

Investigating the position of components of sustainable development in experimental science course of Elementary Schools of Iran and presenting an optimum framework and its validation

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Abstract

Purpose: This study is investigating the position of components of sustainable development in experimental science course of Elementary Schools of Iran and presenting an optimum framework and its validation. **Methodology:** The statistical population is a group of monitoring experts on the components of sustainable development as well as a set of experimental science textbooks in sixth grade of elementary schools of Iran during the academic year of 2016-2017. The sample size according to Morgan's sampling table in expert group was 80 and 12 volumes of textbooks sets, including teacher guides. The sample size in the group of experts was 80 according to Morgan's sampling table and 12 volumes in the collection of textbooks, including teacher guides. **Findings:** The results of the research indicate that the amount of emphasis on the component of the consumption pattern was 5.24% in objectives, 5.86% in educational content, 6.05% in teaching method and 6.69% in assessment. In the waste disposal component, the emphasis is: 4.1% in objectives, 2.15 % in educational content, 2.78% in teaching method and 5.1% in assessment. In the component of animal conservation, the emphasis is: 15.68 % in objectives, 18.03 % in educational content, 9.4 % in teaching method and 9.39 % in assessment. In the energy component, the emphasis is: 12.29 % in objectives, 14.59 % in educational content, 14.66 % in teaching method and 13.25 % in assessment. **Discussion:** In sum, the amount of emphasis of the curriculum of the experimental science course of Elementary Schools was in middle level compared to the six components of sustainable development, and needs to be reviewed.

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1. Introduction

Nowadays, Sustainable development is one of the significant protocols in the international arena (United Nations, 2016). It is believed that implementing this protocol could lead to poverty reduction, welfare and participation in human societies. (Calope, 2016). The concept of sustainable development has a wide range in a way that includes the government, environment, institutions, technology, economics and human perception. (Decry, 2015). Human capital as well as educational system have a special place in sustainable development (Pao, 2015). Implementing projects such as the Green School, the consumption pattern has been one of the practical measures for sustainable development in different countries (Environmental Education Foundation, 2012). Environmental behaviors have been considered in many institutions, organizations and schools in pursuit of sustainable development. (Enzo & Widemann, 2010). Expansion of green space, waste reduction, and reducing energy consumption are other operational programs of active institutions in this field (Hanifa, 2001). It is interesting to note that these practices have led to a decrease in waste production in some schools (Mahoi, 2011). Education curriculum, especially experimental sciences, is a good opportunity for sustainable development education. (Mashallahinejad, 2015). Now in Iran, in the curriculum of experimental sciences, attention has been paid to the components of sustainable development in order to strengthen human capital (Hosseinpour, 2014). The National Education Program document also addresses the concept of the environment and sustainable development (Mousavi, 2014). However, it is a question of what measures should have been taken for each of the components of sustainable development in the curriculum of education.

There are different perspectives on sustainable development. One view is that "development axes" should be considered in a balanced way. These axes are: government, industry, knowledge, ethics, environment, education, communications (UN, 2016, p. 4). The second view focuses on "sustainable development indicators." These indicators are: social capital, human capital, environmental capital. Education in this perspective, is in the sphere of human capital, and education is defined as an investment and a grade in sustainable development (Gallup, 2016, p. 3). Each of the three capital indicators includes the elements that are considered in education and adult education. The problem is that the components of the optimal sustainable development of the elementary period are not codified. The first objective in the present study is to identify these components for experts, and then the experimental science of elementary curriculum is based on these components is examined. One of the concepts that has attracted educational attention in the last decade is sustainable development. This educational concept is internationally conveyed through congresses, as well as the setting protocols to other countries. The purpose of sustainable development in the experimental science curriculum for elementary school is getting familiar with the consumption pattern, environmental protection, waste disposal and environmental understanding of water, air, soil, natural resources, and conservation of living organisms, contaminants and nutrition (Mosaei, 2009, P. 212). On the other hand, due to the broader subscales of sustainable development and other educational necessities in educational system, the components of sustainable development has been neglected in the design of curricula (Andarz, 2015, p. 59).

This lack of attention has been evident in the reports of educational systems at international congresses. At the same time, national and global imperatives require countries to develop sufficiently in developing curricula for components of sustainable development. Accordingly, the fundamental document of education addresses the components of sustainable development (Mohammadian, 2015, p. 40). These cases show that the foundations of primary education are

linked to the future of the economic, social and environmental life of graduates who also become the future citizens (Darabi, 2012, p. 119).

Essentially, designing the learning curricula, the teaching-learning activity is considered in order to make the desired changes in learner behaviour and assess the extent to which these changes are realized (Mashayekh, 2004, p. 9). In the curriculum of students' needs, the social, national, and global needs and values prevailing among students are taken into account so that learners will be covered by the formal educational system of internal and external effectiveness. This is why educational time periods undergoes changes (Mashayekh, 2004, p. 10). The issue that the elementary school like experimental science curricula to what extent has been studied and sustainable development components have been addressed is studied here. But the concept of sustainable development with which components and scales in Iran has attracted the attention of the educational system, is another issue that is followed in this study. Several studies have been conducted in this area, which their findings are summarized here. In education, training of human resources should be done with regard to the components of sustainable development (Navidadham, 2012, p. 18).

The economies of the countries are in line with improving the quality of manpower. Therefore, the training of human resources in education is decisive (Loghmannia, 2010, p. 27). Human capital is said to be graduates with sustainability indicators (Darabi, 2012, p. 107). Effective and efficient graduates in society even have a greater role to play in the material capital and artificial production in each country (Jahanian, 2012, p. 47). These findings suggest that graduates of the elementary school, both at the national level and facing global approaches, will need to acquire sustainable education and skills. Experimental sciences are considered to be general lessons in primary and especial course in secondary education. This content will be a great opportunity for education to provide students with the knowledge and skills in the components of sustainable development (Hosseinpur, 2014, p. 31). The researcher believes that this is likely to be neglected due to the expansion of sustainable development scales, as well as the vast majority of other educational topics in the development of experimental science curricula from the components and scale of sustainable development. If so, the efficiency of graduates in the future will be reduced to the cited research findings. This concern has caused the subject of this research to be analyzed in a quantitative and qualitative way. The main question is to what extent are the components of sustainable development emphasized on the objectives, content, teaching methods and educational assessment of elementary science?

According to the aforementioned issues, seven research questions were raised in this study, in which the emphasis of each components of sustainable development, such as the consumption pattern, waste disposal, conservation of living organisms, energy, natural resources, ecosystem conservation on each of the elements of the curriculum about the objectives, educational content, teaching method and assessment are investigated.

2. Research methodology

Both quantitative and qualitative methods have been used in this research. In the quantitative aspect, a questionnaire was used and in the qualitative aspect, content analysis and library method were used. In terms of its objective this is an applied research and is a descriptive survey in terms of its nature and method. That is why, we can say that in this research, a combination of library methods, content analysis and descriptive survey has been exploited. On the other hand, because a questionnaire was used in the data collection method, it is also a survey. In addition, the sample is not isolated from its actual environment, which justifies the survey. In the qualitative content

analysis section, the experimental science curriculum of elementary has been analyzed. In this way, the data unit is a photograph, text (paragraph) and homework (Q & A course completion). This unit of data has been considered in relation to the components of sustainable development, extracted from the curriculum.

The statistical population of this study is a group of specialists who are monitoring the components of sustainable development of one hundred and two, and also set of textbook of experimental sciences of the six grades of elementary schools in Iran, in the academic year of 2016-2017. In addition to completing the data, the textbooks of teacher guides of experimental sciences of these foundations are exploited. In this content analysis, there was no sampling and the whole content of the textbook was examined. It is worth noting that Shannon entropy software is used to analyze the content of this research.

The sample size in the group of experts will be based on Morgan's sampling table was 80-person and the book set of experimental sciences are 12 volumes. In the process of implementing the research, first, the identification of micro and macro components of sustainable development was carried out through a survey of experts. Then, based on the above components, a list of content analysis was developed and, consequently, the experimental sciences books of the elementary were examined.

In this research, library and field methods have been used to collect information. The library section has been used to achieve sustainable development scales and review of literature of research and in the field, a survey of experts was used to identify the sustainable development components as well as a survey on the sustainable development model in the experimental science curriculum.

In this research, two tools of the questionnaire of the experts' survey and the list of data are used as follows:

A) Questionnaire of experts survey

This is a researcher-made questionnaire, its content is designed and built in collaboration with the expert team. This tool is designed based on components such as consumption patterns, waste disposal and environmental protection, conservation of living organisms, nutrition, energy, natural resources in sustainable development. Since the scales covered by these components are extensive, five experts are considered for each of these three components to confirm the validity. At this level, the proposed corrections by the experts were considered in the questionnaire. After this phase, 20 experts outside the sample were given a questionnaire to answer the questions. After completing the questionnaires, the data were analysed through Shannon's entropy software, compared to calculating the reliability coefficients of the components of sustainable development as well as the entire questionnaire. The reliability coefficient was 0.70, so it has a stable size. The reliability coefficient of the environmental capital component is 0.879, the reliability coefficient of socioeconomic capital component is 0.917, the reliability coefficient of human capital component is 0.855, and the reliability coefficient of the total questions is 0.814.

B) Data recording list

This list is designed to extract data on sustainable development components in science curriculum of elementary school. The scale of this list is designed through library studies as well as through the questionnaire validity. In this list, components such as consumption patterns, waste disposal and environmental protection, conservation of living organisms, nutrition, energy, natural resources in the field of sustainable development are considered, and the subset scales of these components were selected after the stability of the and replaced questionnaires. Data unit

measurements in this photo, paragraph, and practice tool have always been considered in curriculum.

In this study, there will be two sets of quantitative and qualitative data that will be analyzed according to the nature of the data. Implementing data from the questionnaire to identify the components of sustainable development through descriptive statistics and factor analysis are analyzed. The data generated by the content analysis through descriptive statistics and calculating the importance coefficient are done by the Shannon entropy method. In this method, software is used where the priorities of the components of sustainable development are derived from each of the sixth-grade elementary school science curricula. These priorities reflect the place of sustainable development in these curricula. In addition, since in this research, the framework reliability of the status of components of sustainable development is considered, this validation is done through the Shannon Entropy software by different grades, in order to finally achieve the desired framework. It should be noted that in the quantitative data section of the questionnaire, SPSS software was used for data analysis.

3. Results

In order to achieve the emphasis of the experimental science curricula of elementary school, the consumption pattern in each of the objectives, content, teaching methods and assessment was addressed through the content analysis of these curricula. At this stage, the educational objectives were as follows: 5.24% in educational content, 5.86%, 6.05% in the teaching method, and 6.69% in the assessment of the consumption pattern was emphasized.

Table 1. Percentage of emphasis on consumption pattern component in experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
objectives	9.31	8.34	7.58	2.15	0.74	3.29	5.24	4
Educational content	4.7	12.22	12.58	1.89	1.02	2.74	5.86	3
Teaching method	16.67	9.09	3.37	1.47	1.51	4.17	6.05	2
Assessment	15.16	10.87	4.94	2.38	1.15	5.62	6.69	1
Whole syllabus	11.46	10.13	28.47	1.98	1.11	3.96		
Percent ranking	2	3	1	5	6	4		

Utilizing the Shannon entropy statistical software to identify the significance factor and the emphasis on the consumption pattern showed that the emphasis in this regard are as follows: 1. Educational Content, 2. Educational Objectives, 3. teaching method, 4. Evaluation

Table 2. Importance coefficient of emphasis on the component of consumption pattern in experimental science of elementary curriculum

Component	Importance factor(wj)	Rating
Objectives	0.0775	2
Educational content	1	1
Teaching method	0.0719	3
Assessment	0.0197	4

From the point of view of the component of the consumption patterns in experimental sciences of the six grade, Shannon entropy technique showed these priorities. 1) The third, 2) The second, 3) The first, 4) The fifth, 5) The fourth, 6) The sixth.

Although research on the content of experimental science curriculum of elementary school content has been underlined with emphasis on the components of sustainable development, the United Nations (2016) and PAUW (2015) emphasized the need for such research. Khakbaz (2015) in his research, the emphasis on consumption patterns in experimental science curriculum of elementary school has been 14.3%. Sepahvand (2013) emphasized the consumption patterns in the elementary curriculum, and considered the present situation of the current curriculum to be inappropriate in this regard. Mahtavi (2013) affirms the emphasis on the consumption patterns in experimental sciences of some elementary schools, and considers the priorities of this emphasis to be in the third, fourth and sixth grades, respectively. Other researchers have taken the whole emphasis on the need to emphasize curricula, including experimental sciences, in the consumption patterns. It seems that the findings of review of literature are the level of results obtained in response to the first research question of this study.

In order to achieve the emphasis of elementary science curricula, the waste disposal component for each of the objectives, content, teaching methods and evaluation was conducted through content analysis of these curricula. At this level, it was observed that educational objectives were 4.01 percent, in the educational content 2.15 percent, in the teaching method, 2.78 percent, in the assessment of 5.1 percent on waste disposal.

Table 3. The emphasis on the waste disposal component in the experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
Objectives	4.66	6.25	-	1.08	1.47	6.58	4.01	2
Educational content	0.99	3.41	-	0.63	1.52	4.34	2.15	4
Teaching method	2.09	7.58	-	1.47	2.26	0.5	2.78	3
Assessment	3.03	8.7	-	2.38	4.6	6.75	5.10	1
Whole syllabus	2.70	6.49	0	1.39	2.47	4.55		
Course ranking	3	1	0	5	4	2		

Utilizing Shannon entropy software to identify the importance factor and the emphasis on the waste disposal pattern showed that the emphasis in this regard are as follows:

1- Educational Content, 2- Educational objectives, 3- Teaching method, 4- Assessment

Table 4. Importance factor of emphasis on the waste disposal component in the experimental science curriculum of elementary

Component	Importance coefficient (Wj)	Ranking
Objectives	0.2351	2
Educational content	1	1
Teaching method	0.1437	3
Assessment	0.1312	4

From the point of view of the emphasis on the waste disposal component in the experimental sciences of sixth-grades, Shannon's entropy technique showed these priorities: 1- the first, 2- the second, 3- the sixth, 4-the-fifth, 5-the fourth, 6-the Third

Dochry (2015) pointed out six components of sustainable development in his research, emphasizing the need to address the natural environment, including waste disposal. The Environmental Education Foundation (2012) outlines the formation of environmental groups at the school in explaining green schools, highlighting students' environmental behaviours, including waste disposal and waste recycling, or reduced waste production. Henz and Wideman (2010) in their field study of the environmental school considered reducing waste production as a very important component, the need for attention of the curriculum designers, teachers and trainers has attracted attention. Khakbaz (2015) suggests the emphasis of the experimental science curriculum of elementary school on the waste recycling component was 1.6%. These findings indicate that the results of the second question of this study have been consistent with the existing background.

In order to achieve the emphasis of experimental science curricula on the conservation component of each objective, content, teaching method and assessment, the content of these curricula was analyzed. At this stage, educational objectives were observed at 15.68%, 18.03% in the educational content, 9.4% in the teaching method and 9.39% in the assessment of the components of conservation of the living organisms.

Table 5. Percentage of emphasis on the conservation component of the experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
Objectives	9.31	8.34	15.16	27.96	16.18	17.11	15.68	2
Educational content	9.88	8.24	23.48	34.6	18.23	13.7	18.03	1
Teaching method	4.77	12.13	6.73	6.62	12.79	13.34	9.40	3
Assessment	6.06	13.05	7.41	5.96	12.65	11.24	9.39	4
Whole syllabus	7.51	10.44	13.20	18.79	14.97	13.85		
Ranking percent	6	5	4	1	2	3		

Utilizing Shannon's entropy statistical software to identify the significance factor and the emphasis on the conservation component of the organism showed that the emphasis in this regard are as follows: 1. Educational Content, 2. Educational objectives, 3. teaching method, 4. Assessment.

Table 6. Importance factor of the emphasis on the component of conservation of living organisms in the experimental science curriculum of elementary school

Component	Importance coefficient (Wj)	Rating
Objectives	0.1306	2
Educational content	1	1
Teaching method	0.0476	3
Assessment	0.0178	4

From the point of view of the emphasis on conservation of components in the sixth-generation empirical sciences, Shannon's entropy technique showed these priorities in grades.

1- The first, 2- The third, 3. The fourth, 4. The second, 5. The fifth, 6. The sixth.

The United Nations (2016), Gallup (2016) and PAUW (2015) each in their studies emphasized the need for the educational system to be components of sustainable development, including the inclusion of appropriate and applicable curriculum objectives and content. The Environmental

Education Foundation (2012) has been promoting environmental protection, including the livestock, in green school environmental programs. This has also been reported in the research by Tessa (2012), Hanifah (2001). Khakbaz (2015) has reported in its findings that 18.5% of the experimental science curriculum of elementary school has been devoted to zoology, while it was neglected to protect organisms. Hosseinpour (2014) and Mousavi (2014) have emphasized on the training of components of sustainable development, including conservation of animals in the experimental science curriculum. Mohammad Khani (1392) evaluates the experimental science curriculum of elementary school for the conservation of poor living organisms. These findings indicate that the results of the answer to the third question of the research are similar to the results of the current report.

In order to achieve the emphasis of elementary science curricula, the element of energy in each of the objectives, educational content, teaching methods, and evaluation was done through content analysis of these curricula. At this stage, the educational objectives were 12.29%, in the educational content 14.59%, in the teaching method 14.66%, and in the assessment 13.25% was emphasized on the energy component.

Table 7. The emphasis on the component of production and energy consumption in the experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
Objectives	6.98	16.67	11.37	13.98	9.56	15.14	12.29	4
Educational content	19.26	17.9	6.29	18.87	7.6	17.58	14.59	2
Teaching method	20.84	18.19	11.77	11.77	12.03	13.34	14.66	1
Assessment	15.16	17.4	12.35	10.72	11.5	12.36	13.25	3
Whole syllabus	15.56	17.54	1.045	13.84	10.18	14.61		
Ranking percent	2	1	5	4	6	3		

Utilizing the Shannon entropy statistical software to determine the significance factor and the emphasis on energy, showed that the emphasis in this regard are as follows:

1. Educational content, 2. Teaching method, 3. Educational objectives, 4. Assessment

Table 8. Importance factor of emphasis on the energy component in the experimental science curriculum of elementary school

Component	Importance coefficient (Wj)	Rating
Objectives	0.0561	3
Educational content	1	1
Teaching method	0.0946	2
Assessment	0.0213	4

And in terms of the emphasis on energy component in the experimental sciences of the six grade, Shannon's entropy technique showed these priorities: 1. the first, 2. the second, 3. the fourth, 4. the sixth, 5. the fifth, 6. the third

The International Foundation for Environmental Education (2012) has emphasized the need to reduce energy consumption in green school programs in 69 countries, education based on good behaviors of students towards energy. Hens, L, Weidman (2010), in line with the ISO 14001 standard in ECO schools, have identified the need to reduce energy consumption in the context of sustainable development, teaching it to be essential in schools. Hanifah (2001) has experienced the

implementation of the components of development in green activities on a field. Schools that have followed the pattern of energy consumption have been considered in line with schools for sustainable development. Khakbaz (2015) reported the amount of attention to the experimental science curriculum on energy by 21.8%. Mahtavi (2013) writes: Attention to the component of energy in the experimental sciences of the fourth grade and the second priority, and in the sixth principle is the first priority. These findings indicate that in some empirical sciences, the six grades have been adequately addressed to the energy component and need to be reviewed in some other grades. These findings are consistent with the results of the fourth question of research.

In order to achieve the emphasis of elementary science curricula, the element of natural resources in each of the goals, content, teaching methods and evaluation was addressed through the content of these curricula. At this stage, the Educational objectives were observed at 54.5%, in the educational content 9.5%, in the teaching method was 8.29% and in the assessment of 41.7% on the natural resources scientist.

Table 9. The emphasis of the component of natural resources in the experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
Objectives	13.96	2.09	2.28	4.46	5.15	5.27	5.54	4
Educational content	19.26	11.65	2.73	7.55	7.09	8.68	9.5	1
Teaching method	14.54	12.13	5.89	5.15	8.27	7.5	8.92	2
Assessment	12.13	6.53	6.18	5.96	6.9	6.75	7.41	3
Whole syllabus	14.98	8.1	4.27	5.78	6.86	7.05		
Ranking percent	1	2	6	5	4	3		

Utilizing the Shannon entropy statistical software to determine the significance factor and the emphasis on consumption pattern showed that the emphasis in this regard are as follows:

1- Educational content, 2- Teaching method, 3- Assessment, 4- Educational objectives

Table 10. Importance coefficient of emphasis on natural resources component in experimental science curriculum of elementary school

Component	Importance coefficient (Wj)	Rating
Objectives	0.0266	4
Educational content	1	1
Teaching method	0.1252	2
Assessment	0.0358	3

From the point of view of the natural resources component emphasis in the sixth grades of science, Shannon's entropy technique showed these priorities: 1- The first, 2- The second, 3- The sixth, 4- The fourth, 5- The fifth, -6-The Third

Dochry (2015), in his research, studies sustainable development education in many countries based on the indigenous model, recognizing natural resources as an essential component. PAUW (2015) identifies the relationship between wealth development and prosperity for the growing population in the international definition of sustainable development, one of the components being the preservation of natural resources. The Environmental Education Foundation (2012), Tessa (2012) and Hens, L, Weidman (2010) each introduced environmental education in schools for preservation of natural resources as one of the essential and vital components. Mahoney (2001)

described the environmental curriculum, environmental and natural resources as a precious and crucial experience. In the study, Khakbaz (2015) reported a 5.5 percent interest in experimental sciences on environmental and natural resources conservation. Mohammad Khani (2013) writes: In the experimental science curriculum of elementary school, the categories of conservation of forests in the third and fifth grade are discussed, but not related to other environmental related natural resources, especially in the first and second grade. These findings indicate that the results obtained from the response to the fifth study were consistent with the results of the current history.

In order to achieve the emphasis of the experimental science curriculum of elementary school, the ecosystem conservation component in each of the objectives, content, teaching methods and evaluation was conducted through content analysis of these curricula. At this stage, the objectives were set at 7.99%, in the educational content 8.47%, in the teaching method was 5.26%, and in the evaluation of 6.94%, the ecosystem conservation component was emphasized.

Table 11. The emphasis of the ecosystem conservation component in the experimental science curriculum of elementary school

Basic Elements Curriculum	First	Second	Third	Fourth	Fifth	Sixth	primary	Percentage rating
Objectives	9.31	6.25	2.28	8.61	10.3	11.19	7.99	1
Educational content	11.61	10.52	2.94	7.24	9.37	9.14	8.47	2
Teaching method	6.25	7.58	4.21	2.21	3.76	7.5	5.26	4
Assessment	12.13	10.87	3.37	2.38	5.75	6.75	6.94	3
Whole syllabus	9.83	8.81	3.29	5.11	7.3	8.65		
Ranking percent	1	2	6	5	4	3		

Utilizing the Shannon Entropy Statistics Software to determine the significance factor and the emphasis on preserving the ecosystem showed that the emphasis in this are as follows: 1. Educational content, 2. Educational objectives, 3. teaching method, 4. Assessment

Table 12. Importance coefficient of emphasis on ecosystem conservation component in experimental science curriculum of elementary school

Component	Importance coefficient (Wj)	Rating
Objectives	0.1364	2
Educational content	1	1
Teaching method	0.049	3
Assessment	0.0334	4

Dochry (2015) has found in his research that the balance between the six components of sustainable development in the natural environment and human society is possible through the preservation of ecosystems. This calls for sustainable development education in schools. PAUW (2015) writes: "It's not possible to use resources to keep the planet, regardless of ecosystem conservation." The Environmental Education Foundation (2012) writes: Promoting environmental management in schools is also in keeping with ecosystem conservation, and its related education is essential for students. Hens, L, Weidman (2010) has reported that environmental programs at school time have a relative success in maintaining ecosystems that are approved. The same finding has been reported in Hanifah (2001) and Mahoney (2001). Mashallahi nezhad (2015) has reported on ecological criteria after applying experimental science textbooks on ecology: more attention is needed than ecosystem cramming in this curriculum. This finding has also been reported in the

research by Mousavi (2014) and Mohammad Khani's research (2013) and Mathavi's thesis (2013). In sum, it can be said that the findings of the current history with the findings derived from the answer to the sixth question of research have been the same level.

Empirical curriculum in elementary school is one of the great opportunities in education. This significance can be criticized from several angles. Elementary students are in a stage of growth that is curious and learning to be ready to receive information. The education system uses the same opportunity to educate the new generation, educate the citizen, and present life patterns. Each of the lessons in the experimental sciences curriculum can be linked to one of these concepts. Sustainable development in any society requires education of the growing generation. Elementary courses, as well as empirical science lessons and opportunities are immensely familiar with the concepts, behaviours and patterns of sustainable development implicitly introduced to learners and institutionalize behaviour appropriate to each component. The consumption patterns is one of the most important components of individual, family, social and national life. If this element is addressed during the elementary period the teaching of experimental science, one can see the optimized behaviour of learners in this field.

The waste disposal component, which is now considered at a negligible level in the literature of science, is one of the personal and social needs of collective life. Empirical science provides students with the ability to learn individual and social dimensions through observation or behaviour based on waste disposal.

Conservation of other beings is one of the components of sustainable development that is optimal and appropriate in childhood learning. The experimental science curriculum in the elementary period is a very good way for behavioural conservation. At present, much of the information provided in the Experimental Science Book is contained in the cognitive domain of the organisms and rarely emphasized the "conservation of living organisms". While students who are interested in living animals are provided with a clear overview of their individual, family, social, and national dimensions of conservation, learn their protective behaviour. This training will be a milestone in the protection of the environment.

Another component of sustainable development was energy. It was discussed adequately in educational curriculum of elementary school. In a way that its priorities in terms of curriculum elements and academic grades were announced as research findings. Since in the current century energy for the human race has become one vital, crucial and crucial national and global level, it is at least possible for elementary school students based on the stages of development and their level of learning in the program an Empirical lesson on energy. Since textbooks are horizontally and vertically related, the authors of the textbooks, the research and publishing organization of the textbooks, should set the level of addressing each component, including energy, on its agenda, which passes the stages of developmental growth in students compared to the understanding of the concept of appropriate energy and behaviour. The natural resources component somewhat was discussed in the textbooks of the experimental sciences. These resources are also linked to the energy concept, and the ones mentioned in the above are also discussed here. It is important that the components of sustainable development, due to its impact on students' current and future lives, are emphasized by the World Congresses, particularly the UNESCO, on the teaching of applied curricula. Therefore, when it comes to natural resources, the way human behaviour is directed towards the exploitation and protection of natural resources is important. Certainly knowledge and awareness are also required for elementary students. But one cannot expect the important concepts of sustainable development model to be designed solely at the level of knowledge for students. In the research findings, it has been observed in the curriculum of experimental sciences about the

ecosystem conservation component in low level. For example, in the experimental sciences of the third grade, this concept has not been substantially discussed. That is why the author of this thesis believes that teaching experimental sciences in the elementary period is a great opportunity that educational system prepare learners for social life. What is referred to as life skills is dependent on behavioural skills in the area of sustainable development. Accordingly, the practical proposals of the present study were presented to the practitioners. On the whole, it can be said that in elementary science curricula, the components of sustainable development have been partially addressed, but it needs to be revised and reinforced the design of clear objectives, the content of the curriculum, and the placement of hidden curriculum images. It is hoped that the authors of the textbooks will pay attention to the findings of this research and to consider the findings of this research and its suggestions in the future reprinting curricula in the field of experimental sciences.

Since upstream documents are determined in writing textbooks of the development of educational objectives, after which the educational content and the method of teaching and evaluation are determined, they are recommended to the research organization and the authors of the textbooks in the future revision of the experimental science curriculum of elementary school will highlight the contribution of each component to the determination of educational objectives to pay more attention to the components of sustainable development. This makes it possible to prepare curriculum for each component of the structure. For example, the component of the consumption patterns, if a specific goal and any of the elementary science curricula are taken into account, the rest of the educational elements will be provided along with it.

In this research, it was observed that for the component of waste disposal, the consistency between the elements of educational content, educational objectives, teaching method and assessment is rarely observed. In order to resolve this discrepancy, it is suggested that the teacher's book guide be arranged for the purpose of the waste disposal component and the address of the educational content for teachers, so that they, with appropriate teaching and assessment, will focus on the education of the component of waste disposal. The point that only an image for waste disposal in the context among other textbook images with diverse messages is included, does not make this component of sustainable development target-oriented.

In this research, a significant percentage of educational elements including goals, content, teaching methodology and evaluation were considered for components of conservation of organisms. This lesson in the Experimental sciences Program is one of its strengths. Most information is included in the field of animal identification. In this context, it is suggested that in the curriculum of experimental sciences, a specific focus should be placed on the educational objectives of "conservation of animals" so that teachers emphasize the process.

In the research findings, it was observed that for the energy component, the objectives and content of the curriculum, a suitable percentage of the curriculum is dedicated so teachers can use appropriate teaching and assessment methods. Since the energy component plays a very important role in sustainable development, in this context, it is suggested that in the future revision, in the Emergency Science Curriculum Teacher's Manual, each of the six grades of education objectives be clearly written in relation to energy, so that teachers pay attention to the domain of that learning process - to manage learning.

In the results of the research, the natural resources component has been partially addressed in the elements of the educational content, the teaching method, the evaluation, and the objectives. But since there is a discrepancy between the content and the objectives of the teaching and assessment methodology, it has confused the designers of curriculum. Therefore, it is suggested that in the future revision of the curriculum of the experimental sciences, the goals of the natural

resources in the teacher's manual should be clearly expressed in order to provide the relevant topic in the textbook as well as approaches to teaching and assessment by the teacher. This revision is prioritized in the third, fifth, fourth, sixth, second, and first stages, respectively.

In the research findings, it was observed that the elements of the objectives, the educational content, the teaching method and the evaluation of the experimental science curriculum program have been emphasized to some extent on the ecosystem conservation component. Of course, this emphasis has more cognitive aspect and is less indicative of "preserving the ecosystem". Therefore, it is suggested that it should be emphasized in teacher's manual so that teachers can rely on this component more than the current textbook. As an example, it is suggested by specifying the intended purpose, we give a brief explanation about preserving the ecosystem to the messages contained in the book.



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