

Creative strategies for the learning spaces of the future

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Abstract

The paper discusses the role of learning spaces as an integral part of the larger educational ecosystem. Covid-19 pandemic accelerated the trends of digital transformation in education by liberating educational content in time and space and radically reformulating the process of teaching and learning. However, the current spatial archetype of the learning environment still features traditional plans with segregated classrooms and auditoriums. This model is obsolete and does not meet the new requirements of the 21 century education which is student-centred, knowledge and skill-oriented, technology-enabled, collaboration-based and personalized. The role of the teacher is also profoundly changed from transmitting knowledge towards facilitating the educational process that predetermines the wide variety of activities performed in the classroom.

The main objective of the paper is to explore how interior design can be aligned to the new learning theories and technological advances, and to propose strategies for the re-design of the traditional learning spaces. Based on the data obtained in a survey conducted with students to gain insight on their specific learning styles and needs, and a survey conducted with university lecturers to understand their teaching approaches and spatial necessities, six types of spaces were proposed. The study followed the principles of grounded theory to construct a hypothesis on the spatial qualities of each space and relate it to the pedagogical and technological requirements.

Author keywords

Learning spaces; learning environment; future-oriented spatial design; learning experience; educational ecosystem

Introduction

The implications of the social, economic and technological changes in the twenty-first century require rethinking education as an ecosystem. The educational ecosystem is defined as a network of people, educational resources, pedagogical tools and abiotic factors/components which interact to seamlessly work together (Railean, 2019). Derived from evolutionary biology, the term of ecosystem can be applied in the field of education to allude aspects such as diversity, maximum productivity, dynamic adaptability and scalabil-

ity (Luksha et al. 2018). This notion not only transforms our understanding of learning but also considers how education can evolve and prepare learners for the increasing complexity and challenges of the future. The concept of the educational ecosystem takes into account the context in which learning occurs, responds to the fluctuations of the environment, withstands the treads and embraces the learning opportunities to align them to the current and emergent needs of the new generations of learners.

Learning today is no longer confined to the physical space of the classroom, it involves various learning providers who deliver both face-to-face and technology-mediated learning experiences in the physical, immersive and digital learning environment. Covid-19 pandemic played a critical role in accelerating the trends of digital transformation in education by liberating educational content in time and space and radically reformulating the process of teaching and learning. The diversification of the learning environment stimulated the development and application of varied learning methodologies to engage learners, boost their creativity and enhance the learning outcomes. However, while technology and pedagogy advance, one of the components of the ecosystem, the physical environment, has been neglected. The current spatial archetype of the environment still features traditional plans with segregated classrooms and auditoriums which support lecture-based learning and emphasize the hierarchical relationships between educator and learner. This model is obsolete and does not meet the new requirements of the student-centred, knowledge and skill-oriented, technology-enabled, collaboration-based and personalized 21-century education. The role of the teacher, which is profoundly changed from transmitting knowledge towards facilitating the educational process, encourages flexibility in teaching and predetermines the wide variety of activities performed in the classroom. Though the physical environment has been recognized as the third teacher (Edwards, 2011) and its impact on students' engagement and performance has been widely researched (Fisher, 2004; Oblinger, 2005, Jankowska and Atlay, 2008), the rigid design of the classroom conceived for traditional direct instruction remains the same since the Industrial Revolution. This not only does not respond to the educational needs but also constrains current teaching and learning practices.



The main objective of the paper is to explore how interior design as a component of the educational ecosystem can be aligned to the new learning theories and technological advances. We propose strategies for the re-design of the traditional learning spaces, based on the data obtained in a survey conducted with students at the University of Monterrey (Mexico) to gain insight on their specific learning styles and needs, and a survey conducted with university lecturers to understand their teaching approaches and spatial necessities. The study followed the principles of grounded theory (Glaser and Strauss, 1967) to construct a hypothesis on the spatial qualities of each one of the proposed spaces and relate it to the pedagogical and technological requirements.

Pedagogy in the 21st century and its spatial needs

Education in the 21 century is predetermined by the necessity to prepare students for the social reality of a volatile, uncertain, complex and ambiguous future (Fadel and Groff, 2019). In the context of a rapidly transforming world, the main goal of education is to train students to be adaptable and versatile to be able to succeed and thrive in any unpredictable upcoming situation. This requires focusing not only on the knowledge gained but on acquiring the skills of how this knowledge can be used, developing character qualities how to behave and engage in the world, and mastering meta-learning strategies how to reflect on oneself and adapt one's learning to achieve one's goals (Fadel et al., 2015). To include all these four dimensions in teaching requires innovative pedagogical practices that can ensure effective learning and active engagement of the students in the learning experiences. Scott affirms that to rethink pedagogy is as crucial as identifying the new competencies learners need to acquire (Scott, 2015). Pedagogies which support the development of higher order skills, the four Cs – creativity, critical thinking, communication and collaboration (OECD, 2012), should be based on three Ps – personalization, participation and productivity (McLoughlin & Lee, 2008). The application of approaches that give learners the opportunity of making choices driven by their own needs, creative knowledge production and interactive sharing has been afforded by digital technologies. Bringing a radical shift in education, “[k]nowledge technologies shape what is learned by changing how it is learned” (Laurillard, 2012). Being easily accessible and independent of time and space, technology promoted varied interactions with the content, the instructor and the other learners. The transition from a lecture-focused to a learner-centred education involves students in a process of doing and reflecting on what has been done, or the so-called active learning. “Active learning practices may range from simple methods such as interactive lectures and class discussion to case study analysis, role-playing, experiential learning, peer teaching, and flipped lessons. Active learning may involve problem-based, visual-based, collaborative, project-based, or game-based learning” (Misseyanni et al., 2018). It is recognized that the application of these practices needs an adequately designed physical space, adapted to the diversified needs (Baepler et al., 2014; Oblinger, 2006; Fisher, 2005).

The innovative learning environments defined by Mahat et al. as “the product of innovative space designs and innovative teaching and learning practices” can act as change-maker by stimulating educators effectively and efficiently apply active learning pedagogies (Mahat, 2018). Innovative learning envi-

ronment's focus on the dynamics and interactions between the learner, the teacher, the content, the facilities and technologies (Dumont and Istance, 2010a) which once again emphasizes the systematic character of education and acknowledges the importance of the design of the physical space to achieve the goals of education. Dumont and Istance outline the core principles for designing an effective learning environment – learners are the core participants and their active engagement is encouraged; the social nature of learning is recognized and organized co-operative learning is encouraged; learning results as a dynamic interplay of emotions, motivation and cognition; the environment is acutely sensitive to individual differences and preferences and adapts in a sustainable way to both the individual and the group as a whole; each learner is appropriately challenged and pushed constantly to excel; the learning environment clearly states expectations and uses assessment consistent with the aims; horizontal connectedness is promoted across areas of knowledge and subjects in- and out-of-school (Dumont and Istance, 2010b).

Based on these premises, we as designers were interested in the design implications and how the potential of interior design can be harnessed to support the implementation of the innovative teaching and learning practices. Borri et al. identify five multipurpose spaces for the new generation of schools – group space, exploration lab, agora, individual area and informal area. The group space is given priority as the heart of the school where students build and maintain their identity. Its layout should enable flexible setting to accommodate various learning activities as collaboration and work in groups, creation of artefacts and multimedia objects, individual work, and presentation. The exploration lab is the space for learning by doing, with dedicated tools to observe, experience, explore, experiment. The agora is a community meeting space, where groups of students can gather for creative activities or discussions. The individual space is dedicated to focused work, requiring concentration and reflection, it should be equipped with pods, caves with reading and writing tools. The informal space is a recreation area with comfortable furniture for individual retreat or informal group meetings (Borri et al., 2016; Borri, 2021). Oblinger describes the elements which the spaces intentionally designed to respond to the new learning theories and student's needs should possess: flexible layout to provide ease of re-configuration to support immediate change of activities; comfortable furniture to support different body sizes and avoid distraction from learning; environment offering sensory stimulation and seamless integration of technology; decentredness and consideration of the campus as a whole with spaces conveying co-learning and co-construction of knowledge. In addition to these functional aspects, the cognitive dimension of the space and the relations between the spatial elements and the creation of a meaningful learning experience have to be considered. Strange and Banning discuss the symbolic aspects of the space which convey powerful message and subconsciously influence the behaviour and the creation of a sense of place. They propose ten features of the spaces which support the inclusion, security, engagement and community experience. To carry this into effect the space needs to be: welcoming (creating sense of belonging), inclusive (affirming identities and expression of self and others), functional (supporting key tasks and activities), sociopetal (encouraging interaction and

encounters), flexible (adapting to multiple purposes), aesthetic (inspiring creativity and uplifting the spirit), reflective (encouraging imagining and meaning making), regenerative (restoring energy and motivating persistence), distinctive (creating memorable impressions) and sustainable (supporting human experience) (Strange and Banning, 2015).

Learning spaces design – the case of the University of Monterrey

Context of the study

The current study was motivated by the urgent need to re-design the learning spaces of the University of Monterrey (UEM), Mexico. The strategic development plan of the university which is centred in the development of the person and his transcendence in the construction of a sustainable society, results in the adoption of a pedagogical model characterised by active learning practices, application of cutting edge technology, development of disciplinary and transversal competences, creating a warm and safe environment for the students, encouraging work on interdisciplinary projects (fig. 1).

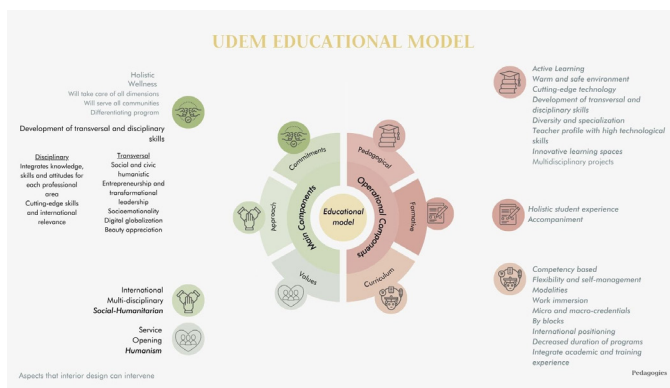


Figure 1. UDEM educational model

However, the physical environment does not support achieving the aims of the strategy. Despite the management's efforts to modernize the campus, the academic buildings where classes are given have not been substantially changed since their inauguration in 1984. The architectural project has been elaborated by the US firm Caudill Rowlett Scott – renowned at that time for their expertise in school design. William Caudill was researching educational spaces and authored the book "Space for Teaching" (1941) and John Rowlett had degrees in both architecture and education. The project they proposed met the needs of the growing student population while taking into account the specifics of the local context. The building consists of four interconnected volumes, featuring open circulation areas adapted to the hot climatic conditions of the region. The façade is treated with vertical concrete panels which function as sun screens blocking the sun from penetrating directly into the classrooms. Nevertheless, the layout is based on standardized cellular classrooms which responded to the lecture-based teaching practices of the past but in the current context hinder the implementation of the aligned to the digital age educational model adopted by the university.

Research method and data collection

To propose spatial solutions for the re-design of the current learning spaces which will be relevant to the pedagogical model and the strategic development plan, a more holistic understanding of the mindset, behaviour and the specific necessities of the UDEM community was necessary. As we aimed to propose strategies for the design of the learning spaces as an inductive process based on the identified gaps between the current and the desired learning experience, grounded theory was selected as a research methodology. The first phase of the research included user surveys and observations, followed by data coding, categorization and scenario mapping and ultimately, development of hypothesis on the spatial qualities of the learning spaces of the future. To gain insight on what kind of learning spaces will best meet the needs and to inform the development of design strategies providing a more meaningful learning experience, two questionnaires were distributed among students and teachers. The purpose of the student survey was to acquire deeper understanding of their specific learning styles and spatial preferences. The teacher survey intended to collect data about the most commonly used teaching approaches and learning activities and the respective spatial needs. In addition, a workshop was conducted with students in the creative field (architecture, industrial design and interior design) with the aim to create scenarios for the future use of the learning spaces and to identify opportunities for future-oriented innovation.

The surveys were implemented in the 2022–2023 autumn semester when 70 % of the classes were delivered face to face and the remaining 30 % were offered online. Responses were obtained from 93 students and 25 teachers. Each questionnaire was designed to collect both qualitative and quantitative information. The questions were predominantly open-ended to encourage the respondents to reflect on the spatial aspects which have a positive or negative impact on the learning experience. Students were asked to describe situations and spaces where they have acted in a very creative way, have concentrated successfully, and where they have been fully immersed into collaboration with others, so that the desirable features of the spaces supporting these activities are revealed. Another important question we were interested in was how a sense of community is fostered so we asked students to speculate on the spatial elements which create a sense of belonging. Teachers' questionnaire focused on their current pedagogical practices, the frequency with which activities are changed during a typical class, which spatial elements of the current environment support or hinder the implementation of these activities and which are the desirable spatial characteristics to freely implement their teaching approach. The technological tools which they usually use or would like to use in the future were also required to be listed.

Mapping the learning experience

Survey results indisputably indicated that the physical space has a great impact on the learning process. Respondents pointed that it influences concentration, creativity, the emotional and physical well-being and the dynamics of the interaction during the class. When comparing which activities are preferred to be performed face-to-face, interaction with the teacher and peers, hands-on activities and presentations are predominant, while listening to a lecture and individual work are preferred to be done online. Among the mandatory re-

quirements towards the space were mentioned the connection with the outdoors, smart technologies, availability of silent areas, comfortable furniture, good lighting and flexibility of the environment.

To triangulate the data obtained from the survey, we organized an intensive workshop where 11 students were challenged to define the needs of the student in 2030 and to envision a better learning experience for the future. By applying design thinking methodology the participants were pushed to generate a wide variety of ideas about learning spaces which meet the future needs of the students. After several critique rounds they were encouraged to visualize the most prominent ideas by giving them a distinct shape by translating the goals and motivations of the users into specific spaces and contexts. The scenario of the future learning experience was visualized into two collages representing the experience in the physical space and in the digital space (Figure 2). The collage technique was selected because of its possibility to provide insight on what students will do, think and feel while pursuing their learning goals.



Figure 2. Collage of the physical and digital learning experience of the future (Developed by B. Elizondo & D. Gamboa)

Conceptualizing the learning spaces of the future

The empirical analysis of the survey data was done together with consideration of the related literature advising that the learning space should support creativity, critical thinking, communication and collaboration (the 4 C's) and allow personalization, participation and productivity (the 3 P's). The development of the spatial typologies of the future learning spaces and the definition of the preliminary design principles for each type was informed by mapping the problematic points of the current physical environment and its comparison with the identified desired future state. Six different spatial types were suggested (Figure 3):

Formal Learning Spaces: Dedicated to scheduled instructor-led classes, where students are encouraged to move and use the different settings, which are most suitable for the various activities performed and always supported by integrated technology.

Individual Area: Informal learning space dedicated to individual focused work and self-directed learning in both open and closed spaces to ensure the student will concentrate undisturbed.

Group Area: Informal learning space dedicated to the collaborative work of small groups of students both in open and closed spaces to encourage dialogue and the individual participation in the group activities.

Webinar / 360°: Formal learning space dedicated to presentations and webinars, designed with a circular layout and flexible LED screens so that the presenter can be seen from all angles of the space.

Arcade / E-learning: Formal/informal learning space dedicated to collaboration. Designed hand in hand with technology,

with a LED floor, interactive screens, tables for augmented reality and virtual reality pods, so that students can take their learning to the next level with the aid of technology.

Encounter Area: Informal learning areas activating the transition areas with additional functions, dedicated to the co-existence and interaction between students, designed with comfortable and flexible furniture to support relaxation and well-being. Integrated interactive screens ensure students will be always connected to the community.



Figure 3. Spatial typologies: Formal learning space; Individual area; Group area; Webinar / 360°; Arcade / e-learning; Encounter area (Developed by B. Elizondo & D. Gamboa)

Conclusion

Technological advances and the change in current pedagogical practices are drivers for the change of the physical space where learning takes place. As teaching methods continue to evolve, spatial design also needs to remain open for changes and empower their implementation. Furthermore, design can play a transformative role enabling changes in the educational ecosystem. The proposed spaces break away from the rigid teaching model of the past and encourage the dialogue between teachers and learners, turning them into co-participants in the educational process and co-creators of knowledge. Such radical transformation is needed to initiate a process of liberation and awakening of students as critical thinkers and creators. The design aims to make students immerse into the environment, to activate the participation in the performed activity, to challenge the imagination, to arise curiosity, to inspire new ideas, to create a sense of security and inclusion in the campus life. Though the floorplan is not fully opened and the enclosed rooms are still preserved, their uniformity is broken as various sizes and various functional areas are proposed to provide optimal conditions for learning. The conventional classroom is converted into a new configuration of flexible spaces which satisfy the current needs but are opened to experimentation so that they easily adapt to the needs of the future. Both teachers and students are stimulated to explore the space and find new ways to interact and establish new relationships. By identifying opportunities for future-oriented spatial design innovation we expect to support the self-directed learning, promote the active participation of the students in the educational process and provide a more meaningful learning experience.

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