DESIGN THINKING IN LEARNING PROCESSES AT HIGHER EDUCATION IN COLOMBIA

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Abstract

Project Based Learning (PBL) methods need collaborative, multidisciplinary and open surrounds, which enable graduate students to develop competencies related with engineering process and service design in the context of real world enterprises. Design thinking has evolved in the last years as a work methodology that allows applying design and innovation in the classroom with an integral and pedagogical focus. In a collaborative project between Universitat Politècnica de València (Spain) and the EAN University (Colombia), the impact of the project based learning method has been evaluated through a design consultancy project deployed in 20 SMEs in Colombia. This consultancy project used design methodologies and processes to diagnose and propose a roadmap to transform companies into innovative companies. The consultancy process based on workshops, courses, talks and tutoring, allows validating the model in real cases, where the student experiments its efficacy and potential through a learning itinerary oriented towards entrepreneurship projects, which trigger the creation of its own company.

Keywords: Design Thinking, Learning Strategies, Project Based Learning, Higher Education.

1 INTRODUCTION

In 1998, UNESCO published the World Declaration on Higher Education in the 21st Century, which presented proposals on what should be its mission and functions. The document became a milestone in the evolution on this matter since it emphasized the importance of higher education in order to guarantee an improvement in the quality of life through training, research, employability and services (UNESCO, 2002), all this encouraging the professional preparation of students. In article 7, aimed at strengthening cooperation with the working world and the analysis and anticipation of the needs of society, section d expressly states that:

d) Learning to undertake and foster the entrepreneurial spirit should become important concerns of higher education in order to facilitate the employability of graduates, who will increasingly be called upon to create jobs rather than simply looking for them. Institutions of higher education should provide students with the possibility of fully developing their own capacities with a sense of social responsibility (UNESCO, 1998).

The new methods of project-based learning are the basis for fostering transversal knowledge through meaningful learning that leads a student to learn by doing, a practice that is being developed by Design Schools around the world and that Business Schools started to incorporate for some years now. This fundamental fact allows university students to develop competencies related to process engineering, strategic service design and product development in real world companies. Therefore, the union between the new teaching methods within higher education and the new methodologies of design at the project level establishes synergies aimed at preparing the students of recent years towards the professional career.

The educational research carried out by professors from Universities in Colombia and Spain has helped to assess the importance of the university context in relation to business needs that in this case, are arising in Colombia and are focused mainly on incorporating the culture of design, innovation and entrepreneurship within the business community of the Colombian SMEs. It is by means of the involvement of tutoring and consulting projects from the university, and the work with undergraduate and graduate students in projects to create, incubate and accelerate business ideas that these will be turned into entrepreneurship projects with the help of professors from the Institute for Sustainable Entrepreneurship at the EAN University, and with the support of theoretical and practical referents from the School of Design Engineering from the Universidad Politécnica in Valencia.
2 EDUCATIONAL CONTEXT OF HIGHER EDUCATION IN COLOMBIA

One of the main objectives of higher education is to mold an active population according to the needs of modern economy. At present, higher education has been oriented to the professionalization of students through an integral formation that contributes to enrich the socialization process of the student, improves its creativity, develops the ethical aspects and foments the critical and collaborative thinking at a professional level (Bohórquez et al., 2008). In recent years, higher education in Colombia has undergone a great transformation thanks to educational policies aimed at improving the quality of teaching and its professionalization. There are four types of institutions for higher education in Colombia: 1) Technical Professional Institutions that offer undergraduate programs at the technical / professional levels for certain jobs or careers. 2) Technological Institutions that offer programs up to the technological level (different from the Technical Professional for its scientific base) and can continue up to the professional title as long as the programs in question are given as propaedeutic cycles. 3) University Institutions or Technological Schools that offer professional, technological or professional technical programs, as well as professional, technological or professional technical specializations. 4) Universities that offer professional undergraduate academic programs and postgraduate programs leading to specialization degrees (1 year), master's degrees (2 years) and doctorate degrees (3 to 5 years), and who participate in scientific and technological research.

In the Colombian context, this distribution of institutions for higher education is formulated in order to take care of all interest groups, since in most cases, these studies are financed with the students and their families' own resources, and the admission to a technical, technologist or professional undergraduate degree is given in function of the economic capacities. However, this structure allows a student to complete his / her first professional qualification or a technical or technological qualification, to continue training in a progressive way, acquiring greater and better knowledge and skills in the same field.

In Colombia, the labor supply and demand for highly educated workers has increased in recent years. A study that was carried out in 16 Latin American countries by the World Bank, shows that the decade between 2000 and 2010 represented a change regarding the increase in the demand for higher education workers, experienced during the 1990s (Gasparini et al., 2011). On average, the wage gap between skilled workers (defined in this chapter as higher education graduates) and unskilled workers (without higher education) grew in the 1990s and declined between 2000 and 2010. In the case of Colombia, Gasparini pointed out that there was a substantial increase in the wage premium for skilled labor during the 1990s, despite the increase in the relative supply of skilled workers. This suggests that there was a strong increase in the demand for workers with higher education and that, although during the last decade the salary premium of skilled labor decreased to some extent, this was not due to a change in relative demand, but to the continuous increase in the supply of qualified personnel (OECD, 2012, p. p 175-176).

In fact, the report generated by ACIEM (Colombian Association of Engineers) in 2012 called Elements for the Reform of Higher Education in Colombia, stated that the concept of expanded innovation should be incorporated in the university, industry and society settings, so that their application in the different fields becomes a reality in practice (ACIEM, 2012, p. 18). This implied the need to incorporate innovation as a cross-curricular concept into the training program of universities, or if necessary, to create postgraduate programs with this theme, as was the case of the EAN University in Bogotá, who created the Master's in Innovation in this same year. In this regard, graduates should have the skills and abilities to manage innovation in the companies in which they would be incorporated, fostering creativity, teamwork and vision for the future. For this reason, it was pronounced in the report that universities should establish specific organizational structures to enable the social integration of research results through innovation, fostering linkage and alliances between university-state-business-society, clusters, industrial platforms, science and technology parks, cooperation, partnership and alliances with communities.

In 2016, the Ministry of National Education in Colombia promoted a series of studies related to the policies for institutional and formative improvement in Higher Institutions in Colombia (González Ávila, 2016, p. 27). It proposed, among other things, to design and implement intervention strategies that would influence students, professors and the administrative staff of Universities to fulfill an efficient accomplishment for the development of life skills in order to promote competences that are related to self-knowledge, and the ability to relate and assertively communicate with the environment and with others.
Although until 2016 the Government of Colombia started to formalize its interest to develop this type of competences, some higher education institutions had already referred to this perspective. The work of the National University of Colombia, which in 2002 and as a public university, began with the construction of knowledge through training, research and extension at all levels with the Program ACUNAR (Toquica & Morantes, 2006), an initiative that was born in the Faculty of Arts and that was resumed by the Faculty of Engineering intermittently until 2015.

The program was conceived as a platform for transferring design skills to emerging productive communities, installed in the Academic Extension Center of the Faculty of Arts, in the Solidarity Extension Program; ACUNAR committed to achieve social equity, economic competitiveness and cultural identity. Since 2002, when the School of Industrial Design opened a space for questioning the practice of the discipline in new scenarios that were characterized by non-industrial productions, it begins a process in which each of the projects that have been developed since then has taken important steps to outline and allow the construction of knowledge that favors in an effective manner the formation of professionals that are capable of thinking the country, suitable to meet the needs of the Colombian population, and attentive to understand and express the general interest.

In 2013, the Ministry of Commerce, Industry and Tourism together with the Colombian Confederation of Chambers of Commerce (CONFECAMARAS for its abbreviation in Spanish)) developed an initiative that was similar to that of ACUNAR, with a group of 20 companies (14 in Bogotá and 6 in Cartagena) with the Integral Design Accompaniment Project (PADI for its abbreviation in Spanish) based on an Accompaniment Model that relies on design methodologies with an empathic approach towards the entrepreneurs of these Colombian SMEs (Mejía, Jimenez-Ibáñez, & Chavarria, 2014).

Private universities have also made their contributions in the same line as the approach of the MEN of Colombia on the development of competences for life, in this sense the EAN University stands out for its approach and commitment to entrepreneurship since its foundation in 1967. Since 2014, it has taken a further step in the project to focus on sustainability and the creation of abundance for society. The EANTEC® model (Training model in entrepreneurial skills from the EAN University) is one of the concrete bets along with the creation in 2016 of EAN Impacta (Patiño Castro et al., 2017), a program based on Design Thinking for Development Of the entrepreneurial initiatives of students and graduates of the EAN University.

3 DESIGN THINKING APPLIED TO THE EDUCATIONAL CONTEXT IN THE UNIVERSITY

Design Thinking is an expression coined by the D-School (Institute attached to Stanford University) to define its teaching and research design methodology, that in some way has served to distinguish what they do from what was done in conventional Design Schools during the last decades at international level. Most of these theories have focused on developing the concept of Design Thinking as a methodology for creating new business ideas, optimizing processes within companies or developing new products or services, however, all agree in the fact that it represents a vehicle or way to innovate in companies.

The implementation of Design Thinking in companies was initially focused on product development, a task that was inherited from the engineering and interest in improving production processes, in some cases, seeking to incorporate better materials or add value through new uses. A more extensive focus included the application of design in business management, social development and economic transformation.

In the 1990's and 2000's, Design Thinking became a topic of methodological interest for some universities, especially for their business schools, which saw in it a powerful tool to enhance innovation in companies, as it happened in Harvard University and the Massachusetts Institute of Technology (MIT).

Design Thinking is presented as the next frontier; a way to develop innovation and solve problems with new methodologies and tools that are integrated in the process of designing a product and/or a service (Viladàs, 2008, 2009). This methodology is unknown to most Latin American fabric companies that have found themselves in a new globalized local scenario with new challenges when creating value in everything they offer to society (Vestergaard, 2005).

The concept of Design Thinking can be defined by a series of basic characteristics that are:
• It is a systemic and integral process based on design practices and methods, where creativity is fundamental and innovation is the goal.

• The development of the process is a collaborative task in which multidisciplinary profiles participate, and in the case of being applied in companies, both internal and external actors participate.

• Its results are focused on applied innovation, which in companies is translated into the development of innovative products and services, the redesign of internal processes.

Based on this, the education from universities and higher education institutions become a key transmission tool when training new professionals, and where the concept of innovation and design must be present. The university education, in general and in particular, in the field of engineering, must be adapted to the necessity of educating according to the criteria of multidisciplinarity, the professional orientation, the information society and the innovation in the development processes of a project. Therefore, the involvement in real and direct projects from an innovative perspective as offered by the methodology of Design Thinking becomes the backbone of the new training in emerging countries such as Colombia with its business fabric in constant evolution according to current times.

4 ACTIONS TAKEN

Between 2013 and 2014, the EAN University decided to create two postgraduate programs, a Specialization and a Masters Degree in Strategic Management of Design proposed in order to meet the necessities of companies in Design Thinking methodologies that support the flowering of Innovation from creativity and multi-disciplinary work. The commitment to these new programs was endorsed by the Ministry of National Education and supported by the Universitat Politècnica de València (UPV by its abbreviation in Catalan) from the School of Design Engineering, who found the program of the EAN University (UEAN by its abbreviation in Spanish) aligned with their programs, so they will recognize part of the training of Colombian students to complement their knowledge in the UPV.

Design Thinking has been permeating different levels of training of UEAN graduate students, especially those from the Institute for Sustainable Entrepreneurship who have been reformed from the curriculum to share the first year of training with an emphasis on Design Thinking (see Figure 1). This is how in year one, students develop creative competences through Design Thinking; in year two, they deepen their training in Innovation, Entrepreneurship or Strategic Design; and in year three, they develop an international experience (see Figure 3).

<table>
<thead>
<tr>
<th>Year 1: Creativity + Design Thinking</th>
<th>Year 2: Entrepreneurship, Innovation or Strategic Design</th>
<th>Year 3: International immersion</th>
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<tbody>
<tr>
<td>Specialization in Creativity for Business</td>
<td>Master's Degree in Innovation</td>
<td>Master's Degree in Design Engineering</td>
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<tr>
<td>Master's Degree in Business Creation</td>
<td>Master's Degree in Strategic Design</td>
<td>PhD (Begin)</td>
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In the entrepreneurship training provided by the Institute for Sustainable Entrepreneurship in undergraduate and postgraduate programs, the EAN University developed the EANTEC® Model, which ensures its transversality, as it is part of the curriculum for all the programs that are taught at the University. In the undergraduate programs, students undergo four modules in entrepreneurship, the first one focused on the development of soft skills and the identification of personal motivations; the second one based on Design Thinking in order to guide the discovery of opportunities on the basis of problems and potentialities of the environment and the development of innovative business models, which are validated in the third module through LEAN Start-up methodologies; and finally in a fourth module, the business plans for these initiatives are developed. In graduate programs, all these methodologies are concentrated in a single module of Sustainable Initiative and Entrepreneurship.
In the second module developed by undergraduate students, the focus of the unit of study is the Design Thinking through a class project developed in multidisciplinary teams that begins with the exploration of local problems of a specific group of users, which are investigated with an ethnographic approach to identify specific aspects, on which various solution alternatives are considered, which are evaluated, prototyped and validated, towards the definition of a business model that is visualized using the business model innovation tool System Mapping (Board of Innovation, 2017). This new approach was implemented in 2014 and since then, the Design Thinking has enriched the EANTEC® model, allowing the creation of much more innovative, differentiated and relevant business models.

On the other hand, in the Institute for sustainable entrepreneurship, actions of social projection are carried out through the accompanying services to entrepreneurs from the EAN University, with the EAN Impacta Program (see Figure 2). The program is based firstly on a diagnosis of the business ideas that are presented, then, it continues with a stage of addressing different phases of accompaniment according to the level of maturity of the initiatives.

The ideas that do not match between the customer segment and the value proposition that is expected to be delivered through products and services must go to the pre-incubation process, where the entrepreneurs develop the Create phase. This phase is based on design methodologies such as Design Thinking and VIP Vision in Product Design (Hekkert & Dijk, 2011), and is composed of 9 segments (Introduction - Context - User - Synthesis - Ideation - Prototyping - Testing - Iteration - Presentation) that are developed in a virtual platform, complemented with virtual tutoring sessions and face-to-face meeting spaces at key moments to promote co-creation and collaboration. The objective of this phase is to develop Minimum Viable Products (PMV by its abbreviation in Spanish), from which a business model that can be consolidated in the next incubation process can be developed, through three phases: Validate (Validation of the business model with the Lean Start-up methodology), Project (Structuring the business model in the market, operational, administrative, financial and corporate governance components), and Advance (Monitoring with advisory committees for strategic management); with an accompaniment in the development of soft skills in Leading.

The idea of implementing Design Thinking in the early stages of developing business ideas, seeks to ensure the match between the market segment and the value proposition, prior to the application of Lean Start-Up methodologies with which the whole business model completes its validation in order to reduce implementation risks and reach relevant, innovative and sustainable business models in the social, environmental and economic fields.

Figure 2: EAN Impacta Model.
Source. Universities Fostering Business Development (Patiño et al., 2016).
5 CONCLUSIONS

The most significant results obtained from the experience with the students, their enterprises and the companies involved in the different processes, are focused on the fact that it can be observed at first hand the results that have been obtained in the processes using the design methodologies oriented to solve real problems of the Colombian business context, based on the concept of Design Thinking.

It has been possible to validate the relevance of the professional competences in design as a vehicle for innovation, entrepreneurship and leadership, developed by the students who are involved in both the formative processes of the postgraduate academic programs and the students and graduates who have participated in the entrepreneurship programs.

Likewise, the companies have been able to receive an open and responsible tutorial on the use of the current design methodologies at international level, that has allowed them to know new points of view about what Design is, the project development and the implication of the designer as a valuable professional and facilitator of innovation in the company.

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