Study of Utilizing the Ecological Contents in Curriculum of Architecture

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Abstract

According to IPCC report 2013, the role of man in environmental catastrophe is incontrovertible because of high greenhouse emission in now and recent century. Buildings nearly discharge one third of these pollutants and the task of architects to prevent this hazardous procedure is critical. On the other hand, one main basis of sustainability is education in order to preserve environment and then, training curriculum of architecture discipline, in climate change conditions, should revise. The new training approach establish on holistic and meditative design. Experience of students should sometimes occur in natural workshops with concern to the ecosystem, biodiversity preserving, low cost, and recyclable materials, renewable energies, passive and vernacular contexts. The integrated design process, as participating all of factors, substitutes the unilateralism in thinking design. This article was conducted to content analyze the scientific documents and comparative study on training methods for architecture discipline in Iran.

Keywords: Education, Architecture, Ecology, Sustainability, Process, Holistic

1. Introduction

Climate change is discussed as an urgent issue requiring global action and necessitating a shift in thinking and decision-making to account for destructive human-environmental interactions. It is known that one-third of greenhouse gases discharged by building sector and consumes approximately 50 percent of the world's resources. It is clear that sustainable development needs radical changes in architecture design, construction, and spatial planning. In fact, there is huge deriver to conserve energy, increase efficiency, and create zero-carbon buildings.

In 1987, Brundtland Commission established an ethical principle that changed global viewpoint and focused on our common future: "We must satisfy our generation's needs without destroying the opportunities for future generations to satisfy their needs." It launched the concept of 'sustainable development 'and thus a question of ecological, economic and social sustainability. Human survival and human welfare may depend on our success in transforming principles of sustainable development into a new global thought:' thinking globally and acting locally'. Planning a sustainable society require holistic approach in all fields, particularly in education in which we learn from and cooperate with nature (Bokalders et al, 2003).

Sustainable architecture is a design process that seeks to minimize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, and development space. It has also focused on conserving ecology and then ecological literacy must introduce into and form new disciplinary. However, it has initially confronted to traditional resistance and in all parts of society because of dominant of consumerism. This overall challenge has influenced on Education of Architecture to which in most of developing countries, architectural graduates are mostly attracted to a profitable procedure through developers, and this is huge threat for our future generation.

2.Research Methods

This article has qualitative and descriptive- content analyzing method that based on library and documental information and limited statistical surveying for field studies. Conclusion has extracted through comparative way between results and logic considerations.

3.Education of architecture and ecological literacy

The conventional curriculum of Architecture presents design skills, construction, and technical and theoretical aspects based on Beaux art or modernism styles. These methods had no attention to fossil fuel consumption, greenhouse gas emission, and climatic consequences and rising average temperature of the Earth. This approach has merely established on relation of designer- clients due to functions, aesthetics, and firmness that influence on higher education, research, operations, and external community (Figure1).

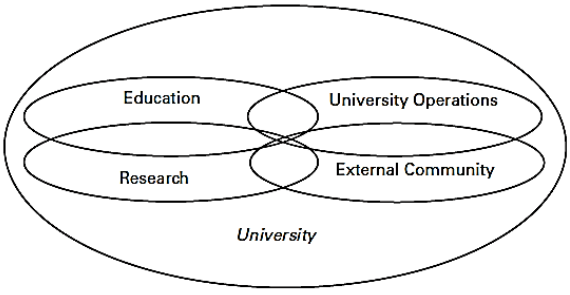

Fig.1. General Practice of Higher Education, (Cortese, 2003)

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In fact, these issues require transdisciplinary and holistic thinking due to energy, ecology, and environmental resources. Holistic formal integration can help produce citizens with the appropriate knowledge, critical thinking skills, technical skills, and social awareness and drive to address climate change (The Commonwealth Education Hub, 2015). It is clear that one major basis in developing countries is education in all of levels, and so this area has main role in new environmental paradigm in climate change conditions. Training is one of the most fundamental tools for maintaining the continuity of upgrading quality and quantity of knowledge and knowledge of the scientific community is an efficient force education and achieve the objectives of society in the territory of any of the original role-playing and artistic knowledge.

Introducing the "sustain" term in literature of the last decade of the twentieth century have changed the viewpoints and offered new literature for world society. It, therefore, needs to change path of education in all of levels and the lifestyle with new thoughts and environmental literature. It is a way of thinking about the world in terms of its interdependent natural and human systems and including a consideration of the consequences of human actions and interactions within the natural context. In addition, changing the lifestyle merely based on sustainable technology is not too enough but we also have to change our teaching how we travel, eat, live, and build our environment.

As architecture is among of the few fields that involve different arts and science in its formation, to build truly sustainable buildings and cities, architects and planners need to think and make comprehensive curriculum in schools holistically. New hierarchy of values, new ethics, and aesthetics due to new cultural patterns transform the paradigms of architecture and change our positions on the good, beautiful, human desirable village or the cities (Medi et al, 2007).

Ecological literacy has introduced in this area and has referred to ability to understand the natural systems that make life on earth possible, and it seeks an understanding principle of organization of ecological communities (i.e. ecosystems) and using those principles for creating sustainable human communities. Ecological literacy equips students with the knowledge and competencies necessary to address complex and urgent environmental issues in an integrated way, and enables them to help shape a sustainable society that does not undermine the ecosystems upon which it depends. The following are core aspects of ecological literacy:

1. Principles of Living Systems.
2. Design Inspired by Nature.
3. Systems Thinking.
4. Ecological Paradigms and the Transition to Sustainability.
5.Collaboration, Community Building, and Citizenship

The demand to begin a change in architectural training, which supports the execution of considerations of sustainability in architecture, mainly precipitates due to the following factors: natural resource reduction, climate change, ecological damage. Current building practices have been slow to respond to the need for enlarging sustainable environmental design within a creative architectural discourse. In other hand, documentation and qualification criteria set up by professional bodies do not yet fully contribute to the efficient encouragement of environmental sustainability in building design. Thus, university curricula can prove to more effective in systematically integrating sustainable environmental design in the education of students of architecture. The role of higher education in creating a more environmentally sustainable future is obvious. The aim would be to train the experts, students, and community to be environmentally literate. These issues present a challenge to the educationist as well as to the students of the built environment, to conform the environmental aspects as part of the built environment (Adegbile, 2012).

The sustainable methods are called upon not only to teach the skills of students in labor market, but to nourish students, faculty and staff, for positive tendency to environmental resources, energy and ecology as well as social and cultural responsibility and awareness and to help them to understand how people can contribute to a better life in a safer world. Thus, sustainability must be at the core of the academic curricula and will require a lifelong and worldwide commitment and all social and economic levels. This struggle represents more closed former areas in higher educations as a fully integrated system (Dias et al, 2004) (Figure 2).

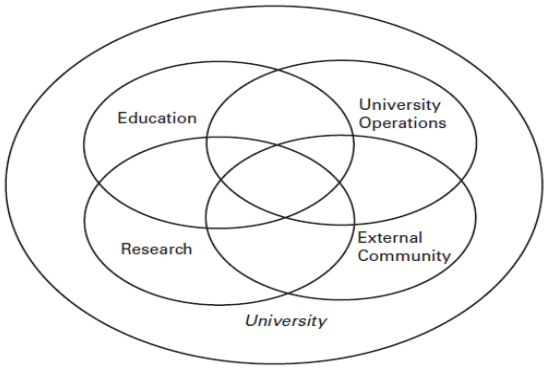

Fig. 2. Higher Education Modeling Sustainability as a Fully Integrated System, (Cortese, 2003)

The curricular challenge for schools of architecture is significant: There should be a major transformation of education to enable architects to be the leaders of collaborative design process with nesting scales of responsibility to ensure sustainable use of land, water, transportation, engineering, and building materials, assembly and integrated systems, as well as building use and adaptive use (Ecological Literacy, 2004).

An international enquiry into architectural education reveals that the achievement of a truly design-oriented integrated ‘sustainable’ curriculum is one that still proves

elusive, compounded by the nature of the subject itself. As a matter of fact, contemporary architectural education has changed little over the last decades, whereas almost every school of architecture still makes a basic curricular split between theoretical and applied teaching units (Rutherford et al, 2006).

4.Architectural Education in Iran

The education of architecture in Iran is often 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 entered in education process have based on background and social requirements in recent years. Thus, the education of architecture influenced by these trends and students learn to be a part of process of building production which developers usually lead it. In Iran, architectural discipline has gradually emptied from native literature and philosophy that they substantially respect to nature and conserving the biodiversity.

As a global tendency, education of sustainable architecture in Iran has undergraduate, postgraduate and doctoral dissertations. In undergraduate, students learn "Environmental conditioning" and "Climate with Design" courses that should be taught with practical programs. Some of branches in postgraduate levels such as sustainable Architecture and Architectural Landscaping that are offered by Iran University of Science and Technology, Tehran University, and Shahid Beheshti University. They include materials for examples, traditional structures, man and nature, fundamental to Ecological and sustainable development, renewable energies in architecture, introduction to indigenous housing and environmental adaptation, and sustainable traditional and vernacular architecture. All of these materials propose and teach in theoretical form and there are rarely practical workshops. Students have usually no awareness about embodied energy, recycling, feedback in design process or simulation, and so on (Medi et al, 2007). In addition, rarely do these courses seek architecture for a life with renewable energy. Students do not inquire to design buildings that use only sustainable resources with efficient performance. The methods of training diverse schools of Iran, the transformation of the method of teaching French after the arrival of the beaux-art school beautiful arts. In General, look at this innovative training program with all the dimensions of the display of form and function and excellence of structure and space, than to maintain the energy and environmental resources regardless of the surrounding world and the reality of human beings ignored (Medi et al, 2008).

Limited evaluating was conducted by questioner surveying on conventional curricula and extracted measurement of teaching quality. Selected152 persons of senior students of architecture discipline are studying in Hamadan Azad University, Boualisina University and Tabriz Islamic Arts University where have under and postgraduate levels. Questions are about importance of ecological literacy, renewable energy and efficient buildings, and effects of technology on human life due to awareness and changing their ethics. The results are shown as below:

- Most of them stressed positive relation between man environment and remarked pollution of current buildings in environment but had no knowledge about sustainable design. In addition, they had no considerable awareness about future requirements, ecology, and environmental resources, social and economic influences in a sustainable design. Beside they mostly depended on session materials.
- All of them noticed to principles of Nature that here it seems the role and influence of media is valuable. On the other hand, the social role of people as consumers and decision makers about sustainable architecture is ignored.
- Changing the levels (undergraduate to postgraduate) has not created important difference in amount of awareness, but it seems that the relation preference of postgraduate students may be affected by some oriented study on energy, climatic factors and so on (Fig 3 to 5).

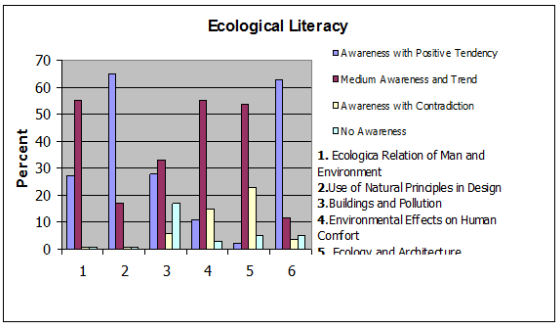

Fig.3. Ecological literacy at some university in Iran

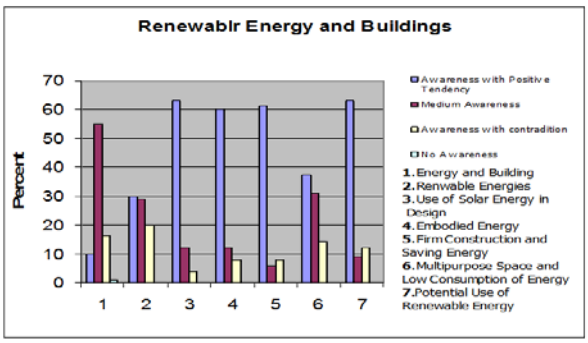

Fig.4. Tendency of Iranian Students for Renewable energy

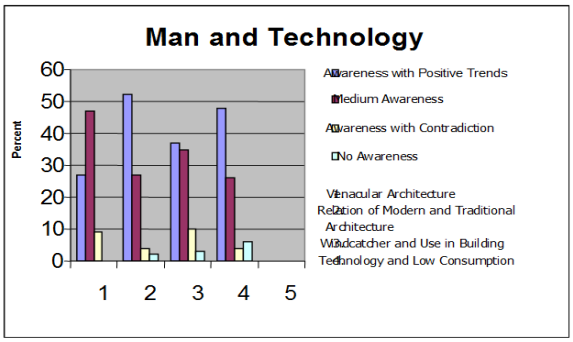

Fig.5. Awareness of Iranian students about man and technology

All of these materials propose and teach in theoretical form and there are rarely workshops. Students have usually no awareness about embodied energy, recycling, feedback in design process, simulation

5.Environmental contents in education of architecture

A sustainable environment's program should consist of an interdisciplinary set of courses spread throughout various university departments, such as Architecture, Anthropology, Agriculture, Biology, Botany, Building, Civil Engineering, Estate Management, Urban and Regional Planning, English, Economics, Forestry and Natural Resources, Geography, Humanities, Architecture, Philosophy, Political Science, Psychology, Quantity Surveying and Sociology. The program of sustainable environment offers students comprehensive exposure to the close relationships between the environment and every field of human endeavor.

6.Challenge and trends in Schools

Schools of architecture should take a proactive role in promoting ecological literacy through aggressive advocacy for green building projects in their own institutional communities. Also assessing the state of ecological literacy in architecture education as part of a long-term effort to inject sustainability principles into architecture education and present a mosaic of current activities as the basis for an ongoing discussion of the future of environmentally progressive architectural education. There is real need of reorienting architectural education towards sustainability so that architects are trained to have a clear understanding of how their role interacts with others to bring about good buildings and designs in many contexts.

There is a need to cooperate with other groups, provide networking, and cluster opportunities for architectural schools, lecturers, and students, support schools in their growth from awareness through to leadership in education for sustainable development, foster empowerment in sustainability program and focusing on student involvement and learning.

The integration of conceptual and analytical approaches of sustainable architecture, for example, "Sustainable Environmental Design Studio" in master program in AA in London, aimed to enrich the design research and practice with a creative phenomenon. In other case, Yannas, one of the most significant researchers in this field, made important observations on studio education integration. He argued that there is not a formula to integrate theoretical knowledge to design work based on the observation. Some students manage to integrate both processes, while some students adopt concepts to add afterwards. He contended that different teaching methods do not affect the speed, ease, or productivity of the design process. He argued that as long as time is a critical factor, the design projects improved day by day, and reaped the rewards of the labor (OZER, 2015).

In developing countries, such as Iran, the need to integrate sustainable concept in design thinking in ideological level, methodological level and the practicing level is necessary. This hierarchical multi-layer approach can also help to formulate a value-based design philosophy for introducing sustainable design laboratory/studio and sustainability related syllabuses to the architectural education.

In addition, there is a request to initiate a change in the formation of building technicians who supports the successful implementation of environmental considerations in the practice of architecture - including issues of climatic design, choice of materials, construction techniques, passive and hybrid strategies, resource efficiency, reduction of impacts, and so on.

Soebarto (2010) has mainly offered these items as three factors:

- The current building practice has been slow to consistently respond to the demands of enhancing sustainable environmental design within a creative architectural discourse;
- Existing accreditation and qualification criteria established by professional bodies do not succeed in

contributing towards the systematic promotion and diffusion of environmental sustainability in the design of buildings.

According to Figure 6, University curricula have shown to be relatively ineffective in methodically integrating sustainable environmental design in the education of students of architecture (Altomonte, 2009).

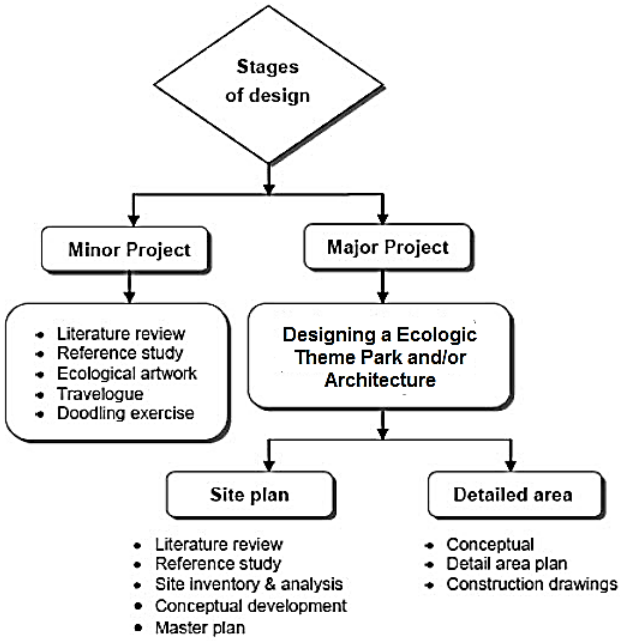

Fig. 6. Design Steps in Ecological Architecture Workshop, (Lai et al, 2003)

In the United States of America, for example, the American Institute of Architects is at present seeking to insert ecological literacy and sustainability principles into architecture education. There is also worth noting and particular emphasis on the "understanding of the principles of sustainability in making architecture and urban design decisions and in the creation of healthful buildings" (NAAB, 2004). In the United Kingdom, to address current pedagogical and professional challenges and facilitate discussion between academics, designers, and representatives from qualification bodies. In 2008, the 'Designs on the Planet' workshop series was set up as a forum between Oxford Brookes University, the University of Nottingham and Cardiff University, with the primary aim of contributing to the development of environmental responsibility as a creative factor in the practice and pedagogy of architecture (Stevenson, et al., 2009).

The success of sustainability in design and in the built environment relies on how institutions of higher learning respond to the ideas generated because of widespread interest in sustainable development. If sustainability is to become an essential aspect of society and economic development then it has to become an essential part of education (Samad et al, 2007).

Table.1
Curriculum planning in Education of Ecological Architecture

Coherence and rigor	The key concepts are clearly identified and coordinated wherever they appear in the curriculum and are reinforced through all key learning areas;
Prior understandings	Students' experiences, knowledge, attitudes and skills from their own lives and previous educational experiences are identified and inform the planning process;
Relevance and connectedness	Students are enabled to relate to their surroundings as a frame of reference and are consulted about what is important and relevant to their own lives;
Flexibility	Schools adapt the curriculum in response to change and developments in the wider world;

Evaluation	Procedures for monitoring and evaluating are built in from the beginning.
Progression	There is a clear and identified path within and across year levels, matched to the needs and interests of the students and structured in developmentally appropriate ways.

(Source: Education for Sustainable Development, 2004)

7.Conclusion

Developing a sustainable design curriculum should be part of the focus and a long-term goal of sustainable architecture. Thinking on ecological symbiosis in worldwide is architect's fundamental responsibility to create environmentally designs and creating safe relations between people and aspects of place. This demands perceptual and analytical abilities pertaining to ecological consciousness and practical means essential to create a built environment that would appropriate a triad system of social, economic, and environmental aspects. The goal of this change is the re-connection of young people with their own habitats and communities. The ecological curriculum in architecture disciplinary is based on the ecology of the surrounding community, not the confining four walls of the conventional school.

The complexity of ecological design education requires new teaching partnerships and continuities. One person has no the knowledge and expertise, such as biologists and geologists, needed to teach or practice the full range of disciplines contained by ecological design. Rearrangement of courses for collaborative teaching, both through internal co- teaching and as interdisciplinary collaborations, may require overcoming profoundly established structures and modes of operation at the University level. In addition, to extending our partnerships, the boundaries of the classroom can and should reach out to the community as well as the built and natural environments. Architectural students can learn from other ecological educators through team works and outdoor practices.

A new approach in education of architecture is on the path and it is starting in the most natural places. The revolutionaries are not professional educators from famous universities; but they are architecture students in under or postgraduate levels with an increasing number of environment-friendly teachers, and some of advisors from widely diverse scientific fields. From the viewpoint of materials and construction, students will learn some basic approach in utilizing natural components and safe and recyclable details due to bio mimicry lessons and vernacular architecture in their biosphere.

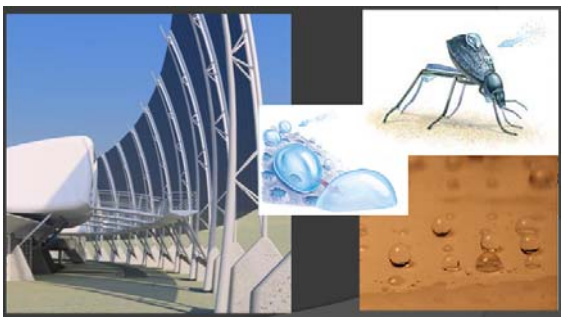

Fig.7. Fog Reduction in an Airport due to Bio technique learnt from a desert beetle
Source: http://www.Cmsl.Co.Nz

Literal cooperation and participation between academic and practical expertise is essential to incorporate sustainable concepts within the educational process. Sustainability as a continuing cyclic concept requires feedback action, which encourages introducing post occupancy evaluation to the architectural profession. This will enable future Architects propose designs and architectural solutions to challenges facing the world e.g. climate change, environmental destruction, social disintegration, poverty, natural resource exhaustion, and financial instability.

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