Project-Based Design and Transdisciplinarity: Rethinking Approaches to Spatial Design Education

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Abstract This paper proposes new approaches to spatial design education that are based on the synergy between the methodology of transdisciplinarity and Project Based Learning (PBL). The paper demonstrates that transdisciplinary methodologies remain theoretical and therefore cannot be implemented to solve complex real-life problems. Only by introducing risk-taking PBL methodologies, generating organic leadership and promoting short- and long-term learning using the components of transdisciplinary performance can real-life design projects be initiated to solve problems and empower all involved stakeholders. The paper analyzes PBL and transdisciplinary research (TR) methodologies as implemented in SpeeDesign projects. The projects were carried out in the Designers Clinic run by the Interior Design Department of COMAS (College of Management, Academic Studies). This clinic provides a unique platform positioned between design practice and academia with the aim of merging the field of design with the world of social involvement. The analysis demonstrates how the use of SpeeDesign can transform a spatial design engagement project into a new platform for emerging design methodologies. The analysis also shows how collaborative and participatory spatial design projects such as SpeeDesign can change spatial design education curricula by removing the current boundaries between academia and practice. To this end, all spatial design disciplines and practitioners—architecture, interior architecture, design and urban design practices, artists, social scientists and communities, as well as politicians, builders, entrepreneurs, economists, policy-makers and lawyers—must engage in reflection and debate toward establishing and implementing this type of short and long-term learning approach. Real-life projects can become a force for innovation and can generate change in the perceptions of all agents involved, as well as the overall perceptions, content, methodologies and outcomes of the entire discipline.

Keywords Transdisciplinarity · Participatory spatial design · Real-life project · Project-based learning · SpeeDesign · Curricula network

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L. Blessing et al. (eds.), *The Future of Transdisciplinary Design*,
https://doi.org/10.1007/978-3-319-06382-9_17

1 Introduction

Design "is never a process that begins from scratch, to design is always to redesign" (Latour 2008, 3). The notion of redesign signifies the unique position of spatial design as a discipline related to the scale of the body and grounded in tactile and sensual experience, thus allowing for the assimilation of a participatory dynamic that redefines spatial design as a new force for active engagement. Redesign allows for the emergence of systems that emphasize fluidity, exchangeability and multiple functionalities—in other words, complexity.[1]

Spatial design education has always dealt with problems related to real-life issues. But have the processes and products involved in spatial design education led to the creation of new knowledge or the emergence of complexities? This paper contends that hardly any such new knowledge or complexities have emerged.

Spatial designers today face far more complex spatial problems than in the past because they must also take additional factors into consideration, among them the public, social agents, civil rights agendas, urbanization, local and other regulations and new forms of knowledge and systems. The role of academia in general, and of spatial design education in particular, is to lead this change by becoming engaged in these processes in as many ways as possible. The contention of this paper is that the initiation of new approaches to education through the interrelation of transdisciplinarity and Problem-Based Learning (PBL) will lead to the emergence of new platforms and systems that synergize practice and academia. Transdisciplinarity as it relates to spatial design has been discussed recently, but not as a multiple and complex system nor in terms of the synergy between academia and practice. The new educational approaches proposed in this paper should have an impact upon both processes and products, change the perception of all agents[2] involved and ultimately transform education and practice in the field of spatial design.

In recent years both practice and academia have responded to the challenges of complex spatial problems. In *The Production of Space* Lefebvre argues that space is a social product or a complex social construction. This Marxist-humanist view affects spatial practices and changes perceptions of spatial theory and practice (Lefebvre 1974). This argument points to a shift in the research perspective, from space as a product to the processes of its production, that is, the multiplicity of spaces that are

[1] In this paper, the concept of complexity refers to that of De Landa and is in line with Deleuze and Guattari. De Landa challenges the current paradigm of social analyses to posit social entities as complexity. Complexity is emergent out of assemblages. Assemblages appear to function as a whole, but are actually coherent bits of a system whose components can be "pulled" out of one system, "plugged" into another and still work.

[2] The actor-network theory (ANT) is an approach to society that is concerned with the mechanism of power. According to this approach, society, organizations, agents and machines are all effects generated in patterned networks of (not simply human) materials. The actor-network approach is a theory of agency, a theory of knowledge and a theory of machines. More importantly, it indicates that we should explore social effects, whatever their material form, if we want to answer the "how" question about structure, power and organization. (Law 1992).

socially produced. Thus, emphasis is placed on the contradictory, conflictual and ultimately political character of the processes of production of space. The production of space belongs to a wide circle of agents, including designers, artists, social scientists and members of various communities, as well as politicians, builders, entrepreneurs, economists, policy-makers and lawyers.

These challenges generate the need to deal with complexities that "take into account the diversity of life-world perceptions of the problems" (Pohl and Hadorn 2008, 112). Therefore, complex problems can no longer be tackled through a single discipline or even multiple disciplines. This paper considers the use of transdisciplinary research (TR) methodologies as a key component in tackling complex problems and uses these methodologies as a platform for design actions. Bringing in new methodologies will require agents to rethink the relationship between process and product, leading to collaboration among multiple knowledge sources and a wider circle of agents. Previously, products and solutions were assessed according to their successful implementation. The assessment did not include questions of processes, time factors, representational tools and cultural factors relating to the various agents involved. As a result, the implementation did not take into consideration many of the factors involved, so that both product and process remained in a state of reduction and exclusion.

This paper demonstrates how new spatial design educational platforms are generated through the interrelation of TR and PBL methodologies. This model, in which the two types of methodologies are assimilated via a design participatory project, is the basis for creating new approaches to teaching and learning spatial design. Today, the boundary between practice and academia has dissolved into models of synergetic processes, allowing all agents to collaborate toward changing human well-being.

2 Transdisciplinarity and Complexity

Transdisciplinarity, as opposed to multidisciplinarity and interdisciplinarity, concerns what simultaneously exists between disciplines, crosses different disciplines and transcends all disciplines. The goal of transdisciplinarity is to understand the imperative of the unity of knowledge (Nicolescu 2005). Pohl and Hadorn claim that "the transdisciplinary challenge with complexity of problems is that of interrelating the broad range of factors to come up with integrated understanding of the problem and integrated suggestions for dealing with the problem" (Pohl and Hadorn 2008, 114). The complexity of any problem driven by current reality can only be fully understood by breaking down the subdivisions into disciplines that make it "difficult to consider an object of study as being indivisible and pertaining to only one discipline" and realizing the need to search for coherent knowledge that is not limited to a single or to multiple disciplines.

Transdisciplinary research (TR) methodology proposes four requirements for identifying, structuring and analyzing complex problems: "Grasp the complexity of problems; take into account the diversity of scientific and real-world perception

of problems; link abstract and case specific knowledge; and develop knowledge and practice that promote what is perceived" (Pohl and Hadorn 2008, 112). These four requirements provide a methodological framework for bringing actors from real life into the research process and allow for collaboration and integration. The main emphasis is on research projects and the creation of new knowledge. Nevertheless, this framework remains an overall research structure comprising sequential segments that are not concerned with real projects.

As stated, in dealing with complexity, different agents from various fields of knowledge, public agencies and others must be included. Tress, Tress and Fry (2005) highlight the significance of non-academic participants in the process of connecting between academia and practice, stating that transdisciplinarity retains the same high level of scientific collaboration in academic settings as does interdisciplinarity, while also including non-academic participants in the process (Tress et al. 2005).

In this paper transdisciplinarity is examined through the theoretical framework of Pohl and Hadorn (2008), and the significance of non-academic participants is considered throughout the process (Tress et al. 2005). This combined procedure allows transdisciplinarity to be used as an applicable tool for rethinking educational approaches.

The application of transdisciplinarity approaches to the field of spatial design requires additional project-determined methodologies. Spatial design education today considers projects as comprising short or long processes and an end product. To address issues of complexity, a new agenda is needed in the form of Project-Based Learning (PBL) methodology that refers to projects beyond process and product.

3 Real-Life Project: A Case Study

In addressing real-life problems and issues of complexity in higher education, the main question is how to develop innovative integrative educational approaches to overcome the boundaries between disciplines. Steiner and Laws (2006) compared two leading universities, Harvard University (Cambridge, Massachusetts, USA) and Eidgenössische Technische Hochschule (ETH) (Zürich, Switzerland), showing how transdisciplinary methodologies changed students' perception in these institutions. In this comparison, the Harvard case study approach is referred to as the written case study approach and the ETH case study approach as the transdisciplinary case study approach.

In analyzing how both universities related to complex problems and issues and to the development of new learning formats, Steiner and Laws claimed that Harvard did not challenge current existing methods but rather focused on written cases in the form of classroom discussions. ETH, as opposed to Harvard, challenged the case study learning format by addressing related real-life problems and developing scenarios that went beyond analysis of the written case.

The ETH case study approach for creating a transdisciplinary setting included the following components: "field related knowledge, the capability to design and

understand a complex system, the social competence needed to actively participate in a group together with stakeholders, the capacity to responsibly choose and apply the appropriate problem solving methods" (Steiner and Laws, p. 327). The cases focused on urban and regional problems and also on corporate sustainable development, giving "students the opportunity to attain competence in applied research in transdisciplinary setting by focusing on [a] combination of research, learning and application" (Steiner and Laws, p. 333).

This comparison of two universities is highly important in considering the issue of interdisciplinarity in higher education and in understanding its role in the interrelation between practice and academia. ETH exhibits stronger ties to all aspects of reality than does Harvard, yet both these educational formats still remain within the realm of defining processes and products as separate entities. Neither poses the challenge of creating a system in which the project becomes the central integration platform.

It appears that ETH did not fully consider transdisciplinarity when addressing issues of complexity because the projects themselves were not the main focal point of all actions and methodologies and because there was a clear separation between process and product. To bring the actual project to center stage, a new agenda is required in the form of Project Based Learning (PBL) methodologies that examine projects as more than process and product. This paper contends that only by implementing transdisciplinarity in real projects and adding new methodologies such as PBL can new educational approaches and methodologies be developed.

4 Problem-Based Learning (PBL) Methodology

PBL was researched extensively during the 1990s (Moursund 1999; Krjcik et al. 1994). In reviewing PBL, the important study by Thomas (2000) raises three significant issues. The first is assessment in order to determine what PBL is and what it is not. The second, effectiveness, questions the correct way to create efficiency models. The third addresses the issue of territory and considers whether interfaced models should be included within the PBL methodology. These three issues are critical for understanding the domain and discourse of PBL.

Thomas (2000) identifies five criteria for PBL. Some of these are essential but very basic, while others open up new possibilities and conditions but have yet to define a different kind of learning. These criteria include the following: "PBL projects are central, not peripheral to the curriculum; PBL projects are focused on questions or problems that 'drive' students to encounter the central concepts and principles of the discipline; projects involve students in constructive investigation; projects are student-driven to some significant degree; projects are realistic, not school-like" (pp. 3–4).

Ayas and Zeniuk (2001) address the issue of PBL from another perspective in the domain. Rather than considering PBL as an academically oriented approach, they see it as emerging from the practice of PBL in industrial R&D projects in companies such as Ford Motors and Fokker. By definition, these are highly complex problems

and require a new learning infrastructure and a new means of implementation. The complexity of real-life projects is clearly an area that academia is only now beginning to think about in terms of opportunity rather than limitations. Ayas and Zeniuk put forward six distinguishing features of PBL for theory and practice: (1) a sense of purpose and clarity in both long- and short-term objectives; (2) psychological safety and a commitment to telling the truth as part of the project environment; (3) a learning infrastructure and a balance between emerging and formal structures; (4) communities of practice that cross project boundaries; (5) leaders who set the tone for learning and model the reflective behavior; (6) systemic and collective reflection so that problems and mistakes become opportunities for learning" (Ayas and Zeniuk 2001, 64–65).

The criterion of a sense of purpose and urgency is more easily achieved in the business world because a business must survive or else face closure. Urgency in academia can be achieved through real-life projects that take all involved stakeholders into consideration. The notion that design projects embody characteristics that grant them a feeling of authenticity was included as one of Thomas's (2000) PBL criteria. Yet this notion lacks the urgency that is so vital to complex real-life problems and to the ensuing design projects. Paraphrasing Ayas and Zeniuk, this paper proposes that short-term urgency/long-term learning be considered as one of the criteria of PBL. The criterion of urgency should drive the agents involved in the project toward creative and radical thinking. Another PBL criterion is psychological safety, which eliminates the fear of failure. Thomas claims that "projects are student-driven to some significant degree" (Thomas 2000, 4). In contrast, this paper refers to Ayes and Zeniuk and proposes eliminating the hierarchy and rethinking involved in evaluation and assessment so as to encourage natural leadership as opposed to management roles. Ayes and Zeniuk state that leadership "reflects the emergent structure and the evolving culture … The leader as reflective practitioner sets the tone for learning" (Ayes and Zeniuk 2001, 72). Academic organizations that promote degree hierarchy and teachers that insist on superior models encourage practically no organic leadership. Examples of academic organizations that do promote organic leadership can be found in some design labs, such as the MIT Media Lab.[3]

While Thomas's (2000) academic model refers to a single project framework, Ayas and Zeniuk's (2001) model suggests that projects comprise communities of practice that allow all individuals to belong to multiple communities. In academia,

[3]Torjman, L.: Labs: Designing the Future. MaRS Solution Labs Report (2012). The labs in general, and the media lab in particular, offer a neutral space dedicated to problem-solving in a highly experimental environment. Projects that are initiated by the needs of industries result in prototyping, allowing a group of students, instructors and users to learn by doing rather than by thinking. Each of the projects employs a user-centric lens, making the end-user into a critical participant throughout the process. The labs focus on diversity of perspectives and skill sets, and on team process, thus representing a convergence of design, ethnography and business to support both theoretical and real-world applications. In a lab, the whole (that is, the solution) is greater than the sum of its parts (the input of individual participants). Proprietary ownership is minimized in favor of objectivity and a commitment to a shared vision.

this model includes different kinds of courses that interrelate and form a network of knowledge, systems and human resources.

Reflexive acts are inherent to the culture of design teaching and learning, and are manifested in all courses in the curricula. It is the contention of this paper that reflexive acts should break the boundaries of the design curricula by transforming spatial design education into a collaborative and participatory design action that includes all agents involved, among them students, faculty members and various communities. This action is referred to as Participatory Reflexivity.

This approach to spatial education adopted here involves assimilating transdisciplinary methodology and PBL methodologies. The following section demonstrates the above proposal using an example of a unique spatial design project called SpeeDesign.

5 Project-Based Design Case Study—The Designers Clinic and SpeeDesign

The Designers Clinic is a unique platform positioned between design practice and academia whose objective is to merge the field of spatial design and the world of social engagement. The platform uses a bottom-up design approach based on community participation in design processes and products. The Designers Clinic operates as a flexible axis running through various academic degree formats and design practice platforms. The clinic attracts multiple stakeholders from such diverse perspectives as academic agents, social and governmental agencies and non-government organizations (NGOs). These agents are the clinic's clients and at the same time the participants in numerous design and planning projects.

The Designers Clinic is a unit within the academic system that initiates projects through educational mechanisms such as studio classes, workshops, internships and labs. The various projects promote the development and innovation of social design and entrepreneurial knowledge by working with academic faculty and experts from various fields of expertise. Promoting project excellence requires the collaboration of experts in design management and entrepreneurship, as well as innovation processes and expertise in community participation methodologies. In addition, the clinic focuses on establishing ties with the community and on identifying changing values and needs contributing to the well-being of various communities.

SpeeDesign is a unique entrepreneurial project run through the Designers Clinic. The first collaborative and participatory SpeeDesign project was held at the Peila Cultural and Art Community Centre (NGO) located in the less privileged old Arab quarter of the Tel Aviv-Jaffa municipality. The end product of the project was an event at which 60 top interior designers, architects and engineers offered design and planning services to members of the local community (Figs. 3 and 4). At the specified time, the designers and architects sat at tables with empty chairs, waiting for something to happen. This was an awkward moment because nobody knew whether

community members would be active participants in the process or would stay away, choosing not to participate.

An hour later, the space was packed with people, including families from Jaffa, single people from Tel Aviv and representatives of small businesses in the area. Some brought scraps of paper on which they had scribbled the dimensions of their apartments, others came with architectural plans that highlighted the furniture within the space and still others brought their iPods (Figs. 1 and 2). Some brought photographs, either hard copies or stored on their mobile phones. The professionals happily took every piece of information they were given and used it productively. The community

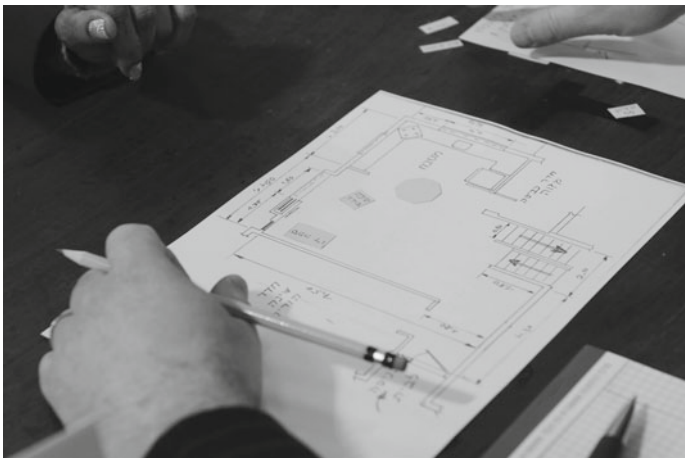

Fig. 1 Speed Design—Architectural information prepared in advance by a resident

Fig. 2 Speed Design—Designers and member of the community discuss a plan

Fig. 3 Billboard advertising the event, displayed all over the city

Fig. 4 Speed encounters between designers and the community

participants were ecstatic and moved from one consultant to another, receiving design solutions and plans of their living and working spaces. Architects with different areas of expertise referred people to their colleagues. Food and beverages were served by local community restaurants and stores. The event felt like a big festive happening, and many people called their friends to come and participate. It should be noted that an entire year of research, planning, production and collaboration was needed to create the infrastructure that made an event of this nature possible.

The SpeeDesign project has all the characteristics of TR methodologies. The process of grasping the complexity of people's right to housing is manifested in the need to combine a wide range of housing issues with differing perceptions, agendas and motives. Development and innovation in the project involved various methodologies for researching multiculturalism, housing typologies and community engagement. Identifying the above issues required taking into account everyday practical constraints to solve urgent residential problems. The process and product development led to the emergence of a network comprising faculty members, professionals, social activists and citizens, representatives of local authorities and others.

An examination of the criteria of PBL indicated that SpeeDesign is also a perfect PBL case study. One of the PBL criteria met by the project is its unique position, in which processes and solutions are simultaneously both short-term and long-term. Engaging with communities usually takes a long period of time and considerable effort. By means of rapid design actions, SpeeDesign made it possible to empower people and bring about significant changes in their well-being and in their living environment. Long-term refers to continuous efforts toward developing design strategies, business plans, communication strategies and joint cooperation with all communities involved in order to generate long-term housing solutions.

The SpeeDesign model for interrelating TR methodologies and PBL also had an impact on the spatial design curriculum and became an integrative model within the undergraduate and graduate studies programs in the form of real-life projects. Projects such as SpeeDesign became the focal point of all academic courses, among them business courses teaching all aspects of the business plan, from marketing, sales and branding to public relations. Other courses addressed questions regarding community identification, strategies for reaching out to communities and engagement in participatory models.

A reflexive process was initiated to develop a transdisciplinary and PBL model of teaching and learning. This process required the ongoing participation of all agents involved. After the event, the participating designers were asked to complete questionnaires that included the following four questions:

1. In helping the community, to what extent did you grasp the problem of the "right to housing"?
2. To what extent did you feel that you could have an impact on the housing conditions of all participants in order to improve their well-being?
3. What kinds of new design tools are offered by the SpeeDesign format?
4. To what extent did your participation change the way you perceive your profession?

All the professional designers and experts stated that focusing on the problem of housing through a different kind of real-life project like SpeeDesign required them to rethink their approach to the issue of complexity. They also stated they were surprised that they were able to help every one of the participants, regardless of the design problem and regardless of the information brought to the table.

In response to the fourth question, one designer said: "The entire encounter was a promotional collaborative act for the professional field of spatial design. To my surprise, the collaboration between different experts could actually generate positive change for the well-being of all kinds of residents." Another architect wrote: "The possibility of such a quick and accessible interaction is not only productive for the citizens but is also a highly liberating experience for the giver (the professional)."

One of the findings of the reflexive analysis showed that among the professionals involved, educators grasped the opportunity to use PBL for cultivating awareness of social and ethical dilemmas among future designers. This project signified the importance of dissolving the boundaries between academia and practice by changing the perception of these educators.

One of PBL criteria is the creation of leadership that is organic and not hierarchic in order to change decision-making procedures and relations among all members, from academic faculty members and students to members of the community and professionals. One example of how the existing hierarchy and decision-making processes were broken down is that each person from the community was given multiple ideas and designs and communicated with different professionals, rather than being given a single design solution for an urgent housing problem. In design and architecture practice, multiple ideas and second opinions are usually considered unethical and are generally prohibited. The process challenged this norm and led to the emergence of an ethical principle for both process and product to create multiplicity in the identities of interiors.

In assimilating PBL and TR methodologies and criteria, a new teaching and learning culture emerges, one that promotes reflection, debate and a new way of thinking and acquiring knowledge.

6 Discussion

The development of new approaches to teaching and learning by means of real-life complex problems will ultimately change the shape of spatial design education. This paper proposes a foundation for new spatial design methodologies based on the synergy between transdisciplinary methodologies and PBL. The paper demonstrates that transdisciplinary methodologies remain theoretical in that they do not use the project as a mechanism for integrating all aspects and agents involved. Hence they are insufficient to deal with and implement complex, real-life problems. Only by introducing risk-taking PBL methodologies, generating organic leadership and promoting short- and long-term learning with transdisciplinary performance components can real-life design projects be used to solve problems and empower all involved

stakeholders. As such, the SpeeDesign platform, in the form of a real-life project, is an example of how a spatial design engagement project becomes the focal platform for transdisciplinary approaches. For collaborative projects such as SpeeDesign to transform spatial design education and remove the boundary between academia and practice, a reflexive process and debate must be established and implemented by all spatial design disciplines, including architecture, interior architecture, design and urban design practices, and by all practitioners as well, among them artists, social scientists and communities, politicians, builders, entrepreneurs, economists, policy-makers and lawyers.

The real-life project can become a force for innovation and can change the perceptions of all involved agents, as well as the overall perceptions, content methodologies and outcomes of the discipline as a whole.

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