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SW-HP model for formulating environmental education strategies for environmental experts of Tehran municipality

Shaho Karami[1], Seyed Mohammad Shobeiri[1], Vafa Ghaemmaghami[2]

[1]Department of Environmental Education, Payame Noor University, Tehran, Iran
[2]HSE, University of Tehran, Tehran, Iran

Email address:
karami.sh@ut.ac.ir (S. Karami), smshobeiri@yahoo.com (S. M. Shobeiri), v.ghaem@ut.ac.ir (V. Ghaemmaghami)

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Abstract: Environmental Education (EE) refers to organized efforts to teach about how natural environments function and, particularly, how human beings can manage their behavior and ecosystems in order to live sustainably. One of the important aspects of the city is the urban environment. For this reason, Environmental experts in municipal should be trained on environmental matters. One of the tools that help us to formulate strategies for Environmental experts of Tehran municipality is the use of a SWOT analysis. Also the AHP model is could be used to prioritize the factors of strategy environmental educations options. In this study, strengths, weaknesses, opportunities and threats of Tehran municipality in environmental educations field are identified and strategies for environmental educations are formulated. Finally all of these strategies are prioritized using a combination of SWOT analysis and AHP (SW-HP model). Results show that although the presented offensive patterns ranked best among strategies, but it was found that the use of a combination of all strategies with attention to their rankings provides the best opportunity to educations of Environmental experts.

Keywords: Environmental Education, SW-HP Model, Urban Environment, Environmental Experts, Tehran Municipality

1. Introduction

Environmental education is a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action (UNESCO, 1978).

The roots of environmental education can be traced back as early as the 18th century when Jean-Jacques Rousseau stressed the importance of an education that focuses on the environment on education. Several decades later, Louis Agassiz, a Swiss-born naturalist, echoed Rousseau's philosophy as he encouraged students to "Study nature, not books (Palmer, 1998). These two influential scholars helped lay the foundation for a concrete environmental education program, known as nature study, which took place in the late 19th century and early 20th century.

The nature study movement used fables and moral lessons to help students develop an appreciation of nature and embrace the natural world (Hoelscher, 2009). Anna Botsford Comstock, the head of the Department of Nature Study at Cornell University, was a prominent figure in the nature study movement and wrote the Handbook for Nature Study in 1911, which used nature to educate children on cultural values (Malone, 1999). Comstock and the other leaders of the movement, such as Liberty Hyde Bailey, helped Nature Study garner tremendous amounts of support from community leaders, teachers, and scientists and change the science curriculum for children across the United States.

A new type of environmental education, Conservation Education, emerged as a result of the Great Depression and Dust Bowl during the 1920s and 1930s. Conservation Education dealt with the natural world in a drastically different way from Nature Study because it focused on rigorous scientific training rather than natural history (Palmer, 1998). Conservation Education was a major scientific management and planning tool that helped solve social, economic, and environmental problems during this time.

The modern environmental education movement, which

gained significant momentum in the late 1960s and early 1970s, stems from Nature Study and Conservation Education. During this time period, many events – such as Civil Rights, the Vietnam War, and the Cold War – placed Americans at odds with one another and the U.S. government. However, as more people began to fear the fallout from radiation, the chemical pesticides mentioned in Rachel Carson's Silent Spring, and the significant amounts of air pollution and waste, the public's concern for their health and the health of their natural environment led to a unifying phenomenon known as environmentalism.

One of the first articles about environmental education as a new movement appeared in the Phi Delta Kappan in 1969, authored by James A. Swan (Swan, 1969). A definition of "Environmental Education" first appeared in The Journal of Environmental Education in 1969, authored by William B. Stapp (Stapp, et al, 1969) Stapp later went on to become the first Director of Environmental Education for UNESCO, and then the Global Rivers International Network.

Ultimately, the first Earth Day on April 22, 1970 – a national teach-in about environmental problems – paved the way for the modern environmental education movement. Later that same year, President Nixon passed the National Environmental Education Act, which was intended to incorporate environmental education into K-12 schools (EETAP, 2002). Then, in 1971, the National Association for Environmental Education (now known as the North American Association for Environmental Education) was created to improve environmental literacy by providing resources to teachers and promoting environmental education programs.

Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, in 1972, declared environmental education must be used as a tool to address global environmental problems. The United Nations Education Scientific and Cultural Organization (UNESCO) and United Nations Environment Program (UNEP) created three major declarations that have guided the course of environmental education. The goal of environment training is increasing the public information about environment offering same probable solutions and making a basis for completely logical and active participation of the society members in protecting the environment and cautious and rational consuming of natural sources (UNESCO, 1987).

It is possible to distinguish four target groups for tertiary environmental education: the Technical Group, the Subject Specialist Group, the Management Group and the Lay Group. Each of these groups requires different sets of skills and abilities. The Technical Group needs to know how to measure environmental parameters. The Subject Specialist Group needs to know about environmental systems. The Management Group needs to have the skills and abilities to resolve complex environmental issues and problems. The Lay Group needs to have attitudes, philosophies and values about the environment. Each of these in turn requires different teaching strategies. For the Technical Group, practical experimental teaching methods based on the traditional subject approach appear to be the most suitable. The Subject Specialist Group needs presentational methods based on either an infusion approach or a new subject approach. For the Management Group, a combination of high level disciplinary teaching combined with intensive short skills courses and more extensive 'junctions' or 'environmental encounters', all of which make use of practice methods of teaching, are suggested. For the Lay Group, experiential methods, where the student's attitudes are challenged by experiences in either an in-service situation or through simulation exercises, seem to be most appropriate (Stokes and Crawshaw, 1986). Environmental experts are one of the members of the technical group. Environmental expert's municipality's duty is evaluate the state of urban environment, improve and preserve it.

As regards protecting the urban environment of cities have main role in environment management (Hardin, 1968). This study seeks to offer a model for Formulating of environmental education strategies for Environmental experts of Tehran municipality. The Strategy sets out a strategic framework for enhancing environmental education outcomes in Tehran municipality.

2. Material and Method

2.1. General Attributes of the Case Study

Tehran is the capital of Iran and Tehran Province. With a population of around 8.3 million and surpassing 14 million in the wider metropolitan area, Tehran is Iran's largest city and urban area, and the largest city in Western Asia.

In the 20th and 21st centuries, Tehran has been the subject of mass migration of people from all around Iran. The modern structures, notably Azadi Tower and the Milad Tower, have come to symbolize the city. Tehran is ranked 29th in the world by the population of its metropolitan area. Although a variety of unofficial languages are spoken, notably Kurdish and Azeri Turkish, roughly 98% of the population understand or speak Persian.

Tehran features a semi-arid, continental climate (Köppen climate classification: BSk). The northern parts can reach a Mediterranean climate (Csa) bordering humid continental (Dsa). Tehran's climate is largely defined by its geographic location, with the towering Alborz Mountains to its north and the central desert to the south. It can be generally described as mild in the spring and autumn, hot and dry in the summer, and cold

in the winter.

Tehran municipality: Public and non-governmental organization, which was founded in 1907, and is responsible for the administration in Tehran city. Tehran mayor is responsible for running this organization. Tehran municipality consists of 22 regions. In each region, there is a part of the environment.

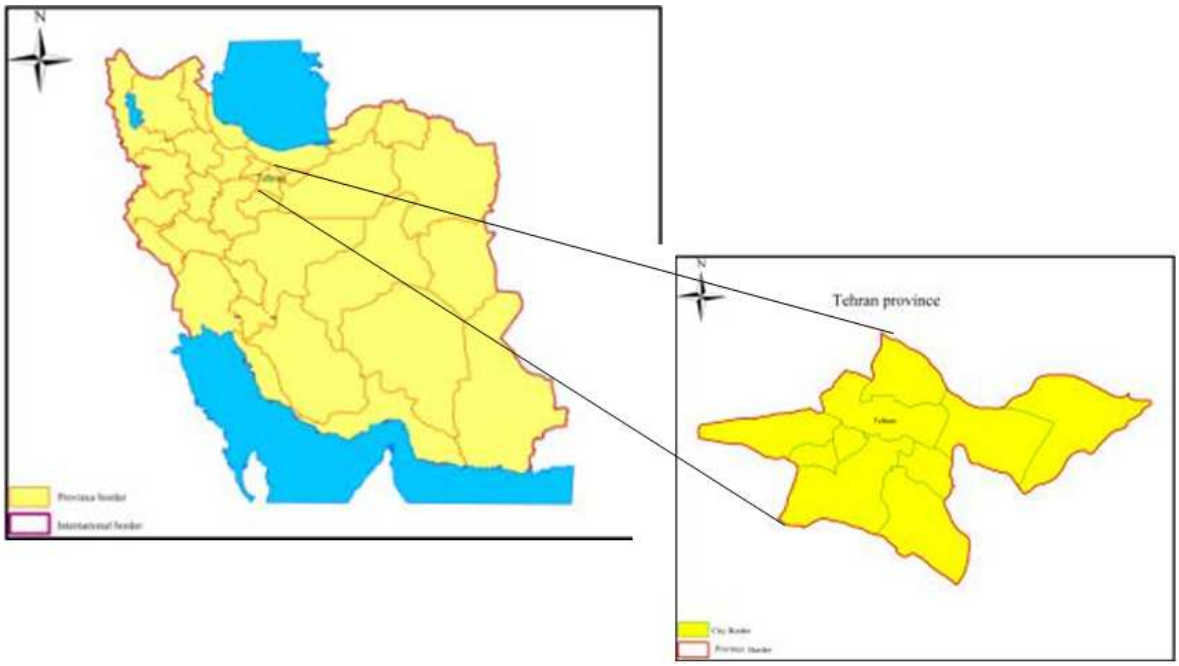

Figure 1. *Location of the study area.*

2.2. Analysis Method

In early years, different method to formulate environmental educations strategies has been presented. In this study the combination SWOT analysis and Analytic Hierarchy process method (SW-HP model) for rebuilding environmental educations strategies was used, after investigating different conditions of influential factors in environment training.

SWOT analysis is a useful tool for strategic planning in environmental management, and supplies the basic foundation for identifying the situation and designing future procedures which is necessary in strategic attitude (Nikolaou & Evangelinos, 2010). SWOT analysis offers a simple way of characterizing the environment; it is an organized approach to brainstorming that helps to reveal insights that would not otherwise be apparent (Pines et al, 2007). It should be noted also that SWOT is a strategic tool accommodating internal strengths and weaknesses with external opportunities and threats. SWOT analysis is a systematic analysis for identifying these factors that formulates strategies by creating the best accommodation between internal and external factors. So through analogy of these factors, it can present four types of strategies such as SO, ST, WO and WT. Therefore, SWOT matrix is a tool which is used in this research in order to formulate initial strategy of instructional organization (Alonso, 2006 & Manteghi & Zohrabi, 2011). When facing a situation and making a decision, we should consider the positive and negative aspects, advantage and disadvantage of this option. SWOT analysis can help us to identify the current situation and consider more compressive before making a choice (figure 1) (Han, 2009& Swan, 2010).

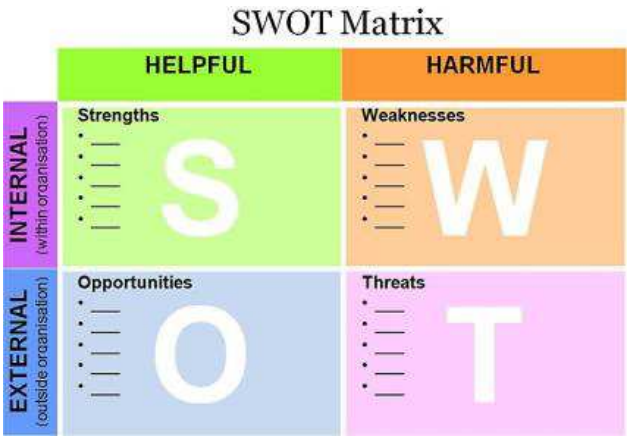

Figure 2. *SWOT Four dimensions of analysis.*

In the Tehran municipality, the parameters that were related to external factors or internal which was for strength or weakness of environmental educations for environmental experts was extracted in the frame puzzle SWOT (Table 1) and after that, the educational strategies was written (Table 1).

Table 1. *SWOT for environmental education.*

Weaknesses	Strengths	
W_1: lack of clear processes and internal communications inside the organization	S_1: holding training courses in organization for its environment personnel, contractors etc.	
W_2: the high average age of staff and lack of interest to training courses	S_2: studying and researching about the urban environment	Internal factor
W_3: never getting help from public funds for performing	S_3 : having facilities such as technical libraries for urban environment	External factors
W_4: lack of enough information about environmental rules	S_4: allocating Financial Credits for holding training	
W_5: lack of staff's sufficient studies about their jobs	S_5: accessing to necessary statistics and information about urban environment	
WO strategies (Preservative pattern)		
WO_1 : invite municipality staff to participate in environmental education training programs.	SO strategies (Offensive pattern)	Opportunities
WO_2: identify and develop partnerships with government departments to provide supporting of Environmental Education advisory Committee.	SO_1: establish an Environmental Education Advisory Committee in Tehran municipality	O_1: having national and government credits for training
WO_3: develop working groups, each chaired by a member of the Environmental Education advisory	SO_2: identify and develop partnerships with NGO to provide advice to the Environmental Education advisory Committee.	O_2: preparing appropriate situation for urban environment
Committee, to work in specific environmental education areas and projects.	SO_3: publish books; Leaflet and a web-based directory of all environmental education programs in Tehran municipality.	O_3: NGO and people's support from environment
WO_4: encourage environmental education providers to work with the Environmental Education	SO_4: advocacy and promotion of environmental education in all parts of Tehran municipality	O_4: allocating credits to fighting against pollution
Advisory Committee		O_5: possibility of repairing and reviving the old gardens of city
WT strategy (Defensive pattern)		
WT_1: an attitude of environmental concerns for environmental experts	ST strategies (Competitive pattern)	Threats
WT_2: the motivation and capacity to work co-operatively with others in achieving environmental education goals.	ST_1: developing and promoting evaluation tools for environmental education	T_1 : water, soil and environment pollution
WT_3: ensure support continues for existing environmental education	ST_2: professional education and training program for environmental experts	T_2 :Lack of homogenous strategies in municipalities
WT_4: Encourage departments of environmental to articulate a clear statement of their environmental education goals and the steps that will be taken to meet these goals	ST_3: develop certification/ accreditation process for environmental education programs in Tehran municipality	T_3 :non compatibility of detailed projects
	ST_4: support, fund or pursue avenues for funding ongoing research into Environmental Education in Tehran municipality	T_4 : lack of enforcement about urban environment by the other institutes
		T_5 :lack of appropriate possibility for Preserve urban environment by municipalities

Reference: authors

Those four large strategies for making environmental education in Tehran municipality are discussed as follows. The concept of SO strategy is using suitable chances with benefiting from strength points of the municipality. WO strategy is benefiting from suitable area with attentive to municipality weakness. ST strategy is also in connection to reducing or omitting hazardous effects by using benefits from strength points of the municipality. In addition, in the final WT strategy with pointing to weakness points of municipality, the hazardous results environmental education is decreasing (Fered, 2011) (Amalnic et al, 2010).

In this study for grading and electing the best strategies, the Analytic Hierarchy Process (AHP), that is one of the best methods for deciding multi-criteria, is used.

The AHP is an intuitively easy method for formulating and analyzing decisions. The process was developed to solve a specific class of problem that involve the prioritization of potential alternate solutions (Byun, 2001 & Karimi, 2006 & Nabi Bidhendi et al, 2013).This method established by Saaty (1977) is a method to solve multiple criteria decision problems by setting their priorities (Karahalios et al., 2011 & Zheng et al, 2012). In the AHP, true to its name, the multi-criteria decision making problem is structured hierarchically. At the top of the hierarchy or the first level is the main objective of the problem. To help ease the decision process, the problem is broken down into all possible related criteria contributing to the decision process (Mamat & Daniel, 2007).

To run the AHP model in this article, first the problem is seen due to AHP model which is including four levels. The first level is known as the goal (selecting the best strategy), the second level is the main criteria of SWOT model and the sub-criteria are in the third level. Moreover, the scenarios are presented in the fourth level (Figure 3).

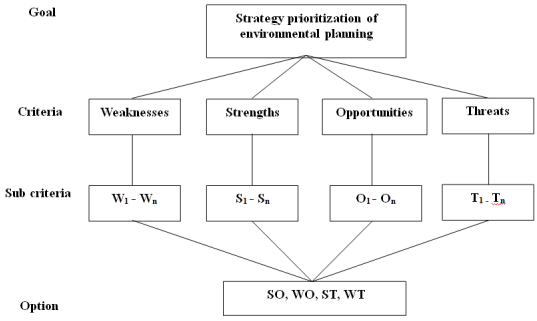

Figure 3. *The hierarchy of the AHP model.*

After selecting the hierarchy of the model, connections and the dependency among the criteria and the pair-wise comparisons were assessed by the experts. However, the Saati's comparison model was chosen (Table 2).

Table 2. *The Saati's pair-wise comparison model.*

Linguistic variables	Numbers
Equal	1
Interval	2
Moderate	3
Interval	4
Strong	5
Interval	6
Very strong	7
Interval	8
Extreme	9

The pair-wise matrix of the main factors is given in Table 3.

Table 3. *Pair-wise comparison of the main factors.*

Factors	S	W	O	T
S	1	2	2	3
W	2/1	1	2	3
O	2/1	2/1	1	3
T	3/1	3/1	3/1	1

In addition, the sub-criteria are compared to each other and the results are used in the Expert choice Software. This software was developed by the AHP group were employed in decision organization (Nabi Bidhendi et al, 2013). The results are given at Table4.

3. Result and Discussion

Table 4. *Final result of prioritization of strategies.*

Strategy	Final weight	Priority
SO_1 : establish an Environmental Education Advisory Committee in Tehran municipality	0.103	1
SO_2 : identify and develop partnerships with NGO to provide advice to the Environmental Education advisory Committee.	0.051	12
SO_3 : publish books; Leaflet and a web-based directory of all environmental education programs in Tehran municipality.	0.079	2
SO_4: advocacy and promotion of environmental education in all parts of Tehran municipality	0.072	5
WO_1 : invite municipality staff to participate in environmental education training programs.	0.070	6
WO_2 : identify and develop partnerships with government departments to provide supporting of Environmental Education advisory Committee.	0.041	16
WO_3 : develop working groups, each chaired by a member of the Environmental Education advisory Committee, to work in specific environmental education areas and projects.	0.049	13
WO_4 :encourage environmental education providers to work with the Environmental Education Advisory Committee	0.055	11
ST_1 : developing and promoting evaluation tools for environmental education	0.077	3
ST_2: professional education and training program for environmental experts	0.065	7
ST_3 : develop certification/ accreditation process for environmental education programs in Tehran municipality	0.060	8
ST_4 : support, fund or pursue avenues for funding ongoing research into Environmental Education in Tehran municipality	0.058	9
WT_1 : an attitude of environmental concerns for environmental experts	0.074	4
WT_2: the motivation and capacity to work co-operatively with others in achieving environmental education goals.	0.043	15
WT_3 : ensure support continues for existing environmental education	0.047	14
WT_4 : Encourage departments of environmental to articulate a clear statement of their environmental education goals and the steps that will be taken to meet these goals	0.056	10

Considering the calculated weights (table 4), "establish an Environmental Education Advisory Committee in Tehran municipality" has the highest weight, and "publish books; Leaflet and a web-based directory of all environmental education programs in Tehran municipality", "developing and promoting evaluation tools for environmental education", "an attitude of environmental concerns for environmental experts", "advocacy and promotion of environmental education in all parts of Tehran municipality" and … are in next rates.

The results reveal that offensive patterns has the highest weight and the best rank in average, after that competitive, defensive, and preservative patterns are located respectively. Therefore, offensive patters for Environmental Education strategies for Environmental experts in Tehran municipality has the highest priority, competitive patters are also suitable. Indeed, use of combination of strategies in order to their rank is the best condition for Environmental Education.

4. Conclusion

Environmental education is not just about learning. It about understands the environmental issues confronting our planet and changing our behaviors so we can build a sustainable world for the future. The Tehran municipality Environmental Education Strategy aims to build on existing excellent environmental education initiatives by providing a supporting framework as well as recommending specific actions that will result in environmental education being even more capable of helping Tehran embrace sustainability. Importantly, this strategy will also help to ensure that all

environmental education initiatives are directly linked to the Tehran State Sustainability Strategy and that they are focused on the prioritized issues identified through the State of the Environment Reporting process. The Tehran municipality Environmental Education Strategy signifies the Labor municipality commitment to building a sustainable future in Tehran.

In SWOT matrix, patterns and strategies are defined base on 4 criteria of strengths, Weaknesses, Opportunities and Threats. Since the importance of the main factors of SWOT is different for prioritization of strategies, therefore the main factor should be weighted. However SWOT Matrix is not able to determine the effects of the weight of these criteria on different strategies. Lots of studies and researches is done and most of them are focused on determination of the importance of the factors and weighting them by definite numbers. In this study Analytic Hierarchy Process were applied, which consider hierarchy relations of factors. In this study Analytic Network Process were applied to solve this problem. In the proposed method, the first level is selecting the best strategy and other levels are SWOT factors, SWOT sub factors, and different strategies which are considered within SWOT factors in strengths, weaknesses, opportunities and threats points. After constructing the structure, to determine the relative weight of the factors, sub factors and alternatives in decision making hierarchy, pair wise comparisons and Expert choice methods were applied. The result of applying these methods reveals that the best alternative is "establish an Environmental Education Advisory Committee in Tehran municipality" which is selected from SO strategies (offensive pattern). The proposed method is capable for development and improvement. This is recommended this method will be studied by considering the hypothesis of the effects of factor and sub factor relations and relations between sub factor and strategies level. To eliminate the defects, use of stakeholder ideas in pair wise comparisons will be helpful to determine the relative importance of the components of the structure Fuzzy methods could be applied.

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