RELATION AMONG PEDAGOGY, SPACE AND TECHNOLOGY AND USERS. AN IMPLEMENTATION OF RADCLIFFE’S PST FRAMEWORK

A.G. Manciaracina

Politecnico di Milano (ITALY)

Abstract

Thinking to the future developments of higher education means to think to the new learning models that describe didactic activities in which both teachers and students converge towards an active attitude. All these models need adequate spaces that support the exchange of ideas and stimulate learning through the use of appropriate tools and conditions. Searching for a definition of what is an “innovative learning environment” should the first step to analyse the context. Many authors described learning space as where both the physical and material space, enriched by technological features and devices and the learning activities are combined in order to innovate university teaching and learning to disrupt the traditional paradigm of one-way learning flow [1]. Many names were given to this new kind of learning spaces and the notion of a learning environment is usually presented with a specific attribute. All these definitions have in common the centrality of the role of technology as a support for learning activities and the collaboration among user to promote greater effectiveness and efficiency in achieving the expected learning outcomes.

Radcliffe and others have provided a framework that puts in relation to technology with space and pedagogy. It’s the so-called PST framework [2]. The PST framework takes his steps from the research carried on by Oblinger: the convergence of technology, pedagogy, and space can lead to exciting new models of campus interaction [3]. It is a question-driven inquiry process synthesized from published literature and knowledge of innovative teaching and learning spaces globally and it empowers a diverse range of potential stakeholders to consider critically and holistically the pedagogical, technological, and physical aspects of teaching and learning spaces and their interactions. It can be used at each stage of the life cycle of a new facility, from conception through stages of design, construction, and operation [2]. The three elements become the levers for reflecting around the concept of an innovative learning environment and propose a set of relations among them. But something seems to be missing. The paper wants to offer, through an analysis of case study (the Politecnico di Milano field research on the creation of innovative learning environments for higher education) an upgraded version of the PST framework from the point of view of design disciplines involving new actor and new relation in order to create and develop further tools to implement an Innovative Learning Environment in higher education.

Keywords: Technology, space, pedagogy, innovative learning environment, learning space design.

1 SPACE AND LEARNING MODELS

Giving serious consideration to changing the instructional paradigm to more active student participation, universities and colleges have begun to invest in the redesign of learning spaces [3].

The new learning models, that have been emerged in the last decades and that are continuously evolving, are crucial to reflect and predict the next teaching activities. These are new pedagogical models and experimentations, oriented to an “active learning” approach aim at increasing effectiveness and efficiency in achieving the expected learning outcomes. Among them the most relevant are the constructive alignment [4], [5], Kolb’s learning cycle [6], social Learning [7], Bloom’s taxonomy [8], [9], Dale’s cone of experience [10], networked learning [11], [12].

Space should, therefore, play a fundamental role in supporting the users (students and teachers) facilitating the activities of exchanging and building knowledge, enhancing creativity and personal skills, providing a flexible, customizable and collaborative environment. There has been a transition from traditional classrooms to more complex learning environments [3], [13]–[15].
2 WHAT IS AN INNOVATIVE LEARNING ENVIRONMENT

Searching for a definition of what is an “innovative learning environment” is important to set up a reflection on the interaction among pedagogy, space and technology. Many authors described learning space as where both the physical and material space, enriched by technological features and devices and the learning activities are combined in order to innovate university teaching and learning to disrupt the traditional paradigm of one-way learning flow. [1].

Many names were given to this new kind of learning spaces and the notion of learning environment is usually presented with an attribute: Modern Learning Environments - MLE [16]; Next Generation Learning Spaces - NGLS [2]; Spaces for Knowledge Generation - SKG [17]; Collaborative learning spaces - CLS [18]; Hybrid Learning Environments - HLE [19]–[21]; Blended Learning Environments - BLE [22]; Virtual Learning Environment; VLE [23]; Future learning spaces - FLS [24]; Technology-Enriched Learning Environments - TELE [15], [25], [26]; Innovative Learning Environments - ILE [27]–[29].

All of these definitions share the central role of technology as a support for learning activities and user collaboration to promote greater efficiency and effectiveness in achieving the intended learning outcomes. Technology can perform several key functions in the change process, including opening up new opportunities to improve teaching and learning [30] making a transition from vertical technology (for teacher’s needs in a confined setting) to horizontal technology (for meeting students’ personal needs across multiple physical contexts) [31].

Reflection on the relation among pedagogy, space and technology have been made.

3 PEGADOGY SPACE AND TECHNOLOGY EVALUATION FOR INNOVATIVE LEARNING ENVIRONMENTS

According to Lomas and Oblinger [32], classrooms with ubiquitous access to technology bring additional capabilities and can engage students in learning and technology can greatly enhance interactivity in the classroom. Therefore, technology must be treated and defined in combination with the place where it’s used (space) and the activity that exploits it (pedagogy). Oblinger has discussed the convergence of technology, pedagogy, and space and how it can lead to exciting new models of campus interaction in which good learning space design can support each institution’s mission of enabling student learning [3]. Other models and researches have approached and reflected on this convergence.

3.1 The PST framework

The PST framework [33] takes his steps from the research carried on by Oblinger, providing a framework that put in relation technology to space and pedagogy. It is a question-driven inquiry process synthesized from published literature and knowledge of innovative teaching and learning spaces globally and it empowers a diverse range of potential stakeholders to consider critically and holistically the pedagogical, technological, and physical aspects of teaching and learning spaces and their interactions. It can be used at each stage of the life cycle of a new facility, from conception through stages of design, construction, and operation. The three elements become the levers for the reflecting around the concept of an innovative learning environment.

The PST framework has been used by other authors as a reference to research in different areas of learning environment evaluation. For instance, it has been taken in consideration in the work of Wilson & Randal [34] where they focus their attention on how a technology-rich next generation learning space is been used both by students and teachers. It was mentioned in the article of Cleveland and Fisher [35] that have summarized a literature review of systems to evaluate a learning environment followed by other works in the same field [36]. It has also been discussed in a paper of Jenny Ng in which she underlines that it takes three aspects into account (pedagogy, space and technology) and for this reason, it shows a more well-balanced approach. She also demonstrates that even if the focus on technology is important, it is also important to ensure that the technology works for the students in a way which makes learning more effective (effectiveness of technology in a specific context) [37].

The image below represents the PST framework with the innovation attributes of every key element.
3.2 The Polimi case study

Politecnico di Milano started, at the end of 2018, a project aimed to define a series of requirements and needs for the creation and implementation of innovative learning spaces for architecture, design and engineering disciplines. A research team (from the Design Department) has involved the users directly to investigate new requirements and demands in the field of teaching. Different purposes have been defined: analysis of spatial needs, potentialities, new uses and habits; organization of all spatial requirements in guidelines, focusing on the design disciplines, to be applied to one classroom’s prototype; reflection on the relation among teaching/learning activity (pedagogy), classrooms evolution (space), innovative tools (technology) and the changing role of teachers and students (users); revision and dissemination of the research. During the research, several research activities have been carried on in order to achieve data and different perspectives.

Among them, a survey was delivered to the four Degree Course Coordinators of the four bachelor degree of the School of Design of Politecnico di Milano: product design, communication design, interior design, fashion design. The Degree Course Coordinator is in charge of its own course plan that it’s submitted to the course council (where disciplines and teachers are discussed) to follow, with the support and the supervision of the School’s organs, a designed didactic objective. Therefore, they are fully aware of the different typologies of activities that are carried on in a design course. In the survey the research team asked them to quantify, assigning a value from 0 to 10, the presence of specific activities, that have been pinpointed after reflection on the teaching carried out in the laboratory courses.

The results of the survey have been summarized in a diagram where every study course is characterized by a different color. The diagram shows visually the increase in the rating as we get closer to activity that has a predominance in high interaction of the user with space and we can observe this aspect in each study course. Every teaching and learning activity are affected by space’s shape and dimensions and tools (furniture and technological appliances) present in the space. Many parameters indicate the need to foster the collaboration of users through spaces that, with the provision of appropriate technological equipment and furniture, can facilitate all activities where the comparison of ideas and the creation of new information are essential, enhancing the central role of the relation among users, activities and space.
4 AN IMPLEMENTATION OF PST FRAMEWORK: THE PSTU FRAMEWORK

The PST framework is an important tool to reflect on the nature of innovative learning environments and to help in their design. As we discussed before it's an important tool that can be used as a compass in environments design and development. What seems to be missing in the PST framework is the presence of the users that in design disciplines is central and plays a fundamental role. Doing a user-centered system design means to start with the needs of the user. Concern for the nature of the interaction and for the user these are the things that should force the design. The user-centered design emphasizes that the purpose of the system is to serve the user, not to use a specific technology [38].

Users are, in a learning environment, players and directors, facilitators and source of resistance, students and teachers, learners and tutors. From reflection conducted upon the framework itself and from the research on the future learning space of Politecnico di Milano, the users, important actor of the teaching and learning activities, is missing in the PST framework. They should be a significant element of the framework and should be equally connected and related to the other parts, even if it’s on another ontological level, creating new design dynamics. The presence of the users could innovate tools opening to further reflections on possible design outcomes. The design of innovative learning spaces is a complex process in which different actor should be involved and different steps should be taken. This vision should be informed by learning theory, as well as by recognition of the characteristics of the students and faculty who use these spaces [39].

The Framework should make a shift from a three-element system to a four-element system, underling the central role of the users, that become “pivot” and core of innovative learning environments. I would like to propose an update of the PST framework adding another actor to the system and creating new relations and actions thanks to the contribution of the design discipline. In the following image, the user is put in the middle of the system. The intention is to reconfirm the importance of users and their connection with the other elements of a complex innovative learning environment. The introduction of the user adds new relations and set the bases for further research actions.

Figure 2. Diagrams of interactions between the four courses
The starting point for rethinking learning spaces to support the next generation of students begins with an underlying vision for the learning activities these spaces should support. This vision should be informed by learning theory, as well as by recognition of the characteristics of the students and faculty who use these spaces [39]. The user can innovate the pedagogy and led by it, can transform the space and be empowered by it, can embed technology and be extended by it.

The design disciplines should become a pervasive sub-layer, able to affect all the decisions and the reflections. The user, as the focal and central point of the new framework, creates new connections, new relationships and new interactions. One possible development is the creation of additional sub-frameworks, one for each external angular element of the system (pedagogy, space and technology) in which the design disciplines that are involved in the process can be explored and correlated.

Every sub-framework can become the source for guidelines aimed to define every aspect of an innovative learning environment, not only the relation between the core elements.

5 CONCLUSIONS

This paper has questioned the definition of an innovative learning environment, identifying technology as a key element for transitioning from a learning space to an innovative learning environment. PST framework proposed by Radcliffe was analyzed, highlighting the convergence of technology, pedagogy, and space from the perspectives of frameworks and tools for designing and supporting the
implementation of innovative learning environments that may help students’ learning. An Italian case was proposed to show the important role of the user in the didactic activities carried on in the learning space. It has been of help in rethinking the PST framework that was discussed, finding a possible missing element. A new updated version of the framework was proposed, inserting the fourth element, the user. The user finds a place in the framework activating new relations with pedagogy, space and technology creating the field for further reflections on the design of innovative learning environments. One of the possible outcomes could be the creations of direction for the design of the elements that concur to innovate and existing learning environment (for instance technological tools or new digital services) in order to define the students and the teachers as its center members, supports their active commitment to pedagogy and creates in them the very own comprehension of their relationship with space.

REFERENCES