Environmental Education and Its Effect on the Knowledge and Attitudes of Preparatory School Students

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ABSTRACT

Considering the serious environmental threats facing Egypt, environmental education (EE) that provides the knowledge, skills, and motivation to take individual or collective action is needed to create a sustainable quality of life. This study was carried out aiming at measuring the level of environmental knowledge among preparatory school students in Alexandria, determining their attitudes towards some environmental concepts, and assessing the effect of EE on these knowledge and attitudes. The study sample was selected by stratified random method, and the assessment was conducted using a questionnaire. Results of the study revealed that 77% of the students had poor level of environmental knowledge and that 23% had fair level. In addition, 80% of the students were found to have negative attitude toward the environment and the remainder 20% were indifferent. Such knowledge and attitudes were positively correlated to their socio-economic levels. Following six EE sessions, an improvement in their knowledge and attitudes was observed where 69% of the students had a satisfactory level of knowledge and 88% had positive attitude toward the environment. Attitude was found to be positively correlated to their level of knowledge prior to and

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following the EE sessions. These results support the need for development and implementation of environmental education programs as part of the regular school curriculum.

**Key words:** Attitude, environmental education, knowledge, preparatory school students, socio-economic level.

**INTRODUCTION**

Environmental Education (EE) has been defined by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as “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”. (1) The Decade of Education for Sustainable Development (DESD, 2005-2014) was proclaimed by the General Assembly of the United Nations in December 2002 in resolution 57/254. The basic vision of the Decade is a world where everyone has the opportunity to benefit from education and learn the values, behaviors and lifestyles required for a sustainable future. Education for sustainable development addresses the issues of natural resources (water, energy, agriculture, housing, biodiversity, etc) and develops the understanding of the interdependence and fragility of the Earth systems. This will enable learners to adopt new behaviors in the protection and use of natural resources, which are essential for human development and survival. (2)

A survey carried out in 2000 by the National Environmental Education Foundation in the United States confirmed that environmental illiteracy is widely persisting among Americans,
and that about 95% of them think that EE would have a great
effect in preparing their children to better understanding of
environmental issues as adults. Consequently, about one-half
of American schools have incorporated the EE in their
curriculum, but for a few hours a year, and many others have
incorporated environmental issues in their science curriculum.

In Egypt, several organizations and projects have been
working in the area of environmental awareness and education,
but their efforts have been isolated and scattered. Among these,
the Integrated Care Society with the contribution of the Ministry
of State for Environmental Affairs and the Egyptian
Environmental Affairs Agency (EEAA) has established the Green
Corner Project. This project has adopted the strategy of
disseminating environmental awareness all over the country
among children and teenagers through the establishment and
refurbishment of 50 green corner libraries in different
governorates. In addition, various training programs have been
conducted by the EEAA for youth, and aimed at focusing on the
linkage between health and environment.

Like many developing countries, Egypt strives to confront
serious environmental threats including loss of agricultural land
beneath urban sprawl, deterioration of water quality by
industrial and agricultural discharge, air pollution and episodes
of “Black Cloud”, insufficient water quantity, and the absence of
a successful solid waste management system. Therefore,
environmental awareness alone is not enough to face these
challenges but education that provides the knowledge, skills, and
motivation to take individual or collective action is needed to
improve the environment and create a sustainable quality of life.
The UNESCO report discussing the major achievements in basic education in Egypt states that there is much interest in stressing the importance of environment in the life of the children. This is through enhancing the child’s respect to the environment and the desire to enjoy nature and work for its protection. Nevertheless, EE is not stated clearly in the vision of the Egyptian Ministry of Education. EE is seen as a cross-cutting theme within the national curriculum, but there is no core course, or text books, or lesson plans, or teacher training, or class time, or content on the exam to ensure that environmental knowledge, skills and opportunities to practice are taught and learned.

Accordingly, this study was carried out aiming at measuring the level of environmental knowledge among preparatory school students, determining their attitudes towards some environmental concepts, and assessing the effect of EE on these knowledge and attitudes.

SUBJECTS AND METHODS

The study was designed to include 3 phases:

Phase I: Pre-intervention phase: In this phase, the study sample consisted of 543 preparatory school students. They were selected by stratified random sampling from the seven educational zones in Alexandria Governorate namely El-Montaza, East, Middle, West, El-Gomrok, Amereya and Borg El-Arab. In each district, two schools were randomly selected: one girls’ school and one boys’ school to give a total number of 14 schools. From every school, one class from the second grade was chosen and all its students were involved. Data collection was done
using a pre-designed questionnaire that included 3 main sections:

1. Section I included questions regarding the socio-economic level of the students. It included questions concerning their age, sex, family size, crowding index, parents’ educational level, parents’ occupation, family income, presence or absence of any information apparatus and its type (radio, television or internet). The total socio-economic score was 38 and was classified into 29-38 for high socio-economic level, 19-28 for middle, and less than 19 for low socio-economic level.\(^{(10)}\)

2. Section II tested the knowledge of the students regarding some environmental topics such as definition of the environment, global environmental problems, water pollution, air pollution, solid waste and energy. These topics were tested through 27 multiple choice questions. Each question was allowing for more than one correct answer. Correct and complete answers were assigned the score of 2, while correct incomplete answers were assigned 1, and wrong answers as well as “do not know” answers were assigned 0. The maximum knowledge level was 54 and scores of 41-54 were graded as satisfactory, 27-40 as fair and scores less than 27 were graded as poor level of knowledge.

3. Section III of the questionnaire tested the attitude of the students towards some environmental concepts. Eighteen statements were designed on a 3-point Likert-type scale, giving 3 to “agree” answer, 2 to “neutral” and 1 to “disagree”. The statements were concerning nature, resource conservation, water scarcity, air pollution and
waste recycling. The maximum attitude level was 54 and scores 41-54 were considered as positive attitude, 27-40 as neutral attitude, and less than 27 were graded as having negative attitudes towards environmental issues.

**Phase II: Intervention phase:** After determining students’ socio-economic levels and measuring their environmental knowledge and attitudes, the intervention phase started. During this phase, an EE program was given to 150 students out of the 543 ones starting the research. The program consisted of 6 sessions (5 theoretical and one practical). Each theoretical session was 30 minute lecture followed by 15 minute discussion. Power point presentation and eco-posters were used. The practical session was about paper recycling. Sessions were given twice per week and thus the duration of the EE program was 3 weeks. The EE program tried to cover all the topics that were included in the questionnaire.

**Phase III: Post-intervention phase:** After implementation of the EE program, the 150 students were asked to re-answer section II and III of the questionnaire previously answered. Improvement in their knowledge and attitude following the EE program was determined.

**Statistical analysis:**

All the data were analyzed using Statistical Package for Social Sciences (SPSS) program version 9.0. The cutoff point for statistical significance was P value <0.05 and all tests were two-sided. Paired samples t-test was used to compare between the means before and after environmental education program.\(^{[11]}\)
RESULTS AND DISCUSSION

Table (1) and figure (1) present the socio-economic status of the students under study. It is clear from the figure that 78% of the students were belonging to the low socio-economic level while only 22% were belonging to the middle. The socio-economic scores obtained by the students had a minimum of 9/38, a maximum of 28/38 and a mean of 15.6±4.5.

Figure (1): Socio-Economic Level of Preparatory School Students under Study
Table (1): Socio-economic Data of the Preparatory School Students under Study

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family size</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-</td>
<td>322</td>
<td>59.3</td>
</tr>
<tr>
<td>5-</td>
<td>217</td>
<td>40.0</td>
</tr>
<tr>
<td>9-12</td>
<td>4</td>
<td>0.07</td>
</tr>
<tr>
<td><strong>Crowding index</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>130</td>
<td>23.9</td>
</tr>
<tr>
<td>2</td>
<td>320</td>
<td>58.9</td>
</tr>
<tr>
<td>3</td>
<td>93</td>
<td>17.2</td>
</tr>
<tr>
<td><strong>Father's education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>13</td>
<td>2.4</td>
</tr>
<tr>
<td>Secondary</td>
<td>105</td>
<td>19.3</td>
</tr>
<tr>
<td>Preparatory</td>
<td>114</td>
<td>21.0</td>
</tr>
<tr>
<td>Illiterate &amp; read and write</td>
<td>311</td>
<td>57.3</td>
</tr>
<tr>
<td><strong>Mother's education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>11</td>
<td>2.0</td>
</tr>
<tr>
<td>Secondary</td>
<td>173</td>
<td>31.9</td>
</tr>
<tr>
<td>Preparatory</td>
<td>138</td>
<td>25.4</td>
</tr>
<tr>
<td>Illiterate &amp; read and write</td>
<td>221</td>
<td>40.7</td>
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<tr>
<td><strong>Father's occupation</strong></td>
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<td></td>
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<td>Professional</td>
<td>100</td>
<td>18.4</td>
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<tr>
<td>Non professional</td>
<td>439</td>
<td>80.8</td>
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<tr>
<td>Not working</td>
<td>4</td>
<td>0.8</td>
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<tr>
<td><strong>Mother's occupation</strong></td>
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<td></td>
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<tr>
<td>Professional</td>
<td>342</td>
<td>62.9</td>
</tr>
<tr>
<td>Non professional</td>
<td>129</td>
<td>23.8</td>
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<tr>
<td>Not working</td>
<td>72</td>
<td>13.3</td>
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<td><strong>Family income</strong></td>
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<td></td>
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<td>400-</td>
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<td>700-</td>
<td>110</td>
<td>20.3</td>
</tr>
<tr>
<td>1000+</td>
<td>3</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Type of information tool</strong></td>
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<td>Radio</td>
<td>215</td>
<td>39.6</td>
</tr>
<tr>
<td>TV</td>
<td>290</td>
<td>53.4</td>
</tr>
<tr>
<td>Internet</td>
<td>38</td>
<td>7.0</td>
</tr>
</tbody>
</table>
Knowledge of the students in the pre- and post-intervention phase:

Figures (2-6) show the level of knowledge of the students regarding environmental issues in the pre- and the post-intervention phases. In the pre-intervention phase, it is clear that none of the students succeeded to provide a correct complete definition of the environment. Correct but incomplete definitions were given by less than a quarter (24%) of them and the remainders gave wrong answers. As for the global environmental problems, questions regarding acid rain and ozone layer depletion were wrongly answered by all (100%) of the students. Two students (1.3%) gave correct complete answers about global warming and 7 (4.7%) students gave correct but incomplete answers about deforestation. This was in accordance to findings of a survey conducted in the United States (2007) which found that junior and senior students demonstrated low level of knowledge (less than 37% correct answers) in regards to global warming.(12) In another survey carried out in Missouri State (2003), 56% of high school science teachers incorrectly perceived that "holes in the stratospheric ozone will increase the greenhouse effect".(13)

As for global warming, the UNESCO made an alert about the need for a prompt action in EE to take into consideration the implications of climate change. Examples include reviewing and re-orienting all levels and forms of existing educational programs to address the causes and consequences of climate change, developing creativity, problem solving and social transformation skills in the learners. Practically, this involves learning actions to reduce energy consumption, use renewable forms of energy, design and use greener technologies, make changes in consumption
patterns, besides some adaptation practices (e.g. drought-resistant farming practices). (14)

![Figure (2): Knowledge of Preparatory School Students about Environment and Environmental Problems in the Pre-intervention (Pre) and Post-Intervention (Post) Phases (Alexandria, 2007)](image)

Regarding water issues, figure (3) illustrates the knowledge of the preparatory school students about causes of water pollution, impacts of such pollution, water pollution prevention methods, water scarcity, and water conservation methods. In the pre-intervention phase, all of the students (100%) gave correct but incomplete answers about water pollution prevention methods such as wastewater treatment prior to discharge, preventing agricultural wastewater disposal and solid waste disposal in the water streams, and the use of oil traps in industrial plant sewerage systems. As concerns the causes of fresh and marine water pollution, 86% and 78% of the students...
gave correct but incomplete answers respectively, and the rest gave wrong answers. Ninety-two percent of the students succeeded in identifying some water-borne diseases, but no one identified all of them. As for the water scarcity causes that include population increase together with fixed amount of fresh water available; and water conservation methods that include reducing water consumption and reuse of municipal, agricultural and industrial wastewater, only 12% and 36% of the students gave correct and complete answers to these issues respectively.

Concerning air pollution causes and impacts, figure (4) clarifies that many sources of air pollution including industrial emissions, burning of fossil fuel, burning of refuse, spraying of pesticides and earthquakes gases have been recognized by 88%
of the students prior to the EE sessions. Some types of air pollutants (lead, carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur) and some causes of increasing levels of CO₂ in the atmosphere (burning of fossil fuel, destroying of forest, motor vehicles) have been recognized by more than one-third of the students (46% and 40% respectively). It is worth mentioning that 98% of the students failed to give correct complete answers about the impacts of air pollution (respiratory tract infection, acid rain, global warming) while only 2% gave correct complete answers.

Figure (4): Knowledge of Preparatory School Students about Air Pollution in the Pre-Intervention (Pre) and Post-Intervention (Post) Phases (Alexandria, 2007)

Answers to questions concerning energy are presented in figure (5). It is obvious that 90% and more of the students gave correct but incomplete answers to all questions. These answers were better than those obtained from middle and high school
students in the United States. Results from a survey among New York students indicated low levels of energy-related knowledge, with 58% correctly identifying renewable energy resources and less than 1% of students scoring above 80%.[15]

Similarly, as regards the knowledge of preparatory school students about the problem of solid waste, it is clear from figure (6) that the majority gave correct but incomplete answers in the pre-intervention phase: 86% for the sources of solid waste (municipal, agricultural, industrial, commercial), 86% for their public health impacts (breeding sites for flies, mosquitoes and rodents, fire hazards, bad smell, traffic hindrance, ground and surface water pollution), 70% for the impacts of refuse burning (respiratory tract infection, release of dioxin, increased level of carbon dioxide), 76% for the school-generated hazardous waste
(paints, laboratory chemicals) and 90% for the household hazardous waste (paints, sharp boxes, batteries and health-care waste). None of students gave any correct complete answer. These results were higher than those obtained from a similar survey conducted in Ankara University (2004) where students were unaware of issues such as sustainable development and solid waste pollution.\(^{16}\)

Based upon the previously mentioned answers, a score was calculated for every student. Scores were found to range between 13/54 and 30/54 with a mean of 19±2.5. This revealed that 77% of the students had poor level of knowledge about environmental issues and the remainder 23% had fair level of knowledge. This was in contrast to a survey carried out in the United States (2008) where a mean score of 40.34/60 was attained in Ecological knowledge by students in the same age period, obviously due to EE that is incorporated within their curriculum.\(^{17}\)

Knowledge levels in the present study were found to be positively correlated to the socio-economic levels of the students \(r = 0.336\) at 0.01 level of significance. This could be supported by another survey conducted in Lebanon (2003) whose results showed that secondary school students had favorable attitudes toward the environment but lacked environmental knowledge, and that such poor environmental knowledge was significantly related to parental education level.\(^{18}\)
Following the EE sessions given to preparatory school students, the re-assessment of their knowledge was performed and the improvement was clear in figures (2-6). Correct and complete answers that were rare in the pre-intervention phase (only in 5 questions out of the 27 ones asked) were found in all questions (100%) of the post-intervention phase. This could be attributed firstly to the timing of the post test being one week immediately after the last EE session and secondly to the interest of the students to learn about environmental issues. As a result, the scores of the students' knowledge in the post-intervention phase were ranging between 39/54 and 54/54 with a mean of 48±2.2. These scores were statistically different from those of the pre-intervention phase at a 5% level of significance (t= 28.65).
In addition, comparison between the percentages of students having poor, fair and satisfactory levels of knowledge before and after the intervention is presented in figure (7). It was clear that after the EE sessions, none of the students had a poor level of knowledge compared to 77% before the EE. Moreover, satisfactory level of knowledge could be observed among two thirds (69%) of the students in the post-intervention phase compared with 0% in the pre-intervention phase. This is consistent with a study carried out in the United States (1999) where the students' environmental knowledge scores increased by 22% after they completed an environmental science course. (19)

Figure (7): Comparison between the Level of Environmental Knowledge among Preparatory School Students in the Pre- and Post-Intervention Phases
Attitudes of the students in the pre- and post-intervention phase:

The attitudes of children are the major focus of many EE programs. The development of environmentally sensitive attitudes in youth is considered important for good behavior later in life.\(^{(20)}\)

The attitudes of preparatory students towards environmental issues are presented in table (2). It is obvious that about 80\% of the students recognized the necessity of controlling environmental pollution resulting from different industries. Besides, about 65\% were accepting the idea of being happy while taking care of flowers. The rest of the statements were agreed upon by less than 50\% of the students, among which is the importance of saving energy; it got the acceptance of only 40\% of the students under study, contrarily to New York students 72\% of which reported the importance of energy conservation and 64\% felt the necessity of making electricity from renewable resources.\(^{(15)}\)

The statements that received the least agreement were about the relationship that exists between destroying nature and destroying ourselves, an advice not to waste the rain and a way to reduce waste through reuse and recycle. All of these statements got agreement from only 2\% of the students. This is in contrast to the findings of a survey carried out in Montgomery (2005) where about 60\% of the respondents considered recycling to be the most important environmental issue to the City.\(^{(21)}\)

Another study was conducted in London (2005-2006) and reported that recycling awareness raising activities are organized in 84\% of the schools, and that, as a result to these activities, 89\% of the schools had a scheme to recycle paper.\(^{(22)}\)
The scores obtained by the students in this pre-intervention phase ranged between 18/54 and 35/54 with a mean of 26±4.1. This revealed that 80% had negative attitude towards environmental issues and that the rest 20% were indifferent. These attitudes were positively correlated to the socio-economic level of the students \((r=0.64)\) at 0.01 level of significance. This correlation was in accordance with the findings of a survey carried out in Turkey (2004). This survey concluded that students with high family income, and those living in urban areas, displayed more positive attitudes towards environmental issues than other students with low family income, and those living in suburban areas.\(^{(23)}\)

Moreover, the attitudes of the students under study were also positively correlated with their level of knowledge \((r=0.436)\) at 0.01 level of significance. These negative attitudes were in contrast to the highly positive attitudes observed among 57% of 15-years-old Dutch students who reported being prepared to pay extra money for saving the environment. However, no correlation could be observed between such positive attitudes and the level of knowledge of these students.\(^{(24)}\)

Following the EE sessions given to the students, the re-assessment of their attitudes was performed and the improvement is clear in table (2). More than 70% of the students reported their agreement about all statements and more that 95% reported their agreement about issues such as industrial pollution prevention, preventing trash throwing into the sea for fish to live, being happy by taking care of flowers, reducing solid waste by reusing and recycling and segregating solid waste by throwing every type in the specified container.
As for the scores of the students' attitudes in the post-intervention phase, the scores were ranging between 39/54 and 54/54 with a mean of 51.65±2.2. Similarly to the knowledge, the scores obtained in the pre-intervention phase were statistically different from those obtained in the post-intervention phase at 5% level of significance (t= 25.65).
Comparison between the percentages of students having negative, neutral or positive attitude towards the environment before and after the intervention is presented in figure (8). It is clear that after the EE sessions, none of students had negative attitude compared to 80% before the EE. Positive attitudes are observed among 88% of the students in the post-intervention phase compared with 0% in the pre-intervention phase. This is in accordance to the study carried out in the United States (1999) where high school students’ environmental attitudes became more environmentally favorable after exposure to a 10-day environmental science course. Another survey was carried out in Iran (2007) and proved that the attitudes of Tehran residents towards the environment are improved through EE programs.

![Figure (8): Comparison between the Attitudes of Preparatory School Students towards Environmental Issues in the Pre- and Post-Intervention Phases](image-url)
CONCLUSION AND RECOMMENDATIONS

Environmental knowledge among preparatory students in Alexandria was found to be low: Poor level of knowledge was detected among 77% of the students and fair level was detected among 23%. Such levels were positively correlated to the socio-economic levels of the students. Environmental issues that were most misunderstood by the students were global warming, acid rain, ozone depletion, deforestation, impacts of air pollution and water scarcity.

Attitudes of 80% of preparatory students in Alexandria toward environmental issues was found to be negative, the rest (20%) were indifferent. These attitudes were positively correlated with the socio-economic levels of the students and with their levels of knowledge. Attitudes of the students were negative towards the reuse and recycling issue, the relationship between destroying nature and destroying ourselves and attempts to stop wasting the rain.

Significant differences in both knowledge and attitudes of the students were observed after attending the EE program: Satisfactory levels of knowledge were observed among 69% of the students and positive attitudes were observed among 88%. These results support the need for development and implementation of environmental education programs as part of the regular school curriculum.

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