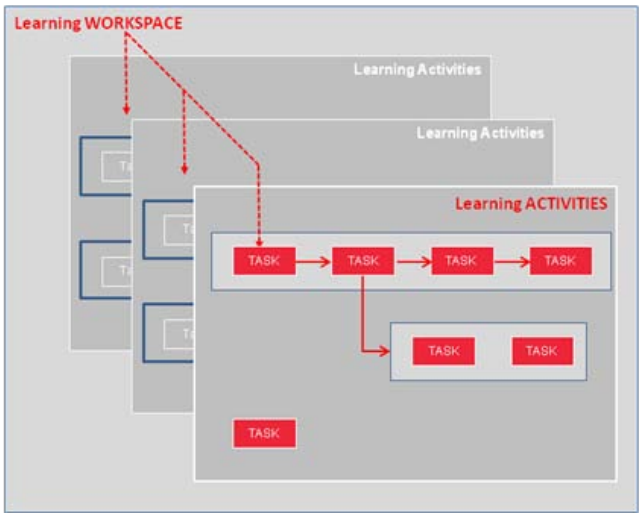

Figure 2. Structure of the learning activities

The Workspaces environment is divided into two areas: Virtual Campus and Learning Workspace (Figure 3). The Virtual Campus area contains the tools to create and manage the different Learning Workspaces which are carried out over time, as well as the data repositories which can be reused in subsequent Learning Workspaces (Institutions and Users, Learning Activities, Learning Outcomes, Keywords). In this way, when a new Workspace is set up, learners can benefit from the data previously gathered as well as from the experience and results obtained in previous Workspaces. Once a Workspace has been set up in the Virtual Campus area, it is possible to define and execute the Tasks which are part of the learning activities. Any number of Learning Workspaces can be opened at once, each one dedicated to the activities performed by different institutions and learners during a period of time.

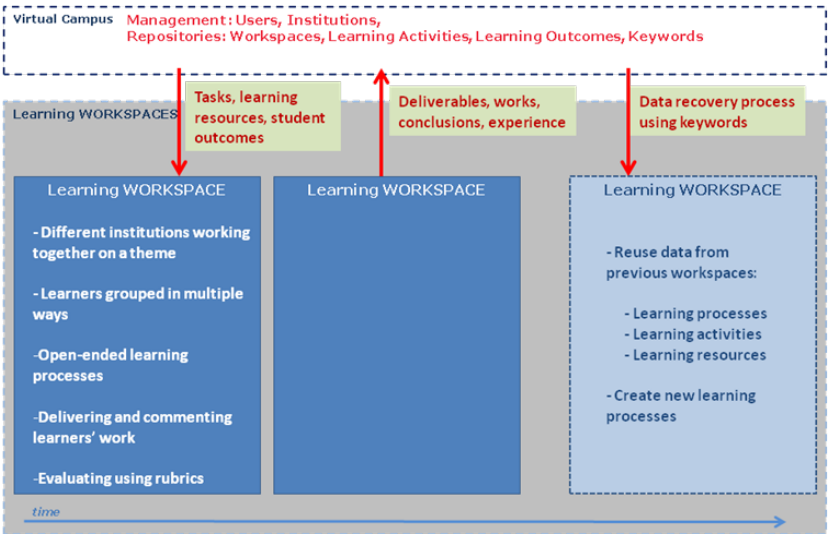

Figure 3. Structure of the Learning Workspace

The functionalities within a Learning Workspace are organised into a menu consisting of:

- Home: Bulletin Board and Log customisable for each of the active groups. This interface provides a quick overview of the system activity and facilitates access to the most recent outcomes (Figure 4).
- Participants: Learners participating in the Workspace including institutions, roles and the groups in which they participate. The work carried out by each learner is summarised in this interface.
- Groups: Students from the participating institutions are part of multiple groups to which Tasks are assigned. The work carried out by each group is summarised in this interface.
- Tasks: Tasks are created within each Learning Activity. A Task can stand alone or be part of a sequence. It can be carried out as individual or group assignment. Learning resources to perform the work are assigned to the task.
- Resources: This contains the learning materials (documents, references) which can be useful for completing the Workspace activities. The list of resources can be filtered by type (text, image, CAD, video), task, learning activity or institution.
- Learning activities: These are selected from the repository of the Virtual Campus area and adapted to the requirements of the Learning Workspace.
- Galleries: Selection of the most relevant student works created in the different tasks selected and commented on by the teachers.

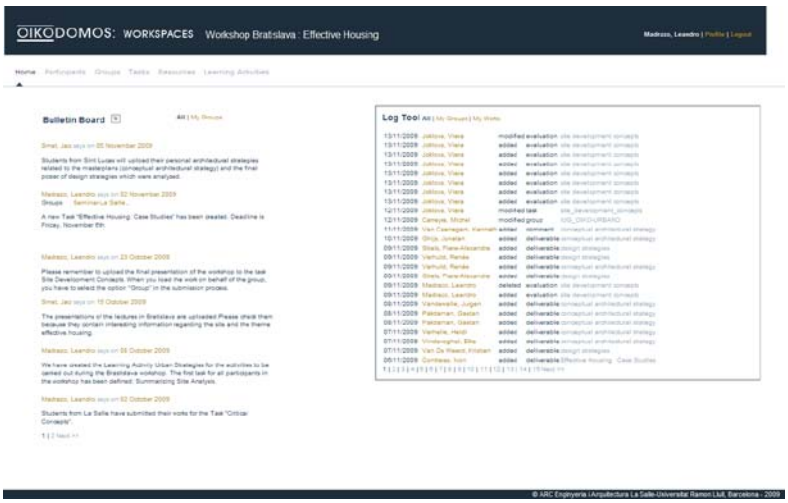

Figure 4. Entry page of a Learning Workspace

The sequences of ongoing tasks are displayed graphically to facilitate an understanding of the relationships between tasks and their evolution over time (Figure 5). Visualizing the process of task development is fundamental for the success of the learning model based on the collaborative construction of tasks. It is necessary for teachers to understand the objectives and results obtained in tasks formulated by another peer teacher before intervening in the process to add a new task. In this way, for instance, teachers can propose a task for their students consisting of evaluating the outcomes produced by the task carried out by students from another institution, or they can formulate a new task which extends a previous one to new objectives. Any online workspace has the potential to sequence learning activities in this way, but our experience and review of the literature suggests OIKODOMOS is the only platform designed to be used in architecture education which has included tools specifically to facilitate the use of evolving learning activities and associated datasets.

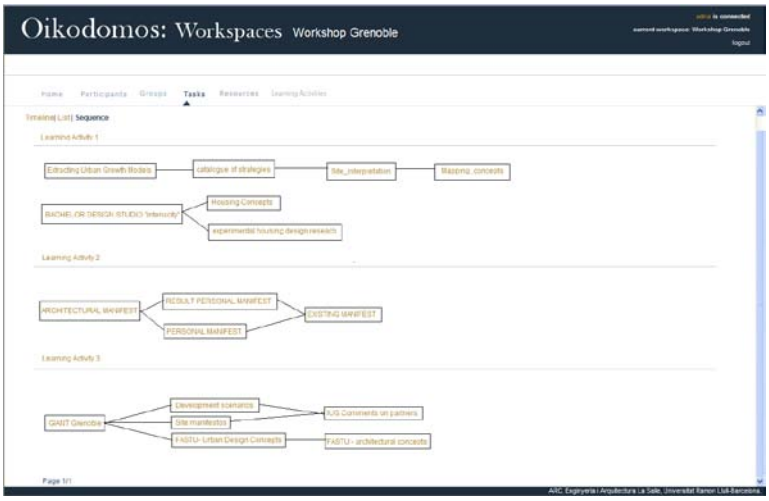

Figure 5. Ongoing learning activities and tasks within a Learning Workspace

In recent years, the design of learning activities which can be used independently or brought together into sequences has been encouraged by the set of specifications developed by the IMS Global Learning Consortium. Learning Design is the name of one of the specifications, but is also a more general term used to describe a process which prioritises student-centred learning, putting the student at the core of the learning process. In the latter context, learning design emphasises careful attention to selecting and ordering learning resources, choosing Learning and Teaching processes and ensuring that the effectiveness of the learning process is evaluated. The use of learning sequences stresses the learning process more than the learning content with the potential to emphasise the interaction among learners rather than between learners and content. Such sequences foster the use of multiple tools in different environments to carry out learning activities [3].

The work delivered by students is displayed when a Task is selected (Figure 6). Alternatively, the works created may also be accessed by a user or group on the corresponding menu (Figure 7). Each deliverable consists of a representative icon, a description and the attached file. Deliverables can be commented on by other learners in two ways: as a single deliverable or as a group deliverable. A file can be attached to the comment, thus promoting critical reflection among learners. Within the deliverable view, it is possible to access the description of the task, the sequence to which it belongs, the materials associated with the task, learning outcomes and the groups working on it.

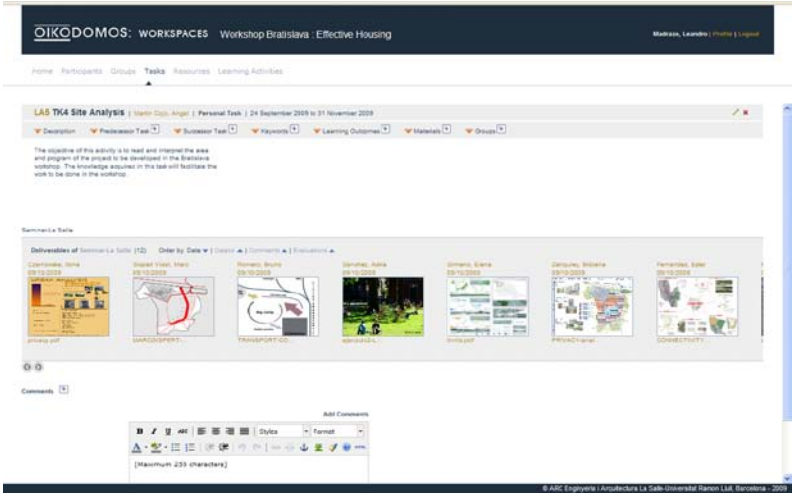

Figure 6. Deliverables submitted to a Task by the different Groups/Users

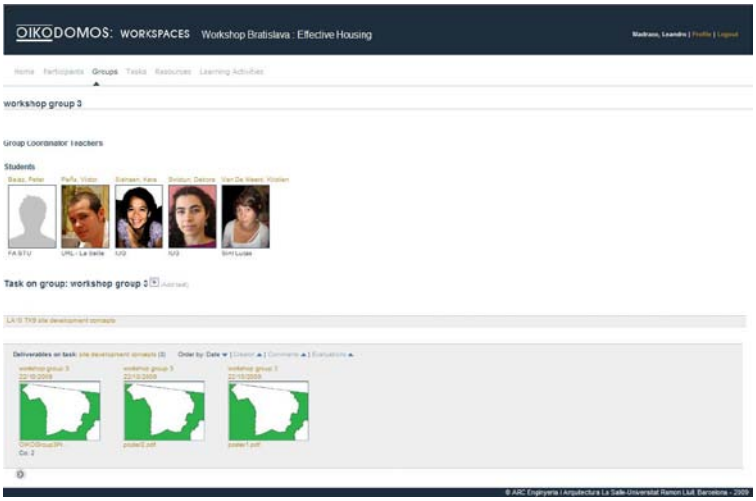

Figure 7. Deliverables submitted by a Group/User

Evaluating learning outcomes and competences are a fundamental part of the approach to the design of learning which we have adopted. As teachers initiate a learning space, they draw up a list of learning outcomes and the corresponding descriptors which will be assigned to the learning activities and tasks. This tight alignment of learning processes through to assessment is illustrated in the diagram below.

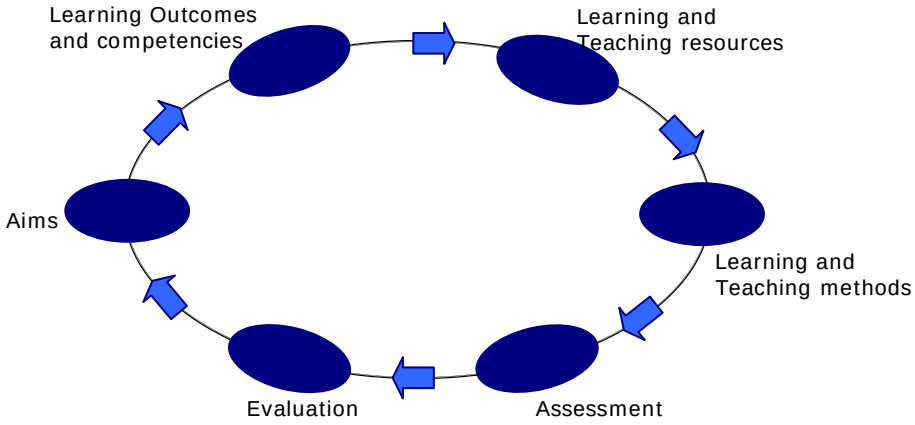

Figure 8. Student-centred aligned learning and teaching

Figure 8 illustrates a process of design for learning in which the learning and teaching elements are reflected on to assure that there is coherence, for example, between what the students are taught and their assessments [4]. Learning outcomes are derived using the model proposed by Bloom [5], which helps to ensure that the students will be working at levels appropriate to the course they are taking, e.g., from using simple skills such as locating information through to more complex skills such as synthesising information.

A grading scheme (rubric) was then created from the list of learning outcomes to be used in the evaluation of student work. Figure 9 illustrates the ranges of marks used, each of which would ideally have an associated descriptor agreed to in advance by whoever assigns the marks. Such agreement is difficult to achieve within institutions let alone on a wider scale. Within OIKODOMOS, the teachers discussed grading in general terms but agreed to apply local marking criteria appropriate to their students, while informally marking all students. These results and their associated comments have been collated as a first step towards the OIKODOMOS partners' collaboratively developing a rubric which could potentially be used for integrated tutoring in programmes jointly run by several institutions.

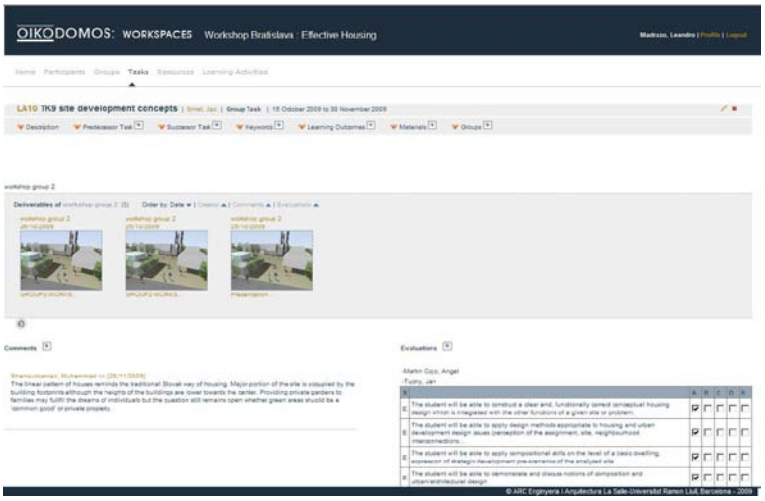

Figure 9. Evaluation of student work using a rubric

Within OIKODOMOS Workspaces, we have created a learning space which supports the construction of knowledge rather than merely providing access to learning resources which have been developed elsewhere beforehand [6]. In this way, both the technological platform and the pedagogic model support each other in the construction of a collaborative knowledge space.

4.2 OIKODOMOS Case Repository

The OIKODOMOS repository is the second major component of the learning platform. This repository is a further development of one created in a previous project, HOUSING@21.EU (www.housing21eu.net) carried out under the auspices of the Erasmus Intensive Program from 2003 to 2006 by five schools of architecture from Belgium, Germany, Spain, Poland and United Kingdom [7]. The existing repository contained over 300 documented cases created by students from five European schools of architecture as part of the activities of the program. As first step in the OIKODOMOS project, the quality of content of the existing repository was thoroughly reviewed: irrelevant information was removed and English texts were edited and corrected. Then, following a usability test of the existing repository and a technical evaluation of the platform, a full-fledged repository was designed and programmed and the upgraded content loaded into it.

The new OIKODOMOS repository consists of a central database with associated Workspaces (Figure 10). This Workspace –which is different from the Learning Workspace described above– enables a group of learners to work with the content of the repository and add new information to it. Before the new content is added to the central repository, a validation process takes place. Tutors need to validate the new content: appropriateness of the case, value of the content and correctness of the text. In this way, we can guarantee that the content of the repository will have the level of quality needed to make it a valuable learning resource.

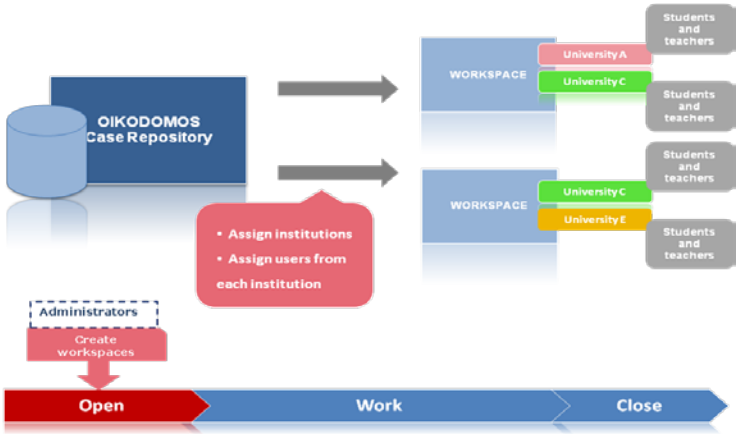

Figure 10. Working processes in the Case Repository

The basic data structure of the repository is the “case study”, which is composed of descriptions, images, bibliographic references, comments, web links, tags and keywords. “Tags” are words that users attach to a case (folksonomies) while “keywords” are categories built into the system to describe a case (ontologies). A “collection” is a group of case studies sharing certain features, and they can be either “private” or “public”. A “summary page” is a format-free document created with the data retrieved from the repository.

Case studies are displayed in a concise form showing all relevant information: representative icon, basic data (architect, place, author), description, keywords and tags (Figure 11).

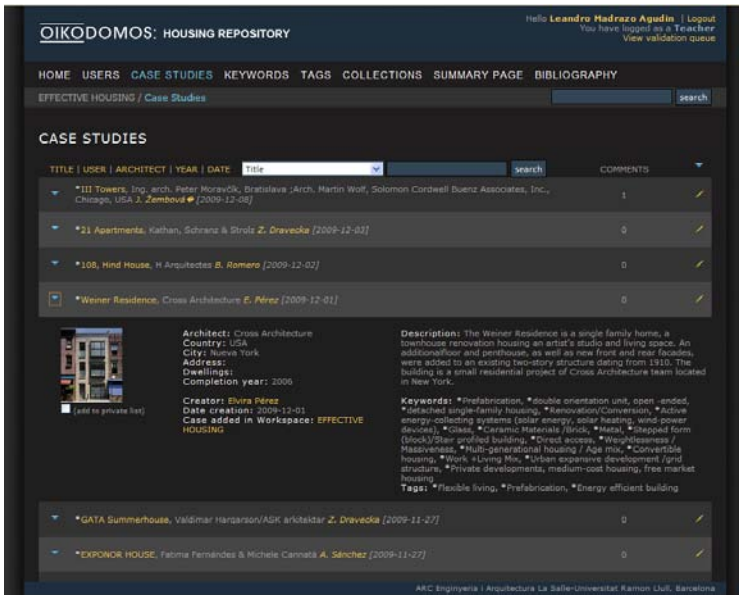

Figure 11. List of cases described in a concise form

After selecting a case, the user has access to its complete description, comprehensive information including its location on a Google map (Figure 12). The graphic information is organised into types of representation: plans, sections, elevations, renderings/perspectives, details, sketches, diagrams, photos, 2-D drawings, and 3-D models. The case study menu provides access to the information associated with the case. The case can be commented on by learners, thus facilitating discussion and critical analysis. Also, other learners can add new images, bibliographic references and tags.

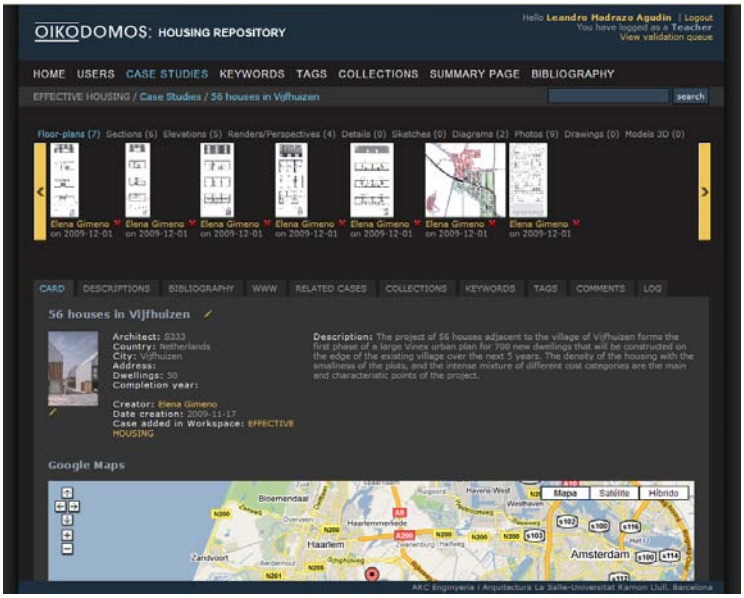

Figure 12. Selected case with complete descriptions

From the existing cases, users can create “collections” which can be stored in their individual working spaces (private collection) or shared with other learners (public collection). This functionality fulfils a twofold purpose: it enables a user to select from the repository those cases that are relevant for the task in hand, and it generates additional knowledge from the existing cases by revealing common features in a group of projects (Figure 13).

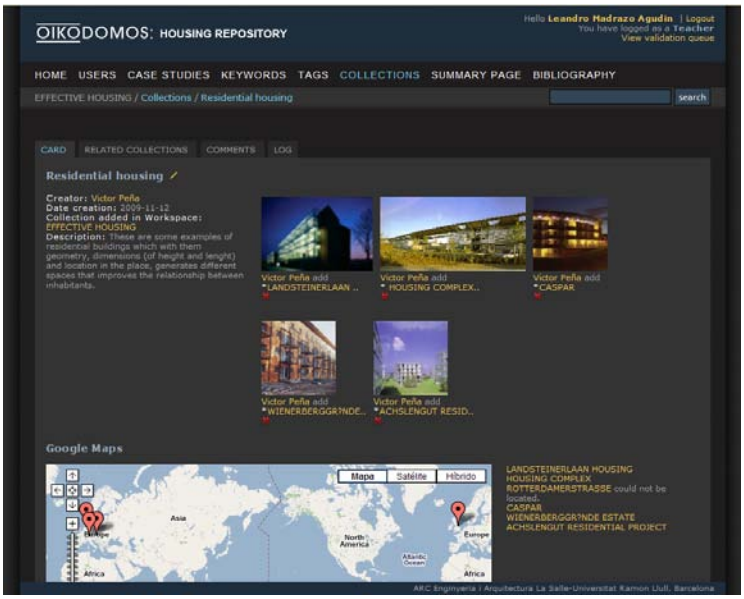

Figure 13. A group of cases

With the “Summary Page” (Figure 14), users can insert previously selected data (a description, an image, a tag) in a free-format document. This information can be complemented with other data (texts, images, links) to create a report and export it in .pdf format. This document can be used, for example, as input for a task carried out in the OIKODOMOS Workspaces. The Summary Page gives the user the opportunity to be free from the repository data structure and to use their expressive capacity to explain ideas or concepts derived from the information system.

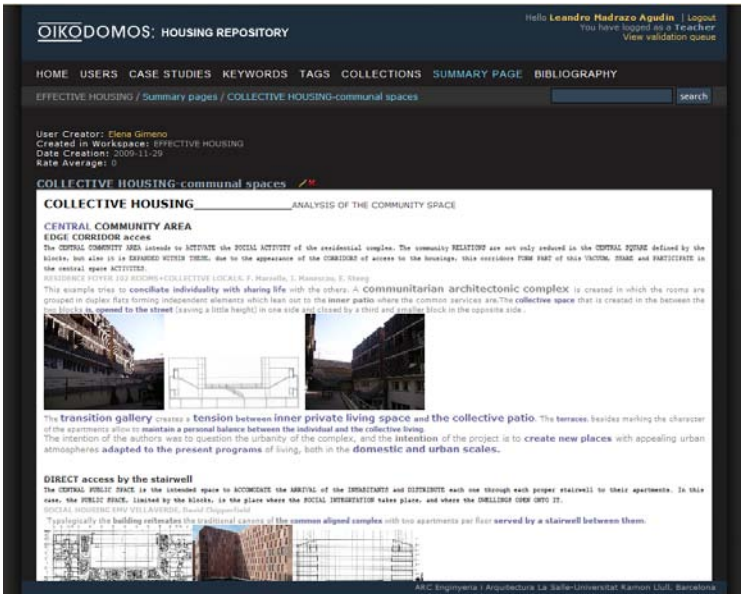

Figure 14. Example of a summary page

The OIKODOMOS Case Repository environment promotes a learning style based on analyses of precedents, which complements the project-based approach of OIKODOMOS Workspaces. For instance, students were asked to collect relevant examples for the subject being examined –e.g.

“effective housing” – which could then become useful references for their peers at other institutions who had been assigned to do a design project on this issue. Case-based learning itself conveys a process of both knowledge construction and knowledge elicitation. First of all, students need to organise the documentation about a case using the structure provided in the repository (graphic representations, tags and keywords, descriptions, groups). Secondly, they extract knowledge from the repository as they sift through the content. Furthermore, in the OIKODOMOS Case Repository these processes are carried out in collaboration, which gives rise to shared and collective knowledge [8].

5 IMPLEMENTATION

The platform has been developed in parallel with the implementation of the learning activities of the virtual campus. An initial version of OIKODOMOS Workspaces was used for the first time in the autumn of 2008. Subsequent improved releases benefited from the feedback obtained after each implementation, until the final version was completed in October 2009. The development of OIKODOMOS Case Repository followed another path, and it was not implemented until it was completed in September 2009.

In their current stage, both environments are functional and can be used to support learning activities. Both environments have been programmed with open source tools, namely PhP and MySQL. This facilitates the further development and maintenance of the platform with the collaboration of third parties. Connections with existing LMS, such as Moodle, have been tested and might be implemented in later releases.

6 EDUCATIONAL APPLICATIONS AND EVALUATION

As discussed earlier, the environments were designed to support an aligned model of learning and teaching, and furthermore to lead students through cycles of experiential learning as discussed by Kolb [9]. As mentioned earlier, the project hosted three Joint Workshops akin to the Design Studios used within architecture education, each of which integrated the use of the online spaces with a face-to-face workshop which brought students and staff from four partner schools together. Student and staff experiences were evaluated at each session using a mixture of informal discussion and questionnaires, and the results fed back into the design of both the environments and the learning and teaching process. The final workshop synthesised the developments over the course of the project, and relevant elements of its evaluation are briefly presented below. Further information is available in the project report [10].

- Students found the environments to be generally user-friendly and effective for supporting their learning. They appreciated the opportunities which the learning and teaching process gave for cross-disciplinary work and international collaboration.
- Underpinned by a common understanding of the pedagogical processes being used, the Workspaces environment allowed partners to collaboratively establish and develop learning activities for groups of students. This included providing and supplementing the support resources required to allow student learning to develop.
- Students were able to upload their work as individuals and as members of a group and could receive feedback from their peers and teachers, as well as marks from their teachers.
- Initial results indicated that the students had deepened their understanding of their discipline. Student feedback indicated that they had gained a greater cross-disciplinary and cultural perspective and useful experience working on multinational teams.
- Staff found the Workspaces environment user-friendly with an appropriate range of tools for effectively supporting the learning and teaching process. They also found the Case Repository easy to use, providing a very useful bank of resources and tools with a great potential for use to synthesise ideas and generate new knowledge.
- Most staff indicated that working with OIKODOMOS had led to a refinement of their approach to designing learning and teaching and broadened their perspective on the requirements for collaborative learning and teaching locally and at a distance.

The experiences of using both environments –Workspaces and Case Repository– have verified the functionality of both platforms and the validity of the pedagogic model they support.

The combined use of both environments provided a unique learning space which could not have been replicated with the existing tools. This learning space, however, does not cover all the needs that learners collaborating through the web might have. For instance, it was necessary to turn to external tools (videoconferencing, chats, blogs) to communicate at certain points (joint reviews, presentations). Nevertheless, the unique aspect of the OIKODOMOS platform lies in its capacity to structure and construct a shared knowledge base throughout the learning process. This way of structuring knowledge is not exclusive to architecture; rather its "constructivist" nature means it is widely applicable to other disciplines as well.

7 ACKNOWLEDGEMENTS

The OIKODOMOS platform has been developed by ARC Enginyeria i Arquitectura La Salle. The programming work has been coordinated by Alvaro Sicilia. Viera Joklova, Jan Tucny, Jao Smet, Jose Depuydt and Luca Botturi, our partners in the OIKODOMOS project, participated in the design specifications of the platform and contributed with their comments and suggestions to their development. The Workspaces environment has been programmed by Joan Pleguezuelos and Adrià Carro using the CakePHP framework and MySQL. Aladar Csernák, from the Slovak University of Technology, has carried out the scheduling interface. Adrià Carro has programmed the Case Repository environment, using the CakePHP framework and MySQL. Mireia Vergés was responsible for editing the content of the HOUSING@21.EU repository. The summary page, the search tool and the Google maps functionality have been provided by Andreas Schmeil from the University of Lugano. Jose Torralba was in charge of the graphic design of both environments.

REFERENCES

[1] Madrazo, L., ed. (2010) OIKODOMOS: A virtual campus to promote the study of dwelling in contemporary Europe. OIKODOMOS Final Report- Public Part. Retrieved on 1/6/2010 from http://www.oikodomos.org, Publications, June 2010.

[2] Shoikova, E., Denishev, V., Peshev, A., Kanchev, P. (2010) Social computing applications for competence based engineering education. INTED, International Technology, Education and Development Conference, Valencia.

[3] Dalziel, J. R. (2003) Implementing Learning Design: The Learning Activity Management System (Lams) In G. Crisp, D. Thiele, I. Scholten, S. Barker and J. Baron (Eds), Interact, Integrate, Impact: Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education. Adelaide.

[4] Biggs, J.B. (2003). *Teaching for quality learning at university*. Buckingham: Open University Press/Society for Research into Higher Education (second edition).

[5] Bloom, B. S. (ed.) (1956). Taxonomy of Educational Objectives, the classification of educational goals – Handbook I: Cognitive Domain, McKay, New York.

[6] Belibani, R. (2010) E-learning for architecture. INTED, International Technology, Education and Development Conference, Valencia.

[7] Madrazo, L., Massey, J. (2005) HOUSING@21.EU. A web-based pedagogic platform for the study of housing in Europe. Proceedings of the ECAADE conference, Lisbon.

[8] Gullà, V., Lùperi, P. (2010) From the development of tools for e-learning to open access repositories. INTED, International Technology, Education and Development Conference, Valencia.

[9] Kolb, D.A (1994), Experiential Learning: Experience as the source of learning and development, New Jersey: Prentice-Hall.

[10] Riddy, P.J., Botturi, L., Schmeil, A., (2010), Evaluation of Results and Projects Impact in Long Life Learning, OIKODOMOS QPLN report, Retrieved on 1/6/2010 from http://www.oikodomos.org, Deliverables, June 2010.