Development of Built Pedagogy from the Environment, Economic and Social Aspects

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ABSTRACT
Technology advancement has brought about modernization, which changes our environment and life style. The rapid development of information technology induces pedagogical changes. Information and knowledge can be retrieved from internet access easily. The traditional teaching mode shifts from passing expertise knowledge to students to interactive learning between teachers and students, and among students. Learning spaces is no longer restricted to classrooms and lecture theatres. Design change in learning spaces is necessary. This paper studies the effects of modern technologies on pedagogy and design of learning spaces. The research reviews the relations between modern technology and pedagogical shift, and develops means of promoting effective teaching and learning through “built pedagogy”. Extensive literature review on the current changes in pedagogy, development of modern technology in academia, and design of learning spaces were conducted to identify the principles of effective design in teaching and learning spaces. The design and operation of Active Learning Classroom, which could enhance communication and collaboration among teachers and students, were studied in detail. Current changes in teaching and learning shifted from “Information Common” to “Learning Commons”; and from “access to technology” to “leverage technology”. Campus design must facilitate the transition from structures and processes based on expertise teaching to a system that enable organization learning. The design of classrooms and lecture features should enable easy reconfiguration. Modern technologies, such as up-to-date AV/IT facilities, virtual whiteboards, are crucial provisions. A case study of the ongoing renovation of teaching spaces in The Hong Kong Polytechnic University was conducted.

Keywords: Information Technology, Interactive Learning, Pedagogical Shift, Built Pedagogy, Active Learning Classroom, Learning Space Design Principles.

Introduction
Our community is undergoing tremendous changes and industrial economy has given way to knowledge economy (Cornell, 2002). Work force consists of knowledge workers and all work has a strong knowledge component (Stewart, 1997; Cornell, 2002). The rapid development of technology has induced pedagogical changes. The increasing integration of communication and information technologies has shifted teaching as teacher-centred practices with primarily one-way delivery of information to student-centred and flexible learning approaches (Jamieson, 2003). Higher education has become reactive (Fruchter, 1999). Learning in universities includes formal learning in classrooms and informal learning, which emphasizes the interaction between teacher and students and among students (Oblinger, 2007). Design principles of learning space should be changed to cope with recent pedagogical development.
Objectives
This paper studies the influence of modern technologies particularly information technology on the mode of teaching and learning; and how the change in pedagogy necessitates changes in design principles of learning spaces.

Deliverables
The aim of the research is to identify the design principles for built pedagogy that enhance effective teaching and learning.

Effective Teaching and Learning Space
Learning is the central activity of universities, which includes “formal learning” and “informal learning”. Formal learning is usually conducted in classrooms and lecture theatres while informal learning involves interaction among individuals (Oblinger, 20067). Effective Teaching and Learning Space

Influence of Information Technology on Pedagogy
Internet offers effective tools for access to graphics, sound, and real-time interactive communications that facilitates on-line learning; and telecommunication technologies have provided a vast array of teaching opportunities for educators (Fruchter, 1999; Colace et al., 2002). The increasing ownership of digital devices such as computer notebook enrich learning methods, which shifted from “passive” to “active” learning. Learning becomes an active constructive process, shifting to student-centred and flexible learning approaches (Brown and Long, 2006; Jamieson, 2003). Students are becoming more responsible for their own learning (Jamieson, 2003). The curriculum is designed to enhance learner’s active participation, interactivity, multiple roles (such as listener, critic, mentor, presenter), and social engagement (such as group work, discussion boards) (Brown and Long, 2006). Learning space should be designed to bring students and faculty together for students with multiple directions (Oblinger, 2006).

Built Pedagogy
Space lays down the law because it implies a certain order (Lefebvre, 2001), which is formed by “shape and identity of the relationships created within it (Ceppi and Zini, 1998). Built pedagogy is the ability of space to define how one teaches (Oblinger, 2006). Learning space embodies the pedagogical philosophies of their designer (Monahan, 2002). Learning space of appropriate design can leverage the intersection of content, technology, and services in a physical facility to support student learning; enhance collaborative learning approach; and provide an environment to students for academic and social purposes (Lippincott, 2006). The design should be user-centred: considering (a) functionality (flexibility and adaptability); (b) user-friendliness; (c) comfort; and (c) aesthetic (Chism and Bickford, 2002; Cornell, 2002; Lippincott, 2006).

Trends in Learning Space Design
Learning space design has shifted from “information commons” to “learning commons”, or from design based on resources to human-centred (Brown and Long, 2006). Brown and Long suggested that space layout and furniture design should enable easy reconfiguration to facilitate constructivism learning. Coordinating architecture and modern technology could create powerful learning environment that fostered face-to-face interaction among students, enhanced active and social engagement, and facilitated small or medium sized group discussions. Classrooms should be equipped with a variety of modern technologies (including computers, projectors, smartboards, video editing equipment and video conferencing) and flexible furniture (Brown and Long, 2006; Lippincott, 2006).
Case Study

General Teaching Classrooms at Block B-C of The Hong Kong Polytechnic University were renovated into Active Learning Classrooms to facilitate collaborative learning.

Active Learning Classroom

Active Learning Classrooms (ALCs) aim to promote interaction and engagement between teachers and students as well as among students; facilitate collaborative learning activities; and improve teaching practices (Baepler and Walker, 2014; Carpenter, 2013; Metzger, 2015; Pundak and Rozner, 2008). ALCs are equipped with various types of modern technologies to enhance student learning and support teaching innovation (Charles et al., 2015; Chiu et al., 2015; Doris and Belcher, 2005; Soderhahl, 2011). The round-table configuration is designed specifically for student group work, observing instructor demonstration and team debate (Whiteside and Fitzgerald, 2009; Chiu and Cheng, 2016).

Chiu (Chiu, 2016) and Cornell (Cornell, 2006) identified five main guiding principles for designing an active learning space, which are:

a) Adequate working areas
b) Flexible and transformation layout
c) Facilitating student-teacher interaction
d) Comfort and safety
e) Psychological appeal

Renovation of General Teaching Rooms

Room BC402 in Block B-C was a general teaching classroom of traditional layout and fittings as shown on Figure 1. Students were arranged facing the front whiteboards in same direction, which was a typical layout for formal teaching and learning. Chair was non-mobile and equipped with an individual writing pad, which did not facilitate group discussion.

Figure 1

BC 402 before renovation

BC 402 was refitted to an ALC. The teacher station was relocated to one side. The original whiteboards were replaced with a system composing of whiteboards and screen for presentation. New mobile chairs and hexagonal tables replaced the conventional classroom chairs. Reflective panels, which could be tilted in slightly different angles, were installed among the lighting panels to provide uniform illumination. Vibrant colour strips were added to the flooring.
Analysis of Case Study

In the case study, relocating the teacher station to one side enables teachers to supervise students conducting group discussions more efficiently as the depth is reduced. This change facilitates student-teacher interaction. The combined system of whiteboards and screen facilitates teaching by allowing teachers to use projector for presentation and elaborate the lectures on whiteboards at the same time. Use of mobile chairs and hexagonal tables enable grouping of students to be performed quickly. The hexagonal shape of the tables enable flexible and transformable layout. Small to medium sizes groups can be formed easily by joining tables together in multiples of one, which facilitate collaborative learning and group works. The reflective ceiling panels provide uniform illumination to different workstations, and increase comfort and health level. Downlights break the monotonous lighting pattern of conventional false ceiling lighting. The vibrant colour of flooring is psychological appealing and can create a comfortable environment and motivate learning. Both teachers and students welcome the changes and agree that the new design creates an appealing learning atmosphere and a comfortable environment, can facilitate interactions between teachers and students as well as among students, and motivate learning. Teachers prefer the new location of the teacher station because they can oversee students’ group work more conveniently and effectively. The renovation responds to current human-centred pedagogical change and meets the design requirements of an active learning classroom.

Conclusion

Modern technologies have induced pedagogical changes. Teaching and learning focus on users. Leveraging the intersection of content, technology, and services in a physical facility can support student learning (Lippincott, 2006). Classroom is a place to access, use and create information (Lippincott, 2006). A user-centred classroom is functional, user-friendly, comfortable, psychological appealing and facilitates interaction among students. Active learning Classroom is designed to meet the new requirements of collaborative learning. The new design should be comfortable, enhance safety and health of users and support information technology. Interior design can create a comfortable environment and motivate learning. Furniture design should be flexible and multi-functional, which allow quick reconfiguration for grouping. Architecture, furniture and technology are designed to work seamlessly and harmoniously (Lippincott, 2006).
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