Physical Informal Learning Environment on Campus Ground: A Review

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Past few decades, there has been a raft amplifying interest in higher education institutions, nationally and internationally, in the creation of new types of learning environment supporting learner-centered or constructivist pedagogy. This paper reviews the effectiveness of the physical informal learning environment initiated by learners outside their formal lecture hours in higher education. The aim of this paper is to present a synthesis of 40 studies from 1979 to 2016 on pyhsical informal learning setting on campus. Learning is the essential activity of colleges and universities. Commonly learning occurs in classrooms which identified as formal learning and sometimes its results from serendipitous interactions among individuals at transitional spaces which classified as informal learning. Space whether physical or virtual can have an impact on learning. Thus, it can bring people together, encourage exploration, collaboration, and discussion. Space can carry an unspoken message of silence which mentioned as the power of built pedagogy in colleges and universities. Nevertheless, the subject remains topical due to the dynamism of the variables, particularly the pedagogy, learning media, spaces, learners themselves and the study location. However, exploring the intermediate space as physical informal learning environment that affect students' performance and satisfaction in higher education remain crucial and decisive among educators and researchers. Therefore, there is a growing interest in higher education institutions, nationally and internationally, in the creating of new types of learning environment supporting learner-centered or constructivist pedagogy. Hence, The Next Generation Learning Spaces project team (NGLS) under Australian Learning & Teaching Council (The University Of Queensland) , explored the interdependence of pedagogy, space, and technology to develop the Pedagogy-Space-Technology (PST) framework which permits institutions to develop new teaching and learning setting that will strengthen student engagement and enhance learning outcomes. This paper contributes to the paramount significance of the quality informal learning environment in order to accomplish functional obligation and cater for learner's emotional urgency for enthusiasm and touch of identity.

Keywords: informal learning, learning environment, built pedagogy, Next Generation Learning Spaces (NGLS), Pedagogy-Space-Technology (PST).

1. Introduction

Past few decades there has been a growing body of knowledge and working patterns as a new path to the design of learning space in higher education institutions. In fact, there are few factors interconnected in driving innovation and experiment in the design of learning space such as changing social patterns, generational change, a changing funding environment, new and emerging technology and the shift to a more learner-centered pedagogy (Velenti, 2002). Conventionally, three learning types of learning structure are incorporated in education system – instructional learning, practice based learning and informal learning. No doubt, instructional and practice based learning happened in campus environment and at work place However, the informal learning may take place in the physical and virtual learning environments, within or off campus. As mentioned by Cunningham and Walton, (2016) the informal learning started way back in history over 50 years and happening at all education levels. Literature identified Loughborough University is developing for the first institutional estates strategy which considers how informal learning space should be developed and coordinated (Cunningham and Walton, 2016) .
The phrase "learning environment" is frequently applied to the social, conceptual environment or psychological comparatively than to the physical learning environment or space (Cleveland, 2009). However rapid increasing figure in both educators and designer, opened the awareness of the important

role that physical space plays in education settings (Beare, 2000;Cleveland and Fisher, 2014; Ibrahim and Fadzil, 2013a). Studies shows that there are positive impact of phyisical environment on learners such as improving learning possibilities (Strange and Banning, 2001) and higher students engagement (Doppelt *et al.*, 2008) Generally,"the production of space through the interaction of the physical and social" (McGregor, 2004) has laid out how possibly pure physical condition of space absolutely perform in and interfere social relations. Comparable theorizing has imitated to blown-over what Fisher (2004) mentioned 'deep spatial silence' or ' unconsciousness' respecting the power of space and the significant on the school managerial structures and learning. Currently, university system is affected by many factors, in order to remain applicable by reacting to the demand for mass education, the challenge to produce quality graduates and the changing needs of the digital age learners. Previous studies have shownsthat learning environment exploration has much concentrate on social and psychosocial rather than physical environment (Aldridge *et al.*, 2012;Barry J. Fraser, 1991;Walker and Fraser, 2005). Therefore this paper aims to review the impact of physical setting on learning which can encourage exploration, collabrotion, and dissussion. As mentioned by Oblinger (2006) physical space carry an unspoken message of silence and the power of bulit pedagogy.

2. Learning Environment Framework: Pedagogy-Space-Technology (PST)
Basically, learning environment is derived from three interdependent aspects particularly the pedagogy, space and technology (Oblinger, 2006) and indicate it as the Pedagogy-Space-Technology (PST) by Radcliffe *et al.*, (2008) . PST is the product of a Carrick Institute-funded Next Generation Learning Spaces (NGLS) project, which was conducted in University of Queensland by Professor Radcliffe. Wilson, Powell and Tibbetts (2008) implied that there was "a nexus between pedagogy, technology and the design of the learning space" and suggested that the PST framework was used for both guiding design and the "Post-occupancy evaluation (POE)" of either discrete learning or network of place. Higher education institutions hold an enthusiasm in fabricating new standard of teaching spaces that buttress learner-centered or constructivist pedagogy. Indeed, the perfect learning outcomes are achieved through a constructivist pedagogical path (Brown, 2005; Ehrmann, 1995; Valiant, 1996). The NGLS project develops the PST framework by examining the relationship between pedagogy, space and technology. Essentially, it aims to enable institutions to create new teaching and learning spaces with the objectives of promoting student engagement and learning outcomes. Basically, the PST framework is an inquiry driven process that is based on Pedagogy, Space and Technology (see Table 1) and thus, can be suited to the specific needs of the institution.

Table 1: Pedagogy-Space-Technology (PST) Design & Evaluation Framework

Focus	Conception and Design	Implementation and Operation
Pedagogy	*What type(s) of learning and teaching are we trying to foster? Why?*	*What type(s) of learning and teaching are observed to take place?*
	-Why is this likely to make a difference to learning? -What is the theory & evidence? -What plans will be made to modify programs or courses to take advantage of the new facilities? What education or training for academics and other staff is built into the plan?	-What evaluation methodology or approach was used and what methods were used to gather and analyze data? -Who was included in the data gathering and analysis? Students? Faculty? Staff? Administrator? Senior Leadership? Facilities managers and technical staff?
Space	*What aspects of the design of the space and provisioning of furniture and fittings will foster these modes of learning(and teaching)? How?*	*What aspects of the space design and equipment worked and which did not? Why?*
	-Who is involved in developing the design brief? Why? -Which existing facilities to be considered in developing concepts? Can we prototype ideas? -Who is involved in the assessment of concepts and detailed design? Why? What are their primary issues and concerns?	-What were the unexpected (unintended) uses of the space and facilities that aided learning or facilitated teaching? Do these present ideas for future projects? -How was the effectiveness of the use of space to aid learning and teaching measured? What was the different metrics used? -Were there synergies between this and other spaces that enhanced learning?
Technology	*What technology will be deployed to complement the space design in fostering the desired learning and teaching patterns?*	*What technologies were most effective in enhancing learning and teaching? Why?*
	-In establishing the brief and developing concepts and detailing designs, what is the relationship between the design of the space and the selection and integration of technology? -What pedagogical improvements are suggested by the technology?	-What were the unexpected (unintended) impacts (positive and negative) of the technology on learning and teaching? -How did technology enhance the continuum of learning and teaching across the campus and beyond?

Source: *Radcliffe, Wilson, Powell, Tibbetts, (2009) Learning Spaces in Higher Education*

There seems to be a very strong significant relationship between pedagogy, space and technology based on the Pedagogy-Space-Technology (PST) Design & Evaluation Framework (Table 1). At current, there are compelling detachment within those who teach in spaces, those who design learning space, and those who incorporate technology into the spaces. Basically, the word "collaboration" is viewed in different perspective by teacher, architect and technologist. Subsequently, an inconsistency in quality, cost and outcomes of designing learning space are found.

3. Learning Space for Higher Education

Learning is dynamic in 21st century. In fact, technologies contributing a mass in altering experiences and aspirations of learners such as interactive whiteboards, personal learning environment, wireless networks

and mobile devices (JISC, 2006; Doshi, Kumar and Whitmer, 2014) . Presently, learners are more diverse in terms of age, ability, and background. Indeed, they have different expectations of learning: some prefer to listen to lectures, while others wanted to learn using the network and mobile devices which mentioned as unstructured or informal learning. Thus, differences refers to Visual-Auditory-Kinesthetic (VAK) learning style (Gholami and Bagheri, 2013). Nevertheless, buildings last longer than ten years and increasingly they should have ability to meet a wide range of learners' needs, both now and in the future (Hill, 2013; Oblinger, 2006). Primarily, an education building is an expensive long-terms resource (JISC, 2006). Indeed, a comprehensive research on the link between physical space and effective learning is much needed. Furthermore, a particular previous research has granted indication on the positive encounter of the physical environment on learners in terms of enhanced learning potentiality (Strange and Banning, 2001) and higher student engagement (Doppelt *et al.*, 2008). Design of the built environment can provide students with circumstances that evoke curiosity and create an ambience for direct engagement to learn in action.

Generally, the pedagogy of higher education is whirled around structured teaching and convey in the form of lectures and tutorial as mentioned by Ibrahim, Fadzil and Saruwono (2013). Meanwhile, approaches to learning in educational setting are very much dynamic in nature. Therefore, traditional Teacher Centered Learning being replaced with Student Centered Learning (SCL) which underline the construction of knowledge through shared situations (The Partnership for 21st Century Learning, 2003). Barr and Tagg (1995) mentioned that this shift from an "instruction paradigm" to a " learning paradigm" has modified the role of the higher and further education setting from 'a place of instruction' to 'a place to produce learning'. In other words, in order to implement the SCL, students are expected to spend a significant amount of their typical learning time outside-classroom in informal learning space (Ibrahim and Fadzil, 2013b). This shows that informal learning space is very synonym with SCL.

4. Informal Learning Space
Informal learning spaces are defined as non-discipline specific spaces frequented by both staff and students for self-directed learning activities and can be within or outside library spaces (Harrop and Turpin, 2013). Informal learning is often treated as a residual category to describe any kind of learning which does not take place within, or follow from, a formally organized learning programme or event (Eraut, 2000). Richardson,(2004) defines informal learning as "which happens outside the formal education system or structured training and does not lead to a qualification. Recently informal learning spaces become equal paramount important as formal learning space as claimed by Brown and Lippincott,(2003) that "more learning is taking place outside of class time that ever before" . As mentioned by Ibrahim and Fadzil,(2013a) informal learning spaces as loci for teaching and learning and urgency to reevaluate the current conditions. Research claim that informal learning space becomes a baring for learners as learning mechanism. Meanwhile, students choose the informal learning spaces to gather and work collaboratively. In addition, the provision of informal learning spaces on campus increased the amount of time that students spend on campus as well as their informal interaction with academic staff. Students identify these informal learning spaces by their own and occupied them for learning and recreational activities. In fact, the improved student-academic interaction and the development of learning community have far-reaching positive outcomes for the University (Radcliffe *et al.*, 2008). As mentioned by Harrop and Turpin,(2013) there are nine key attributes of an informal learning spaces which attracts students to those specific spaces. Those attributes are destination, identity, conversations, community, retreat, timely, human factors, resource and refreshment. Overall these nine key attributes were extremely insightful on how space design can complement students' needs in promote independent pursuit of informal learning environments.

Table 2 shows the summary of informal learning space design principals in relations to the approaches of learning

Author	Design Principal	Approaches
JISC, (2006)	• Flexible-to accommodate current and evolving pedagogies; • Future – to enable to re-allocated and reconfigured; • Bold- to look beyond tried and tested technologies and pedagogies; • Creative- to energies and inspire learners; and tutors • Enterprising- to make each space capable of supporting different purpose	Constructivism styles of learning
Oblinger, (2005)	• Design learning spaces around people • Support multiple types of learning • Enable connections, inside and outside • Accommodate information technology • Design for comfort, safety and functionality and • Reflect institutional values	Students centered learning or learners centered learning
Jamieson et al., (2000)	• Design space for multiple use concurrently and consecutively • Design to maximize the inherent flexibility within each space • Design to make use of the vertical dimension of facilities • Design to integrate previously discrete campus functions • Design features and functions to maximize teacher and students control • Design to maximize alignment of different curricula activities and • Design to maximize students access to and use/ownership of the learning environment.	Multi-disciplinary styles of learning
Siddall, (2006)	• Learning spaces should support a diversity of learning styles • Learning spaces must be versatile • Learning spaces must be comfortable and attractive • Learning spaces are information rich and technologically reliable • Learning spaces must be maintained continuously • Learning spaces should be ubiquitous in space and time • Learning spaces should be used effectively and • Sufficient resource must be allocated for learning spaces	Multi-disciplinary styles of learning

Based on the table 2, it is very transparent that there is no universal agreed approached to creating sets of design principles (Radcliffe *et al.*, 2008). Most of the key design principals discussed on table 2 are associated to the Pedagogy-Space-Technology (PST) Design Framework (Oblinger, 2006). Indeed, these three elements are very interdependent in a cyclical manner which influence each others . Therefore, each of the three components, pedagogy, space and technology are paramount factors in designing next generation place of learning. Currently, some of the transitional spaces are been used as informal learning spaces in higher education as loci for learning (Ibrahim and Fadzil, 2013b). The approaches that been used in design principals are more focusing on student centered learning (SCL) or learners centered which very much emphasized in 21st century education. The SCL approach is currently promoted and encouraged by Malaysian Higher Education classrooms for teaching and learning. The

former Malaysian Minister of Higher Education Dato Seri Mohamed Khaled Nordin forced of having planned, effective curriculum that support to developed a holistic learner; intellectually active, creative and innovative, ethically and morally upright and a person who is adaptable and capable of critical thinking and it is more clearly stated in Malaysian Education Blueprint 2015-2025 (KPM, 2015).

The concept of student centered learning (SCL) has been mentioned as early as 1905 to Hayward and in 1956 to Dewey's work (O'Sullivan, 2004). Many terms have been associated with SCL, such as flexible learning (Taylor, 2000), experiential learning (Burnard, 1999) and self-directed learning. Basically, universities campuses are developed based on conventional instructional methods which focus on teachers centered learning and formal learning approaches namely lecturing and tutorials. By the beginning of 1990s the concept of 'learning' as opposed to 'teaching' mentioned by Barr and Tagg, (1995); Geraldine O'Neill and Sarah Moore, (2005). Currently, the learning pattern implies that students are expected to spend a significant amount of their typical study time outside-classroom environment which commonly referred to as Student Centered Learning (SCL). This approach is relatively new in Malaysia and gaining wide acceptance amongst institutions of higher learning in the country. In one of his inaugural speeches in 2008, the former Malaysian Minister of Higher Education, Dato Seri Mohamed Khaled Nordin mentioned the importance of having a planned, effective curriculum that would help build a holistic learner: someone who is intellectually active, creative and innovative, ethically and morally upright and a person who is adaptable and capable of critical of critical thinking (Nordin, 2008). Based on such a vision, SCL approach is recommended and encouraged in the Malaysia Higher Education Classrooms for teaching and learning (Yusoff, Mohin and Rahman, 2013).Therefore, a proper and effective physical informal learning setting need to be designed to accommodate the student's needs and SCL is seen to be an instrument to produce better quality graduates, who are critical, matured and ready for the job market (Ibrahim, Fadzil and Saruwono, 2013). As mentioned by Yusoff, Mohin and Rahman, (2013) improving the quality of teaching and learning is the second thrust out of the seven strategic thrusts of National Higher Education Strategic Plan (KPM, 2015).

7. Conclusions

Finally, research on the learning environment helped to enlighten and enhance a divergent, multidisciplinary colony in the higher education sector concentrated on new learning spaces and relook they are reaching to learning spaces. In fact, the three key aspects of the PST Framework are taken into account: Pedagogy, Space and Technology and well balanced approached (Ng, 2015). By using PST framework as a reference, which has been applied and tested on real projects, campuses demand to develop their individual roadmap supported by their own   specific circumstances. Conclusively, listed points need at least be considered:

1) Document the learning modalities expected with the new spaces (pedagogy),
2) Document the culture and size of the overall cohort and the project group subsets (space),
3) Document the types of technology that can better enable the learning outcomes (technology),
4) Understand how any new spaces fits within the overall campus structure and the ecology of the existing teaching and learning spaces,
5) Do the new spaces support the student at a faculty level and a campus level?

Ensure that at every stage the PST framework is consistently reviewed (Wilson, Powell and Tibbetts, 2008).

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