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## “Sustainability” Education by Sustainable School Design

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### Abstract

In recent years, sustainability concept has become the common interest of numerous disciplines. The reason for this popularity is, to perform the sustainable development of societies. Easiness of forming a relationship with the word “sustainability” is because of its social, economic and environmental aspects. The term provides different perspectives to different areas. Today, in educational sciences, “environmental sustainability” is one of the main subjects that lesson programs include several studies about. In education system in Turkey, to teach “sustainability” concept, teachers uses traditional education methods mostly. To tell “what sustainability is” only by words is not enough for using the knowledge in the practice. Besides this, students learn much more by seeing real examples rather than hearing about it. In this context, this study aims to nominate “school buildings” as valuable learning environments for students. In other words, school buildings can be seen as 3D text books written by architects. Architecture discipline deals with environmental sustainability and defines various sustainability criteria. Environmental sustainability is related with built environment design and designing with the natural environment. In this study, sustainable school buildings had been analysed related with their design criteria and as a result an evaluation made about using architecture and its products as a concrete material for sustainability education.

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### 1. Introduction

Although sustainability was not a well-known concept until recently, it is now a concept which is being discussed with its many aspects such as environmental, social, economic and cultural. Sustainability and sustainable

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development, concepts first used in the report “Our Common Future” by World Commission on Environment and Development in 1987, are defined in their broader senses as “to be able to meet the needs of today, without compromising the needs of future generations”. (United Nations World Commission on Environment and Development, 1991: 51, 71). After the concept of sustainable development has received a common acceptance all over the world, its requirements have been discussed and various criteria have been determined on this issue. According to the Brundlant Report, one of the requirements for sustainable development is “to create a production system which takes the required ecological base for development into consideration” (Güneş, 2004). The concept of sustainable development discussed in this study is closely related to architecture and building construction process.

## **2. Sustainability in Architecture**

It is not possible to make an exact definition of sustainability in architecture. It is known that this concept, which had been scrutinised with reference to different priorities in every different period, has been discussed under various titles since the 1970s. For instance, while the concept “environmental design” was used in 1970s, “green design” in 1980s, “ecological design” in the late 1980s and in 1990s, the concept “sustainable design” has started to be used since mid-1990s (Arslan, 2008). Definitions such as green architecture, ecological architecture, environment-friendly architecture, and intelligent-architecture are still given as an annotation to sustainable architecture. Sustainable architecture is not an understanding of architecture from scratch; rather it is a holistic approach which contains all approaches, traditional or modern; which has a high concern for the environment; and which requires future-oriented designing. The most known of the definitions on sustainable architecture comes from Guy and Farmer. In their study in 2001, Guy and Farmer examined sustainable architecture under the headings of eco-technic, eco-centric, eco-aesthetic, eco-cultural, eco-medical and eco-social (Guy and Farmer, 2001). These headings try to explain what is at the focus of the environmental conduct.

Sustainable architecture defines an understanding of environment-friendly architecture under all classifications, and contains some universal consent. In general, it can be argued that in a building which is a product of sustainable architecture, an environment-conscious architectural code should be used and therefore the shape, the positioning and the construction practice of the building and its relation to the topography is of great importance.

This approach should be implemented accurately in all the processes from the infrastructure to the construction process, from material supply to treatment, and from the use of material to disposal management. Reducing material waste, recycling, ensuring energy efficiency in the building, sparing of water, minimalizing the maintenance costs by preplanning are issues that should be taken into consideration under sustainable building design.

Although the place and the importance of sustainability in architecture are under discussion, the requirement that the building take the first place in energy consumption emphasises yet again the vitality of the concept. Today, the buildings could not meet the sustainable environment requirements with reference to both unnecessarily consuming energy and uncontrollable production of wastes. It is known that 50% of the energy produced in the world is consumed by buildings and the other half is consumed in transportation and industry (Cebeci, 2005).

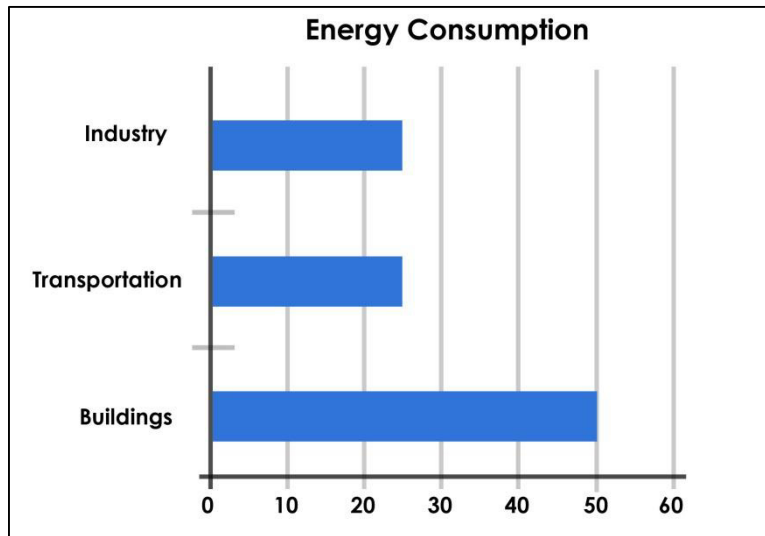


Fig. 1. Energy Consumption of Buildings

According to another study buildings are responsible for the 40% of carbon dioxide emission in the world (Somali and Ilcali, 2009). Therefore, green building systems developed for minimalizing the carbon emissions and the negative effects on the environment are advancing rapidly all over the world. BREEAM (United Kingdom), LEED (USA), SBTOLL (international), CASBEE (Japan) and GREEN STAR (Australia) are some of these certificates.

BREEAM (Building Research Environmental Assessment Method) is the first criteria-based building assessment system devised by Building Research Establishment (BRE) in 1990. In this system the building is examined under nine different categories. These are “Management”, “health and well-being”, “energy”, “transport”, “water”, “materials”, “waste”, “pollution”, “innovation”, and “land use and ecology”. The building is required to obtain at least 30% of these indicator points in order to get the BREEAM certificate (<http://www.breeam.org>).

In the United States the LEED (Leadership in Energy and Environmental Design) system devised by the Green Building Council (USGBC) has been determining the building assessment criteria since 1998. LEED aims at rendering the building production process environment-friendly and improving the material and the technique to the extent that they would cause the minimal harm to the environment. The assessment categories in the LEED system are defined as “materials and resources”, “water efficiency”, “energy and atmosphere”, “sustainable sites”, “indoor environmental quality”, and “innovation” (<http://www.usgbc.org/leed>). LEED provides different levels of certificate with regard to the points obtained in these categories. The certificate categories vary according to the types of projects. One of these categories is the school buildings.

### 2.1 Sustainable School Design and Sustainability Education

When the items under the categories in the LEED certificate program are considered, it is seen that certain criteria are more preferential than others for school buildings. Some of these criteria are the appropriate lighting organisation which would ensure the convenience of the places for education, the quality and the density of the light, benefiting from daylight in the most rational manner, the sound comfort in the places, acoustic requirements, and convenience for hygiene, natural ventilation, air conditioning, energy efficiency, and green spaces.

Design of school buildings with reference to the sustainability is of great importance for sustainability education. Sustainability education appears in the Convention on the Rights of the Children, under the social outcomes of education, where the need for individuals to become conscious about sustainable environment is emphasised (Atay,

2009). The view that the school building, per se, should be considered as a learning material increases the value of sustainable school designs. Taylor, an educationist defending this view, argues in his work titled “learning environment as a three dimensional textbook” that “the structure itself and the surrounding landscape is not passive space but can be an active learning tool for the learning of physics, geometry, botany, and ecology. Teachers, students and parents learn to “read the environment”, interact with and learn from it at many levels” (Taylor, 1993). The ecology concept mentioned by Taylor is closely related to “sustainability education” elaborated in this study. One of the main arguments of the study is that the ecological and environmental sustainability, to a great extent, can be obtained with architecture; and this view can be transferred to the students over buildings.

According to the “Educating for a Sustainable Future” program by UNESCO, an ideal environment education program requires developing values and understanding about the topic, rather a passive transfer of knowledge (UNESCO, 1997). In this respect, “architecture” is quite instructive with reference to the organisation of built environment and the relation of built environment to natural environment. Considering built and natural environments as a book that should be read and using them as learning materials are ideal methods for sustainability education; because, as it is a known fact, not every child could learn by reading books or listening to the teachers. Von Glaserfeld argues that knowledge is formed through active experiences. According to Glaserfeld, knowledge is related to the experiences of the learner and to the environment in which the learner formed that knowledge. Put it differently, acquiring knowledge and understanding is directly related to experience or life (Learning Theories: Constructivism, 2000). In this regard, sustainable schools are concrete materials that are ideal for teaching students numerous concepts and that are easy to access. “School are much more than bricks and mortar –they are symbols of our commitment to education” (Lackney, 1999). A school design according to the sustainability criteria can provide convenience in teaching the student many useful things such as green environment consciousness, energy preservation, simple precautions that would ensure thermal comfort, etc.

### **3. Using Concrete Material for Sustainability Education**

There are numerous studies on instrumentalisation of architecture for sustainability education. Taylor makes mention of a study conducted in Nigata, Japan. In this study, the teachers used “solar greenhouse” as material in science education in the 5<sup>th</sup> grade. The idea of making use of a product of architecture as course material, is essentially preferred with regard to being cheap and providing convenience for applied education (Taylor, 1993). A similar approach is available in the “sustainability education guide” in the Shelburne Farms’ Sustainable Schools Project conducted in the USA. The guide mentions the significance of designing the school building in a sustainable manner and presenting it as a concrete example in compliance with theory (Shelburne Farms’ Sustainable Schools Project, 2011).

Similar studies have recently been conducted in Turkey, and architecture and built environment have started to be seen as course materials in primary school curricula (Gülşay Taşçı, 2014). Nevertheless, the general opinion is that schools are places where education takes place but they are not education material per se. A study, aiming at gathering the views of students on the school buildings, confirms this conclusion. Students, which were asked questions about school buildings, attributed various metaphorical expressions to these buildings (Karasolak, 2009); however, they did not assess the building itself as a learning environment. It is remarkable that the children emphasised what they had learnt “in the building” but did not make any mention of what they had learnt “from the building”. In summary, it can be argued that the children do not have any awareness of the didactic quality of their physical environment. In order to raise this awareness in children, the building itself should be used in the lessons.

Arguing over a concrete example, we may mention the Kingsmead School which was designed with reference to sustainability criteria. The school was designed by the White Design company in Northwich, United Kingdom. The building is the most sustainable school in the region with its material use, recycling and efficient design understanding. The main construction element of the building is wood, which is a sustainable material. With this property, the building can be presented to the students of a concrete example of the importance of the use of natural and sustainable resources.



Fig. 2. (a) Kingsmead School Elevation; (b) Wooden Surfaces and Details

A special system was devised to collect and rainwater and to use it in the toilets; the rain water was collected in a reservoir via the inverted roof and the amount of collected water was presented to the children via an electronic panel. Each detail of the building enabled the students to understand the sustainability criteria. A further emphasis was given to the correct use of sunlight which is a natural resource. The roof and front windows of the building was positioned in a way that would maximise the benefit from daylight. In addition, there is a rest/play ground in each classroom, and a winter garden related to this space. With this winter garden, the thermal loss of the building was reduced and a place was provided for children to grow up plants. The school, designed with the idea of sustainable green building, with all its details, can be read as a book by all students.

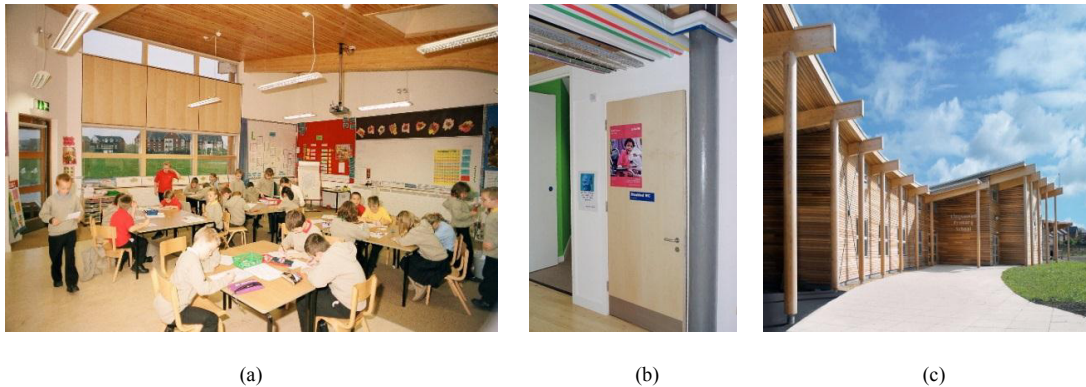


Fig. 3. (a) School, Day Lighting; (b) Water Recycling System; (c) Wooden Structure Components

#### 4. Conclusion

Education has an important place in teaching people to understand, control and change their environment. Ward argues that the education system in many societies could not meet this need adequately. According to Ward, due to failure of education with regard to human-environment relation and communication, the children nowadays could not understand the outside world and could not establish healthy relations with the physical environment (Ward,

1990). Sustainability education has an important mission to fill this gap. Due the necessity of sustainability education and the necessity for originality of the method to be used in this education, school buildings are significant materials in education. The use of school buildings as concrete course materials by the teachers increases the responsibility of the architects. The architects should design the school building in compliance with the sustainability criteria and should not ignore the fact that their product is not only a place where education takes place, but also it is, per se, an environment for learning.

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