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Design thinking for interior and spatial design: A case study within Politecnico di Milano

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Abstract

The contemporary state of Interior Design education is being affected by changes in the professional realm that requires more and more a user/community-centered design to prevent failure in the use phase and to increase the citizen participation in designing their own city-environment. The modern design curriculum is structured to educate students who will go into the field and serve clients and employers effectively and also can lead the market as a change-maker (Foti, 2004). Within the School and Department of Design at the Politecnico di Milano, the POLIMI DESIS Lab has been developing some innovative interdisciplinary programs, crossing the area of Interior and Spatial design with Service design, through Design thinking, user and community centered design. This paper will present two case studies at the Politecnico di Milano that addressed different areas of concern but were underpinned by a shared approach to Design projects that participants are able to inhabit. Through these innovative interdisciplinary programs, findings are presented as the elaboration of a Design Thinking framework that can contribute to many other design disciplines.

KEYWORDS: design thinking, interior design education, co-design

Introduction

During the last few years, Design in general and Interior Design, in particular, have experienced a rapid growth in evolving from one primarily concerned with surface decoration to one based on designing for human behavior (Alkhalidi, 2014). According to Landry (2010), starting from the focus on sustainability to an increasing reliance on technology to the requirement for better professionalism; Interior Design continues to progress in spite of bleak economic forces that seemed primed to exploit such evolution. This may explain the issue that Interior Design education is now shifting to meet the needs of today's students and today's design firms. However, the contemporary state of Interior Design education is not simply molded by changes in the profession and even stop

following the industry (Landry, 2010). It is proved that there are a growing number of students coming out of universities with more than a single Interior Design degree. Williams (2005) believed that it's no longer enough to leave schools with drawing and drafting skills because tomorrow's world needs more product innovators, industry specialists and strategic planners instead of traditional designers. Bowles (2010) indicated that through both formal and informal collaborations with different departments and design firms, graduates are encouraged to gain comprehensive skills which encompass the entire practice of design, including business, marketing, and communication skills while incorporating with humanistic sensibilities.

In the context of higher education, the design curriculum is structured to educate students who will go into the field and serve clients and employers effectively and also can lead the market as a change-maker (Foti, 2004). Within the School and Department of Design at the Politecnico di Milano, the POLIMI DESIS Lab has been developing some innovative interdisciplinary programs, crossing the area of Interior and Spatial design with Service design, through Design thinking, user and community centered design. This paper is about the experiences done in two Design studios (the Final Design studio at the MSc Interior Design and Temporary Urban Solutions, MSc elective course open to all the design students) where an iterative problem-solving process of discovery, ideation, and experimentation that employs various design-based techniques to gain insight and yield innovative solutions (Wylant, 2008) has been tested together with the needs of conducting research to the design opportunities, from the preliminary proposals to the technical executive ones, from the understanding of the personas to their involvement in the prototyping activities and from concept to the final settings.

Review of Literature

Design Thinking

Brown (2008) and Wetzler (2013) believed that the concept of "Design Thinking" has been around in the period of 1960s but has just presented to the popularity, especially in the world of business over the past 10 years. It is indicated by Howard (2015) that Design Thinking has evolved conceptually and widened in scope over the past half-century. Its foundation lies in the design methods movement within design research, which sought to understand how designers think, making decisions and solving problems (Buchanan, 1992; Jones, 1970). From these foundations, Design Thinking evolved to understand as a more generalized concept to tackle wicked problems in designing tangible objects and intangible systems.

In disciplines ranging from experience design to industrial design, architecture, and business, the conscious application of design thinking has been having impacts on the way design and non-design professionals approach problems (Cupps, 2014). However, Johansson-Skoldberg, et. Al (2013) pointed out that Design Thinking is not only about design; it is often used beyond the design context, dealing with people without a formal background in design. As a result, the former role of 21st century designer has now shifted from the limited task as "form giver" to extended job including public communications, human interactions, systems and product platforms, strategies, processes, services and experiences (Brown, 2008; Buchanan, 2008; Gloppen, 2011; Norton, 2012). The strategic use of designers and design companies to partners with organizations so to create innovative practices was seen to be the beginning of most of Design Thinking discussions which focused on the nature of design problems and design processes (Brown, 2008; Buchanan, 2008; Gloppen, 2011; Johansson-Skoldberg, et. al., 2013; Martin, 2010; Rylander, 2009). On the other hand, the purpose of Design Thinking as an approach to problem-solving is to support an organizational interest in the participation of non-designers in the design process with the aim of expanding the organization's capacity for creativity and innovation (Brown, 2008; Leavy, 2010; Martin,

2010; Gloppen, 2009, Rosensweig, 2011). Furthermore, it put the emphasis on the development of an organization capable of building empathy, celebrating new ways of dealing with problems and issues, using iterative processes based on failures, feedbacks, prototyping and making an obligation to changing systems of practices and policies (Rice, 2011).

In spite of the acknowledgement that how a designer designs is on the face of its highly chaotic, it is predicted that there are some kinds of commonality to all design processes which are based on the Design Thinking approach using by many designers and can be learned and adapted even by non-designers for dealing with problems (Brown, 2009; Martin, 2009; Cross, 2011, etc). According to Rice (2011), the Design Thinking process can be experienced in terms of a system of five stages model proposed by the Hasso-Platter Institute of Design at Stanford (d.school). The five stages are as follow: Empathize, Define, Ideate, Prototype, and Test. It is important that, in practice, the process is carried out not always sequential but in a more flexible and non-linear fashion which do not have to follow any specific order and often occur in parallel and be repeated iteratively (Dam and Siang, 2017). On the other side, Brown (2008) highlighted three larger overlapping spaces including a series of related, iterative activities that together build the framework of Design Thinking approach. These steps are known as Inspiration, Ideation, and Implementation. Inspiration is the combination of two related phases called “empathize” and “define” which are focused on identifying the constraints of the problem or challenge, gaining deep understanding of people through a variety of qualitative research methods and allowing the design team to set constraints for the ideation to follow. The next step is ideation in which generating, developing and testing ideas can lead to solution. During the brainstorming session, all ideas are valid, crazy ideas are welcome and it is better to build on someone else’s ideas. The last phase called implementation is the bridge from ideas to reality, starting with prototyping, testing, getting feedback from real users and iterating on the ideas. It is essential that the design team should loop back through these first two spaces multiple times as new discoveries or new insights until a final solution is accepted, engineered and marketed.

Design Thinking in Education

It is believed that there is a mutual benefit from the collaboration among universities and companies. According to Guimon (2013), the collaboration between academia and industry is increasingly a critical component of efficient innovation system and to foster education and training. On one hand, this linkage can help private firms to expand the relevance of research carried out in public institutions, foster the commercialization of public R&D outcomes, and increase the mobility of labor between public and private sectors (Marotta, Blom, and Thorn 2007). On the other side, the strategic management processes used in the education sector is similar to the one which used in the corporate world, using an iterative thinking process, such as Design Thinking allows for flexibility and adaptability in both planning and the integration of viewpoints from all stakeholders. Fartushenko (2016) highlighted that this approach is usually seen in a collaborative form and interdisciplinary methods so to foster creativity and innovation within educational organizations. Cupps (2014) indicated several institutions which have deployed Design Thinking programs in the last few years noticed by d. School which spearheads by IDEO’s David Kelly. Particularly, within the area of interior design education, it is no longer simply design interior spaces within building envelopes. Solutions need to go beyond the look and the functionality of the spaces referring to “design for a purpose, design for experience, design for emotion, design for sustainability and design for transformation” (Muratovski, 2015). Specifically, interior design today is defined and given to students in a broader scene. It is not only the transmission of understanding and exploring of the interior environment but also entails collaboration across a multiple of disciplines, ranging from urban design, architecture, spatial design, environmental design and service design (Hadjiyanni, 2013). Particularly, the literature reveals some courses of high-ranking universities have embraced Design Thinking approach as opposed to traditional approaches within design studio courses.

Case Studies

Methodology

The aims of the study are first to understand the learning approach being used within the two design studio classes and then drawing a framework of Design Thinking approach that can help design educators put into practice and student-oriented purpose in many other design disciplines, for many types of inventive single or group projects. As a result, classroom observation method was used in order to capture these goals. Obviously, classroom observation could be seen as a strategy to improve instructional quality and teaching effectiveness, whether they are conducted by fellow teachers or by administrators. However, teaching is a complex and dynamic activity and during a lesson, many things occur simultaneously (Richard and Farrell, 2012). Furthermore, there are also exist many types of lessons ranging from amateur to professional, from general education to higher education, from primary schools to universities. Especially, in this study, the author's task is to observe two classes in the program of master degree at the Politecnico di Milano School of Design: Final Design Studio at MSc Interior design and Temporary Urban Solutions elective course at MSc in Interior, Communication, Fashion, Product, and Product Service System Design. The two classes were led by a group of professors belonging to POLIMI DESIS Lab and being taught in the type of Design Studio. These courses have shown the unique characteristic as an interdisciplinary teaching and learning activities including lectures, workshops, feedback sessions, presentation, individual and group work, written assignments and exhibitions (AIAS, 2002). That's why a number of following questions were needed to keep in mind:

- What types of students are included?
- What is the physical layout and design of the studio class? How is space used?
- What are classroom management strategies and structure of the lesson?
- What is the approach applying for the whole design process?
- What types of teaching strategies and activities using in the studio class?
- What type of learning materials used to support for design students?
- What types of design outputs that students need to submit?
- What types of interaction occur among instructors to students and students to students?

Design studio observational tools

In carrying out the design studio observation, a number of tools or instruments need to be taken into account in order to help the researcher to collect systemic information so to answer the observational questions (Spiegel, 1997). What follows is some of the types of observational tools used in this study.

Maps

In this study, a number of maps were used to sketch different aspects of the classroom with the purpose of understanding the transition among forms of the studio class. For example, in the "Final Design studio", sketching maps provided a clear perspective of the classroom transformation and materials used in order to serve diverse tasks of a studio session, such as: from lectures to feedbacks, from lectures to presentations, from traditional classroom to active classroom, from teacher-centered learning to student-centered learning.

Field Notes

Writing Field notes is defined as notes transcription or the written account derived from data collected during both observations and interviews. Field notes should be written down as

soon as possible after each observation done because important details may be missed or forgotten by many reasons. Richards and Farrell (2012) believed that field notes are used to “broaden your range of vision” and provide data that will be used in the later stage of the system design.

The Follow-up Conversation- Interview

Although this is an observational task, it is suggested to use the method of interview or interactive conversation with both students and instructors. During the follow-up meeting, it is important to focus on clarifying and interpreting information in order to understand more about teaching strategies used by teachers and how the students respond to the innovative learning approach.

To be concluded, it is no single instrument or tool will be appropriately used for gaining purposes of the observational task and answering all research questions. On the other hand, Chesterfield (1997) indicated that observational tools should be best used in the type of combination with the aim of showing patterns and differences between individuals and groups. Additionally, observational data can be used in mixture with background characteristics of students and instructors to establish relationships between observed behaviours and previous experiences.

Case Studies details

| Temporary Urban Solution (TUS) | Final Design Studio (FDS) |
|--|--|
| Duration: 2 months (11/ 2015 – 01/ 2016) | Duration: 4 months (10/ 2016 – 02/ 2017) |
| <p>Aim: This course focused on temporary design actions to be done in the outdoor area of the Milan theatre “Atir Ringhiera” known as “La Piana”. The studio also explored the opportunities to improve the sense of belonging to this place, attracting people and actions to new kind of activities.</p> <p>Participants: 62 international design students, one course leader, two assistants, a number of Milano citizens.</p> <p>Location: Politecnico di Milano – School of Design</p> <p>Design process Phase 1: Inspiration</p> <ul style="list-style-type: none"> . Students tried to gain a deep understanding of people’s need. . Research methods: Observation, video interviews, learning from experts, analogous inspiration... <p>Phase 2: Ideation</p> <ul style="list-style-type: none"> . Aims to design the temporary solutions (services, spatial design, toolkits...) | <p>Aim: This course focused on the most advanced fields of research and experimentation, particularly on how “public space” both shape and are shaped by cultural activities and how co-design or co-creation of public goods like services, spaces and strategies can actually become a way for engaging citizens and stakeholders in order to shape the European identity.</p> <p>Participants: 54 international design students, four course leaders, two assistants, two internship students, 22 artists, and 21 space owners.</p> <p>Location: Politecnico di Milano – School of Design</p> <p>Design process Phase 1: Discover</p> <ul style="list-style-type: none"> . Students tried to understand the existing system of art-related spaces and people who are living around. . Activities: Sketching, experience maps, video interviews... <p>Phase 2: Ideate</p> <ul style="list-style-type: none"> . Aims to design spatial devices (settings, hosting areas) for the |

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|---|--|
| <ul style="list-style-type: none"> Activities: Defining personas, Creating “how might we?” questions, customer journey maps, brainstorming, co-design session... <p>Phase 3: Implementation</p> <ul style="list-style-type: none"> Aims at creating a real scenario (outdoor event) that could be developed into long-term solutions and will be presented in Milan Design week 2016. Activities: Prototyping, creating event, testing the solution... | <p>installation of artistic activities in indoor and urban interior spaces.</p> <ul style="list-style-type: none"> Activities: Space analysis, co-design sessions, final solution decision... <p>Phase 3: Prototype</p> <ul style="list-style-type: none"> Aims to design a final exhibition /event that will be held in the real spaces (NoLo district) and will be presented for the “ZuArt” festival 2017. Activities: Prototyping, service design, event design, testing the solutions... |
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Table 1 Describing the procedure of two Design studio classes in details.

Findings

Through on-field observation, the complexity of Design thinking towards innovative teaching and learning approach was categorized in a framework which consisted of four main characteristics:

- Design Thinking is a creative problem-solving approach
- Design Thinking is a human-centered design approach
- Design Thinking is a collaborative and multidisciplinary approach
- Design Thinking is an experimental and iterative approach

Design Thinking is a creative problem-solving approach

Regarding problem –solving approach, Design Thinking is particularly valuable for addressing so-called “wicked” problem which was first coined by Horst Riddel and Melvin Webber (1973). Wicked means that the problem is ill-defined or tricky which is not easy to understand, is difficult to measure and the solution is unknown at the beginning of the process (Buchanan, 1992; Williams and Hof, 2014). In a usual project-based learning class, students often need to find a way to answer a general question, to solve a concrete or well-defined problem (Patton, 2012). By contrast, in the two design studio courses, students were given a real-world project that encouraged them to gain understanding and knowledge outside of their own professional territory and personal comfort zones (Ibarra and Hunter, 2007). For example, rather than being asked to design an interior space with a specific given set of physical tasks or constraints, students were introduced to existing contexts in Milan (La Piana and North Loreto district) with the problem of “connecting the community” and “adding value to the emerging qualities” respectively. As a result, they might look at the solution in a broader view that beyond the interior design discipline, such as urban design, spatial design, and service design. Moreover, it was required to be aware of city zoning ordinances and concerning the environmental and social impact before starting the project. For instance, in the “Final Design studio”, with the aim of understanding the design areas by mapping the existing system of indoor and outdoor art-related spaces, the first delivery was the “sketchmob” in the form of freehand drawings during a half-day “flashmob” action. All students were encouraged to use different types of painting or sketching materials to represent the existing spaces in North Loreto.

Concerning the attribute of creativity, Design Thinking is recognized as a creative process that brings together both the use of divergent and convergent thinking. As the key aspect of

the second phase of each project, creating as many options as possible (diverging) and then narrowing down into a number of promising ideas (converging) was clearly evident in the studios' approach (Baeck & Gremett, 2011). In the course of Temporary Urban Solution, by following the ideation guideline based on "DESIGN KIT – the Course for Human-centered Design", each group tried to dig deeper and to investigate the set of problems and then defined them as "Key learning" that were being observed in the previous phase via causes-effects statements and short explanations. Due to three "Key learnings" related to three different issues recently found, student groups continued to create "How Might We" questions as an invitation for input, suggestions, and exploration. For example, "how might we create good ways to inform and introduce the place to the community?" based on the problem of no places for sharing information. "How might we make the open place more attractive to the community?" based on the issue of existing empty space. "How might we connect people within the place?" based on the cultural diversity problems. These kinds of question will suggest that a solution is possible and offer the change to answer them in a variety of ways. After that, all the team started brainstorming session as a creative thinking technique in order to generate ideas. From about 100 concepts generated within 60 minutes, each member of group individually made 2 selections on the most promising ideas and set them score. Working as a group again, they compared the scores that were given to each idea before and then made a decision on which the three highest score as the three possible solutions. The rule of this activity is no judgment, try to encourage as many ideas as possible, build on the ideas of others and stay focus on the target (OpenIDEO, 2011).

Design Thinking is a human-centered design approach

Human-centered design and user-centered design have been around in the early 1990s as the exchangeable term regarding the integration of end-user within a design process. Margaret (2013) believed that human-centered design is the combination of meta-design and service design but closely related to anthropology which aiming to humanize the design process and empathize with stakeholders. Accordingly, the first stage of the design studios' approach was to build empathy that all students needed to go into the field in order to create meaningful insights by gaining a deep understanding of people's needs and aspirations. In the Inspiration phase of the "Temporary Urban Solutions" course, a number of research methods were suggested to use by the instructors. For example, "Learning from people" method by defining the target audience was done via the form of conducting an in-depth interview. In this session, students need to ask the neighbors about how they feel about their place where they live, things related to memories, things cannot be changed or relocated, the problems that arise during the time they are living here on both human and objects. All the information and data were documented, and video recorded. Another effective research method that students must use in this course was trying to "Immerse themselves into the real context" through observation with the purpose of getting benefits from the neighbors. By doing this, the students have learned how to talk with strangers, kept the conversation, encouraged people to tell their whole story and the idea had gradually been formed in a very natural way. In case of the "Final Design studio", the activity which was recognized as the most important part in phase 1 was to interact with the neighborhoods who live in NoLo district via a video interview in order to take advantages of their helps so to understand unarticulated behaviors, desires, and needs in a way that is often more obvious and easier to see than in mainstream members of the community.

Design Thinking is a collaborative and multidisciplinary approach

It is believed that innovation happens when multidisciplinary groups come together to build a common collaborative culture to discover their diverse perspectives (SAP, 2012). Although the concept of creative thinking consists of the principle of flexibility that describes the given problem from different angles, the single individual tends to generate these angles based on experiences and biases. In dealing with the increasingly complex problems posed in today's world, Design Thinking takes advantages of team-based working, collaborative approach with the aim of fostering creativity and innovation by framing a problem from different

points of view. Particularly, there were 62 international students participated in the course of Temporary Urban Solution and the “Final Design studio” revealed the number of 54. The whole studio classes were divided into groups of 4 to 5 members who have different nationalities and separate background majors, such as interior design, communication design, fashion design and product service system design. In these diverse settings, Design Thinking played a role of a common language or the glue that holds different types of disciplines together, seeks to integrate these differing opinions into wider, holistic solution and makes the projects successful.

Furthermore, the collaborative aspect of these two Design studios has gone far beyond the field of design as a multidisciplinary approach that seeks values and expects input from people who even have no specialize in design. As a result, the concept of co-designing was introduced to all students as a key factor in the second phase of each studio. Its activity enables a broader range of people with a diverse background in order to build a creative contribution in the generating of fresh ideas and more efficient decision making (Steen, Manschot and De Koning, 2011). The “Temporary Urban Solutions” and the “Final Design studio” are two good case studies of co-design in education and practice undertaken by a group of students at Politecnico di Milano and citizens within Milano city. Before starting the co-design session, professors need to contact with people who will participate and make sure that they are willing to help and co-operate with students in the design project. For example, within the “Temporary Urban Solutions” course the people that co-operated with the group named ENJOY were four members who have been working for the local paper called “Milan South” and have lived in this area for many years. In this meeting, the group started to explain their ideas and then asked for feedbacks and advice. Interestingly, through the co-design activities, such as co-sketching, co-discussing, and co-selecting, the best idea may come out naturally even not from the fixed concepts prepared by the team before. Different from the “Temporary Urban Solutions” where the students had a single chance to work with the communities on a specific one-day workshop, students in the “Final Design studio” spent most of the second phase’s time to collaborate with their design partners. In fact, there are 22 artists and 21 space owners were introduced to 11 student’s groups for the whole design studio. Meeting time and corporation manners were totally deepened on each group and its co-design partners. For example, group 4 spent only about one hour co-working with artist Alessandra Desole and 2 hours with artist Andrea Tarella. On the other side, group 1 spent even a whole day with artist Qiji from the early morning to the end of the afternoon and kept the conversation during the dinner time at her restaurant. Normally, a co-design session was divided into 3 stages including Preparation, Main activities and Finalizing design. All the design concepts were delivered as an indoor exhibition (figure 2).

Design Thinking is an experimental and iterative approach

Traditionally, designers have used hand sketches, 2D & 3D renderings and models in order to represent their ideas to clients, but in Design Thinking process, the results generated during the implementation or experimental phase are often best translated by the concept of prototyping. According to Dam and Siang (2017), a prototype is defined as a simple model of a proposed solution used to test or validate ideas. A prototype takes many forms but has been usually built by cheap or recycled materials that allow designers to identify weakness early, and to correct mistakes along the way. In the last phase of these design studios, all groups tried to use recycled materials to make a prototype and brought them to the site of the project. The testing days were designed as an outdoor event (figure 1) that encouraged the community to participate, enjoyed the new shape of La Piana and North Loreto district. The outdoor events were officially closed the “Temporary Urban solutions” course and the “Final Design studio”, but it was not the time to say good bye to the project. Students had another chance to develop their solution by taking advantages from feedbacks, revealed some new insights about users which might lead to extra brainstorming session or building new prototypes. It is seen as an iterative approach that knowledge acquired at the later stages can reflect to earlier stages. Information is continually used to both inform the understanding of the problem and solution spaces, and to redefine the problems. This

creates a perpetual loop, in which the designers continue to gain new insights, develop new ways of viewing the product and its possible uses, and develop a greater understanding of the users and the problems they face. Accordingly, Students of these two courses have involved and continued to develop their own projects in order to present their outcomes in Milan Design Week 2016 (Temporary Urban solutions) and the street art festival 2017 named “ZuArt” (Final Design studio).



Figure 1 “Temporary Urban Solution course” – An outdoor event was taken place in La Piana.



Figure 2 “Final Design Studio” – An indoor event was taken place in Politecnico di Milano.

Discussions and Conclusions

In these above case studies, design thinking approach adopted in interior and spatial design has led to the changing of the nature of a traditional design studio. First of all, it is proved that within the master level of design at Politecnico di Milano, the learning objective is not about how to teach students to design a particular interior space like a living room, a bedroom or an office space. Within the two Design studios mentioned above, the main goal is to provide for students with a creative design process driven by design thinking or human-centered design approach so to create fresh ideas and innovative solutions. Besides, another objective could be seen in these two courses is to provide students a chance to improve their

entrepreneur skills such as Communication and collaboration, critical thinking and problem-solving, social and cross-cultural skills.

Secondly, design students will no longer study within only the close space of a traditional design studio, their learning environment will spread to the outside world where they need to observe actual experiences of people and become embedded in the lives of those who they are designing for (Brown and Wyatt, 2010). For example, in the “Temporary Urban Solutions” course, a large number of citizen communities living within the spaces of La Piana- Milano was selected to be clients as well as design partners working together with design students on a specific one day workshop. On the other hand, there are 22 artists and 21 space owners were introduced to 11 student groups in order to implement co-design sessions in the “Final Design studio”. Meeting time and corporation manners were totally deepened on each group and its co-design partners. At the final phase of each design studio, there will be an outdoor and indoor event organized for the purpose of prototype testing, evaluating and giving feedbacks so to develop the project into a long-term solution.

Finally, the concept of studio instructor as a data bank or potential information source for design students have possibly changed as well because of the notion of co-design session have been growing as an action of collective creativity of design students and participants including: guest lecturers, practice designers and even the users as client working together in the whole design process (Sander and Stappers, 2014). As a result, the role of studio instructors has also been changed dramatically. They will take responsibility for both acting as a lecturer, a partner of design students, a researcher, and those who bridge the gap between design studio education and the entrepreneurship, communities and the end-users. In a formal design studio, students often have an opportunity to work with only one instructor. Nevertheless, there were two; three and even four main professors of the final interior design course gave advice, supported ideas and provided appropriate direction to one group at the same time. Moreover, it is possible for student groups to ask for extra instructional time with any professors that they were interested.

Unfortunately, the implementation of Design Thinking approach may have some existing issues need to be concerned. Firstly, most of the students participated in these courses came to an agreement that they needed to spend a lot of time in their design studio and had to ignore almost all other courses. Moreover, the preparation of weekly presentations as classroom exhibition and doing the full-scale prototype for the final event could probably cost much more money compared to other studios in the same level. Secondly, The Diversity of languages and culture could be seen as a barrier to communication and interaction, especially in the first phase of the Design Thinking process. Therefore, Asian students found it the most difficult for them to communicate with those who speak Italian only which was lead to the poor data collecting through face-to-face interviews and co-design sessions. Furthermore, some Asian students felt not really comfortable and isolated in a group with indigenous members. Although it does not affect too much on the final result of the project but still discourage the contribution of the individual. Finally, it is observed that Co-design activities sometimes do not occur as smooth as originally expected because of the rising of accidental problems in practice. For instance, some design partners were so busy and then suddenly refused their participation in the project. One specific group mentioned about the co-design activity as some kinds of fun but did not contribute to the final solution. Others might have problems and disagreements with stakeholders so found it hard to make the final decision. However, these are unavoidable problems during the implementation of Design Thinking process and they do show the unique characteristics of the human-centered design approach as well as reflect accurately what happens in the real-world context.

To be concluded, regarding the strategic application of Design Thinking approach into the Interior Design studio, it requires many collective efforts from different aspects ranging from schools to society, from educators to students, from researchers to practical designers, from experts to non-specialist and needs to be tested so to develop in diverse contexts.

Accordingly, it is strongly believed in Design Thinking as an approach to creativity and innovation for the current and the next generation.

References

- AIAS Studio Culture Taskforce (2003). Studio culture discussion. Paper by the American Institute of Architecture Students discussed at the NAAB Validation Conference, 24-25 October, Santa Fe, New Mexico.
- Alkhalidi, A. S. (2014). Future Directions in Interior Design Education. ICIRS Conferences, Journal of Leadership and International Development.
- Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, 8(2),11- 21.
- Bowles, M. (2010). All the Right Pieces. International Interior Design Association. [Online]. Available at <http://www.iida.org/content.cfm/all-the-right-pieces/> [Accessed 06 June 2017].
- Boyer, E., & Mitgang, L. (1996). Building community: A new future for architectural education and practice. Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.
- Bretschneider, M (2012). The Bauhaus: Understanding Its History and Relevance to Art Education Today. Undergraduate Honors Theses. East Tennessee State University.
- Brown, T. (2008). Design Thinking. *Harvard Business Review*, 86, 84-92.
- Brown, T and Wyatt, J (2010). Design Thinking for Social Innovation. *Stanford Social Innovation Review* (Winter 2010) Vol. 8, No. 1, pp. 30-35.
- Chance, S. (2010). Strategic by design: Iterative approaches to educational planning. *Planning for Higher Education*, 38, 40–54.
- Clifford, M. (2011). 20 Collaborative Learning Tips and Strategies for Teachers. *Teaching Thought, We Grow Teachers*. [Online]. Available at <http://www.teachthought.com/pedagogy/20-collaborative-learning-tips-and-strategies/>. [Accessed 27 December 2016].
- Crag, M. Vogel, J. C and John, H. M (1997). Teaching Integrated Product Development: Educational Innovation at Carnegie Mellon University. *Design Management Journal*.
- Davis, D. (2005). Design Principles: Creating a more Effective Teaching Facility. Proceedings of the American Society for Engineering Education Annual Conference & Exposition.
- Fartushenko, L. (2016). An Interdisciplinary Approach to Promote Creativity. University of Alberta, Faculty of Art and Design, Canada. [Online]. Available at <http://www.designedasia.com/2011/final/AN%20INTERDISCIPLINARY%20APPROACH%20.pdf> [Accessed 20 July 2017].
- Formia, E. M. (2012). Innovation in Design Education: Theory, Research and Processes to and from a Latin Perspective. Published by Umberto Allemandi & C.

- Foti, R. (2004). Best in Class. International Interior Design Association. [Online]. Available at <http://www.iida.org/content.cfm/best-in-class/> [Accessed 06 June 2017].
- Gloppen, J. (2009). Perspectives on Design Leadership and Design Thinking and How They Relate to European Service Industries. *Design Management Journal*, 4, 33-47.
- Gloppen, J. (2011). The Strategic Use of Service Design for Leaders in Service Organizations. *FORMakademisk*, 4, 3-25.
- Guinmon, J. (2013). Promoting University- Industry Collaboration in Developing Countries. The Innovation Policy platform. [Online]. Available at http://innovationpolicyplatform.org/sites/default/files/rdf_imported_documents/PromotingUniversityIndustryCollaborationInDevelopingCountries.pdf. [Accessed 10 June 2017].
- Gross, M. D and Do, E. Y (1997). The design studio approach: Learning Design in Architecture Education. In J. Kolodner & M. Guzdial. *Design Education Workshop* (eds.), EduTech/NSF, College of Computing, Georgia Institute of Technology.
- IDEO (2011). *The Field Guide to Human-Centered Design*. By IDEO.org. 1st Edition, ISBN: 9780991406319. Printed in Canada.
- Johansson-Skoldberg, U., Woodilla, J., & Cetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity And Innovation Management*, 2, 121.
- Kimbell, L. (2011). Rethinking Design Thinking: Part I. *Design and Culture*, 3(3), 285-306
- Landry, M. (2010). The State of Interior Design Education. International Interior Design Association. [Online]. Available at <http://www.iida.org/content.cfm/the-state-of-interior-design-education/> [Accessed 06 June 2017].
- Leavy, B. (2010). Design Thinking: A New Mental Model of Value Innovation. *Strategy Leadership*, 38, 5-14.
- Lemon, K. N and Verhoef, P. C. (2016). Understanding Customer Experience Throughout the Customer Journey. *Journal of Marketing*: November 2016, Vol. 80, No. 6, pp. 69-96.
- Margaret (2013). A Brief History of Design Thinking: How Design Thinking Came to 'Be'. Open Law Lab. [Online]. Available at <http://www.openlawlab.com/2013/09/09/a-brief-history-of-design-thinking-2/>. [Accessed 06 June 2017].
- Marotta, D., Blom, A and . Thorn, K. (2007). Human Capital and University-Industry Linkages' Role in Fostering Firm Innovation: *An Empirical Study of Chile and Colombia*. Policy Research Working Paper 4443, World Bank, Washington, DC. [Online]. Available at <https://openknowledge.worldbank.org/bitstream/handle/10986/7558/wps4443.pdf?sequence=1> [Accessed 15 June 2017].
- Martin, R. (2010). Design Thinking: Achieving Insights via the "Knowledge Funnel." *Strategy & Leadership*, 38, 37-41.
- Martinez, C. A. (2003). "The architectural project". (A. Corona-Martinez & M. Quantrill, Trans.). Texas: Texas A & M University.
- Muratovski, G (2015). Paradigm Shift: Report on the New Role of Design in Business and Society. [She Ji: The Journal of Design, Economics, and Innovation. Volume 1, Issue 2.](#) Winter 2015, Pages 118-139.

- OpenIDEO (2011). 7 Tips on Better Brainstorming. OpenIDEO Tips & Tricks. [Online]. Available at <https://challenges.openideo.com/blog/seven-tips-on-better-brainstorming/> [Accessed 14 June 2017].
- Owen, C (2013). Charles Owen on the Characteristics of Design Thinking. Blogging on Business. [Online]. Available at <http://bobmorris.biz/charles-owen-on-the-characteristics-of-design-thinking/> [Accessed 15 June 2017].
- Rice, E. (2011). Design Thinking: A Process for Developing and Implementing Lasting District Reform. Knowledge Brief. Stanford Center for Opportunity Policy in Education. [Online]. Available at <https://edpolicy.stanford.edu/publications/pubs/260/> [Accessed 31 May 2017].
- Richards, K. C and Farrell, T. S. C (2012). Practice Teaching: A Reflective Practice. Cambridge University Press (7) 90- 105.
- Sanders, B. N and Stappers, P. J (2014). Co-Creation and The New Landscape of Design, CoDesign: International Journal of CoCreation in Design and the Arts, 4: 1, 5- 18.
- SAP (2012). Introduction to Design Thinking. User Experience Community. [Online]. Available at <https://experience.sap.com/skillup/introduction-to-design-thinking/> [Accessed 13 June 2017].
- Steen, M. Manschot, M and De Koning, N. (2011). Benefits of Co-Design in Service Design Projects. International Journal of Design, 5(2), 53-60.
- Stevens, G. (1998). The favored circle: The social foundations of architectural distinction. Cambridge, MA: The MIT Press.
- Tate, A. & Smith, C. R. (1986). Interior design in the 20th century. N.Y.: Harper and Row.
- The AIAS Studio Culture Task Force (2002). The Redesign of the Studio Culture: A Report of the AIAS Studio Culture Task Force. Washington, DC: American Institute of Architecture Students.
- Williams, S. (2005). State of Education. International Interior Design Association. [Online]. Available at <http://www.iida.org/content.cfm/state-of-education/> [Accessed 06 June 2017].
- Williams, B and Hof, S. V. (2014). Wicked Solution: A System Approach to Complex Problem. Published by Bob Williams.
- Wragg, N. (2017). The Design Studio and Design Education. Design Online. [Online]. Available at <http://designonline.org.au/the-design-studio-and-design-education/> [Accessed 31 May 2017].
- Wylant, B. (2008). Design thinking and the experience of innovation. Design Issues, 24(2), 3-14.