Educational Challenges of Sustainable Architecture in Higher Education System of Iran

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Abstract: There is no doubt that during a building's construction and existence, it affects all aspects of local and global environments via a series of interconnected human activities. Therefore, architecture is one of the most conspicuous forms of activities related to the idea of sustainability and shall be able to follow the same patterns of other aspects of sustainable development necessitating a new approach to architecture entitled sustainable architecture. To achieve sustainable architecture as a profession, it is important that the educational organizations try to provide a source of inspiration for the development of innovative learning techniques and processes. At this regard, universities are expected to contribute to establishment, development and reflection of values and ethics in educational framework of sustainable architecture in order to contribute to the transformation to a more sustainable society. In this paper, the intention is to research and discuss different aspects of sustainability in education with respect to how to integrate sustainability in curricula in higher education, especially for education of architecture in higher education system of Iran.
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Introduction

As the sustainability agenda has emerged into international discourse and policy, Higher Education has become a significant point of focus for implementing change, and societies seek direction from the sector. Governmental agencies intend that HE should lead the field by generating scientific and technological advances and by enhancing the abilities of graduates to engage with complex sustainability challenges in diverse professional and practical contexts. HE institutions worldwide are increasingly gearing their corporate operations towards efficient sustainability practice in the management of their estates, generating useful learning about sustainability outcomes and contributing to local and regional sustainability goals. However, widespread institutional change is proving to be elusive, with few institutions managing to unfold and uphold systemic commitments (Sharp, 2002; Ryan et al., 2010). In this regard, the United Nations is promoting a Decade for Education for Sustainable Development (DESD 2005-2014), with the overall aim of integrating the values of sustainability in all aspects of learning. A key objective of the Decade is to develop the competencies required to create a more sustainable and just society for all parts of the world. On the other hand, in the African Preparatory to the World Conference on Higher Education (WCHE+10), the UNESCO Regional Bureau for Education in Africa (BREDA) concluded on the need to focus on ensuring 'that Higher Education fosters democratic values, sustainable development as well as the Millennium Development Goals (Maldonado et al., 2009). Besides, realizing the environmental problems and challenges, whether real or potential, threatening the quality of human life, environmental movements have begun in almost all fields of industrialized as well as developing societies, including business, manufacturing, transportation, agriculture, and architecture which is the central point of this research. It is obvious that economic development will necessitate more construction work in the form of factories, office buildings, and residential buildings and for a household, higher incomes will lead to a desire for a larger house with more expensive and luxury building materials, furnishings and home appliances; more expensive ventilation systems; and a larger yard and garden, better playground swimming pool. All of these changes will necessitate fundamental attention to sustainable architecture. Therefore, higher education systems worldwide need substantial rethinking and reorganizing about the skills that future graduate architects will need to address environmental aspects of construction industry.

Iran, as a developing country faces the same challenges regarding the future of architecture. In Iran, building industry creates lots of environmental problems due to lack of scientific understanding and application of principles of sustainability. Therefore, a key step to achieve sustainability in building industry is that Iranian universities need to establish

special academic programs regarding sustainable architecture. The emergence of concepts of sustainability, sustainable architecture and sustainable education and their reception and implications within academic framework focusing on art and architecture education in higher education system of Iran provides the context for this paper.

Research Methodology

This paper presents a generic discussion on different aspects of sustainability in education systems with focus on education of architecture in Iran. The discussion can be applicable at courses, programs, and cross-disciplinary or cross-university levels of architectural education. This study is mainly composed of documentary data and aims to identify some of the realities regarding the educational aspects of sustainable architecture within the social, economic and cultural contexts of Iran.

Education of Sustainable Architecture

Most of the implications of science and research with regard to sustainable development can be grouped under one or more of these three aspects: ethical, environmental and social. In relation to science and research, universities have responded to changing perceptions of them as social institutions, and of their shaping functions in society. "To meet the challenges head on, universities will need to develop a fuller, more historically informed sense of their own institutional missions, not only as incubators for the production of new scientific knowledge and technological know-how, but also as sites of capacity-building for social analysis, critical reflection and, not least, democratic citizenship" (Jasanoff, 2008; Maldonado et al., 2009). However, the capacity to generate innovative scientific and technological solutions is hampered by research specialization. Similar obstacles to inter-disciplinary work are also evident in teaching and learning, as certain aspects of disciplinary thinking and practice do not help to build capacity to address sustainability questions, for academics or students (Ryan et al., 2010).

During a building's existence, it affects the local and global environments via a series of interconnected human activities and natural processes. At the early stage, site development and construction influence indigenous ecological characteristics. Though temporary, the influx of construction equipment and personnel onto a building site and process of construction itself disrupt the local ecology. The procurement and manufacturing of materials impact the global environment. Once built, building operation inflicts long-lasting impact on the environment. For instance, the energy and water used by its inhabitants produce toxic gases and sewage; the process of extracting, refining, and transporting all the resources used in building operation and maintenance also have numerous effects on the environment. Architectural professionals have to accept the fact that as a society's economic status improves its demand for architectural resources, land, buildings or building products, energy, and other resources will increase. This in turn increases the combined impact of architecture on the global ecosystem, which is made up of inorganic elements, living organisms, and humans (Kim, 1998).

However, we would expect such architecture to be performing, that is, capable of providing occupant comfort at lowest carbon emission; and, expressive, that is to reflect the architectural program and its context in terms of climate, site and culture. Superficially, many recent buildings are claimed to share such attributes. In practice this is not necessarily the case (Yannas, 2005).

In modern society, more than 70% of a person's lifespan is spent indoors. An essential role of architecture is to provide built environments that sustain occupants' safety, health, physiological comfort, psychological well-being, and productivity. Because environmental quality is intangible, its importance has often been overlooked in the quest for energy and environmental conservation, which sometimes seemed to mean "shivering in the dark." Compounding the problem, many building designers have been preoccupied with style and form-making, not seriously considering environmental quality in and around their built environments (Kim, 1998). Social development and change in a certain society, accelerated through scientific development and innovation, require a simultaneous change or at least adoption of innovative ideas and technologies. Obsolete ideas and technologies slow down the momentum of knowledge accumulation and socioeconomic growth process. Same may apply to the methods of teaching. In most developing countries traditional teaching based on 'rote learning' is common, with instructors doing little more in the classroom than copying their notes onto a blackboard' (The World Bank, 2000, Janjua, 2011). To respond effectively, higher education must reconsider its disciplinary mechanisms, institutional structures and its understandings of expertise (Bawden, 2004, p. 29; Corcoran and Wals, 2004, p. 4; Sterling, 2004; Ryan et al., 2010).

Higher Education in Iran

Higher education has an ancient past in the dynamic culture and civilization of Iran (and Islam), reaching peaks of prosperity at the time of the Sassanids with the establishment of centralized higher education institutions in the cities of 'Riv

Ardeshir' and 'Jondi Shapour' from AD241 onwards. Owing to the importance of medicine and medical education in those days and much use of the experiences and scientific achievements of the Greeks, Indians, and Iranians, these cities turned into real centers of ancient higher education (Mehralizadeh, 2005). But, the history of the establishment of academic universities in Iran dates back to 1851 with the establishment of "Darolfonoon", aimed at training and teaching Iranian experts in many fields of science and technology. It was in 1928 that Iran's first university (The University of Tehran) was proposed by an Iranian physicist, Mahmoud Hessaby which was built in 1934. The main purpose of the establishment of the University was to disseminate advanced knowledge in relation to the sciences, technology, literature and philosophy (Higher Education, 2006; Higher education in Iran, 2006; Alavi Moghaddam et al., 2008).

Corresponding to the time of scientific and technological advance in the Western World, the Qajar (Dynasty) Prime Minister 'Amir Kabir' founded the 'Daarul Fonoon' (House of Techniques) as a modern institution in Iran in 1848. In addition to sending students abroad and inviting foreign lecturers to Iran, higher education centers were established in the cities of Tabriz and Urmieh. From 1934, the universities of Tehran, Mashhad, Isfahan, and Tabriz were officially opened. The establishment of the Ministry of Science and Higher Education in 1967, public and private universities and other higher education centers were given a uniform structure (Mehralizadeh, 2005). Following the victory of the Islamic Revolution in 1979, major change took place in higher education system of Iran. To adopt fundamentally new policies which were politically-motivated and to meet the new needs of the revolutionized society, the Ministry of Science and Higher Education was converted into the Ministry of Culture and Higher Education. With the same aim, and to establish a revolutionary culture among graduates of universities and in order to create a new educational system in higher education institutions, new standards were set in basic, applied and humanitarian research and education.

Over the past two decades, an unprecedented type of higher education system has evolved in Iran with unique characteristics resulting from socio-cultural as well as political nature of country. The system has led to tremendous graduations with little scientific discoveries and explorations, the education of millions of students, the creation of a well-trained workforce for professional opportunities, and better ideas and innovations that all have improved the quality and longevity of life of thousands of people. It has also fueled the struggling economy of country, solved some of pressing social problems, and ensured the cultural vitality of younger communities in the limited society. Despite the fact that the Iranian higher education system has provided diverse opportunities for tremendous social and economic mobility and enabled new generations of immigrants to realize their hopes and dreams in urban and metropolitan areas, it still faces some fundamental challenge that can not be ignored. Iran's current challenges in higher education can be categorized in three groups: internal; external; or a combination of both. Internal factors are those within administrators' control; external factors are those out of administrators' control (Sayyari, 1994, p.20; Rasian, 2009). The higher education system in Iran expanded very rapidly during the past two decades and split into two main groups of 'government' and 'non-government' institutions (Mehralizadeh, 2005). But there exists several deficiencies in higher education system of Iran similar to deficiencies of higher education system in other developing countries.

Education of Architecture in Iran

Although there is a strong tendency to profit from Iran's traditional and vernacular architecture, modern and postmodern architecture yet have significant status in architectural education, competitions, and current projects. These activities are not occurring with holistic and fed back approach. Moreover use of traditional aspects is more physical than performative. The constructional elements such as wind catcher, dome, courtyard, canopy and the like include worth knowledge that it may be combined to modern architecture and decreased energy consumption (Yannas, 2005; Hosseini & Medi, 2007).

Iran has followed the Beaux-Arts pattern in architectural education. The years between the two world wars were crucial for Iran's architecture profession, as it witnessed a complete transformation in the organization of the profession. At that time many Iranian students went abroad to study architecture, and many to Paris. As a result, the *Beaux-Arts* model of architectural education came to be favored. The graduates who had experienced the *Beaux-Arts* system became the founders of academic education of architecture in Iran. As a result, the first schools of architecture in Tehran, like other Middle Eastern countries, focused on *Beaux-Arts* based curricula (Etesam, 2004; Bavar, 2006; Andjomshoaa et al., 2011). Additionally education of architecture in Iran is training-oriented and not research-oriented. It is, therefore, resulted that many tendencies in this field are often merely individual taste of the

instructor and/or the student and is mostly depended on journalism. Meanwhile, the environmental courses that are entered in education process in recent years are not based on background and social requirements. Thus education of architecture is affected by these trends and students learn to be a part of process of building production which developers usually lead it (Hosseini & Medi, 2007).

In Iran, higher education regarding architecture exhibits severe deficiencies especially in masters and doctorate levels. Demand for increased access to postgraduate education is likely to remain strong which forces both public and private sectors to seek to meet it with an array of new higher education institutions. This has led to rapid and chaotic expansion of higher education institutions, with the public sector generally under-funded and the private (for-profit) sector focused on short-term, market-driven needs in order to gain more profit.

In undergraduate and postgraduate levels of architecture there are some courses that were formerly taught with practical programs and some of branches in postgraduate levels related to sustainable architecture and architectural landscaping that are offered University of Science and Technology, Tehran University, and Shahid Beheshti University include some theoretical approaches to design and construction.

All of these materials are taught in theoretical form and there are rarely workshops or practical training. Students have usually no awareness about practical aspects of energy in construction and maintenance of a building, recycling and feedbacks in design process. Besides, limited evaluation of the curricula and measurement of teaching quality of senior students of architecture is available in universities, both in under and postgraduate levels. Current methods of education of architecture in most courses are emphasized on individual and competitive learning and not so much on participation, collaboration and cooperation of different specialty branches of architecture and construction. Some studies have argued how and why our current design and construction approach and perception of architecture must be radically changed if we are to ensure a sustainable future for society. Those studies also argued forcefully that this can only be achieved by adopting the environmentalist view in education of architecture.

According to a research about the entire educational system of architecture in Iran, courses in building technology and architectural design and Rondo were the most successful groups in practical jobs. Faint role of general and theoretical courses and the history is clearly visible. The important point is that design and rondo in the other cities universities and technical design in Tehran universities are estimated as most appropriate courses. Then a question regarding of, what course of those polled had a greater influence in your success, has been raised. Their responses confirmed that the above had more influenced in their professional success. In response to this question, none of those in the study did not mentioned of general courses are effective in their profession success. Research results indicate that the two state of architecture education in terms of career or further education are very influential in education of Iran. Each of this state or trend has their own condition in national and private universities in capital city and other cities around the country. Which we should pay attention to special characteristics of each tends to meet their requirements (Mahdavinejad et al, 2012). Studies and reviews on architectural education methods in the Iranian universities indicate that major categories involved van be discussed under following titles:

- Educations are mostly carried out without consideration of interactive relationship between human and environment;
- Efforts to transform the context of conventional educational courses is weak;
- Most of the educational solutions result from short-term strategies and plans; and finally
- Dissociation of provided fields is obvious with lack of interaction between different disciplines related to architecture.

Challenges of Education of sustainable Architecture in Iran

Research as the production of knowledge must include both new-to-the-world discoveries and inventions and situation-specific inquiries in order to apply knowledge to development. Increasing the capacity of researchers and of knowledge users is an essential element of research development in developing countries. The political and social contribution of knowledge must take into consideration the uniqueness of a society and its stage of development, including the population's level of education, the knowledge capital and infrastructures, national competitiveness and indigenous values. The role of higher education institutions has to be appropriate and responsive to different societal needs (Suwanwela, 2008; Maldonado et al., 2009).

Thus, universities and higher education institutions must try to contribute to establishment, development and reflection of ideas, values and ethics in educational framework of sustainable architecture in order to accelerate the transformation to a more sustainable society. Besides, the educational environments created in higher education

systems should enable students of architecture to better understand their physical and social environment; to develop a more positive and constructive attitude towards cultural and environmental diversity, as well as fundamental ecological processes; and to use their scientific knowledge and attitude in a way that is responsible, from an architectural point of view, with respect to the well-being of all users of architectural space in their own society, other societies and even all over the planet as a whole. Higher education systems of sustainable architecture should not only critically influence learning environments and learning processes for students, they should also contribute to creation of an infrastructure that supports and enhances architectural design and construction processes to achieve a life long sustainability.

Table1. Theoretical and Practical Fundamentals of Sustainable Architecture

Knowledge and Theoretical Understanding	Skills and Abilities
• Demonstration of knowledge and understanding of the role of architecture in the long-term development of a sustainable society • Demonstration of in-depth methodological knowledge with regard to architectural design processes • Demonstration of a significant insight into international research and development in architecture • Demonstration of the ability to make decisions in the field of architectural design informed by relevant scientific, social and ethical aspects • Demonstration of an awareness about crucial effect of architecture on humans' living environments and of the ethical aspects of research and development in architecture • Demonstration of the ability to identify the need for further knowledge	• Demonstration of the ability to critically and systematically integrate knowledge of long-term sustainability in complex design and planning processes of architecture. • Demonstration of the ability to identify, analyze, assess and handle complex architectural issues independently, critically, and creatively and to formulate relevant strategies for change. • Demonstration of the ability to plan and, using appropriate methods, undertake advanced design tasks within a given time period. • Demonstration of the ability in speech, writing and visual presentations in both academic and professional contexts, to clearly report and discuss. • Demonstration of the ability to plan and design architectural structures at different strategic scales. • Demonstration of the skills required for participation in research and development in the field of architectural design and construction.

Most of the internationally oriented educational programs of sustainable architecture aim to develop the knowledge and skills of students enabling them from a humanist perspective, to contribute with advanced design skills related to built environment; and initiate and implement architectural spaces and environments that stay sustainable in the long term. In a general view, aims and scopes of educational programs of sustainable architecture which can be applicable in Iran and can pave the way for achievement of an acceptable level of sustainable architecture in Iran can be summarized in table 1 including theoretical and practical aspects.

The curricular challenges of schools of architecture in universities of Iran are mostly related to changes in social, cultural and professional networks of the society. There should be a major transformation of education methods to enable architects to be the leaders of collaborative design and construction processes with nesting scales of responsibility to ensure achievement of sustainability in use of land, water, transportation, engineering, and building materials, assembly and electronic and mechanical systems, as well as maintenance of building and its adaptive use.

Generally, in spite of large differences in professional structures, economic conditions, geographical limitations, cultural, political and historical backgrounds, education of architecture in most developing countries face similar challenges. Education of architecture in general and education of sustainable architecture in particular, feces same challenges in Iran. Most of these challenges are related to following shortages:

- more scientific research on theoretical nature of the specific subject of sustainable architecture and its adoption to local society of Iran is necessary;
- it is necessary to provide diverse options and degrees for education of sustainable architecture in higher education for the mass, in order to distribute meaningful and applicable science among millions who wish to learn and upgrade their professional capabilities and opportunities;
- lifelong education must be provided to professional body of architecture that seek not only formal degrees, but to keep up and readapt to a rapidly evolving technical changes and evolutions;
- universities and higher education institutes must be able to act as contributors of sustainability, providing their societies with fundamental opportunities for sustainable development and maintenance of sustainable knowledge, independent thinking, social identity and values; and finally

- More conscious planning for adoption of new technologies in education of architecture is vital to redefine and reconfigure socio-cultural and economic character of sustainable architecture.

Conclusion

The most important challenges in education of sustainable architecture education in Iran include the limitations of host universities of architecture in provision of skilled faculty members in various domains of sustainable architecture, lack of comprehensive educational plan and complementary education courses in different branches of sustainable architecture, and lack of interdisciplinary cooperation in universities to develop a comprehensive attitude towards sustainability. Besides, in the current higher education climate for education of architecture in Iran, the link between teaching and the research that is done in universities, especially in new established universities is a regular topic of debate.

Therefore, the most important and influential strategies to improve the quantity and quality of sustainable architecture education in Iran, proportionate to the mentioned challenges shall include the initiatives to increase the number of host universities of undergraduate courses for sustainable architecture, to train skilled faculty members in various areas of sustainability, to initiate graduate and doctoral degrees in different disciplines related to sustainable architecture, and finally to improve interdisciplinary cooperation and collaboration among universities.

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