Innovation in architectural education - OIKONET experience

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ABSTRACT: In architectural education possible innovation fields include collaborative learning processes. International research projects, such as OIKODOMOS and OIKONET look for tools that will enable wide international collaboration and enhancement of education with a focus on support of the blended-learning pedagogical model: the *virtual campus*. To apply this virtual campus to architectural education at several universities, three environments were developed: *workspaces, case repository* and *OIKOpedia*. This effort is focused on the problem of innovative housing learning and on different aspects of contemporary global dwelling: participation, sustainability and energy efficiency, informal architecture, digital fabrication, integrated and parametric design approach - results of student workshops bringing new ideas. Parallel to these enhancements of architecture, study implementation of the MOOC (massive on-line open course) approach to architectural problems was tested. The MOOC course *From Concept to Fabrication* in the Canvas environment was prepared.

Keywords: OIKONET, collaborative learning, international research, blended-learning, architecture education

INTRODUCTION

Studying architecture is a specific synergy of technical education and artistic feeling, thought and expression. Architectural education must constantly reflect on the changes in technology, materials, standards and legislation. Information and communication technologies (ICT) represent an extensive information database and enable new avenues of core training modules - seminars and workshops. ICT tools are very useful in the simulation of real conditions, providing new opportunities in the techniques of education, research and practice. Thanks to virtual networks and communication tools, conditions for various forms of multicultural and multi-professional interactions were created.

New educational structures, focused mainly on joint design studios and other on-line or off-line educational activities, were designed, implemented, applied and evaluated. The OIKODOMOS and OIKONET projects implemented, analysed and evaluated the possibilities of virtual education in architecture and urbanism. Their aim is to create a virtual campus: a virtual space for joint educational activities of schools of architecture and urban design. Current focus in schools is the study of housing and its creation. This innovative educational mode, currently focused on the study of housing, integrates formal and informal education and supports interaction between universities, professional organisations, municipalities and citizens.

VIRTUAL CAMPUS

A virtual campus can be defined (according to van Dusen) as …*a metaphor for e-learning and research environment created by the interaction of a number of advanced technologies such as Internet, world wide Web, communication mediated by computers, videoconferences, multimedia, groupware, desktop presentation, intelligent educational systems, virtual reality* [1].

According to the European Commission, a virtual campus represents …*cooperation between universities in the field of e-learning, which includes: a proposal for a joint educational program, created between several educational institutions, including the Convention on the evaluation, ratification and recognition of acquired competences according to national competences; large-scale experiments in virtual mobility to supplement physical mobility and development of innovative dual education program, based on both traditional and distance learning methods* [2].

This broad definition includes many joint activities in strategic areas of education and research, bringing together researchers, teachers, students, managers, administrative and technical staff of universities. Virtual campuses should not be confused with e-learning platforms.

In the design of the virtual campus methodology, the learning outcomes and educational competencies that will be completed by students have to be taken into account. According to the proposal for tuning the educational methodology, universities must begin by …*changing the teacher-centred approach to student-oriented approach. It is the student who must be as best prepared in professional life* [3].

This is well defined in learning outcomes evidencing that students have control over the implementation of the educational cycle. Cognitive and metacognitive skills, personal, intellectual and practical skills, and ethical values should be strengthened during the educational process. According to the European Qualifications Framework, learning outcomes express what students know, understand and are able to do after completion of a learning process [4]. They are defined in the terms of knowledge, skills and competence. Competence is a proven ability to use knowledge, skills, as well as personal, social and methodological abilities in work or study situations, and in professional and personal development.

To implement a virtual campus for architectural education in several universities, three environments were developed: *workspaces, case repository* and *OIKOpedia*. *Workspaces* support project-based learning activities (e.g. creation of architectural designs) in collaborative manner in specialised *learning spaces*. This environment facilitates collaboration among distant learners, carrying a range of joint learning activities: design studios, lectures, seminars and courses. *Case repository* is a digital repository of study resources (e.g. case studies of housing), which is constructed collaboratively by students. *OIKOpedia* is a knowledge base containing concepts studied in the virtual campus. Semantic tools facilitate integrated access to these environments and data querying in the virtual campus databases. These tools are completed via the massive on-line open courses on the specific architectural topics.

OIKODOMOS AND OIKONET EXPERIENCES

The aim of the OIKODOMOS and OIKONET virtual campus training and research projects is the development, research and application of new methods of study of housing and housing design, implementation of innovative education methodology in the field of architectural education (in its different forms and multidisciplinary perspectives), joint international actions addressing housing issues in contemporary Europe (in cooperation with local councils) and the creation of European educational programmes compatible with the Bologna Process, which should combine physical and virtual mobility of students and teachers. In addition, these projects deal with topical issues of housing, and with innovative global dwelling solutions corresponding to social, economic and technological challenges of contemporary society. Finally, they create opportunities for active collaboration between universities and other stakeholders, such as with municipalities and social organisations, addressing complex housing problems.

Problem and Project Based Education in Architecture

Educational activities in the field of architecture and town-planning are focused on the work in design studios. They represent sequences of structured individual tasks (some of them can be implemented separately). Flexibility supporting the constructivist approach to learning is necessary for the differences in educational curricula of the participating universities. The educational process integrates two basic approaches - case studies (where students learn from the previous tasks) and project-oriented learning (where students prepare architectural designs under the supervision of a tutor) [5].

In the Web environment, the first approach is supported by the *case repository* (students-formed database of housing designs with specific parameters on www.oikodomos.org/caserepository), the second one by the *workspaces* (representing working space for workshops, seminars and shared design studios focused on assigned tasks, see www.oikodomos.org/workspaces). *Workspaces*, realised as an on-line learning platform, include ITC enabling remote collaboration on joint educational activities (workshops and studios) in various forms, both virtual and real [6].

Pedagogical Model

The basic features of the OIKODOMOS/OIKONET pedagogical model are:

- A shared learning space created by a group of teachers dedicated to a common theme of study;
- Learning processes structured within a learning space as sequences of learning activities and tasks carried out synchronously and/or asynchronously by participating students;
- A blended way of learning activities and tasks, both at the schools and in the on-line environment.

Learning activities carried out in the virtual campus are based on a simple conceptual structure (Figure 1). *Learning space* is an environment created by a group of teachers who decided to develop joint *learning activities* around a particular theme over a specific period of time. These learning activities 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 they may cut across different ones. This learning structure is sufficiently flexible and neutral to support different kinds of activities, which can be carried out by students working individually or in groups or in collaboration with other students or groups.

The process of creating the network of learning activities starts when a group of teachers agrees on a common theme (its name is given to the learning space), which teachers develop for a given period of time and, then, they determine the ways in which they will address the theme within respective courses (seminars or design studios) at their institution. Once the theme has been agreed upon, different forms of collaboration might be established in order to create a network of shared activities, from individual collaborations (e.g. evaluation of the work done at other schools or a video lecture) to joint activities (e.g. carrying out the same project in the design studios).
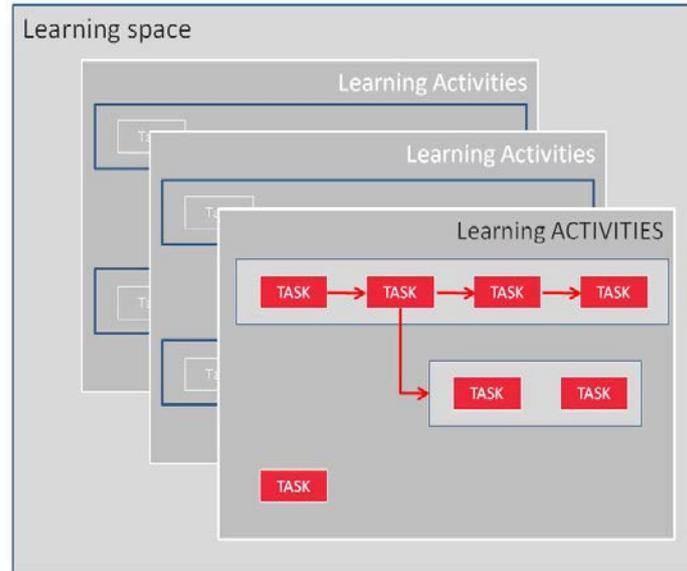

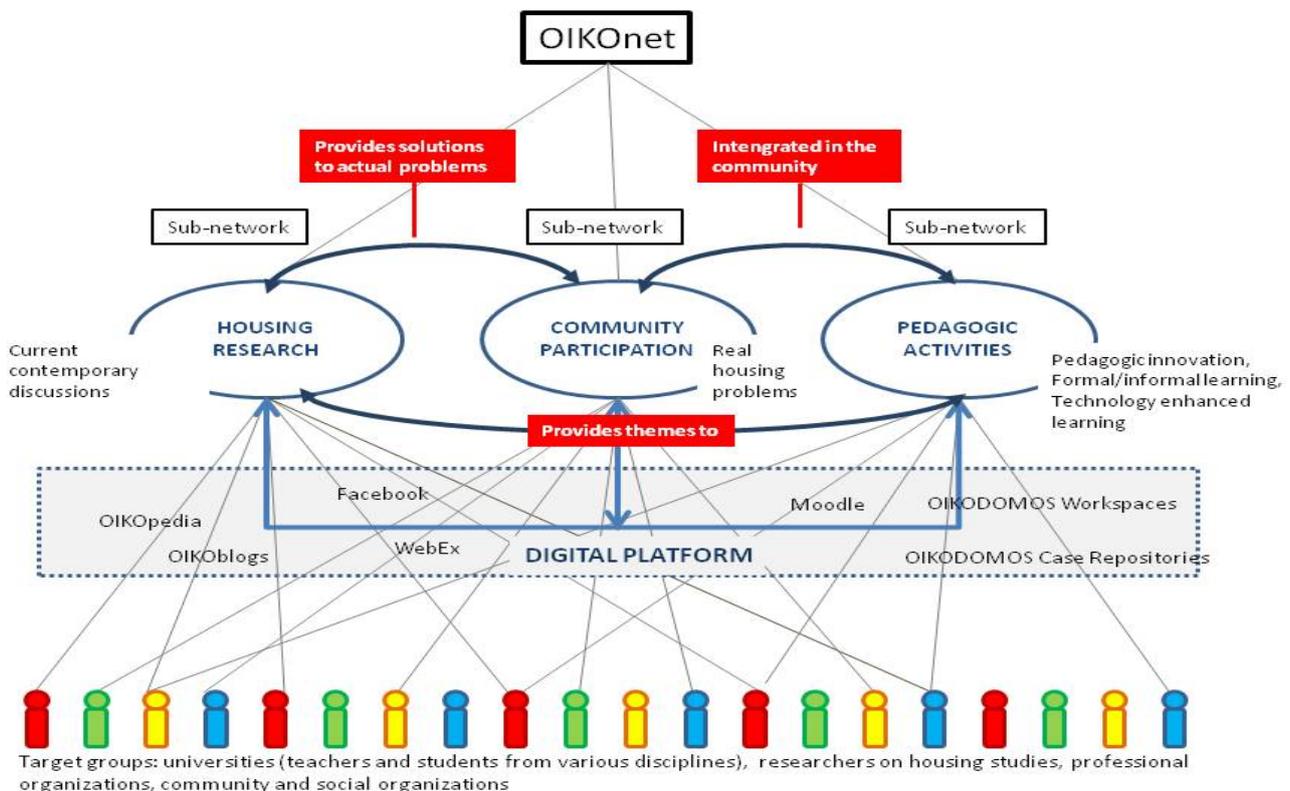Figure 1: Structure of learning activities and tasks.

Figure 2: OIKONET objectives and tasks (by Leandro Madrazzo).

Learning Space Habitat Regeneration Strategies

Urban regeneration covers many aspects of city life (physical, social, economic and environmental) focusing on housing problems. It integrates the multiple dimensions of the urban design process in co-operation with local governance and stakeholders. The objective of the learning space habitat regeneration strategies (HRS) is to explore, in theoretical and

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practical ways, the complex issues of housing regeneration. Learning activities are aimed at analysing particular cases, identifying problems and needs for regeneration, exploring the examples of housing regeneration strategies, forging new visions and proposing actions, which bring together multiple domains (urban planning, architecture, urban geography) [7].

Collaborative on-line and off-line learning activities of the HRS learning space in the OIKONET project started in September 2014 by the definition of learning activities and initial tasks, and by the involvement of subjects available for the collaborative learning process. Partners combined their regular learning activities at home universities with on-line learning activities.

On-line learning activities supported the blended learning approach and consisted of the utilisation of virtual environments for distant collaboration, for work on common or similar learning tasks, for sharing, reviewing and commenting submissions, and for providing structured learning materials (lectures, texts, links and video-lectures). They started by the introductions of participating students, uploaded to workspaces environment, and continued by the research on habitat regeneration strategies.

The outputs from this task were one of the sources for further work and looking for best-practice examples. Later, an on-line lecture on the topic *Bratislava Development Strategies* was given, which was important for partners, addressing Bratislava in their projects. Students and teachers were present on-line at the Adobe Connect videoconference session and, at the end, they asked questions about the area and regeneration issues in the studied city. The video-lecture was recorded and published in the task resources.

Interesting collaborative activities were detected between international groups of students when addressing the tasks on urban analyses. Students spontaneously commented the works of their peers and discussed the problems with each other. Some of the final designs on conceptual models for regeneration development strategies were presented on-line, with the participation of teachers commenting and discussing students' presentations.

Six university partners have joined the learning activities on the topic of HRS until now, involving 16 academic teachers and 230 students for collaborative activities on the issue. The learning space supported the multidisciplinary approaches in the process of housing regeneration - the portfolio of participating partners is a mix of architecture, urbanism, strategic planning and geography. Altogether, 255 students' submissions and 44 teachers' resources documents were uploaded to the HRS workspaces. Five videoconferencing learning sessions were realised, some of them were recorded and added to resources. The first application of HRS collaborative learning activities from September 2014 till January 2015 brought both positive and negative observations.
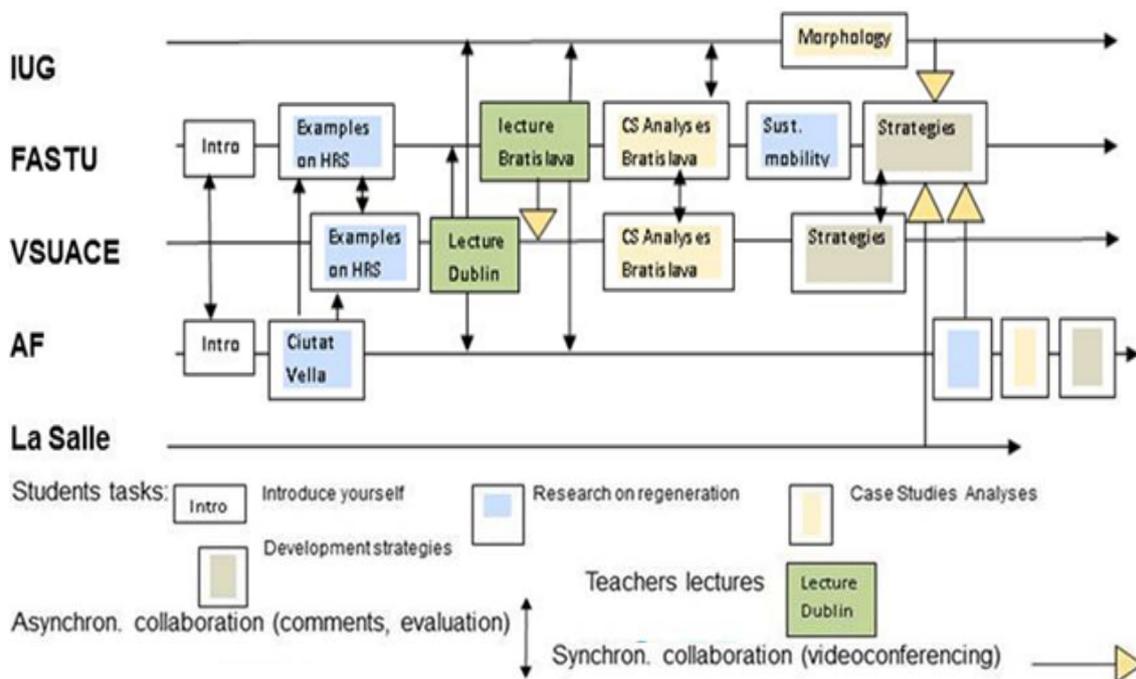

Figure 3: Collaborative learning activities in HRS (September 2014 - January 2015).

A lot of students found the international learning experience motivating, encouraging and inspiring, it was interesting for them to know what others think and like about their work. From their comments in the evaluation questionnaire students expressed: *...it has been a great experience...*, *...hope this system will spread among other subjects too...*, *...very good project...*, *...trying to support international collaboration between universities*. At the same time, however, they also expressed: *...only few comments from foreign students were received...*, *...we did not collaborate, there was no time for closer contact...*, *...very time consuming method...*, *...no feedback on given comments, no real exchange of opinions...*.

A persistent problem seems to be the reconciliation of partners' regular learning activities with the collaborative learning activities of HRS. Differences in schedules and learning approaches resulted in troubles with harmonisation of collaborative activities; learning activities and tasks had to be created during the teaching and reflected the actual needs and possibilities of participating partners more than the common needs. It seems that there are too many tasks in HRS; some of them are quite similar and could be joined.

The experience of the partners in HRS was that insufficient, short time was given for designing and implementing the learning space; the original planning did not work as expected. They contributed in different ways, without sharing an overall view of the learning space. Use of the English language was a problem too - a common language is imperative, the value of deliverables in other languages was very limited for other partners.
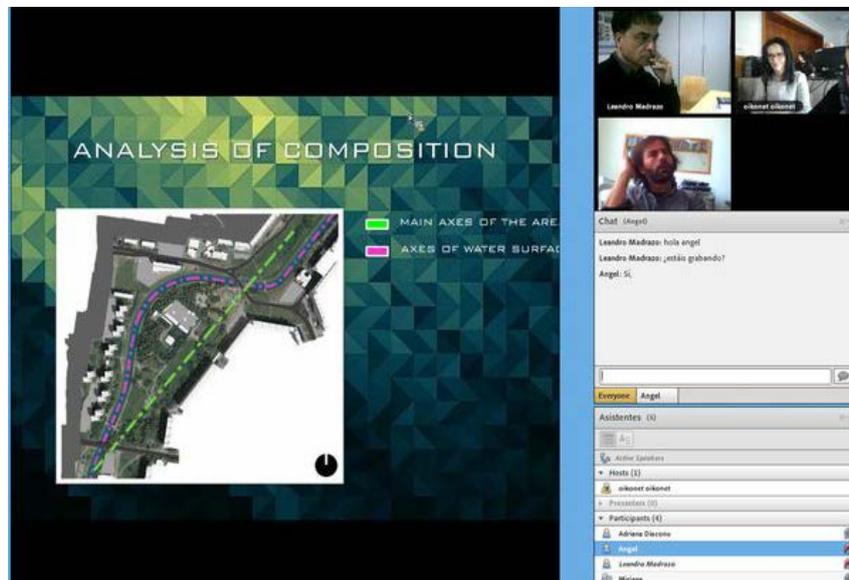

Figure 4: Presentation of the work done by students of the FA-SUT Bratislava in the learning space called: *Habitat Regeneration Strategies.*

Figure 5: Live commenting of this work by Adriana Diaconu from the UPMF Grenoble.

MOOC IN ARCHITECTURAL EDUCATION

In conventional architecture courses, the information in which students engage embodies conceptual structure. Van House has suggested the following: *...Information artefacts, including texts and images, are not simply reflections or carriers of knowledge. They shape and reflect practice and are instrumental in creating and re-creating knowledge as well as coordinating work across space and time* [8]. The difficulty in designing a MOOC for architectural education is that the students cannot be expected to bring the depth of experience gained from working with the integrated and overlapping topics, which the discipline demands. Therefore, the structure of the MOOC has to be designed to lead

students along a more linear development pathway than the *standard* courses, which are longer or have substantial pre-requisites [9].

The MOOC represents an on-line course with unlimited participation and open access. It can use traditional course materials (filmed lectures, readings, problem sets, etc), as well as specific ones: group work, interactive user forums, support of community, interactions between students, professors and assistants. MOOC history is connected with distance learning, which started in the 19th Century with correspondence courses. Later radio and television broadcast courses came, then, audio- and video-courses, and the first e-learning attempts, but typical e-learning is the on-line one, common from approximately 2000. MOOCs were introduced in 2008, and they have become really popular since 2012. The experiences from the early implementations of MOOC courses show that less than 10% of students really finish the course.

The MOOC courses can use different pedagogical models, traditional ones (straightforward curricula, conventional lectures, predictable learning outcomes), as well as those with *less teaching and more learning*: contextual pedagogy, peer-to-peer teaching, group work, automated evaluation and others. Courses differ also in the degree of *openness*: some of them are not only open (and free) for all, but also have open resources, which can be developed or remixed by the course participants. Other courses are free for students, but pedagogical resources are licensed, and other ones are commercial with a variety of business model. Most of them are still free for students and profits are gained in other ways. The used e-learning platforms can be open-source, non-profit or commercial.

The first MOOC topic in the OIKONET project is *Housing Design: from Concept to Fabrication* and it is intended as an introduction to the design of housing for novice learners. The pedagogical design is based on constructive alignment of the previous OIKODOMOS projects, and the topics follow the same pattern and broad scope as implemented in the OIKONET workshop held in Lisbon in July 2014. The programme of the workshop integrated various subjects around the design of a housing prototype: sustainability, energy efficiency, parametric design, digital fabrication and participatory processes. For the MOOC, the housing prototype has been simplified to suit the starting knowledge of the students and the concept of a *Dolls House* has been adopted as the unifying theme. The five topics will lead the participant from some of the social considerations for design of this simple model through a series of topics leading up to the final outputs required for fabrication [10].
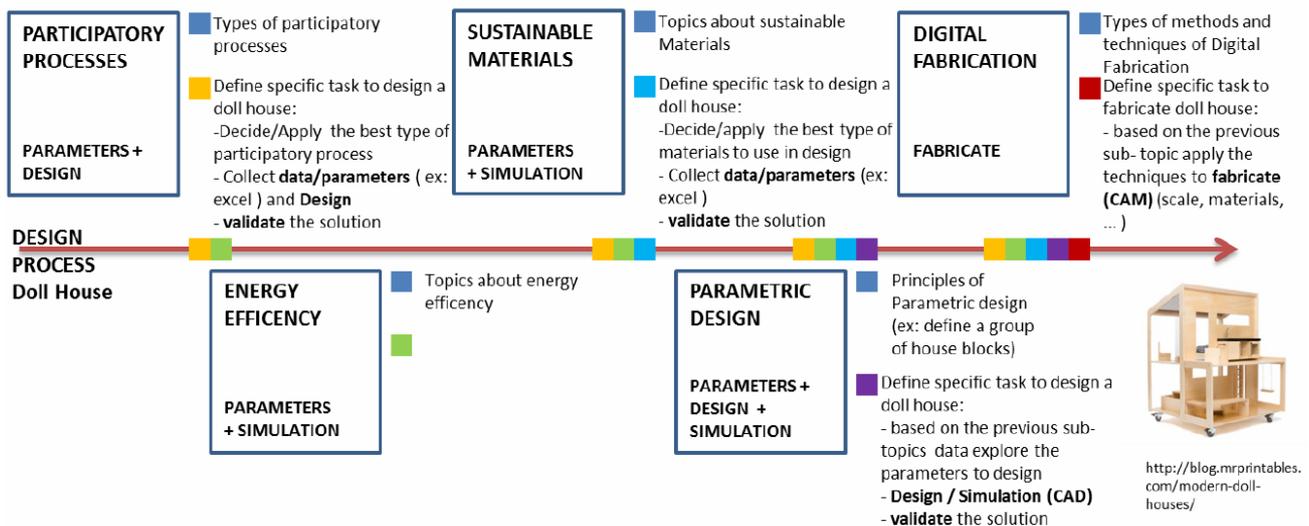

Figure 6: Sequence of MOOC topics (figure by Alexandra Paio).

The proposed MOOC relies on self-study and peer learning, and the learning activities are being designed to encourage and support both. Formative assessment tasks will be used within some of the topics leading up to a competition for the best design. Evaluation of progress is done by quizzes.

The CANVAS MOOC environment [11] was selected for course delivery - a commercial one, but free for use and with positive references as a very good development support for tutor, easy for use, possessing flexibility in agreement of contract terms. Involved tutors have completed a common design template, designed their materials, recorded video-lectures, and they are going to deliver their topics in live sessions.

CONCLUSIONS

In the first stage of development of the OIKONET network, a basis has been set to create a trans-institutional pedagogical structure to address housing studies from a multidisciplinary perspective. Academics from different institutions have started to collaborate in the design of common learning activities, and links between different academic

programmes have begun to be forged, continuing with the pedagogical model set up in the previous OIKODOMOS Virtual Campus. Along this process of implementation, new instruments and methods have been proposed to improve the communication and collaboration in the design of learning processes. The end goal of this collaboration among network partners is to come up with consolidated trans-institutional learning spaces, backed by the respective institutions, which can be maintained after the end of the project activity [12].

The experience gained during the intense international cooperation in the application of combined forms of education in architecture and landscape design authorises the authors to express certain generalising conclusions. Through the Web environment *workspaces* partners (participating universities) jointly define and implement educational activities in the form of a sequence of tasks, implemented separately or in collaboration. For each theoretical topic entries, databases of theoretical sources that are usable for subsequent educational activities are created. Most of the participating teachers confirmed positively the creation of new pedagogical approaches in education in architecture and urbanism, and the acquisition of a more sophisticated approach to teaching techniques, due to both international and multicultural environments and also ICT applications and remote forms of education.

Experience gained during the project confirmed that the learning process must be pre-defined and well-coordinated for partners in order to be collaborative blended learning effective enough. This requires extra effort of involved teachers beyond their normal academic duties, and of course, the ability to work in an international environment. Survey results confirm that students deepened their knowledge of the subjects, completed the theoretical knowledge and, additionally, gained important intercultural and interdisciplinary overview of issues solved. Nevertheless, students expressed their preference for immediate physical contact, while working in international student groups in workshops. Therefore, one of the current research and pedagogical issues seems to be increasing in the sense of perception of physical proximity, while working in the virtual space, as well as the possibility of immediate and spontaneous interaction, exchange of ideas, creative discussions and joint work. Great progress in the application (virtual campus), in educational content and tools was achieved. Still, many things remain unresolved - not so much technological problems, but rather communication between participants (students and teachers). It is mainly about people working together.

Integration of blended on-line and off-line learning activities in a multicultural, international and multidisciplinary environment brings distinct advantages and benefits for educational innovation in architecture and urbanism based on the sharing of different learning/teaching approaches, despite above mentioned difficulties.

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