

The Education of Sustainable Architecture (Proposed for Master Degree)

M.H. FALLAH

Faculty of Art's and Architecture, Shiraz University, Iran
fallah@shirazu.ac.ir

ABSTRACT

Buildings have diverse effects on the environment during their entire life cycles. To achieve environmental sustainability in the building sector, it is crucial to educate architecture students in environmental issues, which is called Sustainable Architecture. Growing concern to promote sustainable development requires an effective response from the education sector. In this context, Universities have a special responsibility considering the additional multiplication effect of the emerging contents in the training of new generations of professionals and the need to transfer actions into the practice of sustainability.

Study in this area shows, specific programme needed to establish for architecture student to educate for sustainable architecture. This study suggest that the best stage to establish programme to achieve sustainable building, could be in Master of Architecture Degree. Since the programme envisages different types of knowledge and activities like understand of design process and building construction methods, which are usually training and practicing in current BA (bachelor architecture) education system. Therefore, this study shows that in order to respond to these requirements, both on innovative academic contents and practices related to sustainability need to establish and define some courses and research methods in master of architecture degree.

This paper cited sustainability and the method of training sustainable architecture in master of architecture degree, to achieve sustainable development in building industry.

KEY WORDS: Education of sustainability, Sustainable architecture, Sustainable building, Sustainable construction, Education sustainable architecture in master of architecture degree.

1. INTRODUCTION

Sustainable development has been and is becoming an important issue in more and more governments' agendas. One the sector, which is concerned in sustainable development, is building industry. This sector consume large amount of resources and also a large number of professionals involved, include architects, project managers, structural engineers and service engineers. The premise that promotion of sustainable development in industrial building sector necessarily implies a series of proactive actions from the academic field and education sector, particularly from universities considered as institutions where knowledge is produced and a social and critical conscience is created with competence to influence the orientation of development in society. Architecture presents a unique challenge in the field of sustainability. To achieve sustainability in building sector, sustainable architecture has been defined as a programme in some major university around the world. Most universities considered this issue by

establishing education system for architecture student. The experiences of some universities show the best stage for this programme is Master of degree in architecture.

2. SUSTAINABLE DEVELOPMENT (SD)

Sustainable development has been and is becoming an important issue in more and more governments' agendas. The concept of sustainability was started by the United Nations' report titled "Our common future" from the Brundlandt commission. In that report, "sustainable development" was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". Sustainability emphasizes continuity and maintenance, concerned with how to maintain or improve life quality within the capacity of supporting ecosystems. The EU also recognized SD as a paradigmatic model for development by signing the Amsterdam Agreement in 1996. In the same year, SD was recognised as a requirement for all education and training establishments of the EU by the Council of Education Ministers. Raúl HALAC "et al"(2005)

2.1. Level of Sustainability

Sustainability can be discussed at different levels such as; the project, building sector, and global levels. The highest level deals with environmental quality such as the global warming, ozone depletion and pollution. While the local level deals with employment and economic growth, site planning, impacts of noise and odour on the local environment. The building industry sector level is concerned with the issues such as adaptive use and durability of buildings, reuse and recycling of materials and efficient use of energy. At the building project level, the indoor environmental health such as ventilation, humidity, lighting, thermal comfort, maintenance and management patterns affecting the durability of the buildings are paramount.

2.2. Sustainable Building

The sustainable buildings according to Langford et. al. (1999) study concerns the issues such as of what can be sustained in the building sector and contribute to the ecological sustainability of the earth. At local level it involves ecological, economic, social and cultural sustainability. Ecological sustainability deals with the preparation of proper site planning of projects, correct orientation of buildings and adequate exposure to sunshine for users. Reductions in the use of non-renewable materials, energy efficiency and waste generations are to be well managed. Most important issue is economic sustainability which requires treating the depletion and deterioration of natural resources with caution. It also encourages investment in green products, pollution abatement and capacity building. While social and cultural sustainability encompasses reduction of the social cost for future generations, preservation of cultural diversity and provision of equal opportunities for all.

2.3. Sustainable Design

Sustainable Design is the thoughtful integration of architecture with electrical, mechanical, and structural engineering. In addition to concern for the traditional aesthetics of massing, proportion, scale, texture, shadow, and light, the facility design team needs to be concerned with term costs: environmental, economic, and human.

Sustainable design for integration of above component technologies that are required to construct environmentally responsive architecture. The study of cultural systems requires that natural and building systems be investigated within the complex social and political context of architectural practice. In sum, the Sustainable Design Program is practical, technical, and philosophical in scope.

2.4. Sustainable Construction

The term “sustainable construction” was first defined in the First International Conference on Sustainable Construction, Tampa in 1994 as “the creation and responsible management of a healthy built environment based on resource efficient and ecological principles”. There are three main elements to sustainable construction: economic sustainability as a result of making more efficient use of resources; environmental sustainability as a result of preventing harmful impacts on the environment; and social sustainability involving appropriate responses to the needs of people at all stages in the construction process.

Sustainable construction is also defined as "the creation and responsible management of a healthy built environment based on resource efficient and ecological principles". Sustainably designed buildings aim to lessen their impact on our environment through energy and resource efficiency. To achieve this point architecture presents a unique challenge in the field of sustainability. Construction projects typically consume large amounts of materials, produce tons of waste, and often involve weighing the preservation of building that have historical significance against the desire for the development of newer, more modern designs.

3. EDUCATION OF SUSTAINABILITY

Growing concern to promote sustainable development requires an effective response from the education sector. In this context, universities have a special responsibility considering the additional multiplication effect of the emerging contents in the training of new generations of professionals and the need to transfer actions into the practice of sustainability. Therefore, to respond this requirements universities should focus, analyze and discuss in building industry today in the frame of the following three fundamental fields of action Raúl HALAC "et al" (2005):

- **Research:** understood as critical and methodological reflection on topics and methods linked to different sources of knowledge.
- **Education and training:** conceived as a process of searching knowledge and methods in different levels, interests and learning fields.
- **Extension and dissemination:** perceived as the transfer of Research and Education to multiple sectors of the community.

3.1 Technology Applied

The technology applied to building involves almost every face of pure and applied science. For successful application it must be understood by all whose work touches on building: owners, architects, engineers, contractors, material suppliers and operators. Most cannot be expected to have either depth or breadth in the knowledge available. It is clear, therefore, that participants in the building industry require assistance in matching available technology with the specific problems encountered in their day-to-day activities.

For example, the Council for Science and Technology Policy which was formed to develop Japan’s grand strategy in the field of science and technology under the leadership of Prime Minister Koizumi, recommended that relevant governmental agencies should work together to promote commercial exploitation of nanotechnology and materials science. The recommended materials science research is aimed at designing buildings with truly innovative structural properties, esthetics and characteristics.

3.2. Design Process

A large percentage of defects in building arise through decisions or actions taken in the design stages. It is also widely known that poor design has a very strong impact on the level of efficiency during the

production stage. The other point is the increasing complexity of modern buildings in a very competitive market – place in recent years, has significantly increased the pressure for improving the performance of the design process in terms of time and quality. In turn, this framing will influence what actions and outcomes are considered possible, necessary or appropriate. Therefore, contexts change over time and during the design process.

The fact that design management has been neglected is understandable to some extent because, building design is a very difficult process to manage. It involves thousands of decisions, sometimes over a period of years, with numerous interdependencies, under a highly uncertain environment. A large number of professionals involved, include architects, project managers, structural engineers and service engineers. The design process therefore needs to be planned and controlled more effectively, in order to minimize the effects of complexity and uncertainty. The lack of adequate design planning, results in insufficient information being made available to complete design tasks and inconsistencies within construction documents. Poor communication, lack of adequate documentation, unbalanced resource allocation, lack of coordination between disciplines, and erratic decision making have been pointed out as the main problems in design process management. Study on design process shows an integrated design process is needed to achieve green attributes, and this places great demand on the design team. The integrated design process primarily involves increased interaction and communication among design disciplines, due to the increased interplay between building systems. AIJ. , 2005.

4. THE ROLE OF ARCHITECT

Education of sustainability have highlighted the cultural construction of sustainability, drawn attention to a variety of ethical positions, explored the nature of decision making and design advice, and discussed the complex system involved, but how do all these come together when we as architect are faced with making day-to-day designs? To illustrate the complexity of the problem we as architects face in terms of the social, scientific and professional positions.

In practice an architect must make many decisions quickly and simply, or architects play many games at once, using many images on the basis of apparent fittingness with the right thing to do rather than deep analysis. Architects embark on a design project, what a store of knowledge about what has load up to it, what is going on and why, and what his or her role is to be in the proceedings and use this as starting point for case specific research. A portion of their knowledge will involve images of what they believe to be turn regarding the environmental and other aspects of sustainability in design. In other word from sustainable view trying to find out how can architecture help to solve global environmental problem.

As we know throughout history architecture has played a crucial role in helping to define humanity's relation to its larger surroundings. Architecture has not merely been a means for providing shelter, but has operated as a constructed model of a larger order, a vehicle embodying the temporal and cosmological understanding of the world in which we live. As such, architecture has the potential to bridge between the pragmatic and the transcendent, playing both a practical and a symbolic role. In this sense architecture can play a pivotal role in the larger paradigmatic movement of sustainability.

4.1. Design Tool

Design tool one of the most important instrument to understand the impacts of method of design on project. For example the use of energy simulation tools in the design phase allowed lots of neat permutations and variations to be explored. However, we all know architects don't want to use them. Because architects are too busy to add any more "learning experiences" to their already overburdened job, they prefer to hire consultants for this purpose.

To encouraging architects to use some tools to assess own design needs to concern design tools, studies show if design tools become easy to use, any "tool user" can become an expert, without necessarily understanding the consequences of his or her actions. Therefore, it is need to understand that tools are tools, and they are only as good as the understanding of the user.

4.2. Design Advice

Sustainability concerned in both, professional and public sector, and there is much information available which sets out to explain how environmental aspects of sustainability relate to architecture and/ or describe how design should address these issues. The advice explains 'how to design and build appropriately what procedures to follow and checks to make, what materials to use, where a building should be oriented, how to construct features that are held to have desirable characteristics.

5. SUSTAINABLE ARCHITECTURE

Sustainable architecture refers to the practice of designing buildings which create living environments that work to minimize man's use resources. This is reflected both in a building's construction materials and in its use of resources, such as in heating, cooling, power, water, and wastewater treatment. A common aim in sustainable architecture is to create 'more closed' and 'less open' systems in buildings, by feeding back, for example, through recycling and minimizing import of materials and export of waste. Therefore, it necessary for various people involved to share the awareness as well as explore methods, programs and technology. Education of orderers and designers is especially important among others.

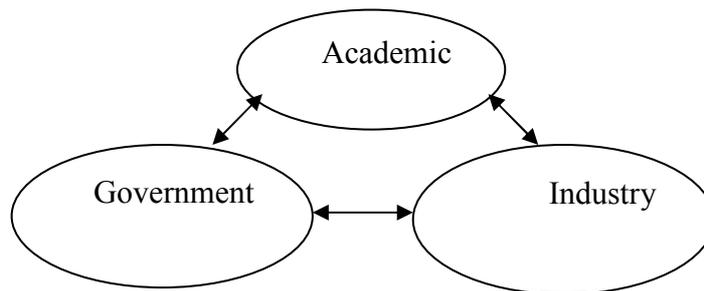


Fig: Interdisciplinary practices contributing

5.1. Education in Sustainable Architecture

Building have diverse effects on the environment during their entire life cycles. Although the tangible impacts are visible only after construction begin, decisions made on the drawing board have long-term environmental consequences. To achieve environmental sustainability in the building sector, it is crucial to educate architecture students in environmental issues.

Regards to design process of sustainable architecture it is needed interdisciplinary, research oriented, and design focused, which will offer specialization in the design, critique and analysis of architectural processes, paradigms and building systems developed in response to the global diminishment of natural resources. This rapidly changing context within which architectural and construction are practiced necessitates focused research in area of building technology such as material research, building ecology, envelope and cladding technologies, digital fabrication processes, and mechanical and environmental systems. Depending on the student's background and interest, studies will be undertaken either in the field of design, theory & criticism, and/or simulation based modeling.

From the preceding discussions it is clear that in seeking sustainable architecture there is no unequivocal course of action that will suit all ethical stances all objectives and all situations. There is no class or style of design which will guarantee success if followed. Rather, there are difficult interrelated decisions to be made that are contingent on particular circumstances.

6. IDEAS FOR RESEARCH AND TRAINING

In investigating how to integrate green innovation into the building industry the researcher found that facilitation is a key role. This involves providing the interface between the available expertise on green innovation and the building team over the life of a project. The most important requirement was the ability to speak the language and understand the culture of the agents involved.

This paper suggest that some programme can be establish in the Master of Science in Building Technology which can explore analytic means of understanding the design and behaviors of building systems. It focuses on aspects of the building performance such as heat transfer, acoustics, lighting, ventilation (computational fluid dynamics), building controls, life-cycle & maintenance, construction, and structures. The other area is the MSc in Building technology, which can help us to explores design decision-making and workflow processes, particularly those related to optimization, simulation-based design methods, and/or collaborative design.

Regards with this study this paper suggested Iranian Universities need to create Masters and Post-graduate courses to achieve the education in sustainable architecture to start prepare some documents for educate expertise about sustainable architecture. Fortunately, several research work and papers to promote environmental education in some Iranian Universities have been published. Julian E.,Silvia d. S., (2005)

7. RECOMMENDATIONS

This paper is based on the premise that promotion of sustainable architecture necessarily implies a series of proactive actions from the academic field and education sector, particularly from universities considered as institutions where knowledge is produced and a social and critical conscience is created with competence to influence the orientation of design and construction method in society. The programme as a whole reflects increasing student and faculty interest in three areas of inquiry — natural systems, building systems, and cultural systems. The study of natural systems relies upon the disciplines of physics and ecology as they relate to architecture.

Finally, from the above details, we can educate some student who are expertise on sustainable architecture to design building to integrating all design method to achieve sustainable development aims. This study shows we need to educate sustainable building design expertise in the master degree to achieve aim of sustainable architecture ideas.

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