Environmental Education in Iranian school Curriculum, A content analyses of Social Studies and science textbooks

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ABSTRACT: The present study has been carried out with the aim of content analysis (CA) of newly-prepared textbooks for social studies and science of the sixth grade based on the three environment education grounds, i.e. ecology, environment, and human activity. It is of CA and descriptive nature. The statistical population was all the sixth grade textbooks pages and the statistical sample was equal to the statistical population. The Shannon Entropy Method has been employed for the CA. The analysis unit has been the textbook pages (texts, images, questions, and exercises). The components and indexes for the concept of Environment education based on the study literature and sources and their validity have been confirmed by environment and education authorities. The results show that the highest frequency in the content of these textbooks is allocated to ecology, human activities and environment, respectively. Furthermore, human activities and environment are more prominent in the science textbook rather than the social studies ones, although ecology is more obvious in the latter. In terms of informational load and importance in these textbooks, ecology, environment, and human activity were the main grounds for the environment education, respectively. In sum, in these textbooks the three aforementioned grounds have not been presented parallel to each other and some modifications to the content of these textbooks are required to make them more understandable for the Iranian students.

Key words: Environment education, School textbooks, Content analyses, Shannon Entropy

INTRODUCTION

Training and education is a process attempting to make favorable cognitive, emotional, and motor (skillful) changes in learners' behavior in order to prepare them for the natural and social environment. Therefore, the experts in charge of training and education in a society, that is the professionals, planners, and especially the teachers are directly responsible for preparing and training children according to the social requirements. They should be permanently informed of the rapid developments in training and education as well as the new and more favorable methods in order to employ them for the objectives (Saffar-Pour, 2001). Being one of the main concerns for every education system is the environment and the interaction between human and their surrounding environment; for the life of human as well as all other animals depends on the environment. Yet, in the recent two centuries with the apparent great advances in technology, human beings

have destroyed the human and environmental values consciously or unconsciously and are indeed gradually ravaging the environment (Dabir-Siyaghi, 2004). In recent two centuries, human being has exerted some bad effects on the environment and natural resources. Along with the increase in their activities, the effects have also increased and the threats to the world resources, natural systems, and population have become more obvious. Accordingly, the need for an inclusive training with regard to the accounting for the environment has become more tangible.

Environment education is aimed at informing people about environment in order for them to appreciate its values, keep it safe, and support it through contemplation about biological processes. Given the ever-increasing importance of environment in contemporary communities, environment education can be regarded as an integrated part of the

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life of the youth (Manzanal *et al.,* 1999; Schlesinger, 2004). Regarding the increasing environmental dangers, environment education and making the students committed and informed of it has become a great challenge for the curriculum in the Iranian schools (Solati, 2005). Since for environment to be an all-encompassing concern for the public, it should be based on the schools and their curriculum at different levels of education which in turn requires proper programming, fine curriculum, providing textbooks in line with its objectives, and well-trained and informed teachers capable of perceiving the concepts and making them readily understandable for the students. Incorporation of environmental concerns in the curriculum lets the students consider environment safeguarding not only as a material, but a human responsibility. The students are trained to learn knowledge and values to employ them in their very life; so textbooks can contribute much to this end.

Science is among the main part of the curriculum for every level of education and learning them helps the students improve their cognition of their surroundings. To do so, they should acquire concepts which help them associate their experiences (DSO, 2012). Environmental standards are among the main standards for the science teaching.

It is worth mentioning that environment teaching is a multi-disciplinary approach to learning, cultivating knowledge, awareness, attitudes, values, and skills in order for the people to be capable of protecting and improving the environment (Karami-Gazafi *et al.,* 2013). Thus, other materials such as social studies can be of great help in the environment education promotion.

The educational systems of various nations also put much emphasis on the inter-disciplinary curriculum. In Canada, for instance, the education professionals insist on incorporation of environment education in the general education (Kohlstedt, 1997). In China, the environment education institutes have been active since 1970s. Environment education in the US has been at work since the early days of the Nature Study Movement in 1890s (Sherren, 2006). In Russia, all the higher education institutes are engaged in the environment education development, providing all the courses related to the environment. As for South Africa, environment education has been entered the textbooks (Wolfe, 2001). The article 50 of the Iranian Constitution stipulates protecting the environment as a public requirement and bans any economic activity or so which inflicts damage to the environment. According to the article, the strategic priority of the national development plan should be based on the public training and participation as well

as safeguarding and rehabilitation of the surrounding environment through research, monitoring the resources, law making, and law enforcement. The Environment Safeguarding and Optimization Act requires training programs in order to promote the public culture regarding the environment safeguarding and optimizing. Also the 4th Plan for National Development sets out environment education and the articles 60 and 64 about environment education have been enacted (EPA, 2009).

In sum, some extensive international efforts have been carried out to promote concepts regarding the environment as well as their training in schools; although they are by no means sufficient. For instance with the content analysis of Sciences textbooks in the Greek elementary schools, Korfiatis et al (2003) revealed that the textbooks provide no sufficient knowledge about the environment for the students. They represent the relations in the environment, yet they consider human being as the absolute owner of the environment, introducing crude materials and food provision as the only task for it. In a study under the title of "*Tendencies in the Images of Environment education*" Carvalho et al. (2011) investigated textbooks of 14 to 18 year-old students from some western and eastern European and non-European countries based on such factors as local and global images; rural, urban, and natural images; adverse effects; human management and natural beauty; images of men and women with the positive and negative effects and came to the following conclusions: despite the eastern European and non-European textbooks tending to represent the images of natural beauties without any interference from man, western European ones tend to represent some images of rural and urban landscapes, adverse effect of the human and their management with a humanistic outlook to the environment. Generally, men's images are more frequent than women's, but the latter are more in some western and eastern European textbooks. Regarding the human effects on the environment, men are more obvious than women; however as for the non-European textbooks, women are represented as having more positive rather than negative effects. In a study regarding the content analysis of sciences textbooks of the elementary level to the 4th grade carried out by Karami-Gazafi et al. (2013) based on the environmental literacy indexes of the US 2061 project, it was revealed that the indexes of cost and benefit for human community interaction with the environment as well as identifying the basic natural resources have the most significance and the indexes for distinction between basic needs and the desires of human beings as well as citing favorite plants, animals, and locations along with their

importance have the least significance. Given the significance and key status of environment education in the textbooks and extensive developments in Iranian school curriculum realized after carrying out the National Curriculum Program, the present study is to explore the three grounds of the environment education (ecology, environment, and human activity) in the newly-prepared textbooks of social studies and experimental science.

MATERIALS & METHODS

Using a quantitative CA, the present study is of descriptive nature. Analysis units are the textbooks pages, for every page consists of texts, images, questions, and exercises. Content analysis has various steps. The first step was pre-analysis (preparation and organization) in which environment education grounds, i.e. ecology, environment, and human activity were chosen and their main components, sub-components, and identification components. Then the content of newly-prepared textbooks of social studies and science were selected so that the frequency of the grounds in the contents would be explored. The second step was material analysis in which the frequency of the grounds in the contents of the textbooks were obtained.

The third step was the results processing in which the data were analyzed by the Shannon entropy method. Entropy is an index to measure non-certainty indicated by a probability distribution in order to reach a much more credible data analysis (Azar, 2001). The content of social studies and science textbooks was analyzed based on the method and in terms of a respondent (social studies and science textbooks) and the three environment education grounds. The messages were counted at first in terms of the three environment education grounds based on any respondent (textbooks) as the frequency and then the following steps were taken:

The first step: Frequency matrices should be normalize based on the following relation:

$$P_{ij} = \frac{F_{ij}}{\sum_{j=1}^{m} F_{ij}} \ (i = 1, 2, ..., m; j = 1, 2, ..., n)$$

in which P is normalized frequency matrix.
i is the respondent No,
j is the indicator No,
m is the number of respondents,
n is the number of indicators, and
f is the frequency of indicators.
The second step: the informational load of any ground were calculated and entered in the columns by means of the following relation:

$$E_j = -K \sum_{i=1}^{m} [P_{ij} L_n P_{ij}] \ (j = 1, 2, ..., n)$$

in which i is the respondent No,
j is the indicator No,
m is the number of respondents,
Ln is the logarithm,
E_j is the informational load, and
P_j is the normalized frequency matrix
The third step: using the informational loads, the relative significance coefficient for any ground was calculated. The more informational load for any ground, the more significance (W_j) for that.

$$W_j = \frac{E_j}{\sum_{j=1}^{n} E_j}$$

in which E_j is the informational load, and
W_j is the significance coefficient.
Environment education grounds consist of ecology, environment, and human activity. In the ecology ground, principles and concepts of this biological branch are presented. Ecology in general, studies the systemic life of the living creatures as well as their relationships to and interaction with each other and the environment, along with its results. The significance of ecology for environment education is in holistic and systemic view to life which regards all the living creatures as having direct or indirect interaction with each other. Of course, the non-living creatures also have their own share. The living Earth is a macrosystem consisting of some microsystems. Thus ecology plays a key role in environment education. Environment education with the environment as its ground is mainly related to the pollutions and natural resources with some ecological concepts. Environment education with the human activity as its ground is mostly related to human and their effect on the environment regarding overpopulation, natural resources overconsumption as well as agriculture and construction (Alavi, 2011: 5). Hence, the present study applies the content analysis checklist as its method (Table 1).

Validity: To specify the content analysis checklist validity for the textbooks, the content validity method and professional consultations were applied. The checklist was checked by four experts and then the final checklist with the three grounds as well as the main components, sub-components, and identification components was confirmed.
Reliability: To specify the content analysis checklist reliability for the textbooks, 10 percent of the pages were selected at random. The sample included 10 pages and 250 units which was encoded again by another encoder along with operational definition. The analysis revealed that out of 245 units, 50 units were encoded as different and the remaining 195 ones as similar. The validity coefficient was obtained 79 percent after the agreed upon and expected units'

Table 1. Checklist of environmental education grounds

Environment Education Grounds	Main Components	sub-Components	Identification Components
Ecology	Living Creatures' Life	Living Creatures	Human Beings; Plants; Animals; Micro Animals
		Living Creatures' Interaction with the Environment	Animals with Plants; Animals with Human Beings; Human Beings with Plants
		Living and non-living Creatures' Interaction with Each Other	Animals with Plants; Animals with Human Beings; Technology and Animals; Technology and Plants
Environment	Status Quo	Pollutions	Air Pollution; Water Pollution; Environment Pollution; Noise Pollution; Wastes and Sewage
		Natural Resources	Air, Earth, Stones, and Soil; Forests, Trees, and Plant coverage; Waters, Ponds, Rivers, Waterfalls, and Seas
Human Activity	Human Beings and Environment	Population	Overpopulation; Consumption Pattern Change; Environmental Ethics; People's Effect on the Environment (Manufacturers, Vendors, etc.)
		Natural Resources	Mines; Forests; Seas and Rivers; Recycling; Natural Energy Employed; Renewable and Non-renewable Resources; Natural Resources Analysis; Natural Energies
		Ecological Agriculture	Non- toxic Soils; Natural Fertilizers; Healthy Farm Products;
		Constructions in the Environment	Dams; Roads; House and Factory

analysis. The statistical population for the present study is the sixth grade textbooks of social studies with 124 pages and science with 95 pages in 2013 and the sample is equal to the total population.

RESULTS & DISCUSSION

CA of social studies and science textbooks based on the three environment education grounds, i.e. ecology, environment, and human activity was carried out using descriptive statistics. To do so, total frequency for each ground as well as the textbooks parts (texts, images, tasks, and questions) for them were explored (Table 2 and 3).

As can be seen in the Table 2, the highest frequency is for ecology (480) about half of which in the text part (0.47) with human activity and environment in the next positions, found in the text part (0.60) and images (0.45) respectively.

As can be seen in the Table 3, the highest frequency is for ecology (415) about half of which in the text part (0.47) with human activity and environment in the next positions, found also in the text part. Then, the Shannon Entropy Method has been employed for the ca. To do so, the frequency for each ground was determined at first (Table 4). Then, the

Table 2. Total frequency of each ground for the social studies textbook

Grounds in Social studies	Fij frequency	Pij in social studies textbook		
		Activities and questions	picture	text
Ecology	480	0.10	0.43	0.47
Environment	184	0.11	0.45	0.44
Human activity	309	0.14	0.26	0.60

Table 3. Frequency of each ground for the science textbook

grounds in science	F_{ij} frequency	Pij in science textbook		
		Activities and questions	picture	text
Ecology	0.35	0.105	0.17	0.48
Environment	0.23	0.11	0.29	0.48
Human activity	0.35	0.14	0.31	0.45

Table 4.Frequency distribution of environmental education grounds in the social studies and science textbooks

	Human Activity	Environment	Ecology	Whole analyzed units
Social studies	309	184	480	973
science	394	263	415	1072
total	703	447	895	2045

Table 5. Normalized data of environmental education grounds in the science and social studies textbooks

	Humanactivity	Environment	Ecology
Social studies	0.43	0.41	0.54
Science	0.56	0.58	0.46

Table 6. Informational loads and significance coefficient for environment education grounds in the social studies and science textbooks

	Humanactivity	Environment	Ecology
informational loads	0.398	0.376	0.399
significance coefficient	0.33	0.32	0.34

data in Table 4. Were normalized (Table 5.) and the informational loads were specified in Table 6. Finally, the significance coefficient for each ground was estimated and explained (Table 6). As can be seen in Table 4, all the statements, images, and tasks of the social studies and science textbooks amount to 2045, most of which belong to the science textbook. Comparison of the textbooks reveals that ecology is more prominent in the social studies textbook and environment and human activity in the science one.

According to the available frequencies in table 4. Normalized data were presented in Table 5. The normalized data for ecology, environment, and human activity for the social studies textbook were 0.54, 0.41, and 0.43 and as for science textbook were 0.46, 0.58, and 0.56, respectively. Then, informational loads were obtained.

As can be seen in Table 6. Informational loads for ecology (0.399), environment (0.376), and human activity (0.398) as well as significance coefficient for ecology (0.34), environment (0.32), and human activity (0.33) were obtained.

CONCLUSION

The results show that for both social studies and science textbooks, the highest frequencies (480 and 425, respectively) belongs to the ground ecology. Other results reveal that the ground environment in the social studies and science textbooks has as many frequencies as 184 and 263, respectively. In addition, the ground human activity in the social studies and science textbooks has as many frequencies as 309 and 394, respectively. The findings suggest a varied focus on the three grounds in environmental education and no parallelism in their presentation. The highest frequencies belong to the grounds ecology, human activity, and environment, respectively which are in line with Hakimzadeh et al. (2007) who state that although the textbooks emphasize the environmental education more than expected, its components have not been regarded consistently. That is to say that some elements are focused more than the others.

In terms of informational load and significance, ecology is the main ground in the environmental education in the two textbooks, leading environment and human activity respectively. It is noteworthy that the difference between informational load and significance coefficient for the three grounds is trivial. Exploring such results as the frequency and significance of ecology suggests, as mentioned at the beginning, environmental education has a pivotal role in the protection and management of the environment. Given the importance of the elementary education and high motivation and curiosity as well as affective factor among the students, it is possible to inject a proper attitude in the students toward the environment and other species of the world as well as interaction among them. Yet Human beings should be taught the basic natural resources and proper interaction with the environment for a "sustainable development" from the very early years, for the environment and human activity contribute significantly to the sustainable development.

What makes the other two grounds – human activity and environment – critical is that human activity has inflicted considerable damage to the environment in many countries (Bier-Hoff, 2001; Hunecke et al, 2001; Bier-Hoff, 2002). It matters not only from the natural resources perspective but from

the economic one, such that human economic activities may affect their long term life. On the other way, the unprecedented warming of the earth, weather and water pollution, greenhouse gas emission, ecosystems annihilation, and thin Ozone layer are among the main consequences of nature exploitation through human manufacturing activities as well as their goods and services, leaving large quantity of pollution and waste in nature and environment (Fotros, 2002). Regarding Iran, the resource-based economy and energy consuming manufacturing has increased fossil and non-fossil energy consumption. Additionally, given the natural resource dependent economy and also the constraints associated with it, it is rational for the future citizens to become familiar from their early years of official education with sustainable development and productive interaction of human with the nature and basic resources. As a result, the 21st century citizens should engage the environment from their childhood in daily decision making and willingness so that they come to the understanding that a sustainable economic, political, and social development requires a sustainable environment with an inclusive look to all the grounds (Karami-Gazafi *et al,* 2013).

In sum, the results revealed that for both social studies and science textbooks, the highest frequencies belongs to the ground ecology, and human activity and environment are in the next positions, respectively. The human activity and environmental grounds are more prominent in the science textbook, but ecology has higher frequency in the social studies one.In terms of informational load and significance, ecology is the main ground in the environmental education in the two textbooks, leading environment and human activity respectively. Thus, one may say that the three grounds in the two textbooks have not been considered similarly and with the same frequencies. The fact requires the planners and composers of the textbooks to take a unified stance toward the three grounds in the forthcoming versions of the textbooks.

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