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RECONCEPTUALIZING THE DESIGN STUDIO IN ARCHITECTURAL EDUCATION: DISTANCE LEARNING AND BLENDED LEARNING AS TRANSFORMATION FACTORS

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Keywords

Abstract

Nowadays, the professional practice is undergoing changes that are affecting the work of architects. Architectural studios and engineering consultancies are reinventing themselves to adapt to social, technological and productive needs. However, despite the professional changes, the training of architects in schools continues to focus on educational models that have grown more and more distant from the professional demands. In view of this, schools of architecture have been forced to revise their programmes to develop teaching methods that enable them to adapt to the current situation. Thus, the Design Studio -considered as the core of education in architecture- needs a reconceptualization in order to change the way architects should learn. Pedagogical approaches such as distance learning and blended learning can help update the concept of the Design Studio and transform it into a new participatory and delocalized learning space.

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INTRODUCTION

Nowadays the profession of the architect is undergoing major changes (COAC ed., 2005; Robinson et al., 2012; Union International des Architects ed., 2014). Architectural studios and engineering consultancies are reinventing themselves to adapt to social, technological and productive changes which are the result of the emergence of global society. For that reason, new forms of professional practice based on collaborative working methods and virtual organizations assisted by new digital technologies are emerging (Pressman, 2006; Elvin, 2007; Robinson et al., 2012). In addition, architects are also developing new procedures for the design and construction of architectural projects and creating other kinds of connections with experts and customers/users involved in the process (Kieran & Timberlake, 2004; Hyde, 2012).

The role of the architect, as a designer, is also evolving towards other professional profiles (Fundación Arquia ed., 2014; Union International des Architects ed., 2014). In addition, the architect is no longer a privileged professional capable of bringing together a set of artistic and technical knowledge, but has become a professional who interacts with others with a more specialized expertise. Consequently, skills and knowledge that the architect must acquire to act professionally in these new working environments are also changing. At present, the architect has to be able to network, to develop a broad perspective of the professional problems, to collaborate in multidisciplinary teams and to achieve an instrumental and social expertise in new digital technologies (Becerik-Gerber, Gerber & Ku, 2011).

However, despite the changes that are occurring in the profession, the training of architects in schools continues to focus on educational models that have grown more and more distant from the professional demands (Nicol & Pilling ed., 2000; Chadwick ed., 2004; CSCAE ed., 2007). Today, the Design Studio still lies at the core of architectural education (Salama, 1995). This pedagogical model can be described as a face-to-face learning space where students interact with others playing different roles of the professional practice and the knowledge is obtained through a process of creating a product design (such as an object, a building or a city). The Design Studio, however, has certain limitations due to the changes that are occurring in the professional field. Thus, a reformulation of the Design Studio is needed in order to transform the way architects are trained as professionals. Pedagogic approaches, such as Distance Learning and Blended Learning, can help transform the Design Studio into a new learning space in order to reduce the current gap between academia and professional practice.

THE DESIGN STUDIO AS A PARADIGM IN ARCHITECTURAL EDUCATION

The Origin of the Design Studio and its Evolution

The Design Studio has played a key role in the training of architects since the eighteenth century when, for the first time in history, the teaching of architecture was regularized in the French academic institutions. It was during this period when art academies and polytechnic schools created the *Modèle Polytechnique* and the *Modèle Industriel* to educate future architects and engineers. Both models blended theoretical instruction (*sciences pures*) taught by academics (*académiciens*) at the amphitheater (*amphithéatre*) with practical learning (*sciences appliquées*) in the *ateliers* under the supervision of an architect (the *patron*).

The *ateliers* system was the core of the curriculum of these institutions. Its main features were: an evaluation system based on competitions (*concours*), the construction of knowledge through a critical reflection between the architect (*patron*) and students (*élèves*), the collaboration between students from different disciplines (architects and engineers) and the practical application of theoretical concepts in the *ateliers* by solving hypothetical design projects. These pedagogical features would become the heart of the Design Studio.

Since then, the pedagogical model of the Design Studio has been redefined over time in order to adapt to social, cultural and productive changes that have occurred in each historical period. As evidence of this, some institutions -such as the Bauhaus, the Ulm School of Design, the Texas School of Architecture and the Cooper Union- established various educational models throughout the twentieth century. However, despite the methodological changes made to the original model, its basic structure has remained unchanged over the course of the years: the teacher poses a project that introduces hypothetical or actual problems related to the practice of the architect and then students work on its development. The teacher guides students throughout the design process while some professional conditions are simulated in a physical space within the school (the studio).

Characteristics

Leaving aside its infinite modalities of application, the Design Studio is a model of reality where a professional situation is reproduced in an academic context. The Design Studio is used in the schools of architecture with the intention of teaching students -through the simulation of various roles (architect, client, builder, engineer and user) and real conditions (the brief, site, budget, and construction techniques)- the skills and knowledge required to work professionally in architectural studios and engineering consultancies. In this sense, Devetakovic (2007: p. 326) expresses that the Design Studio has for a long time been a well-established and constantly evolving pedagogic category simulating real architectural practice within the process of architectural education. Moreover, Schön ([1987] 2010: p. 156) conceived the Design Studio as a reflective practicum: a virtual world which seeks to represent essential features of the practice that must be learned while students are offered the opportunity to experience and learn with little risk in the studios.

Thus, the simulation of the professional practice in the Design Studio has one goal: students must understand, with the help of an expert, how the profession works by solving different professional problems (Problem-Based Learning). Typically, in a Design Studio the learning processes occur when students develop a project in its stages: identification of the problem, information gathering, sketching, development of a design solution, discussion of the results with tutors and peers, intermediate reflections and, finally, the presentation of a project for critical assessment by a panel. During the course of these stages students get a comprehensive view of the complexity of a project (from its conception to its final presentation) and acquire some expertise as professionals.

At the same time, the Design Studio is also conceived as a constructive learning space where students build up their own knowledge through an active process of interpretation, questioning and experimentation. The theoretical concepts are explored and understood by inclusion in a practical context: the project (Project-Based Learning). According to Lamunu (2008: p. 169), problem solving and analysis of situations are part of the design process. This means that one of the outcomes of the learning experiences is the process of knowledge

creation which is achieved actively by doing. The Design Studios in this situation encourage knowledge construction. This explanation suggests that students create their own knowledge from the different experiences they have in the studio when the different phases of the project are carried out. In this context, the task of the teacher is to assist students in their learning process and encourage them to become autonomous thinkers.

Furthermore, the Design Studio is also a social and face-to-face learning space. The teaching and learning processes take place in a physical space within the school in direct contact with teacher, peers and occasional collaborators. The studio is usually a multipurpose open space that serves to support various activities (conferences, seminars, lectures, formal and informal reviews) and promote different patterns of interaction. In this environment, students can work individually or in collaboration with other occasional participants who do not belong to the school.

Limitations

The characteristics that define the Design Studio have certain limitations which directly affect the training of students as professionals. Among the most prominent features, we can cite:

- The learning activities do not take place in the real professional environment.

The training of students in the Design Studio is different from the professional practice because important issues related to budgets, regulations and marketing are omitted. The Design Studio is generally perceived as focused on solving hypothetical problems instead of articulating real and pragmatic architectural problems (Maturama, 2014). Moreover, the role that other actors (customers, users and professionals) may have on the design process is also not taken into account. In most of the projects that students develop in the Design Studio, the client/user is just a fictional character described in the programme or an occasional contributor.

In addition, the Design Studio also does not establish a direct link with the professional practice because students spend most of their learning time interacting only with other students and teachers at school. Although in architectural studios architects collaborate all the time with other specialists with different levels of expertise, in the Design Studio students rarely carry out joint activities with real professionals. Some authors (Anthony, 1991; Cuff, 1992; Boyer & Mitgang, 1996) claim that students are subjected to isolation (in the physical sense but also in the formative sense). This creates a false sense of professional reality that can only be solved if learning is conceived as an open and participatory process.

- The students' learning is limited by the physical environment.

In the Design Studio students learn face-to-face. The Design Studio becomes the social and educational centre for students due to the fact that all learning activities are organized around this physical space. Thus, the relationships that students can establish with the outside world (universities, architectural firms and companies) are secondary and sporadic. Koch, Schwennsen, Dutton and Smith (2002: p. 9) concluded in a report for the American Institute of Architecture Students that students spend all of their time, with each other for four to six years, in the same classes and in the same building. As a result of this, they become disconnected from the ubiquitous public they will serve. Too often, faculty members do not encourage or even allow any unstructured time for students to develop interests and relationships outside of the studio.

Quinn (2000: p. 24) suggests that students' learning in the Design Studio is limited because it is solely based on experiences that they receive when developing a project. He proposes, therefore, that the pedagogical model of the Design Studio is geared towards expanding these experiences outside schools through other activities that allow the participation of other actors (departments of the university, other schools, professional institutions and public organizations). According to Quinn (Ibid.), if you think about what you should be learning while in school, it should extend well beyond the studio to include much more outreach, rather than being sequestered in a building 24 hours a day. Any outside/non-architecture experiences and knowledge that you gain are going to have the greatest impact on your success. This broad, general knowledge comes from greater university experiences through outreach to other departments, lectures, and visiting scholars, and many other things -not just architects or architecture.

- The design process is developed mostly in an individual way.

In the Design Studio, the individual work takes precedence over the collective work since interactions between students and teachers are reduced to certain situations such as informal group reviews and formal presentations. According to Papanek (1995: p. 203), the individualism comes from the professional field where designers and architects are encouraged to think of themselves as artists, with the result that a good deal of design and architecture seems to be created for the personal glory of its creator. Moreover, Lamunu (2008: p. 7) asserts that individual learning predominates in the Design Studio because only students with the best ideas and designs, who are labelled as *independent stars*, are praised. Although team work is also valued in the Design Studio, the *independent star* gains reputation, as opposed to the team. Consequently, this generates competitive working environments whose results are a lack of cooperation and trust among students and an excessive interest in attracting the attention of the teacher. According to Chivers (2015: p. 76), the process of developing an idea also becomes a private, almost shameful act, in which not knowing the right answer is an admission of failure rather than an opportunity for creativity.

- The teacher's influence on students limits their learning.

Teachers often tend to impose their own preferences on students rather than support their development. Dutton (1987: p. 18) states that teachers tend to speak in ways (often unconsciously) that legitimize their power and students orient their speech and work to that which is approved. In addition, Shor (1992: p. 93) explains that sometimes the interventions of the teachers become a barrier to students' learning. The transfer of knowledge from teacher to students limits dialogue and active questioning. In such a unilateral syllabus, the students are told what to do and what things mean. Through this authoritarian discourse, students gradually lose their childhood joy of learning. They also lose confidence in their thoughts and language, making them defensively silent in the presence of a teacher who apparently has the answers worked out already. In these circumstances, communication between the teacher and the student fails because the degree of understanding between the two sides becomes inconsistent and ambiguous. The solution to this problem depends largely on the ability of the student and the teacher to seek a convergence of meanings through a dialogue of mutual reflection. In this way, the teacher ceases to impose in order to assist the student in the learning process.

Ultimately, these limitations are an obstacle to the training of students as they do not comply with current professional demands. The profile of the architect used as a model in the Design Studio has certain shortcomings that must be resolved. In this context, schools of architecture (aware of the problem) are developing and implementing new teaching strategies in the Design Studio in order to provide a better education (Salama, 2015).

RECONCEPTUALIZATION OF THE DESIGN STUDIO: NEW LEARNING SPACES

Currently in academia, there is a broad consensus on the need to adapt existing educational models to the transformations that the professional practice is undergoing. Distance Learning and Blended Learning are two of the pedagogical models which are postulated as the most appropriate to update the concept of the Design Studio. When we integrate these models in the Design Studio, we can observe how they are transforming it. On the one hand, the Design Studio maintains its essential characteristics while it integrates technologies and methods from other fields. On the other hand, it is radically transformed into a new hybrid, distributed and delocalized learning space where a direct relationship with the professional reality is set up, a more active participation is encouraged, synergies are established with different partners within and outside the school and the use of digital technologies is promoted.

The Design Studio as a Timeless and Delocalized Learning Space

In the last two decades, schools of architecture have integrated (parallel to the face-to-face learning model) Distance Learning in the Design Studio in order to create a learning space where students and teachers can work and communicate with everyone regardless of place and time. The implementation of digital tools to carry out the learning and teaching processes in the Design Studio has produced transformations in the way of teaching architecture (introduction of new roles, working methods and evaluation systems), the place where learning occurs (in virtual spaces with geographically dispersed groups) and the training time of students (acquisition of knowledge can occur at any time).

According to Salama and Wilkinson (2007: p. 310), the Virtual Design Studio can be defined as a networked studio distributed across space and time. In such a studio, students from geographically separated educational institutions work together using a computer-mediated environment as if they were part of one Design Studio in one physical space. Wotjowicz (1995: p. 21) also explains that the Virtual Design Studio is an environment where each member has instant access to other members' geometric designs in-progress. Besides, the access to information occurs at different levels of time in several collective environments.

The Virtual Design Studio promotes the development of collaborative and remote projects using asynchronous and synchronous communication tools (Maher, Simoff & Cicognani, 1999). These instruments allow students to gain an increasing understanding of new ways of collaborative networking and integration of digital media in the design process of a project. The use of this type of collaborative tools is carried out in a computer-mediated environment that enables architecture students, designers and faculty members to interact and design via their computers (Devetakovic, 2007). This type of environment helps students and teachers to interact with others regardless of location and time, to create work teams and to participate virtually in the development of a project using digital technologies as design support tools.

For instance, in the Internet & WWW Module Project created by the Department of Architecture & Building Science of the University of Strathclyde (United Kingdom) (Grierson, 2004), teachers organized annually (from 1999 to 2003) a Virtual Design Studio in order to familiarize students with the following topics: how to use the information available on the Internet to develop architectural projects, which online media (synchronous and asynchronous) to choose in order to undertake collaboratively a design proposal and how to exchange digital data related to a project with the client and partners.

Students were grouped into teams of three people. During a four-week period, they had to write a housing programme for an artist, digitally develop a design proposal, keep a record of the work in a web diary and perform an online presentation of the final design to the client. The role of the teachers was to accompany the groups throughout the design process of the project acting as facilitators and to direct students towards a process of self-reflection using as a means the online registration of each group (texts, drawings and images). Teachers also tried to encourage Peer Learning undertaking several collaborative online activities. For example, online discussions with members of each team were held to examine jointly the project and the works were recorded online for review and to facilitate the proposal of new design ideas.

Grierson (2004: p. 84) conducted a subsequent study of the project and noted that, in the beginning, teachers and students put more emphasis on the use of asynchronous communication tools. The exchange of files via email was initially used in the Virtual Design Studio as a means of promoting communications between the teams and the client (teacher). Their integration into the dynamics of the Virtual Design Studio was not a problem because students were familiar with the resource. Most of them used their own emails but some groups decided to create a joint account. Teachers used email to send pictures and texts illustrating client preferences (material, style, form, distribution) while the teams used it to send the client their design proposals for review. However, over the years, this trend changed and students began to use more synchronous communication means because, in their opinion, it facilitated the contact with their peers, and to exchange immediately the information needed to proceed with the project. Students began to use the chat to share design information and the digital whiteboard to add comments to drawings in real time. According to one student, it was easier to have a discussion with colleagues because they used the digital blackboard and the chat simultaneously while they were drawing. The result was that the process of brainstorming was more immediate and direct (Ibid.). Nevertheless, one of the most frequent criticisms among students was the difficulty of identifying which group was working in each moment on the digital blackboard. For that reason, students quickly established a set of procedures to work tidily and to differentiate the design proposals.

Finally, teachers also asked students to create a web diary to document the state of their work and to coordinate the design duties of the team members. Each group had a weblog to upload all communications, texts and images. Later this information was published online. The purpose of this was to teach students to organize information when they work in groups, to create a virtual space to plan every stage of the design process and to simulate the professional practice with an online record of the project (similar to how an architect would proceed).

In a similar way, the Multiplying Time, Place2wait Project coordinated by the University of Hong Kong (China), the University of Washington (United States) and the Eidgenössische Technische Hochschule Zurich (Switzerland) focused on promoting online collaboration between students of different institutions and countries (Hirschberg, 2001). Teachers integrated Distance Learning in the Design Studio in order to create a new form of collective authorship using a database onto which students downloaded their work to be reusable on new architectural design proposals.

The preparation of the Virtual Design Studio was a collaborative effort. According to teachers, it was initially difficult to coordinate resources and tasks between the three partners but, finally, they reached a consensus. For their part, the University of Hong Kong designed a programme to build a house for a Swiss writer and a Chinese painter near Seattle. The goal

was to bring together cultural aspects of the three participating countries in a single project in order to share different architectural point of views. Meanwhile, the University of Washington prepared the documentation on the site while the Eidgenössische Technische Hochschule Zurich provided the two main tools of the project: the modelling software and a virtual environment.

The Virtual Design Studio was conceived as an evolving system structured in individual design phases. After each phase, each group had to store their design works on a common database to share them with other peers. In successive stages, each team had to select the project of another group, to develop it and to create a new version. In some cases, teams returned to select a modified version of their original design while others were not interested in continuing their work because they saw potential in the proposal of another group's version. All database functions were available through a custom interface that displayed and managed the information needed to carry out the new designs. Students had to navigate through the results of the previous phase and choose a design that interests them, request it and download a folder with Sculptor drawing files. The use of a common modelling programme was beneficial for students because it avoided the need to change formats, which often lead to some loss of information. Sculptor was especially designed for supporting the early stages of design and its intuitive interface made it very easy to learn. In fact, Hirschberg (2001: p. 52) comments that students noted that by exchanging Sculptor models throughout the project, they felt they could communicate in a universal architectural language. Supplementary information was also stored in the virtual environment in order to support the learning process of students. Teachers developed a series of visual representations on the collected data that allowed students to visualize the links between different design proposals, to analyse their genealogical development and to know which lines of work provided better design opportunities. In addition to the design work performed in the virtual environment, every eight hours a direct contact via videoconferencing was established by students to exchange ideas, creating a global think tank, operating 24 hours a day.

In both projects, the intention of the teachers was to incorporate Distance Learning in the Design Studio to create a learning space that could go beyond the physical studio and encourage different types of collaboration between students during the design process. The use of digital resources was helpful because teachers could teach the contents of the learning activities in different formats (images, texts, drawings) and means (web diary, virtual interface, chat, digital blackboard) and support individually and collectively students' learning.

In a Virtual Design Studio, the role of teachers and students acquire new nuances. This is because students' learning does not depend so much on the dialogue between the two sides but on the methods and resources used to perform the learning activities. The teachers' role as transmitters of knowledge (a feature of the conventional Design Studio) passes into the background since their main responsibility now is to boost the learning processes in the virtual environment. For example, in the Internet & WWW Module Project, teachers assumed the role of the client to reinforce distance relationships with students, to help them identify their learning needs through a process of self-review (without imposing their professional beliefs) and to enhance students' participation and cooperation in the differently designed learning activities.

On the other hand, students take a more active role in the learning process. Students have to learn to self-manage their own learning, to use the right information to achieve their goals and to plan their study time. In the case of both projects, as teams had been formed, the students also had to take responsibility for their peers' learning. This was a positive

experience because, as it happens in an architectural studio, students learned to distribute design tasks and to delegate responsibilities. Furthermore, they had the opportunity to create a collective environment where students could work together and share their design experiences regardless of their location, time and culture.

The virtual environment is used as a platform of work and communication to establish synergies that give rise to an evolutionary system fed by the exchange of experiences, ideas and documents. Thus, unlike the conventional Design Studio where the information is managed individually, the Virtual Design Studio becomes a space of knowledge in which information is linked to the collective reflections made in the virtual space. This guarantees its value as an active element in students' learning.

Moreover, the Virtual Design Studio also offers students the opportunity to collaborate with learners from other universities in a global context (in the same way as the Multiplying Time, Place2wait Project). This is a unique experience for them to discover new ways of designing architectural projects outside the boundaries of their own institution and to develop communicative skills in order to successfully deal with different professional experiences.

The Design Studio as a Blended and Participatory Learning Space

Nowadays, schools of architecture are implementing Blended Learning in the Design Studio to combine the efficiency and flexibility of computer-assisted forms of learning with the social aspects of face-to-face communication (Achten, Koszewski & Martens, 2011). This partnership between digital technologies and classroom teaching is considered by Garrison and Kanuka (2004: p 96) as an emerging trend in higher education because it constitutes an effective and low-risk strategy which positions universities for the onslaught of technological developments that will be forthcoming in the next few years.

Blended Learning is causing changes in how, when and where students learn in the Design Studio because it combines the methodologies used in traditional teaching and Distance Learning. This results in a multiplicity of techniques that enrich and facilitate students' learning in the studio. Blended Learning supports a rearrangement of current teaching and learning processes and allows the use of several learning theories at once -such as constructivism and behaviourism- selecting the most positive aspects of each of them.

According to Saghafi, Franz and Crowther (2012: p. 16) this pedagogical model creates more opportunities for communication through different media and modes responding to different personalities. Students have an opportunity to learn with teachers and peers in the studio but also with others who live in different countries and belong to other institutions. Because of this, the Design Studio becomes simultaneously a local and global learning space and, at the same time, a physical and virtual educational environment. Furthermore, Information Communication Technologies (ICT) facilitates the instant exchange of multiple design ideas and experiences. As a result of this, the conventional Design Studio becomes an open and social learning space that enables the integration of different groups of learners and the collective management of resources (materials, contents and tools).

For instance, in the Oikodomos Project created by the Escola d'Arquitectura La Salle of the Universitat Ramon Llull (Spain) (Madrazo, 2011), Blended Learning was implemented in the Design Studio with the goal of creating different virtual and physical learning spaces which connect courses (seminars, workshops and lectures), subjects (architectural projects, urban planning, housing design and energy efficiency) and students with different academic levels (bachelor and post-graduate) from various institutions. Thus, combining online and offline

activities, students could individually and collectively develop multiple design solutions and communicate their vision and knowledge about contemporary European housing to other partners (lecturers, architects, urban planners, citizens and researchers).

Schools involved in the project had different curricula, programmes and educational objectives. The purpose of the Oikodomos Project was to bring together this diversity of elements in a single pedagogical framework and to establish a common approach on the design of courses in order to be easily adopted by anyone. The first step was to determine collaboratively the educational processes and the language that would be used, leaving enough flexibility for each school to adapt the various online and offline learning activities to the specific conditions of its programme without losing its autonomy. The second step was to plan how the results would be disseminated and the information would be reused in future activities. To achieve this, the ARC research group (La Salle) created the Oikodomos digital platform. It consisted of two environments: Workspaces and Case Repository. The first supported different project-based learning activities and the second was a digital repository of housing case studies built collaboratively by students. These environments could be used separately or in combination during the Design Studios.

The learning processes were a sequence of learning activities, either online (debates, presentations of the design proposals, site analysis, study a set of concepts, development of a case study) or on-site (conferences, informal reviews, public presentations, visits and activities dealing with the participation of citizens). The joint Design Studio was a basic component of the Blended Learning model applied in the Oikodomos Project. This kind of workshop was part of a sequence of educational activities (online and offline tasks) in which several schools participated. It usually lasted one week. During this time, teachers and students of the participating schools worked physically together on a project. In 2011, students of the Escola d'Arquitectura La Salle and the Gebze Teknik Úniversitesi (Turkey) participated in a joint Design Studio that lasted three days. At the end of this Design Studio, students answered a questionnaire on the combination of classroom and distance activities, the work methodology and the knowledge acquired. This questionnaire was conducted during the development of our doctoral thesis: *The Transformation of the Design Studio in New Learning Spaces. A Study on the Process of Integration between Education and Professional Practice*. The information gathered revealed that the use of a blended approach was positively viewed by the participants. Some students mentioned that it was an enriching experience (out of the ordinary) because they were able to discover new ways to develop a project. As well, they considered it very useful to work online and on-site with students from other cultures. Students also commented that it was a great opportunity for them to improve their visual thoughts and to work with other people from other countries with different architectural ideas. Other students also stressed the importance of carrying out oral presentations and group reviews with teachers at the studio to discuss face-to-face the design errors and to adopt an efficient solution. Nevertheless, students reported some problems of coordination and communication. For example, they mentioned language difficulties. English was the language used but, because it was not the native language, some students had difficulty expressing themselves, causing them some anxiety and fear of being rejected by their classmates. Students also expressed concern about the short duration of the Design Studio. They had three days to develop a design proposal for the urban improvement of a neighborhood in Barcelona. In their opinion, this time was insufficient to work accurately on all aspects of the project. Besides, they did not know in advance the location and the partners so they needed some time to adapt before starting to work on the project.

In the case of the Faculteit Architectuur Sint-Lucas of the Katholieke Universiteit Leuven (Belgium), teachers organized an international Blended Design Studio on urban design (Pak & Verbeke, 2012). Their objective was to offer students new forms of learning and participation beyond the conventional Design Studio combining geographical information technologies and web 2.0 resources with face-to-face methods. Students were encouraged to work collaboratively on a project using an educational platform based on a geographical virtual environment: GEO-VEM. This platform was developed in 2010 as an alternative to the Urbis Geographical Information System tool used by the Brussels authorities. This consisted of two environments: one focused on the geographical location of urban areas and the other to search for information (data, images and texts) through an interactive map. These environments could be used separately or in combination. Its purpose was to promote urban development proposals in the region using the resources Google Maps and Google Earth Extension MediaWiki API. The first environment added information generated by users through a customizable interface. The second established conceptual maps.

The GEO-VEM platform was used to support classroom activities (conferences, visits, reviews with the tutor and group presentations) and online activities (creation of a collective map with geolocated photos, collaborative analysis of the site and presentation of the design proposals). From the virtual platform, teachers organized the contents of the Blended Design Studio on various urban topics related to the city of Brussels that were assigned to each group. Weekly, teams had to upload their works to the virtual platform by creating a web site from which images, maps, drawings and texts were displayed and used. Students used these web sites to share their findings while teachers could track the work done during the design process. Teachers also involved several specialists and students from other institutions in the design and evaluation process of the project. This interaction among participants was essential for the production of a steady stream of inputs (lectures, readings and design proposals) and outputs (assessment of works and feedback from students/professionals to other peers) and for the creation of a direct link with the professional field. Finally, the teaching material and the students' work were also recorded in the virtual platform to be used in future Design Studios.

In 2012 and 2013, teachers organized two more international Blended Design Studios (Pak & Verbeke, 2013). Both had similar objectives to the previous workshop. The existing curriculum, divided into three courses (one theoretical, one focused on the teaching of geographical information systems and another practical), was reformulated. The three courses were grouped in a single Blended Design Studio using the GEO-VEM platform as a means of managing the contents and activities of the three blocks. Students had various tools at their disposal including a collective mapping interface, a data filtering device and an image gallery. In the first Blended Design Studio, students had to study the urban center of the city of Luxembourg and to create a collective map using the virtual platform as a means of combining different types of geographical information. In the second Blended Design Studio, students had to carry out a collaborative urban analysis of an area of Brussels and to share their work on the platform. After the analysis phase, students had to explore different design alternatives to reconfigure the area using the information available on the platform. In both cases, the use of digital technologies did not replace face-to-face interactions between teachers and students, but served to improve the whole learning process by establishing different modes of communication and feedback.

In a subsequent study carried out by Pak and Verbeke (2013: pp. 55-56), the participation of students in the GEO-VEM platform was linked to their progress in the Blended Design Studios. Their participation began to recede and to produce negative effects. According to teachers, some of the most plausible explanations for these effects were: the technical

difficulties that some students experienced when they were developing their design proposals using the platform and the excessive online students' participation. They focused more on the use of the platform than in the learning process and they produced a lot of irrelevant design information. In spite of this, students considered the use of the GEO-VEM platform positive. For instance, a student commented that, overall, the website was interesting and it was easy to create new posts. It was also nice to be able to see other people's works at any time, but at the same time, it was obvious that this kind of approach to teaching had to be done very carefully. Another student acknowledged that it had been a very valuable source in the course of a Design Studio and a very interactive and continuous learning environment (Ibid.: p. 57). Most students also highlighted the potential of the virtual platform to improve their understanding of the development of collaborative projects and relationships with their peers and professionals.

In both projects, the use of virtual platforms was essential to overcome the spatial and time barriers of the Design Studio and to promote multiple modes of interaction during the learning process. As a result of this, more actors were involved in the development of activities. It allowed students to work simultaneously with other learners and specialists who did not belong to the school. This created a sense of being a part of a learning community because it enabled face-to-face integration with classmates and tutors and virtual contact with other collaborators. In the case of the Oikodomos Project, teachers were able to create an open-ended learning space, which transcended the established borders (physical, institutional and disciplinary) and promoted the construction of knowledge through interactions, outside and inside the virtual learning platform, among students and other participants.

The use of Blended Learning does not replace face-to-face connections between teachers and students but it serves to improve the whole learning process by setting different modes of communication. According to Pak and Verbeke (2012: pp. 505-506), the blended approach offers opportunities which are not fully or easily available in a conventional Design Studio setting. First of all, it can promote and facilitate reflective learning-in-action in a novel pedagogical context, in which various communication modes and styles are supported. The possibility of one-to-one, one-to-many, many-to-one and many-to-many communication allows more flexible and adaptable interactions and a greater number of design students. Furthermore, in the new setting Design Studio learning is complemented by asynchronous activities in the virtual campus. They offer the learners the possibility of extended online discussions complementing the activities in the Design Studio. In contrast, the discussions in the conventional Design Studio take place in small groups, complemented by plenaries and reviews.

In a Blended Design Studio, the role of teachers and students also acquires new nuances (in a way comparable with the Virtual Design Studio). It creates interactive learning environments where students are responsible for their own learning while teachers work in structuring the teaching and learning processes. For their part, students play an active role in their own learning and that of their peers from the synergies that are established remotely and physically during the development of the learning activities. Meanwhile, teachers act as a guide to advise students throughout the design project (similar to how they would be in the Design Studio) and as a coordinator to design and boost the learning processes in the virtual learning environment (similar to how they would be in the Virtual Design Studio).

The management of the information was another important factor in both projects. Unlike the conventional Design Studio where students treat information individually, in the Blended Design Studios, the information is accessible to everyone. Therefore, students must learn to

filter and label the correct information for their own use and to transform it into knowledge. They also have to be able to share their ideas in the digital and face-to-face format so their communication skills must cover different media and resources. This is a positive aspect of Blended Learning because it enriches the learning process and opens a window of new possibilities for developing architectural projects.

CONCLUSIONS

Discussion: Distance Learning or Blended Learning?

In the last decades, the implementation of Distance Learning in the Design Studio has led to changes in how, when and where the teaching and learning of architecture takes place in the studios. The goal has been to train new architects with new professional skills and competences. The Design Studio, with the support of digital technologies, has overcome its physical and temporal limitations. In the Virtual Design Studios, learning takes place in virtual environments with heterogeneous groups (with diverse interests, experience and knowledge) which are geographically dispersed throughout the world. The access to information can also occur at any time while the communication between participants can be carried out synchronously and asynchronously. As a consequence of this, the Design Studio has become a flexible learning space where students learn architecture outside the rigid requirements of space, rhythm and timing of the traditional classroom model.

However, despite the advantages offered by Distance Learning, its implementation in the Design Studio has been insufficient for several reasons. The first reason is that teachers have focused more on the technical aspects (information management and exchange) than on the social and pedagogical aspects (collective creation of knowledge and design of educational activities). Only a few cases (such as those presented in this text) are the exception. Today, it is still necessary to develop new instruments and methods to facilitate the design of learning processes in a virtual environment (virtual pin-up, virtual jury, virtual desk critic), to elaborate organizational strategies that encourage interaction between different actors (inside and outside academia), to create procedures to build knowledge collectively, to organize communication protocols in order to show the design results to different audiences and to manage repositories with quality content.

The second reason is that, in each school, Distance Learning has been included within a specific teaching system: a closed and controlled virtual environment, which is isolated from the rest of content and network resources. These virtual learning spaces (online educational platforms and interfaces created as administrative resources by schools) seem determined to limit what is exciting about the Internet and digital technologies: global communication, quick and open reproduction of content and the free exchange of information between network users. Finally, the last reason is that the proximity between students, teachers and peers disappears because communication occurs through a digital medium (even if the contact takes place synchronously). Consequently, there is a loss of communication based on a close and physical interaction that, in a face-to-face teaching model, is an added supplement to student learning.

Because of these drawbacks, in recent years, the integration of Distance Learning as a substitute for the traditional face-to-face model is giving way to a new type of the Design Studio based on Blended Learning. From our point of view, the implementation of Blended Learning in the Design Studio has a future because it combines in a single educational model the qualities of Distance Learning and Face-to-Face Learning. The classes in the studio (seminars, conferences, reviews and presentations) are complemented by learning

activities that take place in a virtual environment (collection and sharing of information, submission of design proposals and open dissemination of results). Combining both models, the Design Studio manages to overcome spatial, temporal and social limits without neglecting the characteristics that define it. For instance, students have the opportunity to communicate face-to-face with the teacher and their peers in the studio but, at the same time, also online with other participants. Thus, one of the limitations of the Virtual Design Studio is solved.

Another outstanding aspect of Blended Learning is that the existing teaching and learning processes can be restructured and reorganized for specific academic needs (academic resources, curriculum and educational objectives). Thus, its integration into the Design Studio offers infinite design possibilities that can be applied in multiple educational contexts. What is more, Blended Learning is postulated as one of the most appropriate pedagogical approaches in the current training of architects because, unlike the Virtual Design Studio, it focuses not only on the technological aspects of ICT but also in its social potential and capacity for collective construction of knowledge. New digital technologies allow strategies, tools and techniques to be established in order to create distributive and participatory learning spaces where students can collectively build up knowledge through research, discussion, reflection, consensus and dissemination of design works.

As a result of this, Blended Learning is used in the schools of architecture to redefine the Design Studio in order to provide the necessary tools and teaching methods to train future architects and to resolve the gap between academia and profession. Nowadays, Blended Learning is being incorporated into the Design Studio in order to create a new type of hybrid learning space that is more transversal, social and close to the professional reality. The combination of traditional methods with computer-assisted forms of learning is helping students to acquire new professional skills related to work in temporary, delocalized and multidisciplinary teams; to combine different specific and cross abilities related to design, research and management; and to master digital technologies in order to manage and spread architectural knowledge. Thus, the conventional Design Studio is becoming an interdisciplinary, interdependent and inclusive learning space where students collaborate with other learners (from architecture or other disciplines) and actors (specialists and non-professionals) in person or at distance to enhance mutual cooperation, to promote the exchange of experiences and to discover news ways of interpreting architecture.

The Design Studio is also changing in a cross-learning space where different areas of architectural knowledge are integrated simultaneously in the design process of a project. Through the online and on-site activities, students can reconnect the information acquired in separate courses and turn it into applicable knowledge in their own work. With this model, it is possible to solve the lack of coordination and communication between subjects of the same degree and to connect them on a single system of Blended Design Studios.

Moreover, the incorporation of digital technologies in the Design Studio is changing the work methodology of students, improving their capacity of learning. Online education platforms, blogs and social networks are some of the digital resources that students are currently using in order to exchange information, to access all kinds of learning contents, to publish freely their work and to discuss topics of common interest with different actors. These technologies combined with traditional learning methods are helping students to expand and enhance their educational experiences by encouraging them to develop new interests and relationships outside of the studio and the academic environment.

Towards a New Model of the Design Studio

When we examine how the Blended Learning is currently changing the educational model of the Design Studio, we can see that there are some trends that begin to emerge and, in the coming years, their integration into academic programmes will be a reality. Thus, we can speculate on the future development of the Design Studio and point out three possible lines of evolution.

The first change is that the term 'Design Studio' could be replaced by a new expression: 'Architectural Lab'. This change could take place because an experimental character could be introduced in the Design Studio. This would admit failure and self-discovery as part of the learning process of students and would focus less on the final outcomes. Besides, this new term would also serve to define several hybrid spaces. These spaces would be inspired by cooperative and knowledge production models and would be interconnected physically and virtually.

The second change could be a transition to a more open model. In this new model, active learning processes based on the development of real projects and methodologies focused on creative, innovative and collaborative processes would be especially relevant. Thus the traditional model would be progressively replaced by a new one based on three basic concepts: interconnectivity, interdisciplinarity and research.

The third change could have to do with the integration of ICT in the Architectural Lab. The need to equip students only with technological and technical knowledge would definitely pass into the background. Learning would focus on what students can do themselves with these digital resources. Their integration into the Architectural Lab would promote new ways of interaction and facilitate the access, creation and dissemination of knowledge despite the physical separation that may exist between students, staff and participants. The use of ICT would also provide tools and learning scenarios characterized by being mobile, personalized and networked.

Implementation of a Blended Case

This paper summarizes part of the doctoral thesis: *The Transformation of the Design Studio in New Learning Spaces. A Study on the Process of Integration between Education and Professional Practice*. The purpose of this thesis is to investigate the factors of change that are currently affecting professional practice and its impact on the teaching of architecture. In particular, it examines how the Design Studio is currently being transformed to give way to new learning spaces. The thesis is presented as a holistic study about different international and national types of Design Studios that stand out for their commitment to pedagogical innovation. As a result of this, an overview of what is happening today with the training of architects in schools of architecture is achieved. At the end of the thesis, as future line of research, we have designed a generic Blended Design Studio. The goal of the project iLab is to create a virtual platform to promote the learning of architecture through research and collaborative innovation. The idea is to adopt a new profile of architect that fits better into the current professional circumstances. This professional profile does not focus so much on whether the architect should have general knowledge or should specialize in a specific area of work. It focuses on a single premise: students have to acquire the ability to be more critical, curious and autonomous.

The iLab project uses a blended approach to develop research projects linked to different fields of architecture (technology, urban planning, energy analysis, heritage conservation and art) with the collaboration of specialists (from different disciplines) and companies from the sectors of architecture, engineering and construction. It combines on-site activities (master classes, reviews, practice period with professional partners) with online tasks (brainstorm sessions, design presentations, edition of video material). The learning process is supported by a virtual platform with two environments: the first hosts different research-based learning activities and the second is an autonomous and private environment where students can manage their own resources (bibliography, audiovisual material, interviews and reports) to carry out their current and future research projects.

The plan is that students adopt the role of entrepreneurs. They will have enough freedom to choose those projects which they wish to develop and investigate. Meanwhile, teachers will assume the task of guiding and accompanying students throughout the entire design and fabrication processes as partners. Professional companies and architectural studios will also play an important role by offering professional advice, sponsoring research projects and providing the necessary resources for the construction or marketing of the proposals.

The duration of each blended design studio will be different depending on the type of research project and academic level. In the degree of architecture, although the projects deal only with theoretical or design aspects, the duration will be at least two semesters (fifteen weeks each) in order to carry out a thorough investigation and to realize the practice period with the partners. The fifteen weeks will be divided into three blocks of five weeks (seminar block, project block and practice block) leaving the last week of each block to perform open presentations.

At present, this project has not yet been implemented in the curricula of the Universitat de Girona (Spain). In the following months, it will be presented to the academic staff of the area of architectural projects to gauge their interest and predisposition to adopt this model in their Design Studios. We are aware that this represents a change in the way of teaching of the school focused on a traditional system. It also involves more hours of work for academic staff. However, we hope that their gradual integration into the curriculum will improve the current training of students as they will be able to establish a direct link with the professional practice, to carry out more collaborative projects and to choose those architectural topics that they are most interested in developing.

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APPENDIX A

The examples presented in this report have been chosen to show briefly how Distance Learning and Blended Learning are implemented in the Design Studio. The Internet & WWW Module Project of the University of Strathclyde (United Kingdom) has been selected because it represents a distance educational model where remote collaboration between students of the same school is promoted using synchronous and asynchronous communication tools. The Multiplying Time, Place2wait Project of the Eidgenössische Technische Hochschule Zurich (Switzerland) represents a distance-pedagogical model that applies a participatory methodology among students from different universities through the collective creation and management of design proposals. The Oikodomos Project of the Ramon Llull University (Spain) is an inclusive and blended educational model that combines diverse elements in a single frame (as courses, subjects, disciplines and programmes) and integrates various educational activities developed collaboratively in different virtual and physical spaces. The GEO-VEM Project of the Katholieke Universiteit Leuven (Belgium) represents a blended pedagogical model where a virtual platform is used to unify three different courses in a single Design Studio and to promote online and on-site collaboration among students through the collective management of different educational activities.