

Application of Green architecture Theory to Teaching of Landscape Architectural Design

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Abstract: The main goal of the Landscape Architectural Design course is to cultivate students' capability in tackling architectural and environmental problems. Under the guidance of the present regulations and evaluation system, transformation to green architecture in China puts forward a new request for teaching of landscape architectural design. Green Architecture Theory strikes a new path for teaching of landscape architectural design in value orientations, teaching pedagogies and curriculum design.

Key Words: green architecture; landscape architectural design; teaching pedagogies

1. Introduction

China is now at the historic moment of speedy industrialization, urbanization, informatization and agricultural modernization, which poses serious problems of population, resources and environment. In 2012, pollution from construction work accounts for a third of the total in China. The ratio between buildings' energy consumption and the final energy consumption of the society has gone up from 10% in 1978 to 27.5%; while if the whole process of production of materials and construction of buildings are reckoned with, the ratio becomes over 40%. The goal of the "Twelfth Five Year" Plan for Green Architecture and Green Ecological Development of Cities" released by Ministry of Housing and Urban-Rural Development in April 2013 is that by the end of the "Twelfth Five Year", green development can be universally accepted, economic motivation system is basically formed to promote green architecture and green ecological development of cities, technological standard

system is gradually becoming complete, research and development capacities are being improved, the scale of the industry initially comes into being, the modeling and leading effects are obvious, and the scientific transformation of urban-rural development is fundamentally realized. The goal set in "Jiangsu Green Architecture Implementation Plan" is even specific. It requires that during "Twelfth Five Year", the total area of the construction projects meeting green architecture standard in Jiangsu exceed 0.1 billion square meters. By 2015, new urban and rural projects in Jiangsu province are to be designed and constructed in compliance with the green architecture standard of One Star or above; by 2020, 50% of the new urban and rural projects in Jiangsu are to be designed and constructed in accordance with the green architecture standard of Two Star.

Supported by high quality external environment, Landscape architectures, which have irreplaceable functions, harmoniously exist with the environment and serve as places of interests for

tourists, refer to the various buildings or construction works^[1]. As the most important man-made trait in landscape, landscape architecture embraces both characteristics of gardens and buildings. In compliance with the sustainable and harmonious social development strategy, green architecture represents the development of social economy and is the only way for human beings to move towards a long term existence. Influenced by Green Architecture Theory, landscape architectural design is supposed to rationally reflect the inherent requirement of ecosystem. To inspire students' green design idea in teaching plays a key role in cultivating future garden designers and city builders thus promoting sustainable development of cities. Under the guidance of the present regulations and evaluation system and on the point of transformation to green architecture in China, how to integrate Green Architecture Theory into classroom teaching of landscape architectural design poses both a threat and an opportunity to teachers of landscape and architecture.

2. Background

2.1 Perfection of Green Architecture Theory

Green Architecture Theory, which focuses on ecological principle and sustainable development in design, is becoming complete after rapid growth. Classics such as *Design with Nature* by L. McHarg in 1969, *Ecological Design* by Sim Van Der Ryn & Stuart Cowan in 1995, *Green Architecture: Design for a Sustainable Future* by Brenda and Robert Vale and *Design with Nature: Ecological Basis of Architecture Design* by Jingwen Yang have successfully stricken a new path for development of green architecture and given rise to the appearance of principles of green architecture with the essence of ecological principles and sustainable development. In 1993, American Institute of Architects, American Society of Landscape Architects, The Ecotourism Society, National Parks Conservation Association, National Oceanic and

Atmospheric Administration and the Greenpeace Organization made joint efforts in compiling *Guiding Principles of Sustainable Design*, which was later published by National Park Service. It clearly defines "sustainability" of natural resources, cultural resources, foundation design, architecture design, energy utilization, water supply and waste treatment. Huey Johnson's *Green Plans: Greenprint for Sustainability* is a feedback of the "Green Plans" in western countries. *Green architecture Design and Construction*, which is compiled by academician Kang Qi, discusses the concept and methods of green architectural design and the corresponding application technology^[2]. The concept of sustainable development of green architecture is gradually becoming complete, and a relatively independent system of theories is being established, providing a solid foundation for transformation of modern architecture education.

2.2 Limitations of Current Landscape Architecture Education

Some technical concepts and theories in green architecture have been introduced into the knowledge system of landscape architectural design education since the 1990s. But in teaching, it is noticed that students tend to imitate the material and structure of the works of those highly qualified architects, seldom pondering over the ecological value or value orientations. This is more of following the trend than of the demonstration of localized ecological thoughts.

In the current curriculum, specialized knowledge of theoretical topics includes structure, materials, ecology, and history etc., which are mostly arranged in different terms according to syllabus but are usually disconnected with design course, giving rise to the disconnection between design and theories and that between design and technique. Finally, focus of the design is laid upon the shape of architecture and presentation of the blueprint, neglecting the clear demonstration of technical traits and design intent. Students are not

clear about the specialized knowledge and techniques concerning green design, therefore, they can hardly apply ecological technology to their projects in a proper and creative way. On the other hand, courses related to Green Architecture Theory are mainly arranged for senior students as elective courses. While landscape architecture is a major closely related to environmental science, making it necessary for students to not only know applied technology but keep a strong sense of environmentalism at the very beginning of their first semester so as to form fundamental professional attainments. The current situation is Green Architecture Theory has not actually been integrated into teaching, thus students do not grasp the essence of the knowledge and techniques learned in class, can hardly internalize what they learn as deep ecological thoughts and norms of behavior to unconsciously bring green architecture design in their design.

3. Application of green architecture theory to teaching of landscape architectural design

The main objective of landscape architectural design course is to cultivate students' ability in tackling various complicated architectural and environmental problems and using creative designs to solve problems. Application of Green Architecture Theory has provided new ideas, contents and methods in value orientations, modes of teaching and curriculum design for landscape architecture education.

3.1 Value Orientations

In landscape architecture, the most concerned for students are specific skills and methods in design. Representative works of such famous architects as Norman Foster, Richard Rogers, Nicholas Grimshaw and Renzo Piano are especially appealing

to students. Ecological ethics and values behind these works are not systematically taught to students who might have to depend on their own interpretation. However, according to scholars Simon and Graham, ecological connotation and architectural guidelines vary from architecture to architecture^[3], among which the most important in landscape architectural design are techniques, esthetics, culture, and society etc. (Table 1 and Table 2). Only when students understand the cognitive source of green architecture design, can they have right ecological ethics and values and move from passive imitation of green architectural design to active exploration and practice.

Category	Cognitive source	Image of architecture
Ecological skills	Scientific rationality, technical rationality	Commercial, modern, futural, dynamic
Ecological esthetics	Anthropology, science, postmodernism	Graphical, organic, futural
Ecological culture	phenomenology, cultural ecology	Regional, cultural, humanistic
Ecological society	Social ecology	Democratic, social, domestic

Table 1: Different Image of architecture and cognitive source of green architecture

Category	Technical measures	Suitable places and environment
Ecological skills	Overall, energy-saving, high-tech, intelligent	Ecological architecture design in compliance with global environment, populated and highly populated metropolis
Ecological esthetics	Nonlinear, organic, pragmatic	landscape and architecture rebuilt with ecological cognition and love for nature
Ecological culture	Regional, localized, low-tech	Suitable for material and cultural basis of the region and the biological region
Ecological society	Appropriate, site-matching, accessible, operational	Enhance social bond of sympathy through accessible communities

Table 2: Different Technical measures and Suitable places and environment of green architecture

Based on the principle of following the ecological rules of nature and existing in harmony with it, green architecture is designed by making full use of the ecological system, and natural resources and showing respect to culture before suitable architectural functions and technical systems are formed. Sticking to the principle of localization, green architecture is sustainable, renewable and recyclable full life cycle architecture, which is safe, healthy and pleasant for dwelling in that it consumes minimum resources but produces maximum efficiency, disturbing ecological system to the minimum extent. Green architecture is dynamic, systematic, harmonious, healthy, sustainable, multi-functional, cultural, pleasant for dwelling, environment-friendly and energy-saving. Sustainability, ecological economic profits and harmony, which represent the core value orientations, are compatible with various properties and characteristics of green architecture to the greatest extent (Table 3).

Value orientations	contents	characteristics
sustainability	Ecological, social and economic sustainability	Dynamic, healthy, systematic
Ecological economic profits	Meeting “4R” standard: reducible, reusable, recyclable, renewable	Healthy, environment-friendly, energy-saving, multi-functional
harmony	Harmony between appearance, structure and function; between the past and the present; between the local place and the region; between nature and humanity	Cultural, pleasant for dwelling

Table 3: core value orientations of green architecture

Enlightened by core value orientations, green architectural design often focuses on the following three topics: reducing burden or influence on resources and environment of the earth; creating healthy and comfortable living environment; existing harmoniously with the natural environment.

It requires that students take an ecological and sustainable attitudes towards the previous ideas for architectural design, realize the effects of architectural design on the whole process of the born, utilization and consumption of energies and that on the whole ecological system, learn to exploit the best efficiency and ecological economic profits by making the least use of natural resources, learn to spot the values and functions of recyclable resources, and get to know the natural, social and cultural background of the region before they can produce the landscape architecture that fits best in the environment, culture and esthetics. These topics give great inspirations to the perfection of teaching pedagogies and curriculum design for landscape architectural design.

3.2 Teaching Pedagogies

According to modern theories of teaching, teaching pedagogy is the organized and structured methods and strategy of teaching. In view of the essence of Green Architecture Theory, traditional teaching pedagogies for landscape architectural design need to be reformed to be more integrated, open-ended and deliberative with a more reasonable and appropriate assessment system.

3.2.1 Integrated Teaching

The core of green architectural design theory is the idea of integrated design^[4], which puts emphasis on the all-round coordination of all factors related to the architecture, from various external factors in the “eco-cycle” including air, sunlight, soil, rainwater and plants, to outside protective structure used to position the building and principles like “Ephemeralization” and “Recycling” that make economical architecture. Only by integrating all these factors in design can the non-renewable resources be saved and renewable resources brought to full play. Integrated teaching should not be restricted to functional or esthetic topics but focus all-round on various external environmental factors and on the analysis, comparison and evaluation of

all kinds of designs so as to rationally create new ideas and new ways of design. Improvement of integrative abilities in design as a whole calls for integration of a range of knowledge and techniques as well as a new system of knowledge and new ways of thinking.

3.2.2 Open-ended Teaching

Open-ended teaching methods need to be applied to teaching of landscape architectural design by calling for collaborative efforts of teachers in other majors and professional architects in curriculum design. In order to have more students explore the latest knowledge of landscape architectural design, students in landscaping, city planning and other majors should be allowed to be involved in some of the seminars, from materials technology to single buildings, from eco landscape to green infrastructure, which lay more stress on utilization of resources, ecological balance and minimization of environment pollution. Teachers and students are supposed to make joint efforts in the design and implementation of green architectural projects by using their own professional knowledge. Targeted integration of green theory and techniques into teaching of architectural design enables students to have a more direct and comprehensive understanding of the technology they have learned.

3.2.3 Deliberative Teaching

Integrated and open-ended teaching methods highlight the characteristics of being experimental, experiential and deliberative. Different from teaching of design which emphasizes much on space, form and style, green architectural design tend to be a rational exploration which seldom derives from personal inspiration but from collaborative efforts. Therefore, not only the finished design, but especially the design process –process of rational design reasoning must be taken as the focus of teaching. The whole design process, including investigation, analysis, discussion and evaluation, calls for enough courage in exploring new fields, an

awareness of being creative from students or design group and a teamwork spirit. Discussion and communication are to be used in teaching to encourage collaboration among students from different majors and communication and design seminars among students or between students and teachers.

3.2.4 Scientific and Reasonable Course Evaluation System

In terms of evaluation of teaching objectives and feedbacks from teachers and students, a scientific and reasonable course evaluation system for design plans are required in teaching of landscape architectural design. Systems adopted to evaluate green architecture vary from country to country, including American LEED (Leadership in Energy and Environmental Design) , British BREEAM (Building Research Establishment Environmental Assessment Method) and Chinese Standard Evaluation for Green building. Though these evaluation systems are used to evaluate finished buildings, some of them, after being simplified, can be applied to evaluate teaching plan for landscape architectural design. In evaluating students' design projects, teachers must attach great importance to indexes such as ecological profits and ecological strategies, without ignoring evaluations of traditional elements in the design proposal like architectural functions and architectural styles. This makes it possible to meet the requirements of integrated teaching of landscape architectural design.

3.3 Curriculum Design

Led by green architectural theory, parallel to the integrated, open-minded and deliberative modes of teaching is the optimization of curriculum design. Landscape architectural design is supposed to fit in the theme of green architecture and strike a balance between varieties of ecological strategies to maximize ecological profits of the design proposal. Designing a balanced curriculum, tightening

connections between design courses and correspondingly increasing the number of theme-related design courses that further illustrate concepts are among the measures.

3.3.1 Designing a Balanced Curriculum

Scholars have made a comparison between curriculum system 1 of ecological education for undergraduate and graduate students in foreign countries^[5], finding that at present ecological education for students in landscape architecture are common in that: courses related to ecological education accounts for over 30% of the total major courses in average; basic knowledge, techniques and value orientated courses are equally arranged but crucial importance of technical education has been initially realized; ecological education is integrated with diverse major courses, among which design course is the key to the education of landscape architectural design and ecological techniques are of crucial importance in teaching. The Department of Architecture and Built Environment in the University of Nottingham has newly started a subject of Sustainable Architecture and Environment (Bachelor Degree in Architecture). Core courses consist of four parts: Theories of architecture, history, architectural energies and renewable energies, economy, policies and user behavior^[6]. All these courses provide a platform for students to enhance their understanding of operation system of architectural energies, renewable energies and society, economy and image of built environment from an ecological perspective and to acquire necessary skills in evaluating, planning and managing sustainable built environment. This is undoubtedly the most illuminative for education of landscape architectural design of China's landscape architecture. In designing the curriculum, teachers must ensure the proportion of eco-related courses in total courses, make clear the types, arrangement and structure of courses in ecological education and integrate these courses with major courses comprehensively.

3.3.2 Tightening Connections between Design Courses

Education is a progressive process, so curriculum design should be conducted stratification by stratification and step by step in a perfect system, keeping connections between themes of design course and gradually introducing collaboration with other relevant majors. In teaching practices, teachers can divide a relatively big design project into several small ones based on actual situation and arrange the teaching phases from easy to difficult to enable green design idea to appear in all size of projects and to keep the continuity. For instance, in certain climatic environment, geographical environment and landscape of substance and humanities, consistent design from cities to landscape to architecture and detailed structure will help promote students' understanding of the overall concepts of green design and cultivate their "responsibility for entire environment".

3.3.3 Increasing the Number of Theme-related Design Courses that Further Illustrate Concepts

Usually design courses for landscape architecture take up a quarter of the total planned hours for undergraduate students. Forty-eight hours are assigned for students to do one to two design courses with a focus on the completeness of the design. However, it seems slow and inefficient when there are too many new concepts introduced into teaching of green architecture theories. After relatively shortening the time for design of large projects, teachers can inspire students' creativity by adding more theme-related design courses that further illustrate these concepts and emphasizing application of new ideas and methods in green architecture theories.

4 Conclusions

Nowadays driven by the idea of sustainable development around the world, China has taken the

build of an economized and harmonious society as one of the fundamental national policies. Hence, ecological and sustainable development is bound to be the common topic of landscape and architecture education with the social responsibility of landscape architectural education becomes increasingly enhanced. Transformation to green architecture has brought about great changes in teaching of landscape architectural design, thus it is high time that teaching pedagogies and curriculum design be changed to keep pace with the times.

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