

Community Space and the School Ground

A 3D Book for the Concepts of Sustainable Development

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Abstract | In recent decades, environmental crisis has been regarded as the most critical humans' concerns. Besides, sustainable development as a holistic approach plays a noticeable role in meeting the challenges and problems raised by this crisis. One of the most practical methods to develop the concepts of sustainable development is teaching these concepts to various people of the societies. Meanwhile, education especially in elementary school, considered as the most basic education levels in every societies, is one of most important objectives of fostering future generations for living in the society.

This paper aims to propose an ecological pattern of education for sustainable development through elementary school ground by applying the research method based on documentary studies, reviewing the sources, and their analysis. The assumption is that the school ground especially in terms of designing based on sustainable development principals, can act as a 3D book. It is also assumed that school ground has the potentiality to teach the concepts of sustainability to the students and people involved in the school. Accordingly, a model is presented for school ground based on the three principals of sustainable design including economy of resources, life cycle, and humanistic design. The outcomes show that designing school ground based on these principals can extensively teach the concepts of sustainable development to students and other individuals in school.

Keywords | Sustainable development, School ground, Education, Design principals.

Introduction | Undoubtedly, one of the most holistic approaches towards designing places for the humans is "sustainable design", originating from the principals of "sustainable development" (Askoblond, 2003). It is to be said that with considering the climatic condition, growing population and development of industrial activities

of Iran, this country can be categorized among the countries for which the sustainability issues are so crucial and need organization and planning. Nowadays, sustainable development, not only considered as a technological concept, but also as an educational one. Moreover, education is regarded as an accelerating process of social changes by means of enhancing general awareness of values, behaviors and life style to reach a sustainable future. It is also the most effective way of facing the challenge of this century, namely sustainable development (Mousaee

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& Ahmadzadeh, 2009). Every person of the society learns how to be unified with the environment and the surrounding society and becomes an effective citizen for his/her society from the beginning years of the education. Hence, not paying considerable attention to the position of the schools, especially elementary schools, as the basis for education and as a potent place for teaching the concepts of sustainable development, causes people get alienated with the needs of the society. Accordingly, with low sense of responsibility, they turn the society into a passive environment lacking influential citizens. This paper is to achieve a model for designing school ground with an approach towards teaching the school involved society and propagating environmental concept. Correspondingly, at first, by expressing the relation between school and educating concepts of sustainable development with assumption that the school ground has the potential to teach these concepts, a model is proposed for designing these places to realize the mentioned objectives.

Research method

The research method is based on documentary studies, reviewing and analyzing the sources and related texts. At the first step, to achieve the theoretical framework of the research and with scrutinizing and analyzing the sources, documents, printed, pictorial and internet sources, the concepts such as sustainable development and school landscape design, as the first space for basically educating the society, fundamental regulations for designing the school landscape are specified. Afterwards, two successful schools in world scale including Rosa park and Eagle rock as well as Noor-e-Mobin school in Iran, are considered and analyzed. Finally, the guidelines based on the three principals which are the bases for designing the school ground according to the concepts of sustainable development, are proposed.

Schools and the concepts of sustainable development

During the 1970s, due to enhancing environmental awareness, the adverse effects of human activities as well as creating a healthy environment, draw scientists' attention of various research fields. Meanwhile, environmental education issues are regarded as the most essential solutions in decreasing the harm to the environment. Truly, in recent decades, with the aim to bridging the gap between two terms "education and environment", notable measurement has been taken. Besides, this hypothesis has been proposed that newly-emerged concepts such as sustainable development can be discussed in educational places, directly and indirectly (Azemati & Bagheri, 2008). It does not seem that the two terms "education and sustainability" have been applied with each other until the mid-1960s. However, the alteration related to environ-

mental education was the results of groups of intellectuals, authors and educated classes of the eighteen and nineteen centuries including Goethe, Rousseau, Moreover, a lot of people believe that Sir Patrick Geddes (1854-1933) Scottish master, was the first individual bridging strongly the quality of the environment and education (Palmer, 2004). From 1970 and 1980, official training has been changed in terms of concepts of sustainability education. Accordingly, the evidence of these changes and the modern role of the schools in Britain, North America and Europe have emerged.

Over the ten years, whole-school programs included more holistic and extensive approaches in sustainability issues. For example, UK's 'Learning through Landscapes' (LtL), Canada's Evergreen, and ENSI's 'Landscape' are among the programs focusing on making changes to provide environmental education in schools (Henderson&Tilbury, 2004). A report pressed in 1974 expressed that developing the environmental learning during the period of education includes whole-school program in or out of the school and it should be considered along with the other issues in education. In 1987, UNESCO released a statement based on the importance of environmental education (Feizi, 2010).

Modern interpretation of environmental education, considers school not only as a groundwork for managing the environment, but a place for teaching environmental issue to the society. Meanwhile, the concept of green school originated from Ecological School Plan proposed by Foundation of European Environmental Education whose aim was environmental education penetrating gradually into various sections of the school management and education in the class and then forming the whole comprehensive environmental management systems of school. In 2007, United states Green Building Council, initiated National Green School Campaign, whose framework is illustrated in Fig. 1 (Zhao, He & Meng, 2015, 311).

These modern approaches for comprehensive development of schools, is a response to global need for changing the direction of management of official education towards the help to equality and creating more sustainable and better future (Scheerens, 2000). In line with sustainable development, there are scientific achievements representing that the education in early ages is more effective, and elementary schools have acquired more success in terms of enhancing the level of sustainable development in comparison to secondary schools as well as acting more prosperously in applying open spaces and school ground as locations for learning environmental issues (Scott, 2009).

In a research conducted by Feizi, it was identified that students of elementary school are more eager to environmental learning in natural grounds compared to student in high- School. They also enjoy visiting natural envi-

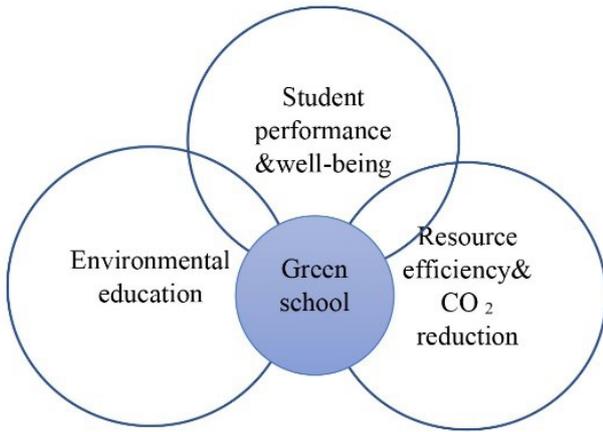


Fig. 1: The basic framework for green school. Source: Authors.

ronment and acquiring environmental education experiences more than the latter group (Feizi, 2010, 45). Furthermore, researches show that greenery in school increases physical activities (Akoumianaki-Ioannidou, Paraskevopoulou & Tachou, 2016) not only in elementary school but also in higher education levels (Jansson, Abdulah & Eriksson, 2018). Accordingly, the school landscape can present notable environmental experience when designed based on the sustainable development principals: 1- adopting sustainable design and management practice 2- conserving and enhancing nature 3- working together and belonging 4- embedding into the curriculum and school culture (Table 1) (Foster, Percival, Chillman, Jackson, Mountain, Burn, Martin, Walters & Robinso, 2006, 84).

School open space, a 3D book for education sustainable development

A lot of educational spaces including kindergartens and elementary schools experienced learning within the sustainable framework and maintenance of the environment. These spaces also, considered their appreciable effects on the students' behaviors and functions. The studies have indicated that the majority of students prefer to learn and be involved in doing an activity in nature and well-defined landscape of an educational spaces (Emami, 2013). As Julie Beth Zimmerman stated, humans are both impressed by the nature and shape of the environment (Kadivar, 2015). Correspondingly, school ground can be effective on enhancing the student's efficiency and daily performances (Bagot, Allen & Toukhsati, 2015).

Recent researches have demonstrated that the forms of the school playground have been designed in order to more control the students and team game. They also have expressed that these school playgrounds are not suitable for boys and girls and bring about wrongful disciplinary behavior. These spaces cause offensive behavior for boys as well as depression for girls (Cheskey, 2001). Accordingly, the school ground can affect students' learning through three important methods: the school ground is a substitute for education in inner spaces, providing facilities which are not possible to have in interior spaces and bringing about an environment for practical learning (ibid). Designing school ground for education and learning can be considered from three aspects including school ground as a space of practical teaching, a space for play, and a ground for contribution to teaching school

Table 1: Educational experiences through designing school ground based on sustainable development principals. source: Authors based on Foster, et al., 2006.

Principal of sustainable development				
	Embedding into the curriculum and school culture	Working together and belonging	Conserving and enhancing nature	Sustainable design and management practice
Sustainable development measures	<ul style="list-style-type: none"> - Creating outdoor educational spaces - Write school policies and work plan relating to school ground 	<ul style="list-style-type: none"> - Reflecting the diversity of school culture and identity - Respecting and creating local signature - Planning for community engagement in school 	<ul style="list-style-type: none"> - Doing survey based on wildlife issues - Planning for managing the habitat - Thinking about habitat - Creation and improvement including wildlife - Creating relation between various habitats - Avoiding restricting measurements such as grass mowing - Creating larger sanctuaries 	<ul style="list-style-type: none"> - Design for minimum environmental impact - Reuse and re-cycle materials - Use ethic material - Considering environmental characteristics - Cooperating with school councils, or specific teams including school grounds steering or management group - Applying project management system - Assign budget

curriculum (Table 2). In the following, three successful schools in terms of realizing sustainable development principals are studied.

• **Rosa park Elementary School**

Rosa Park Elementary school located in Oregon, USA, was constructed between the years 2006-2007. This building was designed to educate the users how to be an appropriate manager for their environment. The energy efficiency of the school is 29% higher than the energy level defined by the Oregon energy code. Some of the environmental measures of the school include: Automatic sensors, energy efficient skylight, natural ventilation through windows. Moreover, Rosa park school is regarded as one of the most successful in revitalizing the historical context of Portland and has a principal cultural influence on restoration and revitalization of this area (Figs. 2 & 3).

• **Eagle Rock Elementary School**

Constructed in 2003, Eagle rock school is located in South Oregon where only includes 5000 residences. This school involves all the characteristics of sustainable development. Architects have designed a school saving energy about 38 % more than the Oregon energy code. Moreover, this school benefits from high level of daylight, and the shadings are installed on the south face of the building façade to prevent excessive heat. Some of the sustainable features used in this school involve: shading in south face of the building, operable window allowing for natural ventilation, recycling most generated waste, maintaining existing vegetation, cultivation of drought-resistant plants, storing the water in three tanks located underground and cooled before reaching the chiller, decreasing the use of the chillers, creating bicycle parking and access to the pedestrian reaching to the nearby residential area, locating part of the building in the hill for applying thermal insulation of the earth,

low-flow plumbing fixture, timed water faucet turning off automatically (Ford, 2007) (Figs. 4 & 5).

• **Noor-e-Mobin elementary school**

Noor-e-Mobin elementary school located in Bastam, Iran, was designed in a 28-hectare ground supported by the Noor-e-Mobin Charity Foundation. This school designed based on various perspectives of educational spaces defined by mass and volume (The Noor-e-Mobin's G2 Primary School, n.d). The project improves the level of sense of citizenship among children and tries to develop children's sense of responsibility as well as cooperativeness. The school ground has been formed in different sections as well as different heights to meet various aims including sport, educational and environmental ones. In Noor-e-Mobin school the environmental education is accomplished not only through the school building and relating with the nature, but through practical educations (Figs. 6 & 7).

Designing school ground and educating sustainable development concepts

The green school ground can decrease students' stress level and fortify the adaptability parameters in their personalities (Chawla, Keena, Pevce & Stanley, 2014, 1). Hence, providing a suitable "space" for students to play which can be a safe space and can response to the students' needs is so vital. This "space" also can serve as a "possibility" for individuals to help to develop their creativity, experience social life, learn the principals of sustainable development including social and environmental ones, indirectly. This issue should be considered by architects and landscape designers of the school, as well as managers and programmers. Moreover, it has been studied that experiencing the issues related to sustainability in school based on the psychosocial parameters, affects the students' behavior and ecological objectives outside of the school (Uitto, Boeve-de Pauw & Saloranta, 2015).

Table 2: Different aspects of school ground and design principal based on educational objectives. Source: Authors based on Foster, et al., 2006.

	Outdoor teaching space	Play	Curriculum-related space
Design guidelines of school ground	<ul style="list-style-type: none"> - Creating well-defined and well-proportioned outdoor classes - Providing places for whole classes (about 30 student) and smaller group - Regarding access, location from classroom, logistics of using the space - Space for storage and necessary equipment - Applying specific features such as trees and slope - Design in focus and features 	<ul style="list-style-type: none"> - Creating versatile and adaptable spaces - Regarding criteria for enriched play space - Creating integrated outdoor and indoor spaces - Creating spaces potent for evoking experience, imagination and challenge - Making balance between challenge and safety - Considering educational needs 	<ul style="list-style-type: none"> - Polytunnel - Raised bed for plant cultivation - Livestock pens - Math maze - Woodland trail - Wind turbine - Pond dipping platform - A place for performance - Story-telling space - Hoops - Nets - Wall targets - Floor marking



Fig. 2: The Rosa Park school ground. Source: Ford, 2007.



Fig. 3: Rosa Park school plan. Source: Ford, 2007.

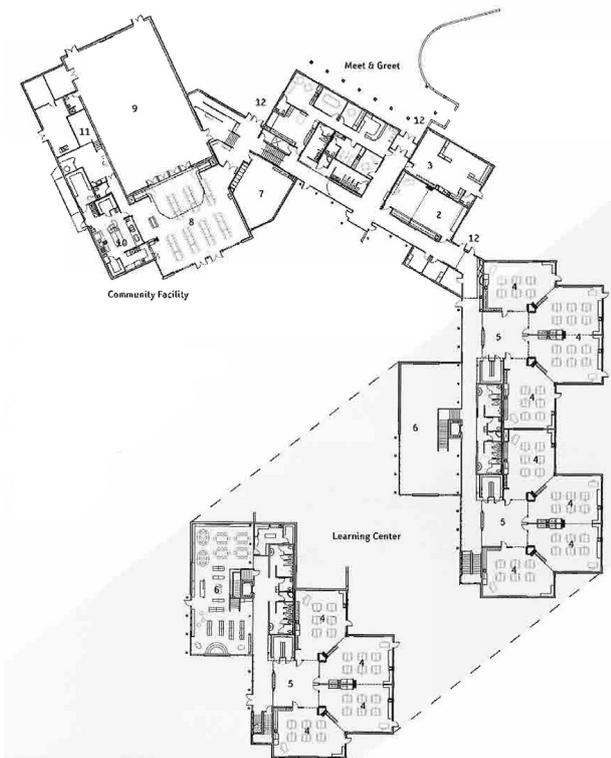


Fig. 4: Eagle Rock school plan. Source: Ford, 2007.



Fig. 5: Eagle Rock school ground. Source: Ford, 2007.



Fig. 6: Noore-e-Mobin school plan. Source: www.feastudio.com.



Fig. 7: Noore-e-Mobin interior yard. Source: www.feastudio.com.

The practical solutions based on these principals are presented in Table 3. Nowadays, the necessary open space for the school is provided through school green roofs applied as an open educational space with considering the safety issues. Along with the ecological and aesthetic benefits, this solution can compensate the lack of open space in the schools; moreover, the roof, as a less-used “place” is turned into a specific “place” for playing, educating and improving the ecological values in city scape. On the other hand, cultivation of local plants and species in the school open space have the positive potentiality including: shading, protecting against wind and rain, bird shelters, absorbing energy and air heat, cooling the air by evaporation, air - conditioning and absorbing the air pollution, soil stability and improve water and air penetration in the soil, acoustic performance, controlling the light pollution heavy rain, positive psychological and mental impact on students. In general, all of these factors are influential in students’ mental and physical health.

These days, the sustainable design attitude as a changing and effective factor in architecture design can meet

the concerns of the present century. This includes specific design approaches that can be categorized as three main principals. Each of them has its own strategies. These principals include: economy of resources (economy of water, energy and materials), designing based on life-cycle (three phase, before and after construction as well as the time of occupying the building), and humanistic design (maintaining natural condition, designing the site, and designing based on comfort) (Kim & Rigdon, 1998). Accordingly, various solutions have been proposed for designing schools such as: applying automatic sensors for school daylight control, waste recycle, using drought-resistant plant and applying renewable resources such as wind, and earth heat energy. However, aside from climatic and environmental approaches of sustainable development, socio-cultural aspects of this issue is so essential to be considered by schools. Today, the majority of schools are regarded as a center for their surrounding local communities and sharing the facilities providing the society with benefiting these advantages and steering the society more and more towards achieving social justice.

Table 3: the principals of school ground design based on the educational concepts of sustainable development. Source: Authors.

Improving the ecological values of the school landscape	Interaction of environmental concepts with social ones	Decreasing the environmental impacts	
		Improving environmental productivity	Reducing resource usage
<ul style="list-style-type: none"> - Diversity in designing open spaces -Creating learning landscapes - Ecological landscape design -Applying natural elements such as: water, pond, stream -Cultivating plants with children -Creating spaces for domestic and homey animal 	<ul style="list-style-type: none"> -Educating the society through presence in school and cooperation - Developing volunteer activities - Designing open group spaces -Assigning special spaces to parents - Having relation with organizations (e.g. environmental and forestry development organizations) -Defining out-of-school time activities for societies 	<ul style="list-style-type: none"> -Surface and rain water gathering -Applying renewable materials -Applying durable and resistant materials -Separating waste for recycling the paper, etc. -Turn the food waste into fertilizer Revitalizing the unused spaces 	<ul style="list-style-type: none"> -Applying natural source of energy -Appropriate orientation of the building -Cultivation of drought-resistant plants -Applying low-consumption equipment -Restoration of existing buildings

Conclusion

These days, the sustainable development attitude and its teaching especially environmental aspects are regarded as considerable objectives of education, particularly in elementary grade. Since students learn how to be linked to the nature and how to respect, maintain and preserve it; they also become aware of various aspects of sustainability. The school building along with its landscape can act as an educational 3D book and convey the concepts of sustainability to students, directly or indirectly and teach them environmental, socio-cultural and economic concepts of sustainability. Accordingly, designing school based on the sustainable development principals can has effect on enhancing such acquaintance. . The school landscape plays noticeable role in acting as a ground for educating the concepts of sustainable development and

its environmental aspects regarding ecological approaches. The school ground can also be a ground for environmental education including maintenance and preservation of miscellaneous species, benefiting from renewable energies and recycling the materials. Besides, with an appropriate deign it can provide a chance for the community, parents and students and the other individuals to be engaged in school as well as providing various aspects of social sustainability and humanistic approaches. This research proposed practical guidelines for designing the school ground based on ecological approaches and considered sustainable development concepts (Fig. 8). It is concluded that the school landscape can be regarded as a place of a behavior providing the society and the students with educating the above-mentioned concepts in form of a 3D book.

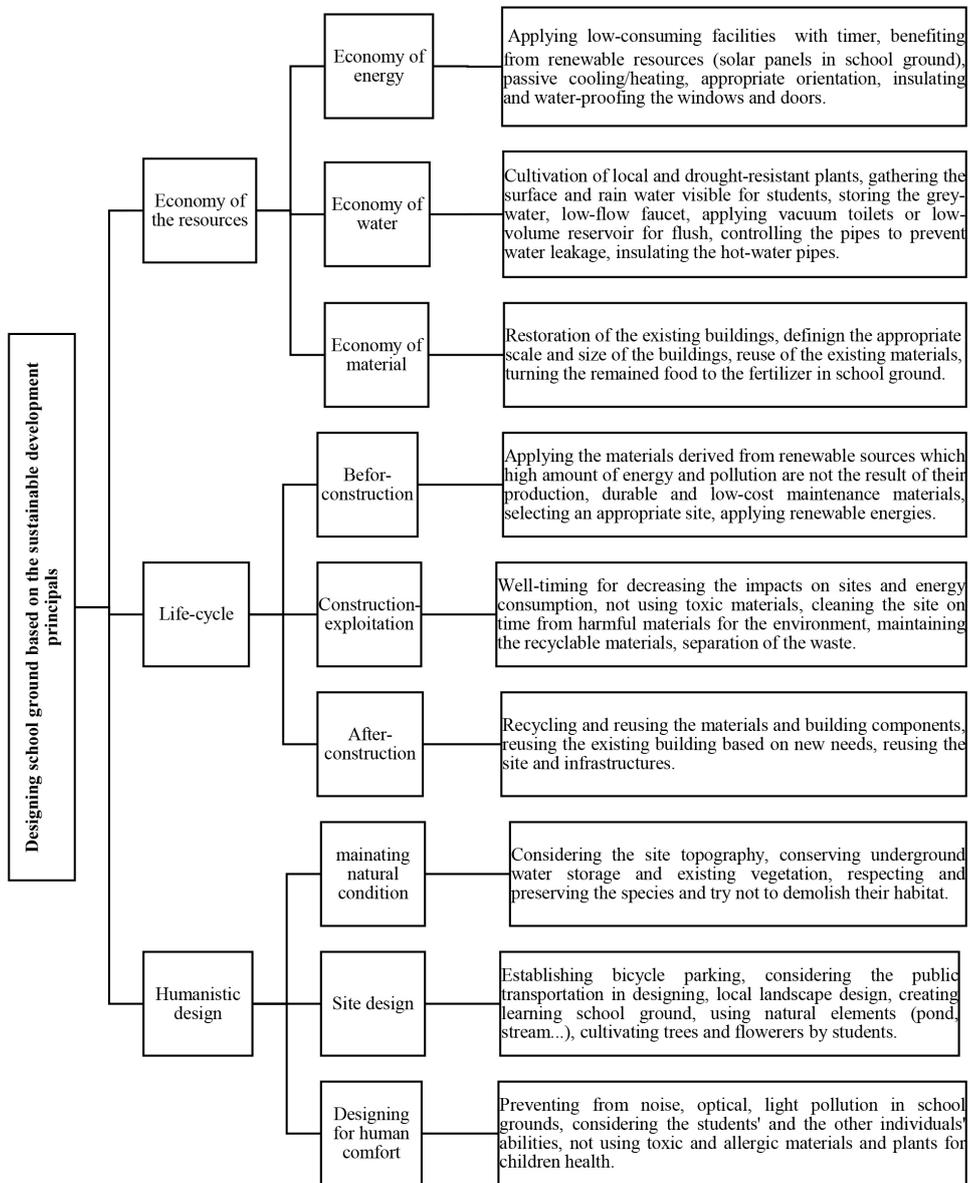


Fig. 8: The guidelines for designing school ground based on the sustainable development principals to educate the environmental objectives. Source: Authors.

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