Designing a Sustainable Secondary Education Curriculum in Sustainable Development (With an Emphasis on the Objective Element)

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Abstract

The purpose of this study is to identify and design a sustainable secondary education curriculum in sustainable development and provide a desirable model. To carry out the present study, an exploratory sequential mixed method was utilized. In the qualitative stage, in order to identify the components of sustainable secondary education in sustainable development, a questionnaire was prepared and data were collected using semi-structured interviews with education specialists and experts. Also, the review of high-level documents, theoretical background, and previous research was done in a quite harmonized manner. In three stages, qualitative data coding, categories, and components of sustainable secondary education were obtained. Following the qualitative stage, i.e., in the quantitative stage, the final model was presented with the aim of implementing a questionnaire and confirming the components of sustainable secondary education in sustainable development. Finally, with the participation of 300 managers and experts, the electronic questionnaire was completed. Findings obtained in the quantitative part of the research were analyzed using statistical methods of factor analysis and structural equation modeling using SPSS21 and LISREL8.5 software. The results indicate that sustainable secondary education in sustainable development has 14 effective dimensions including environmental management, social sustainability, educational sustainability, political sustainability, participatory sustainability, institutional sustainability, developmental education, environmental sustainability, sustainable management, research sustainability, economic sustainability, sustainable monitoring and evaluation system, sustainable administrative and financial system and cultural sustainability.

Key Words: Sustainable Secondary Education, Sustainable Development, Model Design.

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Introduction

Nowadays, the focus on economic growth has led to the question of whether sustainable development has been of interest to humans in previous generations (Hummels & Argiro, 2021). One of the main challenges of the Iranian educational system is the integration of principles and concepts of sustainable development and its institutionalization in the educational system. Despite the efforts made to integrate the goals of sustainable development in the high-level documents, including development plans and the country's scientific program in terms of achieving global aspirations, which were expected to be pursued and reached by 2015, the results were not as expected. It seems that the majority of the environmental, economic, and social problems that we are facing today in the country indicate the need for a greater effort from the educational system at all educational levels in educating students familiar with and committed to implementing the goals of sustainable development in society.

Therefore, in order to achieve the ideals of sustainable development, the educational system, which is supposed to be a pioneer system, must be an excellent model for other organizations and institutions in integrating sustainability into their daily programs and activities. Thus, identifying the components of sustainable education in the education system is already felt. Sustainable development in education with increasing awareness of its role in promoting sustainable development has been a global issue in recent decades (Huaruo, Ling, Yonghui, Xiyuan & GAO, 2020). In addition, more missions and announcements related to the sustainable development of educational institutions are in response to the ongoing concerns of sustainability and guidance of institutions for sustainable development performance (Chan & et al, 2019). Sustainable education is an ongoing, continuous, and interactive learning process that develops problem-solving skills, scientific and social knowledge, and individual and collective responsibility in citizens. In fact, this is done in a way that internalizing concepts, leads to changing attitudes, beliefs, and values, and finally to change their behavior in society and the world.

Sustainable education generally involves intertwined sections. In other words, achieving sustainability through sustainable education requires the collective interaction of human society, which seems to require democracy and pluralistic society that can pave the way for social and environmental sustainability. The educational system plays a key role in transforming society into a sustainable society as it has the power to educate world leaders and empower them to conduct research activities with the goal of creating a sustainable future. The role of educational institutions, especially schools, in the field of sustainability is important and widespread; because the environmental, social, economic, and global

crises are the first steps in creating a crisis of values, ideas, views, and knowledge. In this case, there is a need for educational centers to develop and disseminate the principles of sustainability through education, research, and communication with beneficiaries. The goal is to increase and strengthen awareness, knowledge, ability, and values to establish a sustainable and equitable system based on educational freedom to express new ideas and seek up-to-date solutions to create a sustainable lifestyle. Secondary schools need to function as an organization to integrate environmental and social sustainability and be independent of global, national, and local communities (Mio, 2013). Also, the general belief in today's world is to pay more attention to investing in human resources compared to physical capital, due to longer life and less depreciation (Mahdavi, 2020). Sustainable schools empower children to live a sustainable life and teach them the skills and behaviors they need to be part of the solution to challenges such as climate change. As schools become stable, energy and water consumption and also financial costs are saved. Simultaneously, stability helps to improve students' health, physical and physical well-being and ensures their quality of life in the future. Schools are part of the community and their stability enables them to help the local community be a healthier, safer, and greener place to live. Expecting a sustainable society without sustainable schools is unlikely (Mobile, 2012). In the context of a green and sustainable school, three important human factors are school leaders, teachers, and students. Each of these groups contributes to the success of green school practices. The attitude of school leaders at the beginning of a new program towards a green and sustainable school is very decisive. Teachers are the ones who play an important role in carrying out green and sustainable school activities by connecting school leaders and students. In addition, students are at the core of these schools. Achieving a green and sustainable school will not be possible if students are reluctant to participate and have poor awareness of environmental protection (Poveda & Lipsett, 2014). Since the strategic plans of secondary education are in accordance with the document of the fundamental transformation of education and as in this document the areas of bio-education, physical education, economic and social education are mentioned and more importantly the three main pillars of sustainable development include environmental, economic and social sustainability, therefore secondary education must strive to integrate environmental, economic and social sustainability in all its activities. Secondary education, on the one hand, sends the forces needed by the university to the universities and, on the other hand, trains the labor market forces. Therefore, changing the knowledge, attitude, and skills of high school students based on economic, social, cultural, and biological education is necessary,

and based on this necessity; the present study was designed and implemented. The process of defining curriculum goals based on sustainable development, and setting curriculum goals or outcomes is the main and most difficult step in the curriculum planning process. Objectives play a key role in the curriculum because other stages and elements of the curriculum are based on planning and operational objectives. Goals should have characteristics such as flexibility, uncertainty, and coherence. Because the goals of the curriculum are always affected by the changing and unknown needs of society and will change in the short and long term, the above-mentioned features are necessary for explaining the goals of the curriculum. On the other hand, the curriculum is not only influenced by society but also the changing needs of the audience and the changing nature of the subject strongly influences the goals of the curriculum. Thus, the goal-setting process is a continuous process that continues based on the developments of society, learners, and knowledge (Maleki, 2004). In designing curriculum goals for achieving sustainable secondary education in sustainable development, it is necessary to observe the principle of paying attention to the development of multiple literacies in teachers and learners.

In today's world, pedagogy has a different meaning than in the past and is considered one of the main indicators of social welfare. Social welfare is not limited to material issues but includes a variety of educational, cultural, social, and political measures and services to meet the needs of individuals and groups in society (Vare & et al, 2019). Achieving social welfare depends on educating well-educated citizens. Having useful literacy and teaching useful literacy will create lifelong learners who will lead to the growth and excellence of society; therefore, without teaching multiple literacies, having an ideal society will not be possible. Therefore, the strategies of the country's educational system should be designed to promote multiple literacies of students.

Since the educational environment is subject to cultural, administrative, political, technological, and educational complexities (Swain et al, 2018), thus, to understand this environment, educators have no choice but to think deeply about their practice and experience so that they can play an active intervener in this environment (Saki, 2016). One of the components of creating sustainable secondary school education is the teacher (Krik & Terry, 2004; Duta et al., 2015; Silins, 2004; Hoerr, 2005; Leithwood et al., 2006; and Sousa and Rocha, 2019). Educators and teachers as valuable human resources are among the assets of the education organization in the knowledge-based economy (Belcourt et al., 2008).

Teachers and students need the kind of literacy that enables people to critically analyze technologies through the mass media, television, and film that shape everyday life. In today's world, literacy does not mean the

ability to read and write, but in a knowledge-based society, the word literacy is often used instead of balance and empowerment. (Ghafarian & Habib, 2012). In today's world, there is literacy, and literacy is not limited to one area or field. The mission of the educational system is to train persons that can be capable in a competitive and complex world. Therefore, it is necessary to pay attention to literacy related to the mission of education (Hashemi & Khazaei, 2013).

Students of the Information age need to learn how to decode and think about information instead of accumulating it. From the American Library Association's perspective on information literacy, what learners and individuals seek is information planning. However, the reconstruction of the learning process based on available information sources is done to learn and solve problems throughout the life of individuals, which not only increases the critical thinking skills of learners but also empowers learners in lifelong learning and performance improvement. According to Ford (1995), the connection between information literacy and learning is undeniable, and information literacy should be part of the learners' personal experience. Therefore, information literacy is the main and effective element of lifelong learning and includes library literacy, research literacy, and thinking and critical skills (Mohammadi Mehr & Vajargah, 2010). Although experts have not considered information literacy in determining the dimensions of sustainable education, addressing information literacy in sustainable education is undeniable. Media literacy, which is one of the components of information literacy, is also effective in realizing the idea of sustainable education. Media literacy is the skill of decoding information, analyzing it, evaluating data, and making connections between data and information. Media literacy also includes the set of essential skills and knowledge required to use a variety of media, such as the ability to use images, sound, etc. (Webster, 2003; Manouchehri, & Farahani, 2016).

To move in today's complex media environment, one must be able to better understand the complex messages contained in the content of television, mobile (Telegram, Instagram), radio, newspapers, magazines, books, billboards, the Internet, and other independent media (Mingoia, 2019) Students can create their media and take an active part in shaping the media culture, which allows people to get out of the consumer mode and use the media intelligently. The goal of media literacy in school is to give students the power to control media programs. In our educational system and given the intelligence of schools and given that the world of information technology has strongly influenced educational issues. The goals of media literacy education such as informing and reducing the negative impact of the media on the general public and especially students are necessary (Hosseini & Farajollahi, 2010). Therefore, the principle of cultivating multiple

literacies in the teacher and learner is necessary to realize the idea of education. Multiple literacies are required to transform

Studies show the importance of sustainable secondary education in development. (Birjandi, Shoberi & Larijani, 2017). Vaziri Aghdam et al. (2016) Vaziri Aghdam et al. (2015) presented a curriculum model based on sustainable development from the perspective of the Holy Quran. The results of their studies indicate that the components of freedom, choice, and decision-making, wisdom, lawfulness, critical thinking, responsibility, environment, and culture of peace are among the components of the curriculum based on sustainable development. Results of Home and Barry Studies, (2015); Holm et al. (2015); Sabrin et al. (2014) also show these seven components.

Research questions

1- What are the features of sustainable secondary education curriculum in sustainable development?

2- What is the appropriate model with sustainable development in the secondary education curriculum?

Methodology

The main purpose of this study was to identify the components of sustainable secondary education in sustainable development and design an appropriate model. To this end, a new method of research methods or the third methodological movement, called mixed research, has been used. Since each model must be compatible with the unique social and cultural structure of each community, it was necessary to compile the required quantitative data based on the qualitative data of the research phase. According to Planoclark and Crowell (2007), none of the quantitative and qualitative methods alone can be as effective as the combination of quantitative and qualitative methods. Of the four main designs of hybrid methods, which are: triangulation design, embedded design, explanatory design, and exploratory design, exploratory design has been selected for this dissertation?

This research was based on the purpose of applied research and in terms of the data collection method as a mixed research method. In this research, both qualitative and quantitative methods have been used consecutively and with equal importance through the method of data connection. In the qualitative part of the research, the method of grounded theory has been used, including semi-structured exploratory interviews, observation, note-taking, review of documents, review of theoretical frameworks, review of national and international experiences, and review of research dissertations.

Then, the data obtained from these sources were converted into textual data and the data were unified and categorized. In this stage, open coding was performed with full accuracy and the primary concepts were derived from the data obtained in the secondary or centralized coding, the common concepts were placed in one category. The

obtained categories were compared and discussed and their dimensions were identified. After that, by writing the storyline, the semantic and logical relationship between the categories was expressed. In the selective coding stage, the nuclear category was determined, and at the end, in the form of contextual interactive dimensions, and consequential process, a paradigm model was presented. In general, based on the findings of the qualitative stage of the research, economic, social, and cultural characteristics, as well as the system of specific values of secondary education in Iran, a draft model of sustainable schools was designed. After preparing, compiling, and designing the model, its face and content validity were examined using the views of education experts and the university.

Research findings

Table 2 - Dimensions and categories of sustainable secondary education

Row	Dimensions	Components
1	Environmental education	Environmental literacy
		Waste management and green purchasing
		Physical principles and considerations in the design and construction of green schools
		Clean transportation system
		Foodstuffs
		Procurement management and purchase of facilities
		Energy management training
2	Sustainable social dimension	Considering the production of welfare and social capital
		Citizenship education
		Participation
3	Sustainable education system	Formal education
		Informal education
		Learning
4	Sustainable political development	Social homogeneity (social justice)
		Structural justice
		Respect for citizenship rights
		Environmental justice
5	Participants	Students, principals, counselors and other staff involved in education
		Stakeholders, relevant persons, and influential individuals
6	Sustainable institutional development	Paying attention to indigenous and institutional knowledge
		Paying attention to sustainable communication resources and sustainable communications
		Internal group integration
		interactive-institutional learning
		Continuous and consistent learning
		Experiential learning
7	Developmental education	Attention to learning and application of interdisciplinary approach
		Paying attention to critical thinking

		Service-oriented learning program
		Institutionalizing change and innovation
		Cognitive skills training
		Decision making skills training
		Self-monitoring skills training
		Creating a research spirit
		Incorporating the concepts of sustainability
8	Environmental quality	Optimal energy consumption
		Garbage and wastage
		Transportation
		Land use and the environment
		Pollution
		Sustainable body design
		Internal health
9	Sustainable management system	Having a strategic plan and operational profile
		Participating and consulting with individuals and institutions
		Having social responsibility and accountability
10	Sustainable research system	Design and Implementation
		Financial and moral support
		Observance of regulations
11	Economic sustainability	Economic literacy training
		Investment security
		Employment and income generation
12	Monitoring and reporting system	Monitoring and Evaluation
		Reporting and Accountability
13	Stable administrative and financial system	Administrative
		Financial
		Productivity and innovation

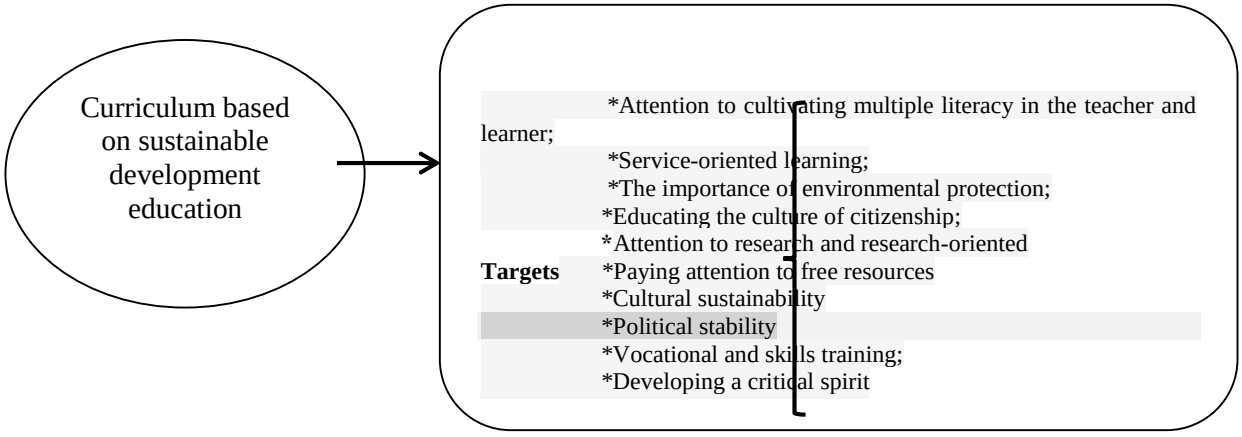

Figure 2 - Curriculum model (with emphasis on purpose)

If secondary schools want their students to learn the concepts of sustainable education, it is necessary to identify teaching methods that are suitable for the goals of sustainable education and to investigate the role of teachers and trainers in the implementation of these methods and what obstacles and problems they face. Are and how can these problems be solved?

In the explanation of the mentioned model, the curriculum based on sustainable development education will provide beneficial literacy and lifelong useful literacy education, which will lead to the growth and excellence of the society; therefore, without teaching multiple literacies, it will not be possible to have an ideal society. Therefore, the strategies of the country's education system should be designed in line with the promotion of students' multiple literacy such as cultural, social, political literacy, information literacy, media literacy and verbal literacy. the sustainable development of something that has led to the formation of a positive attitude in students and students, the integration of theory and practice, the development of communication and professional skills, as well as the increase of their social responsibility, thinking and empowerment, is service-oriented learning that can Be used as an experiential learning method. Sustainable education and sustainable development should be in accordance with the conditions of ecology, environment: Non-degradation of the environment, biological diversity, the centrality of human health and its dependence on the preservation of animal and plant species, environmental issues and problems of the local and national society, the processes in nature and the laws governing them, as well as the changes made as a result of advances Industrialization and human interference, matching the courses of environmental disciplines with values based on scientific thinking, efficiency in the use of resources and less pollution, paying attention to the teaching of alternative clean and renewable energies are some of these things.

Table 2 - KMO and Bartlett test results

Variable name	KMO Value	Bartlett value	Degrees of freedom	P<0/001
Curriculum Objectives	0.918	3406.720	210	0.001

In performing factor analysis, confirmation must be ensured as to whether or not the available data can be used for analysis. in other words; is the number of data required for factor analysis appropriate or not? To this end, the KMO index and Bartlett test were used.

Table3-Specific values of the factors for the curriculum objectives

Factors	Initial Values			Total sum of squares		
	Total	Percentage of variance explained	The cumulative percentage	Total	Percentage of variance explained	The cumulative percentage
	7.587	36.128	36.128	.587	6.128	36.128
	2.362	1.247	47.376	.362	1.247	47.376
	1.106	.268	52.644	.106	.268	52.644
	1.037	.940	57.584	.037	.940	57.584
	.877	.177	61.762			
	.813	.871	65.632			
	.752	.581	69.213			
	.712	.392	72.605			
	.675	.213	75.818			
0	.615	.929	78.747			
1	.580	.761	81.508			
2	.537	.556	84.064			
3	.509	.422	86.486			
4	.447	.130	88.616			
5	.418	.989	90.605			
6	.407	.939	92.545			
7	.366	.743	94.288			
8	.352	.678	95.966			
9	.315	.501	97.466			
0	.271	.288	98.755			
1	.261	.245	100.000			

Table 3 also shows the specific values of the factors for the curriculum objectives variable. According to this table, the first 3 factors explain 54.3% of the total variance, which indicates the high percentage of variance explained by these factors.

Confirmatory factor analysis of curriculum objectives

In order to evaluate the validity of the questions (structure) of this research in the quantitative part, confirmatory factor analysis was used. In conducting confirmatory factor analysis, it must be ensured whether the available data can be used for the analysis or not. In other words; Is the amount of data suitable for factor analysis or not?

Based on what was presented in the measurement models for the curriculum objectives; it is observed that all items of this variable are suitable for examining the desired dimensions in both standard and significant modes. All items have a factor load greater than 0.3 and a significance coefficient greater than 1.96 and have sufficient validity.

Table 4- Indicators of fit model analysis of curriculum objectives

Value	Acceptable domain	Model fit indicators
457/21	–	X^2
134	–	Df
3/41	≤5–3	X2/df
0/079	≤ 0/08	RMSEA
0/90	≥ 0/80	GFI
0/82	≥ 0/80	AGFI
0/95	≥0 /90	NFI
0/97	≥0 /90	CFI
0/7	≥0 /90	IFI

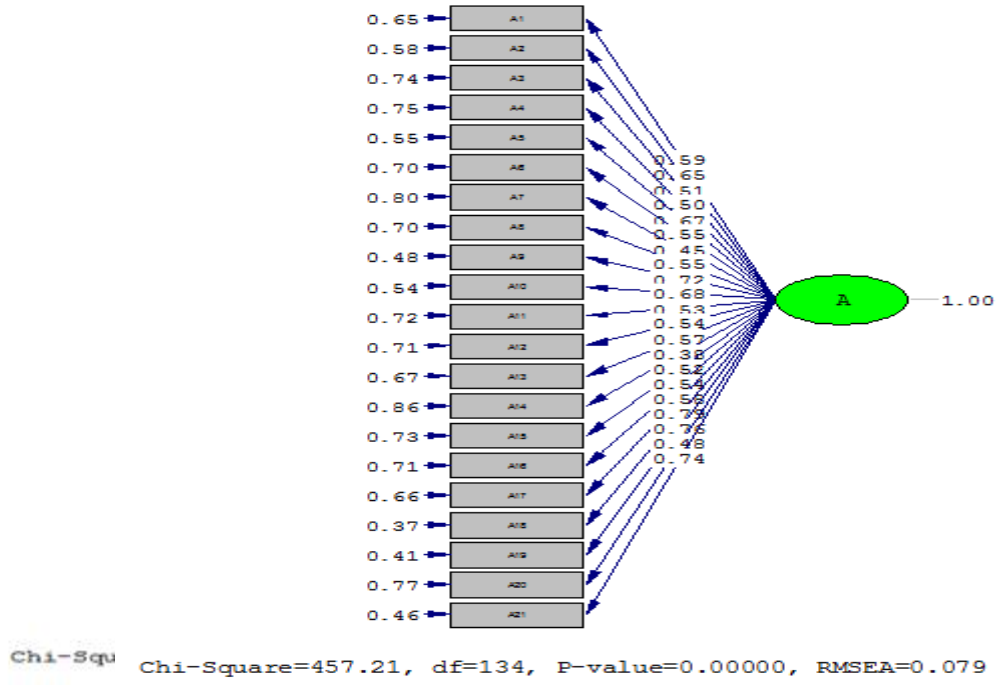

Figure 4-Confirmatory factor analysis of curriculum objectives in both standard and significant modes

Conclusion

The results obtained from the research findings indicate that sustainable secondary education in sustainable development has characteristics that can be expressed in 13 general dimensions. These dimensions and components are environmental management; sustainable social development, sustainable educational development, sustainable development of participants; Sustainable institutional development, development education, sustainable political development, sustainable environmental quality, sustainable management, sustainable research system, sustainable economic development, comprehensive assessment system; stable administrative and financial system; cooperation and dialogue of stakeholders; sustainable management and planning and sustainable research and innovation, sustainable evaluation and reporting, sustainable administration and finance; cultural stability and 58 components.

Among these, the environmental management dimension has six components (environmental literacy, waste management, green purchasing, physical principles and design, clean transportation system, logistics management and purchasing facilities, and energy management training). The social dimension of sustainable education includes three components (production, welfare, and social capital, citizenship culture education, and participation). The dimension of sustainable education includes three components (formal education, non-formal education, and learning). Sustainable institutional development includes seven components (institutional knowledge; sustainable communication resources, sustainable group integration, interactive-institutional learning, experiential learning, continuous learning and physical institutional sustainability) with three components of sustainable education and learning (formal education, non-formal education and learning); dimensions of stakeholder participation, cooperation and discourse have three components (intra-organizational participation; extra-organizational development and cooperation; discourse and communication); sustainable management and planning dimension has two components (governance and management; strategic plan); sustainable research and innovation dimension with two components (design and implementation; financial and moral support) sustainable evaluation and reporting dimension with two components (monitoring and evaluation; reporting and accountability) sustainable administrative and financial dimension with two components ((Administrative and financial) and cultural sustainability dimension has four components (promotion of cultural values; development of cultural capital; protection and support; cultural activity). The results of this study are in line with the results shown in the models of Schreiberg (2002), Valaquez et al. (2006),

Nego et al. (2008), and Calder Wasmith (2009), Jarin et al. (2010), academic leaders for a sustainable future (2014), Faqihi Mani (2012), Kamal and Asmos (2013), Sarma (2011), Mifsad (2012), Yarim and Tanaka (2012), Ganavan et al. (2012), Little Dyke et al. (2013), Collins (2017), Sinaco et al. (2018), Alti Sinaco et al. (2018¬), Yanadluha and Silva (2018); Shaw et al. (2019), Cheng (2019), Zeidani and Elix (2020), Rao and Sinha (2020), Tag et al. (2020) Marandi (2002), Irvani (2006), Taghieh et al. (2011), Dadfar (2012), Sadeghi (2012), Soleimanpour Omran (2013), Shobiri (2013), Bayat et al. (2013), Amini and Mashallah (2014), Malekinia (2014), Shobiri (2015), Saleh et al. 2015), Pourmasoom et al. (2017), Birjandi et al. (2017), Mahmoudi (2019), Asadzadeh et al. (2020).

The results of this study showed that sustainable secondary education includes the following 14 dimensions: environmental management; social stability; cultural stability; institutional sustainability, sustainable education, and learning; political stability, participation, cooperation, and stakeholder discourse; sustainable administrative and financial; developmental education, environmental quality, sustainable research and innovation; sustainable management and planning; and sustainable evaluation and reporting. According to the results of this study, the following practical suggestions based on each of the dimensions obtained, are provided to those involved in the educational system for the realization of sustainable schools. As far as environmental management is concerned, the production and consumption of renewable and clean energy (such as the production of energy from solar panels) in the country's secondary schools are highly recommended. Saving energy in the following ways is also recommended: designing eco-friendly school buildings, and sustainable and green architecture so that for heating, cooling and lighting, there is almost no need for fossil fuels such as gas, diesel, and electricity; equipping classroom spaces, conference halls, offices and corridors, and open space lamps with sensors and LED lamps for lighting; carrying out voluntary energy reduction programs for students, faculty, and staff, such as: turning off computers when not in use, turning off lights when leaving the room, and managing equipment and devices when not in use; and using natural light as much as possible, developing and following instructions and procedures to save water, energy, paper, and other materials.

In terms of social sustainability, the following are suggested: increasing trust, cooperation, empathy, and sense of responsibility among students and staff, teaching human ethics, teaching the ten skills of social life, and teaching the human condition (relationship between the individual and society and their interaction with each other, democracy), improving the mental dimension of quality of life (satisfaction and vitality of life), improving the objective

dimension of quality of life (access to quality resources and services), expanding social networks with the aim of strengthening cooperation and relationships between individuals, participation in NGOs and social associations. In terms of cultural sustainability, the following should be suggested: promoting and observing cultural diversity and intercultural dialogue with mutual respect and understanding, strengthening the sense of place and belonging to the land and local, national, and religious identity between students and staff, promoting cultural values and promoting an inclusive, justice-oriented and peace-based student community; paying attention to and protection of culture as the key to development in four areas (peace and security, social development, economic development, and environmental sustainability), protection and development of material culture (history of art, archeology, folklore and literature, museums and historical monuments, protection, and development of spiritual culture (language, performing arts, customs, handicraft production skills), support of cultural industries (production of local music and documentaries, design and manufacture of handicrafts and cultural tourism).

In terms of sustainable education and learning, it is recommended: to teach "living green" skills in the form of curricula, apply effective learning approaches in educating students that will increase their job ability in the job market, compiling curriculum content related to sustainability courses that can be offered in high schools in the country and including sustainable development curriculum in the curriculum of all fields of study and school courses to increase the sustainability literacy and environmental literacy of students. In terms of participation, cooperation, and dialogue of stakeholders, the following are suggested: involving students and teachers in developing school curricula; active participation in the development of the local community and organizing educational and research programs based on land management; close cooperation of schools with the regional water and electricity company to reduce water and electricity consumption, sharing the experiences of students and teachers about the implementation of sustainable development, encouraging students to conduct group research on the practical and applied dimensions of sustainable development and ultimately to create the conditions for students' voluntary participation in sustainable activities.

In the end, the content of curricula should always be reviewed and given the needs of society and the latest scientific achievements around the world provide opportunities for the growth and flourishing of talents and the development of attitudes and values. (Shahbazi, et al, 2020).

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