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CONSTRUCTING PLACE AND SPACE IN THE DESIGN OF LEARNING ENVIRONMENTS FOR PBL IN MALAYSIAN UNIVERSITIES

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Abstract

Malaysia's provisional entry into the Washington Accord has resulted in an overhaul of engineering education in this country. Gone are the days of traditional teaching in engineering. A myriad of changes have been introduced including changes in attitudes, orientation, curriculum, and delivery, to name a few. One important aspect that architects and planners have neglected is in the area of educational infrastructure, namely the place and space of the learning environment. The advent of new teaching methods has brought with it different infrastructural needs. Problem-based learning (PBL) is achieving great currency in engineering education these days. However, the present-day teaching-learning environment is seen as defective: it does not provide optimum learning in the PBL context. This paper attempts to reconsider the relationship of physical settings to the student learning experience. This paper will also look at the problems of place and space in the engineering education in Universiti Kebangsaan Malaysia, with a comparison made with the integrated architectural program, and provide examples of the environmental design that would be conducive to PBL

Keywords: Engineering education, problem-based learning, architectural education, place and space, physical environment.

Paradigms in Our Engineering Education

The ruling paradigm of education, a subject we focus upon, describes the now familiar Industrial Model and Knowledge-Age Model borrowed from Costa and Liebmann's summary (Costa and Liebmann, 1997). The Industrial Model of Education is still very much in play, however we perceive it. The Knowledge-age Paradigm is simply a list of inconsistencies that are displayed in education today.

We are moving toward a learner-centred classroom approach and away from the traditional teacher-centred classroom approach, which clearly indicates that learners are very well in control of their own learning. Students are self-directed, and teachers are master learners, learning alongside students. Individualized learning plans are visible, but usually within a single comprehensive program aligned with standardized assessments. This is presumably an anomaly, and not a paradigm shift.

A clear instance of this teaching-learning approach arises when we hear that students require contextualized knowledge, and practice solving real-world problems instead of learning isolated facts. These students, nevertheless, are required at the same time to participate in problem-based learning pedagogy while still being bogged down with additional mathematical subject matter or even common university subjects - especially in Malaysia, where these subjects are prerequisites. This is a clear indication of the continuing existence of the Industrial model.

undermines the creation of more collaborative learning communities.

According to Peter Radloff (1998), the idea of a 'learning ecology' encompasses the multiple dimensions of a student's on-campus existence that directly affect their learning experience.

Radloff took his concept beyond the walls of the common teaching facilities into the greater campus environment. Whilst drawing on earlier studies, Radloff stresses the crucial roles that open space plays in campus life. He contends that universities can only support communities of scholars through an institutional commitment to constructing an integrated physical, cultural and organizational environment, in order to achieve strategic pedagogical outcomes. At a social level, he advocates increased opportunities for shared interaction amongst the entire student population, which would require appropriate buildings and open space as well as an appropriate institutional culture. Radloff also proposes the use of shortened lecture periods to provide individual students with more opportunities for reflective thought.

The issue of the on-campus built environment has not been a primary concern in the literature dealing with the teaching and learning process in higher education since the 1970s (Marton & Saljo, 1976; Entwistle & Ramsden, 1983; Biggs, 1999). The absence of concern with the place of teaching and learning is evident in the influential student learning literature that has emerged. According to Jamieson (1998), that body of research insensitively offered a concept of teaching and learning as a teacher-student-content relation that is itself unrelated to the physical location of the individual teacher or student. The idea that teaching and learning is context dependent was put forward; however the concept of 'context' was narrowly defined, for example, in terms of classroom climate (Biggs, 1993), or departmental procedures including assessment (Ramsden, 1992). This body of work also tended to ignore the extensive (and concurrently developed) literature that insists on the fundamental importance of the 'cultural' understandings that students bring to their learning experiences, from Freire's (1973) concern with 'critical consciousness' to social constructivist views of learning (McWilliam & Taylor, 1998).

Newer research on student learning has focused on the 'experience' of learning (Biggs, 1999; Marton & Booth, 1997) and the concepts of a student's approach to learning and a teacher's approach to teaching (Prosser & Trigwell, 1999). Despite this shift away from very specific learning or teaching situations to broader research topics, however, the relationship between physical place and how a student experiences learning or a teacher approaches teaching is not a primary concern. A cynical view might be that it is the conservative nature of the pedagogical researchers and practitioners themselves that has actually eliminated consideration of the physical environment from any serious and in-depth analysis of teaching and learning. It is the one variable that is taken as fixed. Spatial cognition is largely an unconscious process, as it has been 'domesticated' through the formative experiences of living that we encounter in our own homes (Bachelard, 1964).

Design Features of the Physical Environment—Creation of an Active Learning Space

The importance of physical place to those pedagogical processes that remain on-campus is intensely relevant. In this context, the type of built environments that universities are offering students is of the utmost importance. The relations embedded in the physical design of on-campus institutions should be consistent with more student-centred approaches to learning.

According to Strange and Banning (2001), the physical features of a campus environment can either promote or hinder learning. The design of the built environment can enhance relationships by providing space and structural connections or hinder relationships by being spatially incongruent and disconnected. In the design of a classroom, for example, the question of stimulating the senses of its users should be emphasized. The built learning environment should provide a sense of belonging of one's own space, the opportunity for connections with others, sensitivity to the local context, and meaningfulness and relevance to the world.

The architectural studio-based design environment has always demonstrated its dialogic communication content by continuously addressing and exhibiting sustainable construction and inhabitation, resource stewardship, universal access, and human inclusiveness through function. These ideas are "conceptual" in the sense that they are ideas about human equity that are larger than the physical elements that manifest them (Weisman 1994). The architectural design at play must therefore incorporate "experiential" social justice by properly composing the formal organization of the architecture such that it communicates dialogically. This issue is innate to the physical and formal qualities of light, shape, colour, texture, material, form and space as perceived by each human inhabitant; it is the demonstration of human equity through bodily experience.

An equitable understanding of the diversity in people's lives, cultures, abilities and requirements is fundamentally pertinent. In the spirit of researching a more holistic method of architectural design and practice, the question of human diversity within a broader methodology of design geared toward human needs should be posed. The design process should identify unique human needs—feelings of security for the elderly or inclusiveness for different sexualities, for example—as "performance" requirements within each problem itself, as opposed to the exterior mandates of legislated codes or regulations. Knowing the different capacities of a person in a wheelchair, for instance, how does one—based on this initial recognition of an individual's needs—design a proper hallway and doorway? When considered in this manner, regulations like the Malaysian Standard Guidelines for the Disabled or the Uniform Building By-Laws of 1984 then become "checks" for design as opposed to "how" an architect designs. Embedded in the understanding of the unique qualities of all people, this holistic method appears much more capable of enabling a design method that supports human equity. As with the engineering program or any other program, for that matter, the learning environment should include every aspect of learning, not only focusing on what it takes to be competent in learning but also incorporating an element of human inclusiveness. Learning should be humanistic in nature.

From the experience of running the architecture program and the constraints encountered, several key elements of the establishment of the architecture department and possible design features meant to address pertinent concerns have been identified below, based on the three key features of space designed for active learning. They are:

1. Providing a sense of belonging.

    i. Small studio size - The design emphasized small studio size to promote a sense of belonging and community for a very diverse student population. Human beings have a need for identity. Creating places where we are treated anonymously generally creates a feeling of disconnection.

    ii. Maximizing the use of natural lighting - Along with the environmental focus, the school design should maximize daylight for its potential impact on learning as well as for reduced energy use. The use of natural materials supports advocacy for renewable resources.

    iii. Quiet individual study spaces, small group and seminar spaces, team spaces and project work spaces.

2. Catering to the need for flexible and multi-use spaces.

    i. Movable and collapsible furniture – To address the functional changes involved in the active process as a result of variations in teaching delivery, spaces should be designed to incorporate multi-function activities such as project presentations.

    ii. Highly flexible, self-contained and distraction free spaces. Whole movable wall units (not the old folding partitions) allow the faculty

in lecture theatres, computer-based activity in computer laboratories, experimentations in designated laboratories). New learning environments need to allow for multi-functionality. This includes both teacher-centred and student-centred approaches, as well as formal, scheduled classes and informal student use. Student-centred and collaborative approaches to learning, as well as progress assessments, will increase the variation in student activity in formal classes.

Our formal spaces increasingly need to accommodate informal requirements when facilities are accessed by students outside of scheduled classes. Radloff (1998) notes that 80% of a student's time on campus is spent informally outside of scheduled classes. Current on-campus teaching facilities are under-utilized when not reserved for formally scheduled classes, leaving students to work in libraries or cafes not generally designed for large numbers of students working collaboratively, or to opt to work in their own domestic spaces. As with the situation in the Faculty, empty classrooms becomes spaces for isolated study where collaborative study is unsuitable. This is a situation that is both pedagogically and economically untenable.

ii. Design to maximize the inherent flexibility within each space.

Due to the need for multi-functionality within a class session, it must be possible to quickly re-organize the available space or place for a particular activity(s). One recent approach to increasing flexibility has been to divide a total area to allow for specific functions (e.g., formal class, group work, computing, etc).

iii. Design features and functions that maximize user control.

Maximum user (lecturer and student) control of the facility's functions should be foundational. The reliance on centrally-provided technical support, as in the case of technical support for video conferencing or computer laboratories, can be a costly and intrusive aspect of formal classes in those locations. At the same time, students will take full responsibility for the facilities and be accountable.

Technical support is typically prioritized for formal, teacher-led activities, which reduces the likelihood of technical support for student-directed, informal work undertaken without direct teacher involvement.

3. Recognizing the use of non-classroom spaces for learning.

i. Design to integrate previously discrete campus functions.

Where practical, facilities should be designed to overcome the present on-campus separation of functions and services. The availability of facilities that provide access to food/drink, communal areas for informal interaction and comfortable furnishings would help to merge social interaction and individual activity for students and others who prefer such an environment.

Explicit attention should be given to the design of the areas external to the 'built space' to complement and extend the overall learning environment or the 'outdoor classroom', with covered walkways, arcades and verandas provided as a useable transition space between inside and outside.

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