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RESEARCH ARTICLE

Healthy campus by open space design: Approaches and guidelines



Stephen Siu Yu Lau^{a,b}, Zhonghua Gou^{c,*}, Yajing Liu^b

^aDepartment of Architecture, Tongji University, Shanghai 200092, China

^bDepartment of Architecture, University of Hong Kong, Hong Kong, China

^cFaculty of Built Environment, University of New South Wales, Room 3001, Red Centre West Wing, UNSW Built Environment, Kensington Campus, Sydney, Australia

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Abstract

This paper examines the architectural and landscape design strategies and intentions for green, open spaces facilities targeting stress alleviation for learning environments such as those of university campuses in a compact urban setting. Literature reviews provide three prevailing perspectives for physical design pedagogical operatives: healing gardens where greenery and plants produce restorative effects; flexible spaces that accommodate functional needs of different activities; and green buildings that incorporate open space as a catalyst for integrated eco-system. Corresponding design approaches (landscape design, spatial design and green design) are scrutinized by case study. A comparison of two university campuses with different urban contexts is conducted to identify challenges and opportunities for applying these design approaches. For a compact campus, high-dense surroundings may limit the size of an open space and may handicap circulation and accessibility; on the other side, a small open space may provide its users more intimate contact with natural restorative elements and also a more controllable microclimate for physical comfort. A healthy campus should encompass diverse open spaces to satisfy different purposes. Finally, a framework that integrates the three approaches is combined to produce a sustainable design rubric.

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1. Introduction

Universities act as a power house, gushing forth innovative ideas, creative thinking and tangible effects of social and cultural vitality, by connecting the most intelligent, active

*Corresponding author

E-mail addresses: gouzhonghua@gmail.com,
z.gou@unsw.edu.au (Z. Gou).

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researchers with a wide source of new knowledge. However, many students are exposed to high levels of stress in their university life. Surveys repetitively show an increasing number of university students who are experiencing significant stress due to interpersonal conflicts, self-esteem problems, financial constraints, time constraints, frustration and emotional problems (Andersson et al., 2009; Chambel and Curral, 2005; Misra and Mckean, 2000; Mosley et al., 1994). Stress referring to an imbalance between environmental demands and human response capabilities has been evidently linked with physical ill health (Chida and Hamer, 2008; Miller et al., 2002; Sagerstrom and Miller, 2004) and deteriorated mental health (Hammen, 2005). The stressful university life also threatens students' academic performance (Hamaideh, 2011). In this sense, design of campus is far beyond providing a place for study. It should also be healing—serving functional as well as mental needs.

Open spaces located between buildings and working as joints of surrounding environments, provide a sense of direction in a campus by integrating and organizing different places and elements; they also can provide an esthetic sense by involving attractive surroundings and creating visual surprises. Many creative and innovative ideas occur in outdoor environments, away from formal classes and discussions. The natural scenery and a relaxing atmosphere in open spaces encourage impromptu meetings and discussions, and provide fresh air for stressed scholars (Payne, 2009). On the other hand, a large number of university campuses in the world have taken the lead in a green or sustainable building revolution. In green building assessment tools such as Leadership in Energy and Environmental Design (LEED), open spaces as the sphere for micro-ecology

and sustainable environments are believed to lead to a healthy community where plants, natural habitats, pavements, shades and lights jointly create an eco-system and microclimate in addition to supplying comfort and sustenance for users (USGBC, 2009).

The dual role for social interaction and environmental enhancement—mutually reinforcing one another, features an open space in healthy campus life. How to design open spaces to alleviate students' stress and to promote healthy campus life? To answer this question, this paper conducts a literature review to identify in what way an open space may influence human stress. Based on the review, three design approaches (landscape design, spatial design and green design) are discussed respectively with cases and guidelines. The research method is two-step case study. The first case study is a general examination of open space design in different campuses to identify potential design elements and guidelines; the second case study is focused on two campuses respectively representing two different urban contexts (high-dense and low-dense) to find out challenges and opportunities to apply the design elements and guidelines. Finally, a framework is developed for stressing open spaces in the early stage of campus planning and design.

2. Literature review

2.1. Healing garden

There is an accumulated evidence of the influence of the landscape on people's health, from ancient times to the present day (Thompson, 2011; Velarde et al., 2007). A range of theories and approaches have been forwarded in order to

Table 1 Summary of evidence of health effects of natural views.

References	Healing effects	Measurements	Design elements
Ulrich (1984)	Shorter post-operative hospital stays	Number of days in hospital after surgery	Natural scene; trees
Heerwagen (1990)	Restorative benefits for heart rate data and emotional states	Heart rate; self-reports of emotional state	Painting of natural scene; distant mountains, sunset, clustered trees and open grassy areas, path (mystery)
Leather et al. (1998)	Less job stress and intention to quit	Self-reports of emotional state	Percentage of the view from window with rural elements
Wells (2000)	Higher naturalness score post-move gave better cognitive functioning	Behavioral observation	Amount of nature in window view
Kuo et al. (1998)	Lower mental fatigue	Attention-tests; neighborhood social ties-test	Varying levels of nature (trees and grass) surrounding public housing (scale 0-4)
Taylor et al. (2002)	Improved self-discipline	Attention-tests	Amount of window view of nature
Ottosson and Grahn (2005)	Increased powers of concentration	Attention-tests; blood pressure; heart rate	Garden, with old fruit trees and a variety of flower species
Van den Berg et al. (2007)	Higher happiness, lower stress, anger, depression and tension	Attention-tests; emotion-test	Park-like forest area with creek
Hartig et al. (2007)	Reduced stress and improved mood	Attention-tests; blood pressure; emotion-test	Natural environment: tree views/nature reserve

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