Investigating the Sustainability of New Built Art Schools Based on Executive Methods and Used Materials in Buildings

Arasteh Dianat¹, Peyman Adami²

^{1,2}MSc in Architecture, Sanandaj branch, Islamic Azad University, Sanandaj, Iran

Abstract

The main objective of the study is to investigate the effectiveness of construction methods and used materials in stability of educational spaces, and in particular new built art schools. As the sources of un-renewable energies are about to finish as well as its damage to the environment, countries have tried to pay more attention to the sources of renewable energies as well as sustainable development. There is no doubt that optimizing energy use can do a great help to growth and development. Regarding this idea, considering sustainable architecture approaches in educational spaces, particularly schools is of a high importance since in addition to the observance of the essential points of the Green buildings and saving energy, such schools are educational tools for training the students in sustainable architecture and finally after introducing the factors of sustainable architecture in educational spaces, tries to investigate these factors in a new built art school. The method of the study is descriptive analysis through using documentation technique.

Keywords: Sustainable School, new built art school, local materials, sustainable development, sustainable architecture

Introduction

In order to define sustainable architecture it can be said that sustainable architecture should hold the identity and cultural and historical values of yesterday and tomorrow. Whatever referred to as sustainable architecture focuses on sub branches including energy, climate and optimization of fuel consumption. Unfortunately, it pays little attention to concepts like thoughts and identity as these concepts can be categorized in basics principles of sustainable architecture like resource savings, designing to return back to the cycle of life especially at designing for mankind. As times passes by and environmental issues become more important universally, one of the fundamental characteristics of hardworking countries in environmental protection is policy making in education as the third dimension of sustainable development.

Following the conference in 2013 and the preparation of agenda 21 and chapter 36, the study has tried to pay attention to environmental education and training for sustainable development. With respect to the 4 main components of this chapter which all points to the teaching of sustainable basics as well as being in an education decade for sustainable development, all countries are trying to design and propose ways of teaching the principles of sustainability. In the end, all have agreed on "teaching of sustainable development in school as a whole". The traditional school buildings no longer meet the needs of students and schools should be useful as a learning environment as well as having sustainable architecture. The aim of this study is to identify the principles of designing a school which according to its technical features could contribute towards the development and promotion of education. Its shape has to be in a way that first create a responsive architecture in order to coordinate with schools' social, economic and cultural conditions and secondly be in accordance with the environmental conditions.

The building of green school is designed based on savings principles in energy consumption and environment protection. It is worth mentioning that at this type of schools environmental principles have not been targeted but its importance is in an effect which has on students. A research which was conducted in United States about the effect of green schools on students' performance, they concluded that natural light at classes and air quality inside the building are the two elements of designing a sustainable building. A green school tries to prepare fresh air, comfortable temperature, and enough light, the lack of unwelcomed noise as well as maximizing productivity resources and minimizing pollution.

Sustainable development

To better understand the concepts of sustainable architecture it is necessary to provide the definition of the concept of sustainable development. Experts have different views on the definition of sustainable development and each has defined it based on their own views. But the definition of committee Brantlnd which is generally accepted one, considers sustainable development as one which provides the needs of the present generation without compromise, regardless of future generations ability in meeting their needs. The concept of sustainable development means providing solutions in contrast to the physical traditional, social and economic pattern of development which can prevent problems such as the destruction of natural resources, destruction of ecosystems , pollution, population rising, inequality increase and low quality of human life .

In the sustainable development model, the three factors of human (social) environment and the economy are being considered and recommended simultaneously in order for the Comprehensive development plans to be shaped with no damage to the environment. It is worth mentioning that development should not be mistaken by growth. Development is qualified, conceptual and deep but growth is quantified, surfaced and physical (Eslami, 2004).

Another type of sustainable development is one which leads to improvement of human lives quality. In addition, sustainable development should develop human beings health and the ecological systems (relationship between humans and the environment) in long term. Environment is also defined respectively. Desirability of an environment for human being depend on materialistic conditions with psychological ones that environment imposes on them. It is worth noting that this issue focuses on bilateral relationship between the community and the environment which the relationship between the two can have a direct impact on the health of the human psyche.

Sustainable development is a process in which financial, Economic, trade, energy, agriculture, industry policies and other policies are designed in order to lead to a development which is economically, socially and ecologically sustainable and its concept is an enough investment in education, health, population, and energy, so that it brings no social debt for future generations

(Mellat Parast, 2009, 122).

Sustainable Architecture

Sustainable architecture is one of the contemporary architecture movement, the movement which is considered as a logical response to the problems caused by the age of industry. With the Industrial Revolution and technological development in architecture industry, local architecture has been clean forgotten. Sustainability in architecture is achieved when this stability and sustainability are formed in terms of its structure in architecture. (Ameri fard, 2014, 53).

Sustainable architecture can be pushed forward based on the following issues (Gasem Poor Abadi, Asgari, 2012, 52):

A: Savings in resources: The mason should have this capability in order to use the materials in a way which both be useful during its life and even after it is done as well as being the components of other constructions. An ideal objective can be achieved through saving energy, material, and the water.

B: Design based on life cycle: If we have look at the life cycle and the nature, we can understand that everything is taking place in order from beginning to its return to the environment. Therefore, sustainable development can be achieved through a careful investigation of each action from its design to practice as well as its destruction and recycle. In fact, environmental consequences of the building should be paid attention to in life cycle.

C: Human Designing: The principle has the most impact on the design. Observing this issue is to pay attention to life capability of all components of universal life system. Architecture must provide security, physical and psychological health and well-being of its residents as well as having the least negative impact on cognitive conditions, topography, wildlife and the plants.

Sustainable architecture approach has come to existence in response to human sustainable survival and human environment that depends on maintaining the balance of the biological world. Sustainable environment in terms of local environment is one which the main living areas are used and is likely to be continued using. There is a balanced coexistence between human society and the natural environment in terms of sociocultural issues in order to use both the social and economic resources . Natural environment can cause psychological recovery (recreating the spirit) and reduce stress . Since the community of a group of people is defined by a common goal and the physical environment includes artificial (man-made) and natural environment , by paying a careful look at the model of sustainable development the Model of human / environment (artificial, natural) connection cab be shown clearly.

The definition of sustainable school

School is one of the first social environment which man enters to and his soul and personality are formed at school. The impacts of educational environment on the quality of education and the students and teachers' behavior have caused a close relationship between architecture and education. With respect to the high impact of learning environment architecture on mind and soul of the students, paying a careful attention to forming such a space is of a high importance.

Regarding the given definitions about sustainable development, the best way to construct schools' buildings is through applying sustainable architecture principles. In this way we may get closer to the objectives of sustainable development. On the basis of sustainable development model : society - Economics –environment, we can categorize the objectives of sustainable school in each of the following sustainable development factors. (Table 1)

The Model of	Community	Economy	Environment	
sustainable				
Development				
The goals	of Appropriate	Taking advantage of the	Maximizing the students'	
Sustainable school	stimulation	nature's free energy	welfare	
	Security	Minimize the cost of	Maximizing usable space	
		construction		
	Vulnerability	Reduced maintenance costs	Simple design	
	Meeting the needs		Maintenance and the	
			improvement the natural	
			values	

 Table 1: The Compatibility of sustainable School's Goals with sustainable Development

 Parameters

The criteria of Sustainable school

The evaluating systems of sustainable development are having a short history in the world. The energy crisis of 1970s provided the budget of research opportunities to leading architects, environment activists, and the engineers in order to study the technological solutions and energy efficiency systems. Saving energy in the building was the first response to environmental problems in this regard and other aspects of sustainability raised their attention gradually. In the year 1993, the United States Green Building Council was formed as a coalition of various organizations related to the construction, especially the Association of America's Architects.

The United States Green Building Council developed a program in order to utilize the principles of green buildings which was in fact a response to the importance of construction industry with environmental problem-solving approach including global climate change, non-economic and wrong use of natural resources and developed threats to human health (these regulation is running in 41 countries, including the US, Canada, India, UAE and....). Offering LEED license to the building is in fact a movement in line with maintaining sustainable development in the construction industry and the concept of green buildings. The Council has set some standards in order to introduce a sustainable as follows:

• Sustainable Sites: the selection and preparation of a site for a school can be a particular challenge due to space and budget constraints. In order to achieve sustainable architecture, considering two points are of a high importance: First, erosion and dust control and avoiding any pollution coming from construction activities: Second, considering construction site in terms of the climate and environment of the region.

• Water efficiency use: This case needs to reduce the use of water, including the elimination of the drinking water in landscaping, initiatives solutions including the use of rainwater and Green roofs and paying attention to the sewage system.

• Energy and atmosphere: The use of renewable energy in place, for example geothermal heat pump and the Solar panels.

• Materials and resources: Materials and resources is to pay attention to the recycling and reuse the materials . In fact, it is the use of renewable materials which can return to the nature.

• Indoor environmental quality: ventilation inside the building and the fresh air in the classroom, paying attention to thermal control system, the lighting, acoustic control and to prevent any contamination must be considered in design of a sustainable school.

• Innovation in Design: Innovation in design can give more credits to the buildings .

• A regional Priority: considering regional priority depends on various geographic areas and environmental conditions (Douglas, 2010)

Sustainability in Construction methods and materials

Edward Browne in his book "Guidelines to Sustainable Architecture to design Sustainable educational environment " points out some particular items in designing sustainable schools which are as follows: (Bryan, 2010, 143)

- Letting more sunlight into the building
- Open roof with a central open space, glass hallways and classrooms with light ceiling
- Gable roof with glass surroundings or sun space with central hallways
- Stair-like roof in order to provide ventilation in different levels with the help of sun

The buildings used to be built with materials coming from the region itself. The materials used to be used the way they were or with making some changes in them. It was not considered

economical to use the materials coming from other different places due to its transportation costs, (Yazdanpour, 2014)

The materials for educational buildings used to come from the region itself respectively. For instance, Schools located around stone mines would use stones in their constructions, schools close the jungle would use wood in their construction. On the other hand, local materials can be used differently as well. This method includes creating buildings with soil bag method which its inventor was Nader Khalili, an Iranian Architect. It has been estimated that there are about 1000 to 1500 buildings in the world which are built through using soil bag methods including the residential homes, offices, shops, schools, temples, clinics and even ecological villages (Tmijani, 2013)

Recyclable materials help to maintain natural resources. Such examples are producing concrete from recyclable materials, to use small brick pieces in order to prepare brick and concrete blocks, and the materials such as wood can also reduce building trash. (Bolori bazaz, 2010)

Regarding the regional priorities which depend on the climate of the geographic areas, modernization development and equipping of school organization sets out rules and criteria in order to the design educational facilities in the country's region.

Hot and dry climates: The major need of this climate is the cooling systems of the building. The best settlement of the building is a direction which is toward north direction. In one way classes the classes should be located in north as well as for the hallway to be in the south direction. The task of the canopy is to provide shadow on the windows during September and October . It is better to use heavy building materials such as brick, stone, concrete and insulation for the external walls as well.

Cold and mountainous climate: The major need of this climate is the heating systems of the building. The best location for the building is 30 degrees to southern east, provided that they should not be open to the winter's cold winds. The use of integrated forms depending on the climate and form in which the least external surface is against the most volume and forms of compact and dense building with plan and square, close to the cubic volume is recommended. One way classes should be located in the south as well as for the hallway to be in the north direction

Hot and humid climate: The major need of this climate is cooling system and moisture removal in 5 to 8 months of the school year. The north direction is the best direction. One way buildings are the appropriate model, so that the classes should be on the north of the plan and hallways should be located in the south of the plan. The external walls have to have thermal insulation which the surfaces of these and the insulation levels should be steamed.

The mild and wet climate: The major need for this climate is the heating system in the winter as well as creating natural ventilation in warm months of the year. The best direction to use the energy is 15 degrees to the west and 30 degrees to the East . One way buildings are the appropriate model, so that the classes should be on the south of the plan and hallways should be located in the north of the plan. (Development Organization, modernization and equipping the schools, 2005)

Tehran technical complex art School

In this part of the study, we have used all above mentioned parameters in order to investigate Tehran technical complex art School, Gorgan branch in terms of its sustainability. The Tehran technical complex art School was constructed in Gorgan in the year 2009 which includes 12 classes, 3 computer sits, 7 workshops, a praying room, a management room, and a secretariat and an audio-visual hall. At present, 300 students have enrolled in the school. By paying careful attention to the design of the school, it can be claimed that the placement of the hallway in the middle of the building, surrounded by the classes, does no help in this climate condition. It is worth mentioning that there is also no protection for the external walls of the building against rain.

Through reviewing Edward Brown regarding the design of educational spaces, it is worth noting that The Tehran technical complex has not observed any of these important factors, such as open roof with a central open space, glass hallway and classroom with light roof, gable roof, and stair like roof. The stated items by the Green Council of the United States such as water efficiency use, sustainable site, energy, regional priorities, material and resources were not considered in the construction of this ate school respectively. (Table 2)

Table 2:	Observing the listed	criteria o	of sustainable	school by	Tehran	technical	complex a	art
school								

Criteria for sustainable schools	Steps in the school construction				
	Met	Not met			
Sustainable site	×				
Water use efficiency	×				
Energy and atmosphere	×				
Materials and Resources	×				
Indoor environmental quality	×				
Innovation in Design	×				
Regional Priority	×				

Conclusion

According to what was said, it can be claimed that there has been a few samples of the laws of sustainability in educational spaces. The materials used in construction has nothing in common with the climate of the region at all. There was no attention to air ventilation as well as no protection for the external wall in rain. Of course, the absence of codified law for sustainability of educational centers in the country is another problems of achieving sustainable education. The modernization organization of schools have regulations in environmental design of educational centers, but careful attention in designing educational centers by modernization organization of schools is not being considered by the organization itself.

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