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The Exploration of Green Architecture Design Integration Teaching Mode

Liang Shuang[1] & Han Yibin[1]

[1] Southwest University of Science and Technology, Institute of Civil Engineering, China

Correspondence: Han Yibin, Southwest University of Science and Technology, Mian Yang, Sichuan Province, China. Tel: 1-518-144-5562. E-mail: hyb727@sina.com

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Abstract

With the deepening of the concept of green building design, the course of university education gradually exposed many problems in the teaching of architectural design theory; based on the existing mode of teaching and combined with the needs of architectural design practice it proposed the "integrated" method of green building design. It is an effective way to improve the overall level of green building design.

Keywords: green building, teaching mode, integral design

1. Confused

In the 20th century, environment and energy crisis is forcing people to rethink the relationship between human, architecture and the environment. Green building as the applications of sustainable development, has carried out a lot of research work, and achieved fruitful results; universities also add related courses (Zhuang et al., 2015). But, the architect still confused in the green building design practice. (1) first, because with the theory of "function and form" of architecture specialty teaching fundamentally is not for the realization of "green" performance, and the goal of green buildings do not overlap in the theories and methods, difficult to cultivate green architects (Yang et al., 2015; Qu, 2011). (2) excessive refinement of disciplines and professional division, improve the efficiency, split the organic connection between the disciplines, architects often can only work within the limited scope, lose their mastery of architectural integrity, lack of ability to deal with related discipline problems. (3) lack of original innovation research on the "green building" design theory and method, or haven't found the key to start. Starting from the HVAC disciplines of green architecture research is more, results are more focused on the optimization and upgrade, difficult to architect applications directly, lack of green building design theory and method of research as the goal and key problem of exploration and practice (Chen, 2015).

2. Overall Design as the Core of Green Building Design Teaching Mode

Architectural design theory, focusing on vocational skills training of "function, space and form". In the teaching process, the types of classification is based on building function, the scale of the building, the complexity of the circulations, method of spatial organization，shape processing characteristics and differences (Ge & Zhe, 2015). Due to the limitations of period and knowledge, professor focus on the problem of "form and function", ignore the buildings performance and other indicators, such as economy, environmental compatibility, indoor environmental quality, energy or resources, etc.

This creates a misconception that the building function and modeling is in the absolute leading position, while the other attributes in the second, also can cause people think other content as the attached, the subordinate (Xu, 2015).

In the process of conventional "so-called" (Huang, 2015) green building design, green performance does not appear as a fundamental goal, only is a kind of decorative and remediation technology, so it is difficult to realize the fundamentally goal of green building performance. On the contrary, from the point of achieve the basic goal of green building, to do this way to explore:

According to the basic function, first of all, from the index, including heat, light, sound environment, the green building basic performance, focusing on the analysis of the base of sunshine, ventilated environment, preliminarily determine a variety of architectural form, and settle the suitability and feasibility of function and form through bidirectional interaction adjustment. Under the background of new era, new requirements, new

problems, needs to thinking again about the building basic meaning and target value, establish and perfect of operational green architecture design theory and method (Ou, 2014); reform the system which carry out teaching activities according to building function type, emphasizes on cultivating the integral design capacity of realizing comprehensive performance of the green building:

(1) Theory research aspect, it is necessary to insight into the primary and secondary relations including the function, form, such as economy, culture, environment, the basic building attributes, breaking the traditional, simple "function form theory" occupied the absolute dominance, establish the theory of green building design, "green" as a starting point, the objectives is realize the comprehensive performance, study and formulate the corresponding design method and working steps (Liu et al., 2012). Change the conventional one-way, linear architecture design process, increase the work link of green design, starting from the basic requirements of green building, comprehensive consideration the relationship between buildings and environment， the green construction conceptual design forward to the scheme design phase, as a necessary part of the design. In the early scheme design stage use advanced computer sunshine, ventilation and thermal environment analysis method, quantitative research the possibility and corresponding performance index including building orientation, layout, size, shape, height, space organization, along with the basic design methods of function and form, in order to fundamentally determine the integrity performance indicators of green building, avoid the void and embarrassment during construction drawing stage by add additional technical measures.

(2) Professional teaching reform aspect, need to optimize the curriculum system, perfecting pecking order and mutual relation between the green building design and traditional design course, emphasis on the base point that building "green" is as important as "function and form", correct the misunderstanding that green performance is divided into a subordination and simple status. On the specific teaching method, the early intervention of the green design, training students in the program began focusing on building integrity, including green performance indicators implementation situation, the building of the green properties, form and function as equally important starting point or goals to consider, many possibilities to explore solutions (Zhang et al., 2014); On steps in the design of the teaching work, establish and perfect assessment indicators including function, form, environment, material and energy, indoor environment quality, and uses the loop optimization design process, to avoid building theory of single function of "form" attribute, trains the student the overall work ability.

3. New Type of Teaching Practice

3.1 "Integrated" Curriculum System Integration Explore

Explore change a simple "linear" (Zong et al., 2012) way of green building design, adopt "integrated" design method, and improve the overall quality of building. On the premise of acknowledging such as the building function, space form, and cultural heritage the basic requirements, form a parallel green architectural design creation method. Different from the conventional design "linear" process, function, form, after the green technology, the green building key indicators of environmental and energy quantitative simulation preconditions before scheme. On the basis of analysis and evaluation environment and energy index by the use of computer analysis tools, from the perspective of implementing green performance, put forward a number of possible architectural form, further carries out the function and traffic flow organization design work, several rounds the necessary debug and optimization work, forming the green building solutions meeting the demand of multi-object. "Integrated" green building design method is shown in Figure 1.

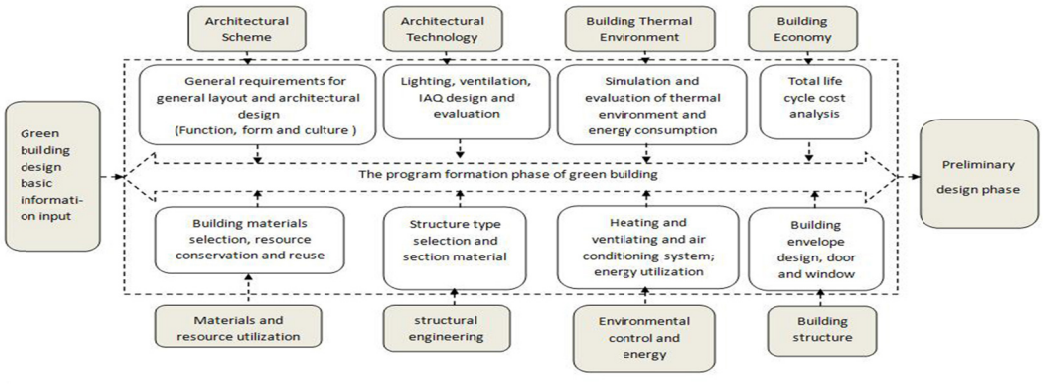

Figure 1. "Integrated" green building design method

(1) Discipline Integration

Pay attention to break the graduate student's professional boundaries, regardless of the specific professional, emphasized the need to complete mastery of the architectural knowledge structure and ability; Regularly carry out the interdisciplinary study, research and discussion (Gu, 2015). Architectural design and theory, building technology and science, building environment and energy application and other professional graduate study together study green building general courses, improve the comprehensive understanding and design capabilities. Coordination between teaching and scientific research, clear of green building design talents training target, strengthen the core role of architecture design professional in a group, the rest of the class all about this. Pay equal attention to personnel training and scientific research, professional collaboration, and promote mutual learning between disciplines and consummate the knowledge system.

(2) Flexible curriculum system

Traditional teaching curriculum is up to the school, students have no choice. After the reform of reorganized course system, building technology, implement phased education courses is not only the content, also adopts the module on course system schedule of learning way, curriculum is divided into module partition according to belongs to the different stages of green building, students can according to their own schedule and recognition about the course to arrange the order of course, the module is divided into “general module”, “Design module” and “research module” .Capable students, can choose module learning across the stage, students also can according to oneself circumstance unity in accordance with the requirements for the corresponding study, first grade for general categories of green building technology course education; Grade two to grade four education training for the design, students will integrate green technology knowledge smoothly into their design; Grade five main for green building technology research stage, the students can do special research on relevant green building issues. Modular teaching diagram are shown in Table 1.

Table 1. Modular teaching undergraduate course content

Phase	Grade	Content	Optimized content
General phase	Freshman	The introduction of green building	The framework system of green building technology course
Design phase	Sophomore—Senior	Series of courses:	Green building, education oriented, Open column content
		Series of building structure	The column of construction materials classes
		Control of the physical environment of buildings	The column of building structure class
		The construction material and structure	The column of building physics and construction
			The column of construction equipment
Special phase	Five-grade	Graduation design	Thematic design
			Study on the internationalization institute of curriculum practice

Project training phase, combined with the need of design topics, embedded into the four stages of seminar in all stages.

Project 1: green building case interpretation and analysis. Help students to review and consolidation of basic knowledge, surrounding green design requirements of performance in design plan descriptions, introduces the actual case of green building, the emphasis is on Consolidating the concept of green building design.

Project 2: site sunshine, lighting, wind environment analysis simulation, and comparing the performance.

Project 3: building palisade structure thermal design (wall and roof), selection and utilization of building materials.

Tutoring this two projects focus on design scheme and technology thinking, in terms of architectural design, students are required to complete the green building design, plane function layout, shape design, in terms of

architectural technology, students need to understand the basic knowledge of green building, design principles and main technical points, guide the students to think about green buildings design method in the combination of active and passive technology.

Project 4: building indoor environmental control and energy use, focusing on quantitative analysis, the optimization scheme, adopt the method of computer simulation and experiment data testing, guides the student to adopt quantitative analysis technology to guide the green building (Table 2).

Table 2. Teaching plan about the graduation design topic of green building

Phase	Key point	Weekly	Content	Remarks
Design preparation	Learning theory	Winter vacation	Collect data, Learn the green building	Read notes and examples of analysis;
	Learning software	12	Explain task in detail	Analyse software;
			Field survey, Analyse the design background	Topic one: Green building case
	Investigation and analysis	3	Refine the task, Analyse and mine the basic condition, Preliminary determination of the vertical scheme	Complete the research report, analysis report Complete the base of modeling
Overall concept	overall design	4	Put the sketch of functional zoning	Complete overall design;
			Class discussion layout sketch, multi program comparison;	Topic two: Simulation analysis of site sunshine, lighting and wind environment
			Adjust the site layout and vertical, complete the overall design	
Conceptual design	The first phase of the sketch conceptual design	5	Conceptual Design of buildings	Modify conceptual design
			Study the main points of space design on the construction of green building	Add the concrete function, analyze the simulation, and complete the conceptual design.
		6	evaluation	
	The second stage of the sketch	7	Determine ideas and framework	
			The arrangement of design content	Submit the second stage of the sketch
		8	Profile design, adjust the spatial relationship; the formation of the structure, the design of the structure of the building envelope analysis simulation	Modify and complete
		9		the general plan and environmental design;
	The program in depth		Discuss and revise the programme	Complete the material of the interim written reply;
		10	Adjust and optimize function and space	Topic three：The thermal design of building envelope
		11	The in-depth layout of the environment	
	The third stage of the sketch	12	Design layout of the third stage	Modify and complete The third stage of the sketch;
		13	Adjust and improve the technical scheme	Research the key space and modeling
	Improve the design	14	Discuss the facade design and node design	Topic four: Indoor environment control and energy application
			Depth adjustment of key space; Hash the computer simulation	

Results expression	15	Deepen the design, Drawing analysis diagram, Select the expression, Prepare formal drawings	Complete the formal drawings, design specifications, production reporting documents

3.2 Explore Teaching Mode Innovation

(1) Online courses

It mainly through the form of open education resources (Yang, 2013). On the basis of the traditional teaching mode, building technology courses can take advantage of the MOOC, realize its teaching idea of "inner–integration outside–expand", make green building education form a set of new course system" personalized teaching" and "learning self-independence". General categories of stage, limitation categories and credits, students can have any combination on the MOOC platform.; design training phase, the main use of MOOC course platform, through modular splitting the course, compiled from various courses belong to the category of green building technology sector, duplication, so that students choose to study; research stage, relying on the MOOC good openness as early as possible for the students to participate in the green building research and practice opportunities, and for further study of the postgraduate stage.

(2) Research training

Green building is still in the research and development of teaching stage, unfavorable use the traditional "mouthpiece" way in teaching, teaching should not only focus on lectures, also should pay attention to the use of extra-curricular knowledge, practice the close combination of teaching and open teaching mode., teaching should encourage students to participate in the scientific research training program, the program is designed for undergraduate students in school of a scientific research project funding scheme. The plan attaches great importance to the process rather than results, aims to cultivate students to complete the task independently under the guidance of tutor, for college students offer the opportunity to participate green building scientific research, guide students to pay attention to and understand the forefront of architectural dynamically, actively explore the knowledge of the green building, enjoy the happiness of a new learning style.

(3) Design competition into teaching

Design competition has important role in such aspects as in promoting teaching reform of architectural technology, and guide in the teaching reform of colleges and universities pay attention to cultivate students' innovative ability, cooperation spirit and practical problem solving ability. Actively encourage students to participate in design competition, and guide students more comprehensive understanding knowledge outside the textbooks in the process of competition, enhance their awareness and understanding of building technique course, so they can independently apply course knowledge for innovation research. At the same time, also let them know their learned knowledge and they should master the knowledge gap, encourage students to learn is no longer simply rely on classroom teaching, but pay more attention to class inside and outside the integrated course. In addition, the design competition have high requirement in ability of rapid judgment, flexibility, proficiency such as, students can exercise thinking ability, in order to break through the limitations of book knowledge, development thinking (Du, 2015; Shi, 2015).

4. Conclusions

Green building education needs to break the traditional professional boundaries, professional collaboration, multi-link cooperate, work together to achieve. Green architecture design teaching and practice of the ultimate goal is to enhance the level of scientific research, training high level architecture design talent, provide high quality green living space for people. Begin from architectural education, explore and practice the effective way of green design and approach, is the important guarantee to realize the above targets.

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