

Effective Areas and Solutions for Sustainability Education Development in Iranian Architecture Universities

¹MohamadEbrahim Tghavi Bafghi, ²Hamed Moztarzadeh, ³Khosro Movahed

¹ Ph.D. Candidate, Department of Architecture, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

² Assistant Professor, Department of Architecture, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

³ Associate Professor, Department of Architecture, Shiraz Branch, Islamic Azad University, Shiraz, Iran.

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ABSTRACT: Today, given the rapid population growth, development of sciences, new changes in all aspects of human life, and ultimately, the occurrence of unfavorable conditions for the human environment, sustainable development has attracted considerable attention as one of the most critical and common issues at the international level. Among the strategies to achieve sustainable development, education is the most effective mechanism of society to deal with the century's biggest problem, i.e., sustainable development. According to the United Nations, education is needed to promote sustainable development and improve public awareness of environmental and developmental issues. Sustainable development using educational tools, in the first step, requires identifying the areas and factors that play a role in the development of sustainability education. This study aims to identify the effective factors for the development of sustainability education in Iranian architecture universities using the analytical-inferential strategy. The qualitative analysis of the documents revealed that the educational environment, educational system, and society were the most effective ones in the development of sustainability education of architecture students. Finally, solutions were presented to improve public awareness and reform the educational environment and system to develop sustainable education in Iranian architecture universities.

Keywords: *Sustainability, Sustainability education, Architecture education, Sustainable development.*

INTRODUCTION

Rapid population growth, the advance of new sciences, and changes in all aspects of human life in the last century have created unfavorable conditions for the human environment. Subsequently, as sustainability has been highlighted in recent decades, human beings have taken a step towards paying attention to the environment and using resources considering the needs of the next generation to improve the crises caused by the incorrect ways of life dealing with the environment. Human intervention in nature is an essential issue concerning sustainability in urban planning and architecture through artificial environments. Undoubtedly, the structures formed in the present age have been influenced by the thinking method and the educational topics learned by specialists and graduates of this field in universities and educational centers. People are currently dealing with society as environmental crises, especially in architecture and urban planning, result from the architects' and urban planners' learnings. Therefore, pursuing

issues related to the sustainability of artificial spaces in forming the foundations of thinking in architecture and urban planning, i.e., universities and research centers, and reviewing strategies for improving sustainability education methods are of great importance.

Today, extensive research has been done on the concepts of sustainability and sustainable development in architecture and urban planning, and universities and research centers have defined and expanded the related disciplines in different parts of the world. A review of the literature shows that most of the above studies have only addressed the generalities of the subject regarding sustainability education and its development and have not explicitly mentioned the factors and areas affecting the development of sustainability education. However, the present study has made an effort to cover this gap. Despite many articles and conferences on sustainability in Iran, the educational structure of architecture disciplines has not changed compared to previous decades. Given the

*Corresponding Author Email: hamed.moztarzadeh@gmail.com

necessity of this issue and the importance of addressing the position of sustainability in architectural education, the primary purpose of this study is to investigate the effective areas and provide sustainability education development strategies in Iranian architecture universities to raise the architects' real mental and practical awareness and commitment to sustainable development in society.

By observing and evaluating the current educational conditions of architecture and the practical situation of sustainable development in the country and reviewing the available resources, the following questions were asked in order to achieve the research objectives:

Which areas are effective in developing sustainability education for architecture students?

What are the appropriate strategies to develop sustainability education in Iranian architecture universities?

According to the research goals and the asked questions, the research hypotheses can be described as follows:

Areas such as educational environments, educational system, and society can affect the development of sustainability education for architecture students.

Raising public awareness about sustainability and its principles and modifying the educational system and environments following it can be introduced as effective strategies in developing sustainability education in Iranian architecture universities.

Research Background

In recent decades, sustainability has received particular attention in education at all levels, especially in architecture, and extensive research has been performed in this regard. Table 1 lists some of the most significant studies conducted on this subject.

MATERIALS AND METHODS

This research reviews a collection of related scientific articles to achieve sustainability education development strategies in architecture universities. The studies are then categorized, and solutions are extracted from them. For this purpose, an analytical-inferential approach is used. The data is qualitative, and the research seeks to prove the hypotheses and answer the questions by qualitative analysis of the obtained documents. The present study has four sections. The first section reviews the literature on sustainability and sustainable development, general sustainability education, and architecture. The second section identifies the functional areas in sustainability education. In the third section, the obtained information is classified, and its content is analyzed. Eventually, the fourth section offers effective strategies in the development of sustainability education in architecture universities. Fig 1 depicts a schematic of the research process.

Theoretical Framework

In order to understand the research subject, it is necessary to define the meanings of the words on which the research is based. In this regard, the topics of "sustainability," "sustainable development," and "sustainability education" are analyzed in this section to identify the factors affecting the development of sustainable education in architecture.

Sustainability and Sustainable Development

The term "sustainability" is derived from the verb "sustain" in English, originating from the Latin roots "Sus" and "Tener," meaning "to hold" or "to maintain" (Daryani, 2005). Webster's Dictionary defines sustainability as "the use of resources in a way that does not harm or exhaust them." A significant number of studies have discussed the concept of sustainability. However, the most straightforward and most comprehensive definition of this word is "what can be sustained in the future." It is provided when a set of social, economic, and environmental sustainability is created (Kamran Kasmaei et al., 2011).

The first idea of sustainability came from Aldo Leopold. He considered the ability of the environment to absorb and tolerate human influences and raised the concern that to what extent the environment can withstand the effects of contemporary human life and remain stable. In the 1970s, following the awareness of environmental crises, movements arose worldwide concern of sustainable development. With the rise in public awareness of environmental issues in the same decade, discussions were raised about sustainable development (Abbaspour, 2007, 1007).

The culmination of this debate was the 1992 World Conference on Sustainable Development, known as the "Earth Commission" in Rio de Janeiro, Brazil, later known as the Rio Commission, in which a resolution was issued to present strategies for the sustainable development of the world, and the world countries were obliged to follow this resolution. Ten years later, in 2002, another conference was held in Johannesburg, South Africa, at the level of ministers of countries and environmental experts to emphasize the Rio Commission resolutions and make them more globally enforceable. The critical definition of sustainable development presented at the Rio Commission is "a development that meets the current needs of human beings without compromising the needs of future generations and takes into account the environment and future generations" (Hatami Golzari, 2008). In total, more than 50 different definitions of sustainable development have been presented around the world, each of which can be the subject of another study. The most famous definition of sustainable development was published by the Prime Minister of Norway, Gro Harlem Brundtland, at the World Commission on Development and Environment in 1987 under the title "Our Common Future," which is "a development that meets the needs of today's generation without destroying the ability of future generations to meet their needs." Most definitions of sustainable development have had their

Table 1: Results of studies on sustainability education

Foreign studies			
Scope	Title	Format	(Authors (year)
Discussing that how universities can make a significant contribution to a more sustainable future	Sustainability Education: Perspectives and Practice Across Higher Education	Book	Sterling. (2010)
Introducing the latest findings of projects focusing on teaching education for sustainable development at universities	Teaching Education for Sustainable Development at University Level	Book	Leal Filho & Pace (2016)
Demonstrating how to use a new sustainable performance simulation tool called Easy Approach for Sustainable and Environmental Design (EASED) to architecture students	Teaching sustainable design in architecture education: Critical review of Easy Approach for Sustainable and Environmental Design (EASED)	Article	De Gaulmyn & Dupre (2019)
Describing how different architectural programs implement sustainability education within their respective curricula	Understanding students' perception of sustainability in architecture education: A comparison among universities in three different continents	Article	Boarin et al. (2020)
Investigating how entrepreneurial competencies can be taught in sustainability education programs in higher education	Bringing an entrepreneurial focus to sustainability education: A teaching framework based on content analysis	Article	Hermann & Bonzanini Bossle (2020)
Domestic studies			
Scope	Title	Format	Authors (year)
Investigation of the importance and position of sustainability courses and comparative comparison of courses approved by the Ministry of Science of Iran with those of three successful universities abroad in terms of sustainability education	Investigating the status and importance of sustainability courses in architecture at the undergraduate level	Article	Ahmadi et al. (2016)
Identifying the factors and criteria of sustainability of higher education institutions and assessing the sustainability of the University of Tehran	Presenting an operational model of sustainability assessment of higher education institutions: A case study of the University of Tehran	Article	Malekinia et al. (2016)
Analyzing the effect of education, especially environmental education, on sustainable development from an investment perspective according to World Bank standards	Analyzing the role of investment in education to achieve sustainable development with particular emphasis on environmental education	Article	Ghaffari et al. (2016)
Reviewing the concept of sustainable development with a critical approach and studying the concept of sustainable education based on the sustainability model	Sustainable University: Prerequisites for achieving sustainable education	Article	Hamzeh Robati et al. (2017)
Identifying the components of sustainable education in higher education institutions	Sustainable education analysis based on AHP model in higher education: Combined research	Article	Hamzeh Robati et al. (2018)
Investigating the reason for teaching the principles of sustainable architecture to children in the primary education system through school architecture	Teaching concepts related to sustainable architecture in the primary education system by highlighting them in school architecture	Article	Haghparast & Soroush (2019)

critics, proponents, and opponents. However, the focus of all of them has been on paying attention to the next generations, the future of the environment, and the protection of the global environment. Sustainable development pursues the following main goals:

Meeting the basic needs of humans;
 Improving the standard of living for all;
 Preserving and managing the biological systems (ecosystems) for a more secure future;
 Paying attention to the habitat of organisms;
 Providing tools and intellectual and technological facilities (Mofidi Shemirani & Moztarzadeh, 2014).

Education and Its Role in Sustainable Development

After the 1992 conference, the sustainable development perspective took on a broader dimension, and "Sustainable Extension" revised old views in all areas of development, making significant changes in the levels of planning, design, processes, and specialized development sectors such as civil engineering, industry, agriculture, and education (Maknoon, 2001).

Education is among the most effective components affecting the sustainable development of any country. The main idea of Education for Sustainable Development (ESD) is to implement programs that are locally relevant and culturally

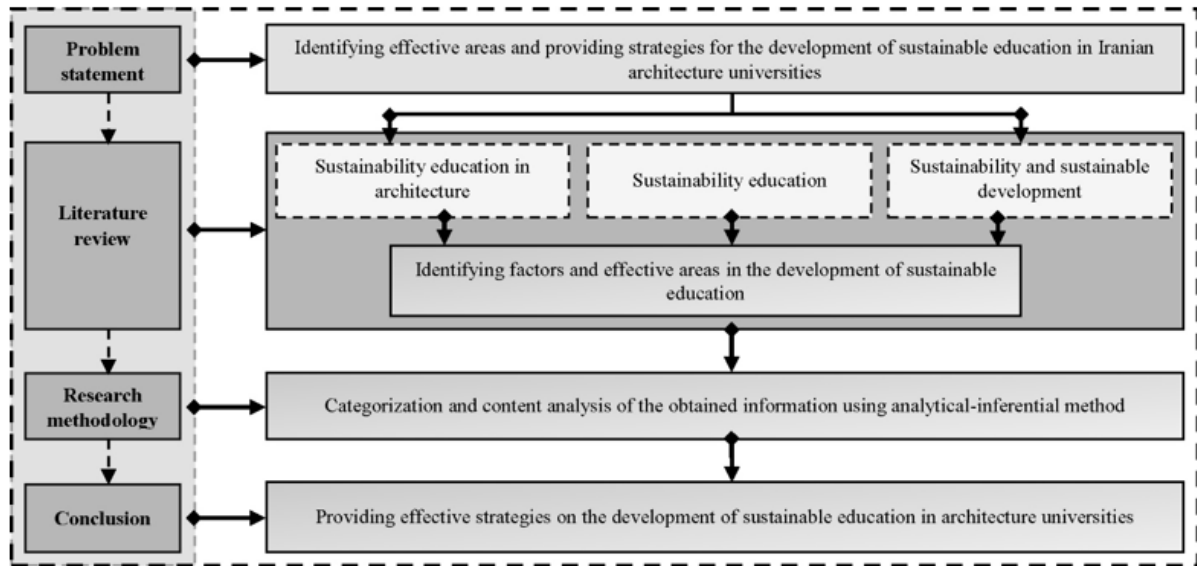


Fig. 1: Research process

appropriate, and its primary origin can be attributed to the intergovernmental conference organized by UNESCO in 1968 aiming at reconciling the environment and development, which led to the development of the human and biosphere program. This conference took an essential step towards holding the Human Environment Congress in Stockholm in 1972. The outcome of this conference was the development of the United Nations Environment Program, in which education for environmental protection was a part of its activity (UNESCO, 2015). Following the effectiveness of environmental education programs, ESD was first included in Chapter 36 of Agenda 21. This chapter identifies four components to get started: improving primary education, reviewing the existing education to address sustainable development, promoting public understanding and awareness, and training skills (Bureau of Public Information, n.d.). The United Nations declared 2005 to 2013 the "Decade of Education for Sustainable Development" and stated that sustainable education for sustainable communities is achieved through proper education (Ghaffari et al., 2016). The Decade of Sustainable Development allows everyone to benefit from education and learn the values, behaviors, and lifestyles necessary for a sustainable future and cause positive social change. The ultimate goal of this decade was to integrate the principles, values, and practices of sustainable development into all aspects of education and learning. One of the essential measures to achieve this goal is to understand and demonstrate sustainability issues, such as poverty, hunger, AIDS, and environmental degradation that have affected countries, communities, and individuals. In addition to developing,

understanding, and respecting their values, the values of society and other parts of the world are also crucial for the decade of education, in a way that it is known how local actions play a role in the global transformation towards sustainable development (UNESCO, 2015).

Given the importance of education in achieving sustainable development, many experts and researchers have paid attention to "sustainability education" and provided several opinions in this regard (Table 2).

With an overview of the opinions provided by experts, it can be said that education is the most effective mechanism of society to deal with the biggest problem of the century, i.e., sustainable development. Sustainable development requires holistic, systemic thinking, interdisciplinary insights, and knowledgeable, creative, and participatory people. Production of qualified human resources requires education development, which is among the critical issues of sustainable development (Musaei & Ahmadzadeh, 2009).

Development of Sustainability Education in Architecture

Architecture deals with the design and construction of the environment. Every decision in this regard has different environmental consequences in the long term. All efforts should be based on sustainable thinking (Khatami & Fallah, 2010). Given the particular importance and sensitivity of sustainability education in architecture, several international and national meetings have been held in developed countries, and numerous statements have been issued since the 1990s. In the global statement of the Talaris Summit, 215 heads of

Table 2: The role of education in the development of sustainability from the theorists' point of view

The role of education in the development of sustainability	Theorists
<p>Comments & views</p> <ul style="list-style-type: none"> - Moving from the current level of education to future educational methods (sustainable education) 	
<ul style="list-style-type: none"> - Modernizing educational policies and creating symmetry and integration between systematic and ecological ideas in order to move towards sustainable education and achieve it 	Greco & Ipina (2014)
<ul style="list-style-type: none"> - Sustainability means the challenge of learning to live differently. 	
<ul style="list-style-type: none"> - Consider educating young people to pay more attention to the needs of future generations and protect the planet more. 	Matsuura (2007)
<ul style="list-style-type: none"> - Education for sustainability means linking learning with social, economic, cultural, and environmental dimensions. 	
<ul style="list-style-type: none"> - Increasing students' acceptance through sustainable education concerning the complexities of life in conditions with limited resources. 	Greco & Ipina (2014)
<p>Achieving sustainability requires changing people's thinking and behavior and transitioning to lifestyle, consumption, and sustainable production patterns.</p>	
<ul style="list-style-type: none"> - Changing the ways of thinking and behavioral patterns of society to achieve sustainability by combining and incorporating the principles and concepts of sustainability in educational programs. 	Teodoreanu (2013)
<ul style="list-style-type: none"> - Institutionalizing ideas, concepts, values, and global aspirations of sustainability in research activities, curriculum, university campus management, university leadership, and relations with the indigenous community through educational tools in sustainable universities. 	
<ul style="list-style-type: none"> - Changing and promoting human rights and dignity, eradicating poverty and developing sustainability, creating a better future, equality and social justice, respect for cultural diversity and international solidarity, and shared responsibility through educational tools 	UNESCO (2015)

universities and higher education institutions from 42 world charters emphasized the need to establish sustainable thinking in the higher education system and specialized disciplines. At the 1993 World Congress of Architects in Chicago, the need to pay attention to sustainability in architectural education was emphasized.

Another instance is the Michigan University of Architecture and Urban Planning research project, which was carried out in collaboration with the National Center for Pollution Control in 1998. In the United States, energy education became a significant part of the architecture education curriculum in the 1970s, and issues related to sustainability thinking, besides energy issues, became a part of the American school curriculum in the 1990s. Today, prestigious universities attempt to put the knowledge produced in this field into practice as much as possible. On the other hand, other methods of international monitoring have not made good progress in targeting the construction and development of cities and industries, and perhaps better results will be achieved if designers and builders are sustainability monitors (Khatami & Fallah, 2010).

Until the early 1980s, the dominant paradigm of the world community was the growth paradigm that influenced all economic and social approaches, and higher education systems and approaches were no exception to this rule. Research and education, especially in universities, have primarily focused

on knowledge and expertise in a specific field and have been formed to promote economic growth. In education, structures, processes, teaching methods, educational contents, and assessment methods have been developed following this purpose. With the emergence of the sustainability paradigm and the change of our fundamental assumptions, higher education systems must adapt their structures to these conditions and make changes beyond minor curriculum or research on sustainability issues. These changes include a change in higher education management style, restructuring administrative and academic duties such as changing the market-industry-oriented research paradigm and providing a learning process whose skeleton is sustainability (Fadeeva & Mochizuki, 2010).

Government agencies, universities, professional organizations, manufacturing companies, and institutions all have different roles in realizing 21st-century engineering attitudes and programs. Universities can provide the necessary programs and guidelines for achieving sustainable development by establishing leading centers and strategic planning, which include:

Modification of university courses by combining the attitude of sustainable development with design and engineering courses;

Using universities as laboratories for sustainable development, such as the Green University;

Teaching concepts such as green auditing and evaluation, product life cycle evaluation, and green engineering management;

Waste based on minimum waste, appropriate models for engineering methods, predicting interdisciplinary courses, understanding the psychology of change to implement sustainable development in university curricula;

Development of permanent education activities of universities for graduates and former engineers to get acquainted with new concepts and attitudes of sustainable development (Forum for the future, n.d.).

In order to create new areas in architecture education and provide new educational methods based on the use of renewable energy and attention to environmental conditions and climate design, the courses "Regulating Environmental Conditions" at the undergraduate level and "Climate-Friendly Architecture" at the graduate level of architecture have been planned. These courses taught in theory and workshops in previous years are now taught only in theory. These courses are usually presented in theory without practical workshops and research examples; so, it is natural that their impact on students would not be so profound. Students often do not have enough information about energy and energy-related concepts such as recycling methods, design feedback, and analytical and simulation software in the energy consumption process. Due to the lack of using these items in the workplace, they have no motivation to be aware of them. Thus, students' inclination to these fields is not based on the needs of the market and society but personal interests. Therefore, when material and financial tendencies determine the students' desire for a particular field, students cannot be expected to present in the fields and sub-fields required by the country and have a purposeful impact on society with double motivation. However, a sense of responsibility has gradually attracted students to the issues of sustainable architecture (Hosseini et al., 2008).

Areas and Factors Influencing the Development of Sustainability Education

The goal of education for sustainable development is to integrate the principles, values, and practices of sustainable development in all aspects of education and learning (Woo et al., 2012). Achieving sustainable development by using educational tools, in the first step, requires identifying the areas and factors that play a role in the development of sustainability education. Therefore, according to the studies conducted on sustainability and sustainable development and sustainability education and its development, influential factors in sustainability education can be extracted as listed in Table 3.

According to Table 3, the factors affecting sustainable education development can be classified as three general areas (Fig. 2): society, educational system, and educational environment, each of which includes sub-categories as explained briefly in

the following (Fig. 3).

Society

In this research, society consists of people, designers, and builders, which are described as follows:

People: Education of environmental concepts and sustainable development should be institutionalized as behavior in individual and social actions of individuals, not as a method (Moharramnejad & Heidari, 2006). Society is the container for the formation of all civilized human activities, and its behavior affects the environment through its approach to society. Therefore, to achieve sustainable development goals, public education must have the following characteristics: cohesion, expansion at all levels of society, promoting a sense of responsibility, and public awareness.

Designers and Builders: Architects, designers, and builders have direct intervention in dealing with the environment and resources by constructing buildings and required spaces of human beings. Given the current status of buildings and cities in all countries, especially developing ones, the need to pay special attention to the structure of sustainability education in architecture is quite noticeable.

Educational Environment

The Physical Environment of Universities: A campus is an ideal place to experience new environmental design approaches and learn about environmental practices. Given the universities' mission to develop higher education and expand thinking and research following sustainable development, several issues, such as global warming, ozone depletion, and loss of environmental diversity, can be addressed on campuses and create a small world of related experiments. Demonstrating low-energy projects, providing equipment made of paper in buildings and the possibility of recycling, using new energy technologies, and ecological testing approaches in regional management provide learning opportunities. Universities can include environmental programs on their agenda in three ways: providing environmental education in undergraduate curricula; offering specialized environmental courses in postgraduate studies;

Introducing the concept of sustainability as a practical agenda in the organizational life of universities, including construction, transportation, landscape design, and use of consumables materials (Kriken, 2004).

Students and Teachers: As future policymakers and decision-makers, students must have the necessary qualifications to adapt to the complex challenges of environmental sustainability. In this regard, first, students must be familiar with environmental sustainability (knowledge and awareness); second, they must have the necessary skills to perform sustainable actions (skills); and third, they must have necessary personal and emotional characteristics for sustainable environmental performance in the environment (values/attitudes) (Rieckmann, 2012).

Table 3: Factors influencing the development of sustainability education

Areas affecting sustainability education		Source
Factors	Description	
People and social environment	Achieving public awareness of environmental resources, ethical principles, values, behaviors, and skills according to sustainable development and public participation in decision-making is essential, and coordination between executive management and city councils is crucial (Dias et al., 2004).	Hosseini et al. (2008)
	People can play an influential role in the design and policy-making process as students' social environment guides students' minds towards sustainable goals. We need to know that sustainable architecture, an essential part of the design and implementation process, requires public participation and decision-making (Martins et al., 2006).	
Educational method	In order to promote sustainable development, education must be provided in a general, continuous, and widespread manner at all levels of society and reciprocally increase social responsibility (Brady, 1996).	Musaei & Ahmadzadeh (2009)
Educational system	Introducing new educational methods based on renewable energy and attention to environmental conditions and climate design (Brady, 1996).	
Students	If the sustainability concepts at different levels of society are adequately taught, their effects on students' thinking and understanding will appear.	
People	Investing in development education and producing human beings with scientific, skill-oriented, changeable, systemic, and researching characters allows for expanding the development process in all dimensions of society, educating the people of the society as the main factors of development in the best way, and improving the quantity and quality of society (Musaei & Ahmadzadeh, 2009).	Musaei & Ahmadzadeh (2009)
Builders	Training the engineers in the 21 st century following sustainable development goals can play an influential role in improving their vision and applying sustainability principles in their lives and professional activities (Alavimoghadam et al., 2008).	Alavimoghadam et al. (2008)
University and higher education system	An essential responsibility of universities is to provide a suitable environment for sustainable education and research. Many activities to improve the level of education and research following the goals of environment and sustainable development are being carried out in various universities around the world, whose short-term and long-term strategies are generally referred to as the Green University program (Green Campus Initiatives, n.d.; Environmental Center, n.d.).	
University and higher education system	In sustainable education development, the role of education, especially the higher education and university system, is undeniable because the higher education system is responsible for training most of the people who form society's decision-making and professional bodies (Khatami & Fallah, 2010).	Khatami & Fallah (2010)
Designers and architects	For an architect to play a leading role in the realization of environmental considerations, on the one hand, his/her ethics and values must be based on sustainability. On the other hand, he/she must have knowledge and skills of sustainable design and construction (Khatami & Fallah, 2010).	
University and higher education system	Higher education represents an essential investment in human resources that contributes to sustainable development by providing and promoting learners' knowledge, skills, and attitudes (Sadeghi et al., 2010).	Sadeghi et al. (2010)
Educational environment	From the perspective of environmental psychology, and educational environment makes learning easy and enjoyable. Environmental factors (concerning physical environment) can influence the learning process in interaction with non-environmental parameters and contribute to or hinder education (Mortazavi, 2001).	Azemati & Bagheri (2008)
University & higher education system	Higher education in the era of sustainable development is one of the prominent social institutions to create the appropriate infrastructure for commitment and implement the concept of sustainable development and deal with environmental risks (Salehi & Pazoukinejad, 2014).	Salehi & Pazoukinejad (2014)
University & higher education system	The role of academic institutions in sustainability is significant and broad because the environmental, social, economic, and global crises are considered the first step among the values, ideas, views, and knowledge. Therefore, universities must disseminate sustainability principles through education, research, and communication with beneficiaries. Universities, thus, must act as an organization to integrate environmental and social sustainability, independent of global, national, and local communities (Mio, 2013).	Hamzeh Rabati et al. (2017)

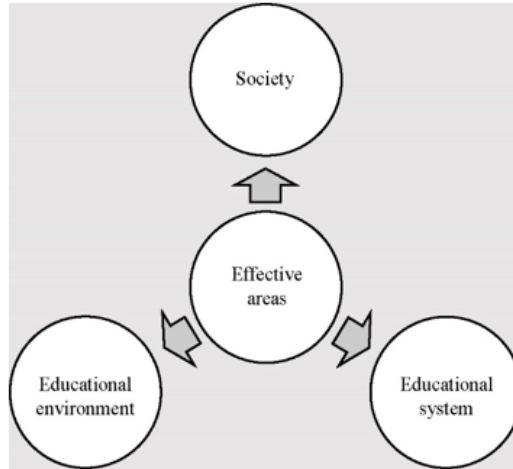


Fig. 2. Areas affecting sustainability education

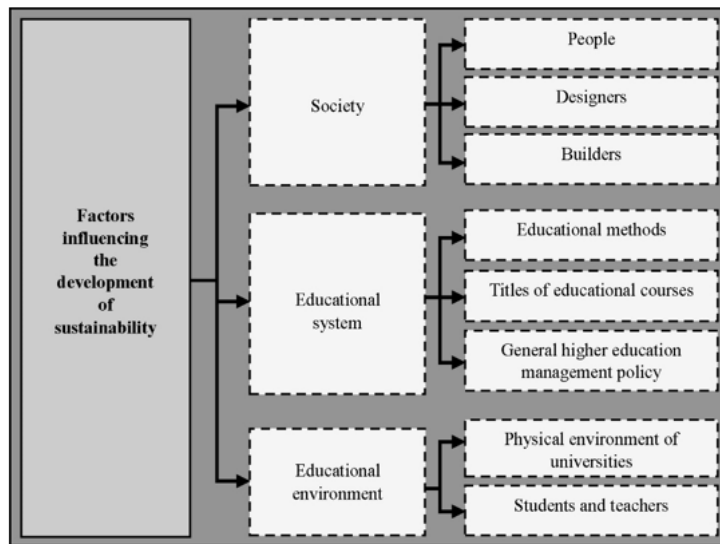


Fig. 3. Factors influencing the development of sustainability education

Teachers should also experience interdisciplinary and intradisciplinary perspectives and increase the learning level from the local to the global scale, since many environmental hazards, such as climate change and pollution, outweigh local issues (Woo et al., 2012).

Educational System

System of education involves indices that are explained as follows:

Educational Methods: The structure and goals of education are determined in educational planning. In sustainable architecture education, the content of the courses is a bridge connecting the construction sciences and design skills with social, economic, and environmental development. Architecture education

is a process in which people with general knowledge are transformed into skilled and expert individuals. In the role of architects, these people guide all practical factors in the complex design and implementation process, following the project goals and sustainable development (Memarian, 1992, 25).

Titles of Educational Courses: Two statements submitted by the Union of International Associations and the United Nations Educational, Scientific and Cultural Organization (UNESCO) advise architects to look for ways to achieve ecological sustainability. Environmental balanced and sustainable development of built environments have been known as the goals of architecture education. Since then, many architecture universities have added new courses based on technical aspects

of sustainability, such as "smart energy design" or "bioclimatic architecture" to their curricula (Stasinopoulos, 2005).

General Higher Education Management Policy: The first aspect of sustainability in higher education institutions in sustainability education. Regarding preserving the environment and ecosystems as pillars of a sustainable society, changing the values and focal worldviews affecting individuals and organizations is necessary. To this end, sustainability researchers must develop a new field of research to support the transition to a sustainable society with an emphasis on evolving the research (Dedeurwaerdere, 2013). The main question is what kind of education should be provided by higher education centers to help sustainability. In other words, what kind of education in higher education centers is under the category of sustainable education? The structure of "sustainable architecture education" can be classified as three levels (first level: three general concepts of comprehensiveness, integrity, and unity; second level: strategic tendencies of naturalism, holism, and contextualism, reliance on capability, and tendency

to basic patterns; third level: educational recommendations). The realization of this kind of education is expected to lead architecture students to a kind of internal and natural insight and tendency towards sustainability in architecture (Iranmanesh & Khajehpour, 2014).

RESULTS AND DISCUSSION

Rapid growth and development in all fields, regardless of current environmental conditions and resources, has confronted the world community with severe problems in the fields of environment, nature, climate, and energy resources. Although more attention has been paid to sustainability with the movements started several decades ago, the continuous movement of human life towards sustainability and sustainable development is still essential. In this regard, public and specialized education and participation have a very influential role.

According to the studies, the areas effective in sustainability education can be divided into three parts: society, educational

Table 4: Providing solutions for the development of sustainability education in architecture education

Area		Solutions	
1	Society	Continuous and extensive public education at all levels of society	Improving the level of knowledge and awareness of people and society regarding its sustainability, benefits, and principles
		Promoting a sense of responsibility and awareness in the people	
		Community participation in planning	
		Creating a suitable and purposeful cultural, social, and economic environment	
		Paying attention to the intrinsic and essential aspects of sustainability	
		Understanding the needs of the market and society	
2	Educational system	Planning the primary strategy of education based on naturalism, holism, contextualism; reliance on capability; tendency to basic patterns	Changing and modifying the educational system following sustainability and its principles
		Modifying the course titles with a sustainable development approach in theory and practice	
		Commitment and awareness of teachers to the principles of sustainability	
		Turning universities into laboratories for sustainable development - environmental education	
		Specialized courses in postgraduate education	
		Development of permanent educational activities of universities for graduates and engineers	
3	Educational environments	Effective communication with the academic and professional environment	- Observing the principles of sustainability in the construction of the physical environment of universities - Special attention of teachers and students to sustainability and its principles
		Human design	
		Saving the resources	
		Life cycle-based design	
		Promoting a sense of responsibility	
		Understanding the place of sustainability in personal interests	
Avoiding orientation without cognition based on a sense of diversity			

system, and educational environment." These areas affect each other directly and reciprocally. Only if an appropriate and harmonious consensus and orientation is formed in all of them can they significantly impact sustainability education in all specialties, especially architecture, by applying the proposed solutions. After identifying these areas, practical strategies for developing sustainability education in architecture education were extracted, as shown in Table 4.

CONCLUSION

This article introduces the community, system, and educational environment as functional areas in developing sustainability education for architecture students and offers solutions to achieve it. Sustainable architecture is an essential part of the design and implementation process that requires public participation and public decision-making. People can play an influential role in the design and policy-making process and lead the minds of the community towards sustainable goals. Therefore, familiarizing people and society with sustainability and its principles seems to be quite effective and necessary. Architecture education is a process in which people with an average level of knowledge are transformed into experts. In responsible architects, these people direct all the influential parameters in the complex design and construction process towards the project goals and realization of sustainable development. The university environment is also an ideal place to experience new approaches and environmental design and motivate exercises following sustainability and its principles. Environmental and non-environmental factors can also affect the learning process and aid or hinder learning. However, very little attention has been paid to sustainable architecture in Iranian architecture universities. Sustainable architecture and its principles are rarely seen or even not seen in the educational system and its environment. The planning and policies of the university should be such that an architecture student can use the concepts of sustainability and its principles correctly in creating the architectural work. Therefore, modifying and presenting new educational methods based on sustainability and its principles, renewable energy, environmental conditions, and climate design of universities in the educational system and its environment can be reasonable solutions for this issue.

According to the studies, it can be said that the research hypotheses have been proven and can be expressed as a theory. Research theories include the following:

Educational environments, educational systems, and community people are all effective in developing sustainability education during the study period of architecture students, which should not be ignored.

Improving society's public awareness and modifying the educational system and environment following sustainability and its principles are accepted as effective strategies in developing sustainability education in Iranian architecture universities.

Now, by identifying the areas affecting sustainability

education in Iranian architecture universities, the managers of educational affairs in universities are expected to take more effective steps to develop and promote sustainability education by changing the current method. It is hoped that this paper will be used as a basis for future research in sustainability education. It is recommended that other researchers present logical and workable solutions for sustainability education in Iranian architecture universities.

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