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An Evidence-based Framework for Happiness and Healthy Campus Landscape Design

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Numerous studies and reports indicate that college students suffer from mental health, such as depression, anxiety, or even thoughts of suicide. However, the campus environment is an important place in the built environment for humans to contact nature. A well-designed campus environment with natural elements could have a positive impact on students' learning and performance. At present, studies have confirmed that "nature" in the living environment can directly or indirectly affect human's physical and psychological health and even brain activations. Based on this, the research raises the question: The campus environment is the main living space for students. To what extent does the campus environment have a potential for restorativeness? To what extent could the campus environment provide a sense of happiness, thereby reducing the generation of negative emotions, and achieving the benefits of physical, mental, and brain relaxation? To explore this topic, the study takes National Taiwan University as a case study to illustrate how to combine technology with physical and psychological responses, such as photovoice, wearable devices (e.g., HealthCloud app and iPhone), and big data image analysis to collect and integrate the real-time data within images, psychological response (e.g., pop-up questionnaires), physical response (e.g., heartbeat, heart rhythm variability, blood oxygen concentration, etc.), and environmental information (e.g., temperature, humidity, latitude and longitude, environmental sound, etc.). By using those data and combining with the landscape theory and design principles, we could create a healthy landscape campus. The practical and theoretical framework of bringing technology, brain, and mind together could apply to infer and improve the campus environment, which in order to enhance the overall happiness in the future.

Keywords: *Living areas, Happiness, Healthy campus, Landscape Design Principle, Brain Activation.*

Extended Abstract

The expansion of urban cities has significantly impacted human life and landscape space. In recent years, mental health problems such as depression, anxiety, stress, unhappiness, and life dissatisfaction have increased worldwide (Hernández-Torrano et al., 2020). Separated from their families, students may find themselves in a transition state to adulthood and must meet new life challenges alone, re-establish group relationships, and learn new professional knowledge to progressively become more independent (Cleary et al., 2011; Lipson et al., 2019). However, the transitional process into adulthood is associated with poorer mental health outcomes compared with other life processes (Arnett et al., 2014; Lipson et al., 2019).

A campus environment is an important place for humans to be in contact with nature and allows landscape architects to translate their concepts of the natural environment into an architectural space. Students spend

a long time in school engaged in various daily activities. A well-designed campus with natural elements can positively impact students' academic performance, activity performance, stress relief, and life satisfaction (Browning & Rigolon, 2019; Hipp et al., 2015; Turk et al., 2015). The campus environment provides opportunities for contact with nature and influences psychosomatic health (Felsten, 2009; Li & Sullivan, 2016). In recent years, studies have examined how the campus can be a stimulus for attention recovery. Research results have indicated that campuses with large waterscapes, grasslands, plant environments, gardens, and squares benefit users.

Furthermore, accessibility, visibility, comfort, recognition, and a sense of belonging affect perceived restorativeness and landscape preference (Foellmer et al., 2021; Lu & Fu, 2019). These attributes were incorporated into a theoretical framework for academic green spaces that support health on campus (Foellmer et al., 2021). Another study found that the indoor landscape preference score indoor with for forest landscape posters was higher than that for the green wall systems, and an outdoor environment with rest spaces, a large amount of greenery, and rest seats generated the highest landscape preference and restorativeness scores compared with those of other settings (van den Bogerd et al., 2018). In addition, individuals who had a strong connection with nature preferred natural landscapes, and this preference affected their perception of environmental resilience (van den Bogerd et al., 2018). Using the 36-Item Short Form Health Survey (SF-36) to measure well-being and physical, psychological, and social health, another study found that extensive grasslands provide a sense of "being away" and restores direct attentional fatigue. Moreover, grasslands provided space for socializing and regulating loneliness, thereby improving health benefits (Foellmer et al., 2021). In addition, the symbolic meaning of "space" on campus imprinted good memories and enhanced positive emotions (Foellmer et al., 2021).

Studies have confirmed that "nature" in the living environment can directly or indirectly affect human physical and psychological health and even brain activation (James et al., 2015; Kim et al., 2010; McCormack et al., 2010; Tang et al., 2017; Ulrich, 1983; Vujcic et al., 2019). Moreover, humans' pursuit of inherent psychological happiness—such as through their relationship with the environment—is a two-way dynamic interaction. Whether viewing natural landscapes, experiencing natural activities, or practicing mindfulness, yoga (Butzer et al., 2016), or qigong (Hung et al., 2021), the individual's interaction with the natural environment generates a subjective perception of psychological well-being (Bratman et al., 2019). Therefore, this study raises the following questions. (1)To what extent can the campus environment—the main living space for students—engender restorativeness? (2) To what extent can the campus environment provide a sense of happiness, thereby reducing negative emotions and allowing physical and mental relaxation?

This study aims to transfer concepts from environmental psychology-related theories such as attention recovery theory (Kaplan & Kaplan, 1989), landscape preference (Kaplan, 1987), and pattern language (Alexander, 1977) into environmental design. Therefore, the study proposes a research design framework that focuses on providing a healthy campus that supports human health.

This study uses the research concepts mentioned above to consider the National Taiwan University campus environment as a case study and illustrates how technology and physical and psychological responses can be combined. A previous study used the eCognition software to categorize land cover into four types: grasslands, forests, artificial sites, and water bodies; large areas and continuous grasslands or water bodies positively impacted psychological status and perception (Chou et al., 2016), whereas elements of the campus landscape layout—such as landscape structure, plants, brightness, and other characteristics—provided mental health benefits related to the perception of environmental qi (Chou et al., 2020). A study indicated that a large area of trees, grasslands, and waterscapes provided the best environmental qi experience, overall recovery and reflection experience, and landscape preference, generating scores higher than for the built environment (Hung et al., 2021).

Numerous studies have confirmed that landscape

gained of how spatial frequency interacts with statistics present in images to determine aesthetic perception and preference (Wu & Chen, 2020). Therefore, by linking brain activation with psychological responses, researchers can explore the mechanism of the landscape's impact on human responses.

This study integrates the findings mentioned above with cutting-edge and novel technologies such as HealthCloud, Photovoice, and brain activation to propose a framework for the empirical research and design of an overall healthy campus environment. These methods may reduce the time and cost of funding for the field investigation of the human–nature experience, further expand and strengthen environmental evaluation, and incorporate various stakeholders. Future research can compare the diverse methods of expert field investigation and cutting-edge technologies with the user's participation. By using theoretical and empirical approaches and research findings, this study can provide beneficial design criteria for improving the campus environment to enhance the learning space and overall happiness and health.