

## Integrating Blended and Problem-Based Learning into an Architectural Housing Design Studio: A Case Study

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### ABSTRACT

*This paper presents how a blended learning pedagogic model is integrated into an architectural design studio by adapting the problem-based learning process and housing issues in Istanbul Technical University (ITU), during fall 2015 and spring 2016 semesters for fourth and sixth level students. These studios collaborated with the “Introduction to Housing” collaborative learning space carried out in the EU OIKONET project are also evaluated through the content and the process of ITU design studios.*

**Keywords:** Blended learning, problem-based learning, architectural design studio experience, housing, OIKONET.

### INTRODUCTION

In architectural education the main aim is to evoke in architects and designers of the near future, imagination, a sense of humor and curiosity while educating them as creative, flexible, sensitive, open-minded, and questioning students. As opposed to popular belief Groat and Wang (2013) state that design is a learnable process even if that learning does not always guarantee good design.

The ITU Department of Architecture “provides a positive and respectful learning environment that encourages the fundamental values of optimism, respect, sharing, engagement, and innovation among students and faculty in all learning environments both traditional and

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nontraditional” (NAAB, 2014). This program allows design studios to apply blended learning pedagogic models, and the problem-based learning process.

In the ITU 2015-2016 academic year, current squatter settlements and middle-upper residential areas were the main subjects for fourth and sixth level architectural design studios, which embraced the problem-based learning model. In both semesters, collaboration with the OIKONET “Introduction to Housing” (IH) learning space, contributed to the blended learning model of these ITU studios. “OIKONET, a global multidisciplinary network on housing research and learning” ([www.oikonet.org](http://www.oikonet.org)) is an Erasmus Network project co-financed by the EU to foster pedagogic innovation in the field of housing studies (Madrazo et al., 2017). The implementation of the learning activities takes place in the OIKODOMOS Workspaces ([www.oikodomos.org/workspaces](http://www.oikodomos.org/workspaces)), a web-based learning environment which enables the collaborative design and implementation of learning activities structured in sequence. The participation in the OIKONET network offers students a new perspective on their design process, insofar as they were encouraged to learn in a global context, both collaborative and competitive.

In each semester, relevant tasks were shared by ITU students and teachers in the “IH” learning space through the OIKONET network and in collaboration with international architectural schools including the School of Architecture of Valencia, Spain (ETSA-UPV), Lisbon University Institute, Portugal (ISCTE) and Gebze Technical University, Turkey (GTU). This case study aims to present the integration of blended and problem-based learning pedagogic models into a housing design studio in ITU. It also addresses how blended learning and problem-based models affect the performance of an architectural design studio dealing with housing issues. The methodology is based on evaluation of ITU architectural design studio students’ performance and productivity considering tasks and problem-based housing projects implemented by using virtual platforms and the physical environment. It is also based on students’ evaluation of the studio process.

## THEORETICAL BACKGROUND

The aim of architectural education is to ensure students’ awareness of their creative potential and to enrich it. Students thus can see problems under various combinations of circumstances and produce designs to be able to cope with them. Students should also know that architectural education and experience are life-long learning processes (Yurekli, 2009). Contemporary architectural education provides diverse creative opportunities. The virtual and the actual are synthesized into a new and growing environment. Students are expected to be technologically, culturally, socially intellectual, creative and experiencing. Intuitive and accidental design approaches also add spirit, inspiration, and uniqueness to experimental design processes (Alkiser and Ayiran, 2009). Architectural education seeks to develop

teaching and learning methodology and advanced technology. Problem-based learning and blended learning are ever-developing pedagogic models in architectural design.

Schön (1985) thought that architectural design studio itself is a model for education in all other professions. Design is a creative (Groat and Wang, 2013) and generative (Cross, 2011) process, which is beyond simply finding solutions. “Problem-based learning (PBL) educational model has important pedagogical benefits”. It is founded on problem-based project work. The project is an integral part of the model and hence project-oriented and problem-based learning are interwoven in the terminology (McLoone et al, 2014). Graaff and Kolmos (2003) summarize seven common pedagogical principles related with all kinds of PBL models: An existing problem principle is the starting point of the learning process and more motivating. Self-directed principle gives freedom to students to orient and formulate the problem and solution. The experiential learning principle is necessary to build on students’ previous experiences and interests. The activity-based principle engages students in their research, decision-making and designing. The interdisciplinary principle lets students go beyond traditional subject boundaries in order to find solutions. Exemplary practice principle helps students how to learn for future challenges. The group-based principle encourages students to develop their competencies, communication, and teamwork skills.

The design process is motivated by facing a certain *problem*, through *conceptualization*, *experiencing* in different ways such as coincidences or sketches, and *communication* through inspiration or suggestions by others. (Groat and Wang, 2013). In the PBL studio, the culture of learning together is a dialogue between teacher and students, and a creative process that occurs spontaneously in a learning platform, giving the skill of “learning-to-learn” to both students and teachers in an intellectual environment. “Learning-to-learn leads to “life-long learning” formation (Aydinli and Kurtuncu, 2014).

Blended learning (BL) is a pedagogic model to advance architectural education and make the design process more effective, creative, and easier for architectural students and teachers by using different communication tools and environments. Evolving collaboration technologies allowed international virtual studios and the BL pedagogic model to become more commonly used. A blended learning course, described in the Online Learning Consortium, integrates online with traditional face-to-face class activities in a planned, pedagogically valuable manner; and where a portion of institutionally defined face-to-face time is replaced by online activity (Picciano and Dziuban, 2007).

There are *advantages* and *disadvantages* to blended learning programs. Advantages in terms of incorporating the strengths of synchronous and asynchronous learning are greater flexibility of time, meeting different needs, and learning styles, (Ho et al., 2006, and Vaughan, 2007). Earlier technologies, extended new modes of collaboration and sharing of information, social media and other ICT tools (Madrazo et al., 2016) in design practices.

The disadvantages are potential struggles with technology, lack of motivation, insufficient time management skills and the expectation of less work (Vaughan, 2007). Fear of losing control in an online environment or lecturing identity may be disadvantages for course teachers. There are three factors affecting the success of blended learning courses: course design, communication (student-student interaction both in physical and virtual environment), and motivation (teacher encouragement and course organization) (King and Cerrone-Arnold, 2012).

Both blended and problem-based learning architectural design studios can address design problems. Housing is a popular problematic theme in architectural design studios. Combining BL and PBL pedagogic models in collaboration with housing studies is believed to contribute to architectural design education as well as to housing issues.

### **COUPLING OF HOUSING WITH A PROBLEM-BASED AND BLENDED LEARNING MODEL**

Housing design is a comprehensive learning tool in architectural education due to its large-scale challenges and complicated, complex and multi-dimensional features. The housing theme is easily addressed in a PBL pedagogic model in a design studio. It helps students to work in multidisciplinary collaboration and focus on architectural concepts such as sustainability, affordability, and density.

Blended learning can also support an architectural design studio by adapting PBL pedagogy and housing issues. More complex and blended methods, programs, platforms, and networks can support housing education.

“Introduction to Housing” is one of the collaborative learning spaces carried out in the OIKONET project. Its pedagogic purpose is to initiate students to the basic principles of designing what a house represents in contemporary cultures. It is based on a blended-learning philosophy, which intertwines face to face (f2f) instruction with computer-mediated using a variety of teaching methods and learning (Madrazo et al., 2017).

ITU 4th and 6th semester architectural design studios addressed different housing themes through integrating a problem-based and blended learning model. Computer-aided design software and online communication technologies were used in the design process. These ITU studios introduced an online “IH” learning space in the OIKONET network, which provided a collaborative virtual learning environment with an interface for users to share their tasks, ideas, and comments.

In brief, housing issues, PBL, and BL in which online workspaces were introduced into traditional f2f and technology-based activities, all contributed to the dynamics of the design studio process through extensive international collaboration of distant learners of both teachers and students.

## EVALUATION OF ITU ARCHITECTURAL DESIGN STUDIO

Housing in Istanbul offers architectural students extensive opportunities to understand, discover, and overcome hidden and exposed housing and environmental problems through both traditional and online design mediums.

The architectural design studios in ITU in collaboration with "Introduction to Housing" workspace addressed two different housing topics: "New Directions In Urban Housing: Fikirtepe Squatter Settlement Case" (fall 2015) and "Self-Made Neighborhood: Along Bagdat Street" (spring 2016). General themes, housing, and transformation in the syllabi were the same for different scales for both levels. There were one teacher and thirty ITU students with seventeen in the fall and thirteen in the spring in collaboration with three international universities in each semester during the activity period of the OIKONET network. Although ITU students are very familiar with computer-based drawing techniques and communication systems in the various virtual environments, experiencing an online network system, "IH", was new for all.

The content of two ITU studios are discussed in reference to the pedagogical principles of problem-based learning. These were derived from seven common principles by Graaff and Kolmos (2003), principles of communication-based and conceptual-based learning by King and Cerrone-Arnold (2012) and Groat and Wang (2013) and the process-oriented principle by Aydinli and Kurtuncu (2014). These principles were harmonized with the housing theme and the BL pedagogic model including traditional and computer-based environment according to learner's skill, talent, background, and point of view. The content of the two architectural design studios was evaluated in the context of "what is learning design". Below, the learning design process is analyzed according to specified PBL principles and by the BL approach under the housing theme. Table 1 shows ITU design studio activities and tasks delivered in different mediums.

PBL	HOUSING	BL		
<b>Pedagogical Principles of the Studio</b>	<b>Tasks and Activities in the Studio</b>	<b>Physical Environment</b>	<b>Virtual Environment</b>	
		<b>Traditional f2f</b>	<b>Computer-based (national)</b>	<b>OIKONET network IH &amp; TD (international)</b>
<b>Problem-based</b>	First Impressions	Class	Dropbox	IH
	Background of the Area	Class	Dropbox	IH
	Environmental Analysis	Class	Dropbox	IH
<b>Self-directed</b>	Design Approach	Class	Dropbox	
<b>Experiential learning</b>	Creating Storyboard	Class	Dropbox	
	Making Section-Model	Class		
	Making Video	Class	Dropbox	IH
<b>Activity-based</b>	Preparing Survey	Class	Dropbox, WhatsApp, Facebook	
	Visiting the Area	Project Site		
	Conducting Survey	Project Site		
	Evaluating & Discussing Results of Survey	Class		IH
<b>Interdisciplinary</b>	Lectures	Class		Skype
	Provided Documents	Class		Dropbox
<b>Exemplary practice</b>	Housing Profession	Project Site		
	Example Analysis	Class	Dropbox	IH
<b>Group-based</b>	Making Shared Model	Class		
	Various assignments	Class	Dropbox	IH
<b>Conceptual-based</b>	Architectural Concepts	Class	Dropbox	
	Meaning of Dwelling	Class	Dropbox	TD
<b>Communication/ Interaction-based</b>	One on one interview	Class	E-mail, Facebook	
	Commenting on other students' work	Class		IH
<b>Process-oriented</b>	Juries for initial designs	Class	Dropbox	IH
	Commenting on Initial and Final Design	Class	Dropbox	IH
IH: Introduction to Housing TD: Thinking Dwelling				

Table 1 – ITU design studio activities and tasks delivered in different environments.

*Problem-based:* Housing was the main theme of both studios but the contexts were distinctive. While Fikirtepe was a squatter settlement, Bagdat Avenue was a middle-upper income housing area. Urban transformation was an actual agenda in both. Students focused on various housing design and urban transformation models. Students explored the right question to formulate the problem in the physical and social context through analyses. First impressions were based on their site visit and individual observations to perceive and understand about the area through concepts. The background of the area was researched through literature review. In-depth environmental context analysis was done through the “swot” technique. All work was presented and discussed in class and shared and commented on in the workspace.

*Self-directed approach:* Students were supposed to figure out and formulate the main problems themselves. They needed to come up with a cause and effect relationship about the potentials and problems of the area. Design was not dictated and they decided on their own the design approach and directed their development of solutions in the studio through discovery, experience, discussion, and knowledge exchange among the students and teachers.

Back and forth movement in the process was the key. The main focus of the studio was the interactive relation of ideas and actions between teacher and students. The final product was not an imagined result which the teacher or student previously had but a result of interwoven thoughts (Uluoglu, 1990), which was created by interaction in the studio.

Giving independence to students is important. Yurekli (2009) carried this idea forward saying architectural education could be considered a “black hole”, that is to say, “the output was as important as the input.” There should not be a perpetuation of a type of education with its rigid curriculum restricting and making students inconspicuous.

After a literature search, presentation, and discussion of design approaches in the class considering sustainability, affordability, re-densification etc., students were set free to find their own designs and social approaches.

*Experiential learning:* Experiential learning is based on one’s life and interests in order to understand the world better. Davis (2006) stated that the best teacher for architectural students is reality itself. “A community of inquiry” stressed by Garrison and Vaughan (2008) allows learners to have “deep and meaningful educational experiences”.

To raise interest and curiosity about design issues among ITU students, one-day workshops such as preparing storyboards, sectional models and/or videos were created. Students could create a useful, utilizable, and re-producible knowledge through their experience regarding their one-day lifecycle to reveal their routine daily life experiences to “re-think” and “re-

understand” a housing design. They shared their work for an in-depth discussion in class and on the workspace.

*Activity-based:* In design, the impetus is commonly referred to as a “problem” for an unmet need that prompts the development of a designed artifact as a solution for the future. Whereas in research, the impetus is typically framed in terms of a “question” to be answered at least in part by examining current and/or past evidence. (Groat and Wang, 2013).

ITU students designed a questionnaire to use with residents to gather information about user profiles, existing problems, and area potentials. They visited the area to make face-to-face interviews. The analysis of the survey was discussed in the studio and shared on the workspace.

*Interdisciplinary:* Workshops were conducted by specialists from different disciplines and provide students with new perspectives. Professionals and professors from Holland, Iran and Turkey coming from different fields gave lectures in the ITU studio and on Skype. ITU students asked questions regarding different fields and perspectives and shared in Dropbox.

*Exemplary practice:* Students do learn about learning and this equips them for success in future solutions. They are expected to develop their professional identity and responsibility (Graaff and Kolmos, 2003). Examples provide learners a way of exploring the architectural world.

In the studio, and online workspace a precedent analysis from published and online sources related to environmental characteristics, building program and conceptual approach was submitted as individual work.

*Group-based:* Peer-learning is facilitated and encouraged, as this is also central to the effective development of communication and teamwork skills (McLoone et al., 2014). Students learn how to handle the process of group cooperation in different stages (Graaff and Kolmos, 2003).

At the beginning, students made a shared model of the whole area to understand the city pattern used it to develop their initial design. Group work for various assignments enabled them to communicate, coordinate teamwork, and decide on the material, color, and technique of the model.

*Conceptual-based:* A concept is not an isolated, changeless formation but an active part of the intellectual process constantly engaged in serving visual communication, understanding, and problem solving. Students generally have extreme difficulty with conceptualization as much as transferring theoretical/ principles to the project work (Graaff and Kolmos, 2003).

Mental abstraction, integrity of form, function and technology, inner and outer space relationships and space organization were considered through conceptualization related to requirements and environmental parameters. Students participated in the OIKONET “thinking dwelling” program uploading the pictures upon the concepts.

*Communication/Interaction-Based:* The main idea of the design studio is the interactive relationship of ideas and actions between teacher and students. Communication and participation can lead to an increase in student motivation (Ho et al., 2006). The high quality teaching experience comes from the ability of blended courses to provide opportunities for increased interaction between students and faculty (King and Arnold, 2012) through juries, criticism, and reviews. These opportunities create effective discussion mediums, interactive environments to enhance, accumulate, and articulate the ideas, critiques, and even debates among students. With these interactions students can find their way during the design process. Yurekli (2009) claimed that students should learn correct knowledge through visiting the existing environment, reading a book, or surfing the Internet.

In the studio one-to-one interviews were another way for students to communicate with each other and teacher. This was a communication technique that students mostly preferred. Students were also encouraged and engaged interactively by involvement in commenting on other student’s work in the class and on the IH workspace.

*Process-oriented:* The process-oriented approach needs “culture of learning-together and learning-to-learn” (Aydinli and Kurtuncu, 2014) among the learners in the design studio process. Learning is a never-ending process and bloomed by the synergy of the participation to the learning environment. The studio represents a “holistic process” including all kinds of assignments, experiences, and a lot of intermediate products as well as final projects. It concerns a whole process instead of a “finished/final product”.

Design process and multiplies knowledge is as important as design project to evaluate student success. In studio students shared their initial designs and final products through juries, one-on-one discussions in class and comments from students in the studio and on the IH workspace.

## RESULTS

Learning design in ITU was based on PBL with the principles mentioned above in collaboration with BL pedagogic model and housing theme during two semesters. At the end of the each semester, ITU students were asked to evaluate the design studio process in terms of PBL, BL, and the housing theme.

During the fall semester more than half of the seventeen students (53%) who submitted their projects performed highly, 23% had medium success, 18% were under achievers, and only one failed according to their grades. During the spring semester seventy percent of the thirteen students who submitted their final projects performed highly, 23% had medium success and one student failed. All thirty students evaluated the design process as below.

*Evaluation of problem-based learning approach:* A great majority of the students believe that the project site had a positive influence on their design due to its, unique, visible, physical and social characteristics, the possibility of visiting and learning and working with real lifestyles.

*Evaluation of blended learning approach:* Half of the students said that one-on-one interviews with their professor motivated them and one third of the students were motivated by group discussion. This shows that students prefer the physical environment and having someone with whom to discuss their ideas. Half of the students think that they worked in the studio environment efficiently and liked sharing and working together and learned a lot from the presentations. The other half thought that they did not work in the studio environment efficiently as it was crowded and noisy and they preferred to work alone. The students who found the OIKONET network effective were satisfied to share various examples, comments, and work with other universities. Twenty nine percent of the 45 ideas of the students on the online network were about more direct communication and group working with international students. In other words, their feeling was to make the platform more real, interactive, and visible by using Skype discussions and shared activities. More than 42% of the proposals suggested the need for an easier interface and uploading system. These results showed that overall, students were satisfied with being a part of an online network. The most common communication tools among the ITU students were WhatsApp, Facebook, and e-mail.

Thirty ITU students were given 23 various tasks and activities, shown in the Table 1, to implement individually or in groups to share either in the physical or virtual environment. Students were responsible for doing five tasks in the fall and eight in the spring on OIKONET “IH” workspace. They uploaded 33 (fall) and 71 (spring) tasks to the network. During both semesters more than half of the students completed all tasks in the network. Forty percent completed sixty percent of the tasks during the fall and more than one third of the tasks during the spring. This can be considered an encouraging completion rate of tasks showing their performance, given the difficulties of motivating and engaging the students in the online network.

*Evaluation of housing theme in architectural design studio:* All of the students agreed with the positive impact of the housing theme in terms of importance of daily life, opportunities for gaining extensive housing knowledge, requirements for different people, various typologies, housing legislation, and housing research.

## CONCLUSIONS

Housing issues, problem-based learning and blended learning can be integrated to create a dynamic and creative pedagogic model in an architectural design studio. Although online education is sweeping through architectural education models, traditional education systems in architecture do not seem to be sacrificed as long as the experiential dimension of architecture is considered. Blended learning offers a wide range of flexibility to use available technologies and it is mainly affected by motivation, communication, and course design. The learning design process in a studio can be defined in advance and organized by the instructors. The key for being creative and innovative in the design process is to be open-minded, make a sensation, and raise curiosity using all kinds of traditional and online design tools in face-to-face and virtual design environments.

As a result PBL is very compatible with BL in which different ratios of traditional face-to-face learning and online learning can be adopted into architectural education. In addition, integration of problem-based learning, blended learning and the housing theme can help students to gain extensive information, interactive creativity, technology skills, socio-cultural awareness, and foreign language experience by using both physical and virtual environments and be applied to pedagogic models in architectural education and in a dynamic design studio process.

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