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Review Article

EVALUATION OF THE EXTENT OF SUSTAINABILITY IN NEWLY CONSTRUCTED ART SCHOOLS BASED ON PROCEDURES AND THE MATERIALS USED IN THE BUILDING

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ABSTRACT
Nowadays, renewable energy resources keep depleting and use of these resources causes destruction of environment, under which the countries have paid attention to use of renewable energy resources and expansion of concept of sustainable development as much as possible. Without doubt, optimization of energy consumption can assist for development and growth. Protection from natural resources, reduction of air pollution and other environmental pollutions, protection from ozone layer, physical and mental health, future of the man and so forth have been mentioned as the issues that their necessity keeps revealing. Sustainable buildings can pave the way for controlling energy consumption and protection from natural resources. Since educational spaces are the most important buildings in cities, the approach of sustainable architecture in designing these spaces can assist for effective training in students in addition to energy saving and reduction in environmental effects, that such spaces have been considered as educational tools for training sustainable strategies to students. The present research seeks to examine model of sustainable development and sustainable architecture and examine the factors contributing in sustainable architecture in educational spaces in a newly constructed art school. The main purpose of the present research is to examine the extent to which the construction strategies used in sustainability of educational spaces especially newly constructed art schools have been effective. In this research, the descriptive-analytic research method has been used with qualitative and quantitative data in nature. Further, documentary method has been used to collect data.

Keywords: *Sustainable School, Newly Constructed Art School, Local Materials, Sustainable Architecture, Sustainable Development*

INTRODUCTION
To describe sustainable architecture, it can assume sustainable architecture as the keeper of identity and historical and cultural values in the past and future, assumed in line with nature. What mentioned as sustainability in today's architecture issues addresses the subsections including energy, climate and optimization of fuel consumption, that unfortunately attention to the concepts such as sustainability of attitude, meaning, identity and so forth have less likely considered in it, yet these concepts can be considered in the classification for the early principles of sustainable architecture including saving resources, designing to return to lifecycle, and designing for the man.
By the passage of time and prevalence of environmental issues throughout the world, policy-making for training as the third dimension of sustainable development has been mentioned as the leading index in the countries which have advocated protection from environment.
Followed by holding conference on earth in 1992 under the issues of training program for environment and education in line with sustainable development, regarding four important components of this conference which convey training sustainability background and the prevalence of sustainable development at current age, all the countries have put a huge effort to design and propose several strategies for training sustainability background and have reached to the issue of training sustainable development at school as a whole.
Since the building of the traditional schools no longer can meet the students' needs and the schools should be a useful learning environment having sustainable architecture, the present research seeks to recognize the background to design a school to assist for development of training regarding the spatial and technical

characteristic and to create a space replete with a sustainable architecture adapted with cultural, environmental, social and economic conditions of schools.

Building of green school is designed based on principles of saving in energy consumption and protection from environment. The important point lies on this fact that just environmental principles and less consumption of energy resources are not targeted in these schools, yet the importance lies on the effect on spirit of students.

A research on effect of green schools on spirit and performance of students has been conducted in U.S, concluding that arrival of natural light to classrooms and increase of quality of air inside building as two elements of design of sustainable building directly affect students' performance. Providing fresh air, comfort temperature, adequate light, the absence of unwanted noise, maximization of productivity resources and minimization of pollution have been mentioned as the aims in green school.

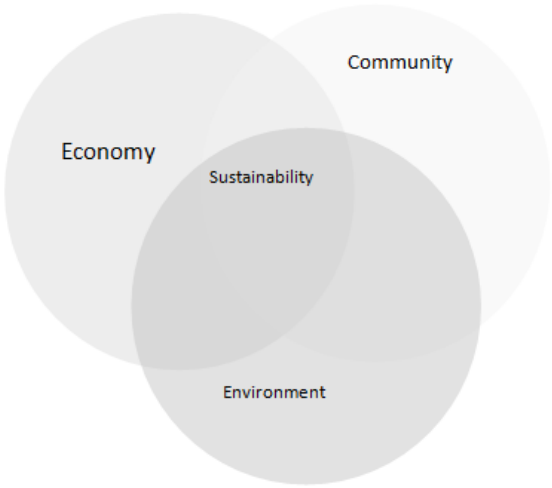

Image 1: Model of sustainable development and overlapping factors

Sustainable Development

For a better understanding of concepts of sustainable development, it requires representing a definition for the concept of sustainable development. The scholars have different points of view on sustainable development, yet the definition by Committee Brantlnd has assumed the sustainable development as a development which meets the needs at current age without compromising and neglecting the ability of future generation in meeting their needs. Concept of sustainable development implies representation of the solutions against traditional physical, social and economic pattern of development that can avoid rise of the problems such as destruction of natural resources, destruction of ecosystems, pollution, over population, spread of injustice and low quality of human life. Three factors including man, environment and economy are concurrently considered in sustainable development model (image 1), that it is suggested to develop comprehensive development programs in a way not to damage to environment but to assist for enrichment of social and economic structures. Yet, development must not be misunderstood with growth. Development refers to a conceptual term but with a superficial growth (Islami, 2004). Another type of sustainable development is in this way that it can result in improvement of quality of life but it cannot be human-oriented. Further, it can improve health of human and ecological systems, that is, the environment-man relationship. There is a unique definition for environment, saying, and favorability of an environment for the man in addition to relying on material conditions associates to mental conditions that an environment imposes on the man. It should be noted that such issue insists on the mutual relationship between the community and the environment that the type of this relationship can directly affect health of the man. Sustainable development refers to a process in which economic, financial, commercial, energy, agricultural and industry policies and other policies are designing in a way resulting in a development which is sustainable from economic, social and ecological perspective,

implying a sufficient investment in education, health, population and energy, so that no social debt raises for the next generations (Melat, 2009).

Sustainable Architecture

Sustainable architecture refers to a process in contemporary architecture, i.e. a process which is accounted as a logical reaction against the problems occurred in industry age.

With industrial revolution and technological advancements at architecture area, local architecture at most areas of the world that has formed based on the nature and surrounding environment has undergone neglect. It can state that sustainability in architecture comes to realize when the sustainability develops in architecture from structural perspective (Ameri, 2014).

In environmental ethics, just an emphasis is not put on natural environment, but an emphasis is put on the necessity of ethics in human environment so as to construct the human settlements based on a more proper recognition from environment. To sum up, it can consider sustainable architecture regarding three points (Ghasem and Asgari, 2012).

-saving resources: there must be this capability in the building to exploit from resources in a way to sustain beneficial during its lifetime, being used as a source to prepare other materials. In this regards, it can achieve ideal aim by protection from energy, material and water.

-design based on lifecycle: if we pay attention to life cycle and nature, anything occurs precisely from the procurement stage till return to nature, that it must reach to a deeper recognition from sustainable pattern by overview of any process from the starting point to ending point of process including design, implementation, exploitation, destruction and recycling.

Human design: this principle has the most important effect in design. With compliance with this principle, an attention has been paid to viability of all the constituents in world biological system. The architecture space must enable to work out to provide security, health, physical and mental comfort for the residents in a way to have the least effect on ecological conditions, topography, wildlife and plants.

The approach of sustainable architecture should have been developed in response to sustainable life of man and human environment which is dependent on survival of biological balance. Sustainable environment refers to an environment from ecological perspective in which leading biological systems of environment have been used and undergone survival.

A balanced co-existence has set between human community and natural environment from socioeconomic perspective so as to exploit from economic and social resources. Natural environment can raise mental retrieval and reduce stresses. Since community is defined as a group of humans with the same aim and the physical environment is recognized developing from nature and man-made environment, thus it can represent the model on how to tie human and environment in sustainable development model.

Definition of Sustainable School

School is the first social environment that the man enters in it and his spirit and personality develop there. Effect of educational space on quality of education and behavior of students and instructors has caused rise of a close relationship between education and architecture. With regard to huge effect of architecture in educational environment on spirit and body of students, it is of great importance to pay attention to how the creation of space is.

With regard to the definitions obtained from sustainable development, if school is considered as a sample of structure with a style of architecture, it can state that the best method to construct this building lies on exploitation from principles of sustainable architecture; as a result it can get close to aims of sustainable development.

With regard to sustainable development model, it can classify aims of sustainable school in each of the contributing factors in sustainable development model as follows (table 1):

Table 1: Adjustment of aims of sustainable school with parameters of sustainable development

Sustainable development model	Community	Economy	Evniornment
Aims of sustainable school	Appropriate stimulation	Taking advantage of the free energy of nature	Maximize the welfare of students
	Security	Minimize the cost of construction	Maximize usable space
	Ease of variability	Reduce maintenance costs	Simple and modular design
	Meet the needs		Protect and improve the natural values

Criteria of Sustainable School

Sustainable development evaluation systems have a short history throughout the world. Energy crisis in the 1970s provided the budget for research opportunities for pioneer architects, environment activists and engineers so as to engage in studying technological solutions and energy productivity systems. Saving energy consumption in buildings has been the earliest response to environmental problems, that other aspects of sustainability were gradually drawn into attention. In 1993, U.S. Green Building Council as a coalition of organizations related to construction especially American Institute of Architects was developed.

In US Green Building Council, a program was formulated so as to use the principles for exploitation from green buildings that have been a response to importance of construction industry with the approach of resolving environmental problems including the world change of climatic conditions, non-economic consumption of natural resources and threats to human health.

LEED, or Leadership in Energy & Environmental Design, is a green building certification program which is considered to set sustainable development in construction industry and green building concept. This council has specified several criteria to design this space so as to introduce a school as a sustainable school, which the mentioned criteria are as follows:

-sustainable sites: selection and preparation of a site at school can be accounted as a special challenge due to space, budget and limitations, yet two points can be taken into consideration to achieve sustainable architecture: 1- control of erosion and dust and avoidance from any pollution from construction activities, 2- attention to site from perspectives of climate and environment of region.

- Water use efficiency: this implies needing to reduce use of water which includes removal of use of drinking water in landscaping, innovative approaches including use of rain water and green roofs and attention to sewage system.

-energy and atmosphere: use of renewable energies at site including geothermal pumps, solar panels to generate electricity and water can be mentioned.

-materials and resources: it must pay attention to recycling system and reuse of the materials, including the materials which are renewable having the capability to return to the nature.

-environmental quality in building: it must pay attention to suitable ventilation inside building and fresh air in classrooms, attention to thermal control systems, suitable amount of light, Acoustic control and avoidance from any pollution in design of sustainable school.

-innovation in design: this assists for more validity at building.

-regional priority: observance of regional priorities relies on different geographical regions and environmental conditions (Douglas, 2010).

Sustainability in Construction Methods

Among the factors mentioned above, materials and resources and regional priority are much more close to issue of construction methods, that it can assume them at the area of sustainable architecture studies. For this, the present research examines the domestic rules and regulations of construction methods with an emphasis on issue of sustainable construction methods. Further, Edward Browne has mentioned some

factors concerning design of sustainable schools in the book "the guides towards sustainable architecture to design sustainable educational spaces" which include:
-use of a type of joinery to passes the sunlight as much as possible
-outdoor roof with central space, glass corridor and classroom with light ceiling
- Gable roof with glass space or solar space with a central corridor
- Stepped roofs to provide ventilation in different levels with the help of the sun.
In the past, different buildings have been being constructed via the materials extracted from environment. These materials have been being used as existed in nature. Use of materials at other regions has not been economically effective, because difficulty in transfer of materials and high cost of transport has been being added to other expenditures (Yazdan, 2014). The materials used in educational spaces can be prepared from local materials that existed in that region, e.g. stone has been mentioned as the material used in proximity to stone mines. On the other hand, it can achieve a new method through local materials. This method implies creation of buildings via bags of dust, invented by Nader Khalili, an Iranian architect. It has been estimated that 1000 to 1500 buildings have been constructed via bags of dirt throughout the world, including the land uses such as residential settlements, administrative departments, stores, schools, clinics and ecological villages (Tamijani and Farhoudeh, 2013). Recyclable materials widely help for protection from natural resources, i.e. concrete construction through recyclable materials, use of bricks and concrete blocks, materials such as wood cause reduction of construction debris (Blori, 2010). Concerning the issue of regional priority which relies on climate at geographical regions, the modernization, and development and equipping of schools organization has proposed some criteria and regulations for designing the educational spaces under different climatic conditions.
Arid and hot climate: cooling buildings is the most important heating need under this climatic condition. The direction towards north is the best direction to set building and also the direction towards sought in case of creation of total shadow on windows is proper. In one-way classrooms, the classrooms are considered at north direction and corridor is considered as south in a way not enclosed. The canopy is deemed to create shadow on window in two months of autumn. A composition of heavy construction materials including brick, stone, concrete together with thermal insulation are recommended to be used at exterior wall.
Cold and mountainous climate: heating buildings is the major need at this climate. The best direction to settle the building is south to 30 degree of eastern south provided that winter is not considered at the area of cold winds. Use of a cohesive form regarding the climate and forms that have the least external surface against highest volume and also forms of compressive building with square-shaped plan and the volume close to cube is recommended. One-way classrooms should have been considered in south direction and the corridor enclosed in north direction.
Humid and warm climate: cooling is the major need at this climate during 5-8 months of education year. Northern direction has been accounted as the best direction. One-way buildings have a proper pattern, such that the classrooms in northern side of plan should have been predicted. External walls should have enjoyed thermal insulation that the surfaces of these thermal insulations must serves as steamtight. Moderate and humid climate: heating space at winter and cooling space at summer have been mentioned as the major need at this climate. The best direction to use energy can be 15 western degree to 30 eastern degree. One-way buildings to assume classrooms in south direction and non-enclosed corridor in north direction are accounted as proper pattern (Modernization, Development and Equipping of Schools Organization, 2006).

***Art school "Mojtame* Fanni Tehran"**

In this section of research, the aforementioned factors have been examined at one of the newly constructed art schools that the extent of sustainability of this school is examined regarding what mentioned previously. Art school "Mojtame Fanni Tehran" has been established in Gorgan, sponsored by Mojtame Fanni Tehran. Art school "Mojtame Fanni Tehran" has been established in Gorgan in 2009 with 2750 meter infrastructure. There are 12 theory classrooms, 3 computer sites, 1 chapel, 1 directory room, 1 secretary and 1 audio-visual hall. Currently, 200 students are educating in art school "Mojtame Fanni

Tehran". With regard to settlement of Gorgan in moderate climate, draught is the major need at this climate. Taking accuracy in design of art school, it can perceive that corridor is set at the middle of school and classrooms are around it, that such thing will have no help for draught. On the other hand, there is no choice to protect from materials at façade of this school against rain. Yet, use of brick in façade due to suitable thermal resistance enjoys a substantial impermeability and avoids waste of energy. With regard to overview of materials that Edward Granville Browne has referred to them for designing educational spaces, it can perceive that none of the aforementioned factors including outdoor ceiling with central open space, glass corridor, classroom with light ceiling, gable roof with glass space or solar space, and stepped roof to provide ventilation in different levels with the help of the sun have not been observed in art school "Mojtame Fanni Tehran". Adaptation of the aforementioned points by U.S green council with construction methods in art school "Mojtame Fanni Tehran" indicates that the factors mentioned by green council such as water consumption, sustainable site, energy, regional priority, materials and resources have not been into consideration (table 2).

Table 2: Observance of the aforementioned criteria of sustainable building by art school "Mojtame Fanni Tehran"

Criteria of sustainable building	Compliance of factors in construction of art school	
	Observed	Not-observed
Sustainable site	×	
Water use efficiency	×	
Energy and atmosphere	×	
Materials and Resources	×	
environmental quality inside building	×	
Innovation in design	×	
Regional priority	×	

Conclusion

With regard to what mentioned above, it seems that few number of rules mentioned at the area of sustainability of educational spaces are observed in art school "Mojtame Fanni Tehran". The materials used in art school "Mojtame Fanni Tehran" have no consistency with climate at the area. Creation of draught for ventilation has not been taken into account in design and construction of building and no thought has been taken for protection from exterior wall against rain. Yet, lack of comprehensive rules in country for sustainability of educational centers is assumed as other concerns to have an access to sustainable education centers. There are a variety of criteria to design climate at education centers in the modernization, development and equipping of schools organization, yet taking accuracy in designs by the modernization, development and equipping of schools organization, it can perceive that these factors are not observed by organization. With regard to findings of research, it can say that importance of sustainable development and attention to new energies has enjoyed a low degree in our country, needing to extensive research and culturalization.

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