

LEBANESE AMERICAN UNIVERSITY

**THE INTEGRATION AND THE IMPACT OF ENVIRONMENTAL
EDUCATION IN SCHOOL CURRICULUM**

By

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A project

Submitted in partial fulfillment of the requirements
for the degree of Master of Arts in Education

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School of Arts and Science - Beirut Campus

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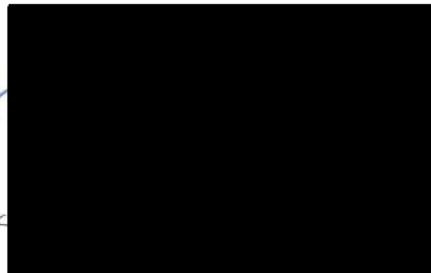
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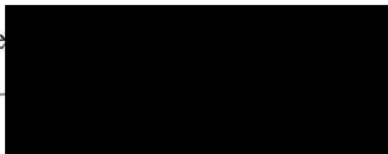
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The Integration and the Impact of Environmental Education in School Curriculum

Samar Fouad Bouzeineddine

ABSTRACT

This study described the integration of environmental education in the school curriculum in formal and non formal contexts and examined its impact on the knowledge, skills, attitudes, and behavior of forty five students in grade ten. Qualitative data from the principal interview, teacher's questionnaire, and school's documents showed that students learnt about global and local environmental topics (Pine Forest) in Languages, Biology, Chemistry, Social Studies, Sociology, and Economics. Quantitative results from students' pre and post assessments showed that environmental education program had a positive and significant impact. Students improved their environmental knowledge and skills and reinforced their positive attitudes and behavior. Findings suggested that further longitudinal studies are important to sustain the positive influence of environmental programs on students' ecological awareness, skills, and attitudes in the secondary, intermediate, and elementary classes.

Keywords: Environmental education; Formal education; Non formal education; Local environment; Environmental knowledge, skills, attitudes, and behavior

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CHAPTER I

INTRODUCTION

Environmental problems have become challenging affecting the balance of the ecosystems on Earth. If we do not recognize the seriousness of these issues globally and locally, humans may become an endangered species. The major and permanent key, to reduce the consequences of such problems or solve them, is in the hands of our future generations, our children. To protect and love nature, children should be made fully aware of the benefits we derive from nature's resources and of the sense of beauty and its positive effects on their minds and hearts. Through informal conversation with educators at different schools, and through personal experiences with teaching and school administration, I realized that environmental education (EE) in the Lebanese curriculum, which is essential to develop students' level of knowledge, skills, and attitudes, is ineffective. Therefore, schools should enhance their role in supporting students to be involved and empowered citizens who will draw a better picture of the future world. It is important to maximize the effectiveness of environmental education, formal/ non-formal through means of integration across the school curriculum.

Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among humans, their culture and their biophysical surroundings.

Environmental education also entails practices in decision making and formulating a code of behavior about issues concerning environmental quality (Palmer, 1998; Palmer & Neal, 1994).

Non-formal education is the education that takes place outside the formal school system. In a non formal system of education, environmental education is built on several factors such as: curriculum, teachers' quality of environmental knowledge, skills, and attitudes (Metin, 2010). Non-formal educational programs, which take place in nature centers, zoos, community clubs, science centers, television, radio, newspapers, and other media-generated educational programs, enhance and complement formal educational programs because they have the same goals.

Effective environmental education incorporates problem solving, hands-on learning, action projects, scientific inquiry, critical thinking, and cooperative learning. It employs relevant subject matter and topics that actively engage students in reducing the causes of environmental problems such as: air pollution, land pollution, water pollution, waste management, deforestation, and global warming.

1.1 - Purpose of the Research Study

The study first describes how environmental education, that includes a curricular unit on Lebanon's Pine Forests, is integrated into the school curriculum at Green School in the frame of intra and extra curricula in grade 10. Intra curriculum integration of environmental education is implemented during the process of teaching and learning across the subjects: Arabic Language, English Language, Chemistry, Biology, Math, Social Studies, Economics, and Sociology. Extra curriculum integration is implemented by participating in special environmental events, days, and action programs in addition to using opportunities in the management of resources and school grounds as authentic learning experiences (Department of Education and Training, 2001). Second, the study aims to assess the influence of environmental education on students' environmental

knowledge, skills, attitudes, and behavior. Below are two figures that illustrate EE integration across the curriculum.

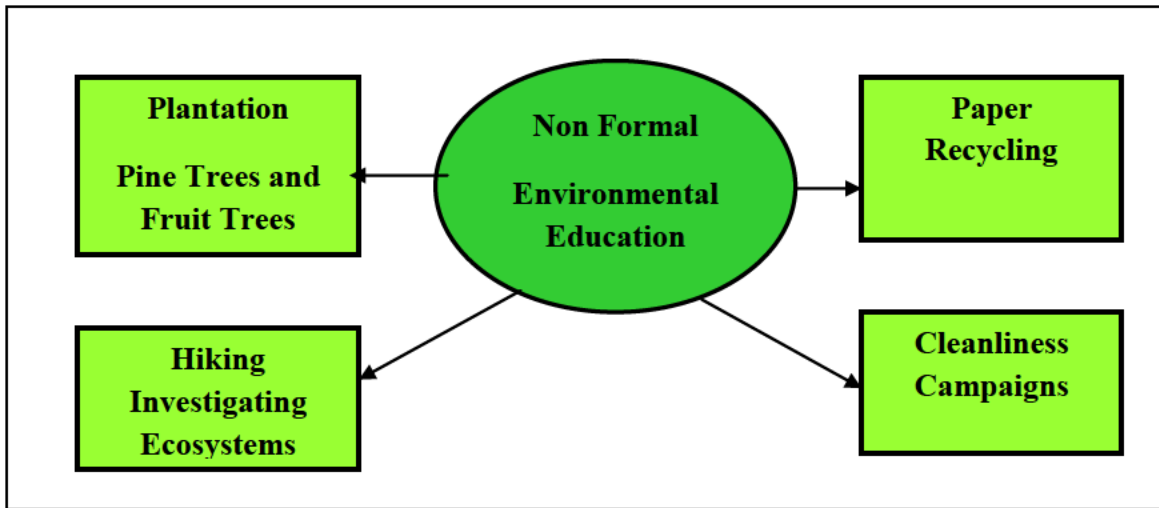


Figure1.1. Non-Formal Environmental Education across Grade Ten Curriculum

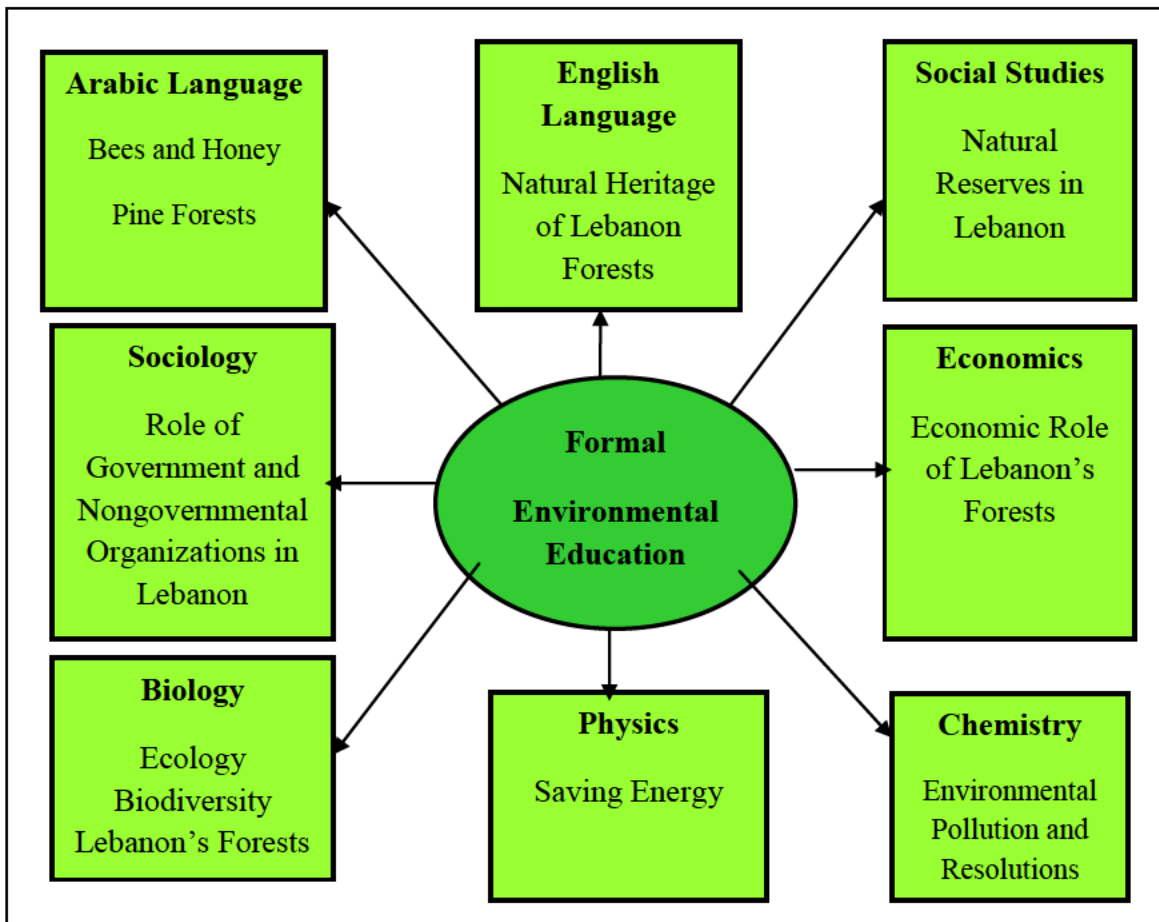


Figure1.2. Formal Environmental Education across Grade Ten Curriculum

1.2 - Research Questions

1. How is environmental education integrated in the school curriculum in grade 10?
2. How does environmental education program including Lebanon's Pine Forest unit influence grade 10 students' knowledge, skills, attitudes, and behaviours?

1.3 - Rationale of the Research Study

Since the body of research conducted on environmental education is insufficient in Lebanon, this project is important to address the Ministry of Education to do further research studies and develop tools to evaluate environmental literacy in schools' curricula and assess its effectiveness. Though "environmental education was introduced in 1997 for the first time into the Lebanese general education curriculum, it is integrated mainly into the science and social studies at the elementary, intermediate, and secondary levels and the implementation is not effective" (Makki, Khalick, & Boujaoude, 2003, p. 3). In addition, the curriculum of grade ten lacks local environmental topics such as Lebanon's Forests that concern the community in High Matn areas in particular and Lebanese citizens in general. Therefore, this project presents a new model of environmental education program to maximize effectiveness through means of integration across the school curriculum in order to educate our present and future generations about environmental issues and prepare them to participate in short and long terms solutions.

1.4 - Research Context

Green School, a private high school, is located in Ras-Elmatn in Lebanon's mountain, 850 km above the sea level. It is surrounded by a serene environment of Pine Trees, where building industries or farms, is prohibited according to a decree issued in 1997 by Knayssi municipality. Having a rich, green natural field around the school can enhance students' learning, interests, and attitude towards their local environment. Therefore, it is essential to apply new teaching methods like inquiry, experiments, projects, and discovery in order to develop students' cognitive, physical, emotional, and social skills. They are the basic keys of educating a person to become a fully active member in society, as the school mission states in the school document "the development of students academically, ethically, socially, aesthetically, and physically in a learning organization where educating the person as a whole is vitalized in order to become a fully active member in society".

In 1997, formal environmental education was integrated into science and social studies at the elementary, intermediate, and secondary levels at the school according to the Lebanese general education curriculum standards. In addition, environmental extracurricular activities – indoor and outdoor activities- have been developed in the school program. Indoor activities are drama shows, art exhibitions, science fairs, and cleanliness campaigns; whereas, outdoor activities take place in the natural surroundings of the school, Ras-Elmatn, or in the other Matn areas, are hiking or planting pine and cedar trees. These activities are done in collaboration with environmental organizations like Association for Forests, Development, and Conversation (AFDC). Besides, Green School environmental club was established in 2009; its members, intermediate and secondary students, often participate in local and international environmental activities, contests, and exhibitions.

In 2011, a new vision added another dimension of environmental education. It is the transference of the school into an eco-friendly school in High Matn areas. The school is in the process of establishing an integrated system to enhance students' environmental knowledge, skills, and attitudes with extra emphasis on the ecosystem of Pine Forests. Environmental education is to be integrated in sciences as well as in humanities subjects. Therefore, grade ten students will be able to learn about the environment, in the environment, and for the environment.

Learning about the environment is the acquisition of knowledge and understanding of environmental topics (Palmer, 1998). Students learn about natural processes in the environment, essence of ecosystem diversity of Lebanon's forests, humans' dependence on the forests environment, impact of humans' conduct on the forests, environmental issues like forest fires, greenhouse effects, acid rain, types of pollution, and protection of the environment.

Learning in the environment is the acquisition of several various skills (Palmer, 1998). Students develop skills related to waste management, plantation, saving energy in addition to oral and written communication skills, problem solving skills, study skills (research and inquiry), and social skills.

Learning for the environment is the acquisition of values, attitudes and positive behavior for the environment (Palmer, 1998). Students gain the appreciation of care and concern for life in Lebanon and on Earth, respect for Lebanese cultural heritage, and contribution for supporting solutions to environmental problems. Table one illustrates the components of environmental education in the school curriculum.

Table1.1. Components of Environmental Education in School Curriculum

Learn about the Environment	Learn in the Environment	Learn for the Environment
Natural processes in the environment	Technical skills: waste management, plantation, recycling, composting	Appreciation of care and concern for environment and life in Lebanon and on Earth
Essence of ecosystem diversity	Oral and written communication skills	Respect for Lebanese cultural heritage
Humans' dependence on the environment	Problem solving skills	Contribution for supporting solutions to environmental problems
Environmental issues	Study skills: research, inquiry	
Protection of the environment	Social skills: inter and intra personal skills	

The process of teaching and learning environmental education is built on student-centered strategies. Students are engaged in research, inquiry, discovery, projects, and hands-on activities to expand environmental knowledge, develop skills, and show positive behavior and attitudes towards local environment namely Pine Forest.

Green School is committed to a long-term school action plan for the environment in the wider community in Ras-Elmatn. A green community fosters the sense of responsibility and leadership that makes the participants (students, teachers, parents, villagers, and municipality members) involved in the decision-making process related to ecologically sustainable development which is the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Pezzey, 1992).

The following chapters will elaborate on the literature review, methodology, results, discussion, and recommendations for further research.

CHAPTER II

LITERATURE REVIEW

This chapter presents a review of the literature that highlights the significance of environmental education and its contextualization. It describes the integration of environmental education in school curriculum and its components. In addition, the literature describes the impact of environmental education on students' knowledge, skills, and attitudes.

2.1 - Significance of Environmental Education

The body of research conducted on environmental education and environmental problems has been growing in the last 25 years in many countries (Metin, 2010). Due to the crucial environmental issues on Earth, “natural resources depletion and the increasing threat to ecosystem sustainability”, environmental education should be a basic pillar in education to enrich students' ecological awareness because they are the future leaders (Roksandic, Milovanovic, & Markicevic, 2011, p. 490). Two significant words, education and environment are linked together. Why and what for? The answers lie in the feelings and concerns of individuals “since no educational program of work can be successful without individual commitment and personal concerns” (Palmer & Neal, 1994, p. 3). So, the achievement of environmental education (EE) should be guided by individuals' needs, satisfaction of interests, solving environmental problems supported by willingness, devotion, and responsibility. If the ultimate goal of environmental education is to sustain Earth and its resources for future generations' survival, then environmental education is

essential to produce environmentally active adults fully aware and equipped with knowledge, skills, and most of the learning experiences which contribute to develop environmental care, values, and attitudes (Alnewashi, 2003; Palmer, 1998). Therefore, school vision should adopt global and local environmental education.

2.2 - Contextualization of Environmental Education

Schools play a major role in building a link with the community for the purpose of establishing “contextualization through active learning”, a strategy that stands for developing the school curriculum in the frame of its local context where teachers connect the content to the authentic life experience of students (Ruiz-Mallen, Barraza, Bodenhorn, Ceja-Adame, & Reyes-Garcia, 2010, p. 1756). In local environment, where the child grows, learns from and belongs to, environmental education should be offered. The results of a study conducted in Mexico revealed students’ poor environmental knowledge and little interest in their community forestry due to lack of connection between the environmental topics, activities, and their regional environment (Ruiz-Mallen & Barraza, 2008). “Think globally and act locally” (Baez, Knamiller, & Smith, 1987, p. 58) should be focused in secondary school environmental educational programs. Consequently, Mansour (2010) in collaboration with Association for Forests, Development and Conservation (AFDC) has published a teacher’s guide to shed light on environmental education to protect Lebanese forests through teachers and students. This guide is used to develop a strategy to integrate environmental education in Lebanese environmental curriculum.

2.3 - Integration of Environmental Education

Researchers suggested that formal and non formal environmental education complement each other to preserve the environment and guide people to live a healthy life (Metin, 2010). Environmental education should be a major component of formal education in schools since it is a basic necessity for human survival (Alnewashi, 2003). Several studies (Environmental Education and Training Partnership, 2004; Alnewashi, 2003) elaborated on several approaches to formal environmental education in schools:

1. “Infusion” is merging of environmental topics and activities in the existing curriculum.
2. “Imposition” or “Module within a Subject” is adding environmental themes to the curriculum such as energy consumption and chemical wastes.
3. “Framing” or “Cross- Curricular” is integrating environmental themes across all classes.
4. “Environmental Problem Solving” is the cooperative learning strategy where students are engaged in solving authentic environmental problems in their local environment (Alnewashi, 2003, p. 25-26).

Callicutt (1996, p. 3-5) in his position paper has addressed a “Holism” design of an American public school curriculum that is an “environmentally-based educational system” where all the subjects are totally integrated, moral and sentimental commitment is required, and authentic examples are provided to transform knowledge into action . In Nigeria, the government in collaboration with educational researchers integrated environmental education into social sciences curricula at the secondary level by implementing the following approaches:

- Integrating different subjects through cross curricular discipline focusing on EE
- Creating a new environmental education subject
- Presenting particular EE units into current social science subjects: geography, economics and social studies
- Training teachers to teach their subjects with extra emphasis on EE (Adedayo & Olawepo, 1997).

Studies in Thailand and Serbia found that environment and sustainable development are a small part of the school curriculum and mainly taught in sciences (Thathong, 2010; Roksandic et al., 2011). But environmental education can be developed and integrated through Language Arts (Erdogan, Coskun, & Usak, 2011) and all other subject areas (Thathong, 2010). Teksoz, Sahin, and Ertepinar (2010) elaborated on the views of pre-service teachers in Turkey about the scope of EE in formal education that covers the following topics: all issues dealing with environment, environmental pollution, resolution of environmental problems, global warming, environmental cycles, water and water pollution, biodiversity, air pollution, energy usage, and health education.

Non-formal environmental education is another major component of environmental education that refers to any systematic activity done outside the formal system to meet intended learning objectives (Alnewashi, 2003). Non formal environmental education plays an important role in spreading environmental public awareness due to its numerous and diverse programs that allow students to interact with community members and reinforce their knowledge and skills (Alnewashi, 2003; NAAEE, 2000). For example, in Malaysia, non-governmental organizations have contributed to implementing non formal environmental education through many activities such as “talks, workshops, seminars,

exhibition, radio shows, competition, clean-up campaigns, camping and tree planting” (Said, Yahaya, & Ahmadoun, 2007, p. 19).

To enhance students’ knowledge, awareness, and skills, Alnewashi (2003) suggested certain non-formal environmental education approaches. The “Cafeteria Approach” focuses on chronological and approved curriculum that consists of various interesting activities like drama, exhibition, media, and publications. The “Workshops in Natural Setting Approach” is centered on teaching through the environment and creating learning activities in natural surroundings. The “Environmental Action Approach” highlights environmental action projects that examine environmental issues, and “Movies Approach” uses media as an effective means to enhance knowledge, awareness, attitudes, and values.

In addition, non formal education does not require curriculum only but qualified teachers in terms of environmental knowledge, skills, and attitudes (Metin, 2010). Both formal and non formal environmental education is essential in preserving the environment (Larijani, 2010). In order to have effective integration of environmental education into the school curriculum, formal and non formal environmental approaches should be implemented.

2.4 - Components of Environmental Education

The implementation of environmental education requires the three interlinked components identified by researchers (Harris & Blackwell, 1996; Palmer, 1998; Palmer & Neal, 1994; Said et al., 2007; Thathong, 2010), education about the environment, education in or through the environment, and education for the environment.

The aims of environmental education have been declared by the Tbilisi Conference (UNESCO, 1977):

- Education about environment, developing knowledge and understanding the environment and Man's relationship with it
- Education in or through the environment, using the environment as a resource for learning by means of discovery and students' authentic learning experiences
- Education for the environment, developing values, attitudes, and positive behavior.

While integrating environmental education into the school curriculum in the formal and non formal contexts, the three components of EE should be highly considered to attain the desired learning outcomes regarding knowledge, skills, and attitudes.

The following figure (Palmer, 1998, p.144) represents how the dimensions of knowledge, skills, and attitudes are incorporated into the structure of the environment program.

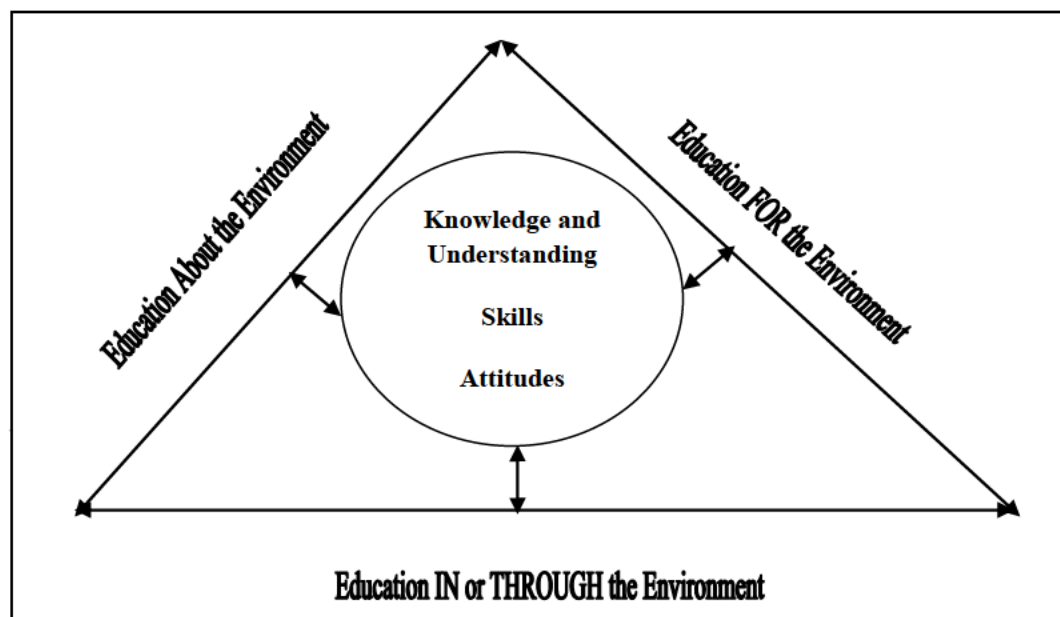


Figure 2.1. Components of Environmental Education

2.5 - Environmental Education in Lebanon

In Lebanon, the research studies on environmental education are limited. One study (BouJaoude & Youssef, 2003) aimed to examine the effects of integrating environmental issues into a science unit on water on students' performance, achievement, and attitude toward the environment. The results were highly significant in terms of cognitive questions improvement, and the students' positive attitude towards the environment.

Boufhakereddine (2007) studied the impact of applying the GLOBE program - hands-on international science and education program – and found that the participants improved their academic, social, and leadership skills because they were given the opportunities to use their knowledge in realistic situations. The results of another study (Makki et al., 2003) on Lebanese secondary school students' environmental knowledge and attitudes showed that the participants had inadequate knowledge of basic environmental concepts and issues. However, they were interested in protecting the environment but unable to make decisions.

2.6 -Impact of Environmental Education on Students' Knowledge, Skills, and Attitudes

An active and authentic environmental education program was applied in Mexico and maximized the effectiveness of teaching-learning skills and enhanced students' motivation and ecological knowledge because it focused on people's daily concerns and allowed them to participate in solving their problems related to local forest management (Ruiz-Mallen et al., 2010). Therefore, teaching strategies for EE - field study, case study, inquiry-oriented instruction, student-centered classroom activities or authentic experiences in a naturalistic

learning environment- are found to be effective to promote an enjoyable environmental learning (Teksoz et al., 2010; Ballantyne, Anderson, & Packer, 2010; Simsekli, 2010).

A study on the environmental knowledge, attitudes, and behavior of Maltese youth, (Mifsud, 2011) confirmed that the implementation of environmental education did not only increase students' knowledge but also improved their positive environmental behavior. In the United States, a research study showed that environmental education programs have supplied grade eight students with rich, thorough, and realistic experiences that expanded their knowledge, enhanced their thinking skills, and improved their performance abilities to address environmental problems in the world (Bartosh, Tudor, Ferguson, & Taylor, 2009). Also, a research report about measuring the effectiveness of North American environmental education programs showed the significant difference of environmental knowledge, affect, and behavior between students who participated in school-based environmental education programming and their counterparts in the same study (McBeth, Hungerford, Marcinkowski, Volk, Cifranick, Howell, & Meyers, 2011).

The results of a study that was conducted in Slovenia to compare between eco schools and ordinary schools showed significant differences in students' knowledge but their environmental behavior did not improve (Krnjic & Naglic, 2009) while Coertjens, Pauw, Maeyer, and Petegem (2006) found that schools do affect the development of students' environmental attitudes and awareness when they are engaged in environmental activities supported by constructivist teaching methodologies. According to Roksaudic et al. (2011), students' environmental knowledge is improved by "environmental education and practice"; in line with Janssen and Crauwels (2011) who focused on the importance of exploring and observing local environment. Furthermore, Uzun, Atli, and Saglam (2010) suggested several strategies to improve students' attitudes such as in-class activities and

field studies, in addition to teachers' role model and their enthusiasm in enriching student' environmental knowledge. According to previous research studies, the integration of environmental education program across the school curriculum has shown positive impact on students' learning.

To conclude, researchers have noted that the integration of global and local environmental education in formal and non formal school curricula is important to produce environmentally active and informed students. In the following chapter, I will display the methodology used in this study.

CHAPTER III

METHODOLOGY

This chapter presents the research design and methods, the sample characteristics, the instruments used to collect data, measures taken to ensure validity and reliability, and data analysis.

The objectives of the study were to describe the integration of environmental education (EE) into grade ten's curriculum and to determine whether there was an impact on students' knowledge, skills, attitudes, and behavior. The research study explored the principal's and grade ten teachers' perceptions regarding the integration of environmental education across the curriculum and examined the impact of the environmental program on students' knowledge, skills, attitudes, and behavior.

3.1 - Method

The research design included qualitative as well as experimental method of pre assessment, environmental program intervention, and post assessment. Three main instruments were used to collect data: student's questionnaire, teacher's questionnaire, principal's interview, in addition to analysis of documents collected from teachers' lesson plans and students' portfolios.

3.2 -The Population and the Sample of the Study

The study was conducted in the Green School in Ras-Elmatn in the Mountain of Lebanon. It is a private school that includes kindergarten, elementary, intermediate, and secondary departments. The socio-economic status of most of its students is middle. The

school is committed to the Lebanese Program supported by the American Program in the areas of English Language, Math, and Sciences. For the purpose of the study, a purposive sample of all grade ten students was selected based on my judgment as capable of providing the needed data (Frankel, Wallen, & Hyun, 2012). Grade ten students were forty five (27 male, 18 female). Their ages ranged from 15 to 16 years, and their academic performance was of different levels: above average, average, and below average. Other participants were the school principal and seven grade ten teachers of English Language, Arabic Language, Biology, Chemistry, Physics, Social Studies, and Sociology subjects.

3.3 - Instruments

Three major instruments were used to collect data: students' questionnaire, teachers' questionnaire, and semi-structured principal interview. In addition, teachers' lesson plans and students' portfolios generated data to cross check results from the above instruments. Fraenkel, Wallen, and Hyun (2012) identified several advantages of the questionnaire: a) it can be given to a big number of subjects at the same time b) it is self-administered c) it includes different types of items such as closed ended and short-answer questions d) it allows confidentiality and secrecy and e) data are collected at one point of time. Also, interviews have advantages which are: a) respondents show collaboration and understanding b) questions can be illustrated c) incomplete answers can be modified d) questions do not require reading and writing skills from the respondent and e) interview provides more time with the respondents (Fraenkel et al., 2012).

3.3.1 - Student's Questionnaire

The first method of collecting quantitative data was the students' questionnaire. It is composed of four sections to assess students' knowledge, skills, attitudes, and behavior (Appendix I). Knowledge questions consist of 24 items about Lebanon's forests, environmental terminology, natural resources, and the balance of the ecosystem. Skills questions consist of 6 items regarding environmental awareness, recognition of different types of soil and trees, waste management, pine trees plantation, and citizens' role in reducing fire forests. Attitudes questions consist of 10 items about the effects of human conduct on the environment and the roles of governmental and nongovernmental organizations in protecting the environment. Behavior questions consist of 10 items about positive behavior towards environment.

Most of the questionnaire's items were adapted from previously published instruments; other questions were constructed to meet the purpose of the study. The first part of the knowledge questions (10 items) was developed for the specific purpose of the study to introduce a Lebanese Pine Forest unit (Mansour, 2010). The second and third parts of the knowledge questions (9 items) were adapted from Importance of Teaching EE in Serbian Schools (Roksaudic et al., 2011). The fourth part of that knowledge questions (5 items) was adapted from National Environmental Literacy Assessment, Phase Two: Measuring the Effectiveness of North American Environmental Education (McBeth et al., 2011). Skills questions (6 items) were developed to serve the purpose of the study in relation to Pine Forests in Lebanon. Attitudes and behavior questions were adapted from National Environmental Literacy Assessment, Phase Two: Measuring the Effectiveness of North American Environmental Education (McBeth et al., 2011); and A Study on Developing a

general Attitude Scale about Environmental Issues for Students in Different Grade Levels (Metin, 2010); and Environmental Literacy Comparison between Eco-schools and Ordinary Schools in Slovenia (Krnal & Naglic, 2009); and An Investigation on the Environmental Knowledge, Attitudes and Behavior of Maltese Youth (Mifsud, 2011).

3.3.2 - Teacher's Questionnaire

The second method of collecting data was teacher's questionnaire. It was a semi-structured questionnaire administered to seven grade ten teachers who teach Arabic language, English Language, Chemistry, Physics, Biology, Social Studies, Sociology, and Economics. The questionnaire was translated into Arabic then back to English to make sure the meaning of concepts remained accurate. The questionnaire is composed of four sections (Appendix I). The first section consists of five questions related to environmental education in Green School curricula before the new intervention program. The second section consists of six questions related to the description of the integration of environmental education across the subjects taught in grade ten. The third section consists of five multiple choice questions to identify the attitude of teachers towards the environmental program. The fourth section consists of twelve multiple choice questions that describe teachers' opinions regarding the impact of EE integration on students' knowledge, skills, and attitudes.

The questions were adapted from previously published instruments with certain modifications to serve the purpose of the study. They were adapted from Contextualising Learning through the Participatory Construction of an Environmental Education Programme (Ruiz-Mallen et al., 2010); National Environmental Literacy Assessment, Phase Two: Measuring the Effectiveness of North American Environmental Education

(McBeth et al., 2011); and The Environmental Knowledge and Attitudes of Prospective Teachers in Lebanon: A Comparative Study (Vlaardingerbroek & Taylor, 2007).

3.3.3 - Principal's Interview

The third method of collecting qualitative data was the principal's semi-structured interview that was conducted in the office setting and audio recorded. Three sections of open-ended questions were constructed to draw out the principal's perceptions and evaluation of the school approaches to environmental education and its impact on students' knowledge, skills, and attitudes. One section of five multiple questions elicited the principal's reflection on the role of the school in developing environmental education. The questions were developed to be relevant to the other instruments' items. Later, data were transcribed, categorized, and analyzed (Appendix I).

To check the readability and the comprehensibility of students and teachers' questionnaires, they were piloted on 6 secondary and intermediate teachers of Chemistry, Biology, Physics, Math, and English subjects and the questions were modified twice to correct the ambiguity of some terms. Gudmundsdottir and Brock-Utne (2010) have focused on the importance of piloting in minimizing the errors of a research design, developing a project more efficiently, and increasing the validity of the results.

3.4 - Procedures of the Study

The process of implementing the study extended over three phases: pre assessment, environmental program intervention, and post assessment. First, in the pre assessment, students' questionnaire was administered to all grade ten students in the examination hall during the first week of December, 2011. Second, the integration of environmental education in both formal and non formal contexts was implemented over four months as

was decided by the school and teachers of grade ten. Third, in post assessment, students' questionnaires were administered to all grade ten students under the same conditions during the third week of April, 2012. Then, an interview was conducted with the principal and a questionnaire was administered to seven grade ten teachers of Arabic Language, English Language, Biology, Chemistry, Social Studies, Sociology, and Economics.

3.5 -Validity of the Study

The content validity of the study was established since the coherence of the research questions and the items of the various instruments were evident (Morse, Barrett, Mayan, Olson, & Spiers, 2002). Instruments meet the objectives of the research questions related to the integration of EE in grade ten's curriculum and its influence on students' knowledge, skills, attitudes, and behavior as shown in the table below.

Table3.1. Alignment of Research Questions and Instruments

Instruments	EE Integration in Grade 10	Influence of EE on Students Knowledge, Skills, Attitudes, Behavior
Student's Questionnaire	All environmental knowledge, skills, attitudes, and behavior questions are integrated in grade 10 core subjects: humanities and sciences.	It is administered twice, pre and post assessments, in December and April to determine the influence of EE on students learning.
Teacher's Questionnaire	First three sections address teachers' reflection on EE program in grade 10	Last section addresses teachers' views of EE impact on students' knowledge, skills, attitudes, and behavior.
Principal's Interview	First three sections address principal's reflection on EE program in grade 10	Last section addresses principal's views of EE impact on students' knowledge, skills, attitudes, and behavior.

Furthermore, the enhancement of validity, credibility, and reliability was established by utilizing triangulation since data is derived from three different instruments (Groenewald, 2004; Franke et al., 2012) and are later cross checked for similarities.

3.6 -Data Analysis

3.6.1- Quantitative analysis

The students' questionnaire was composed of four sections – knowledge, skills, attitudes, and behavior and generated quantitative and categorical data. Quantitative data, collected from knowledge and skills items, were analyzed by constructing the mean, frequency distribution and histograms while categorical data, collected from attitudes and behavior items, were analyzed by constructing frequency distribution and percentage of responses to twenty items (Frankel et al., 2012). The computer software Excel – Data Analysis – was used. This technique was applied twice upon the administration of pre assessment and post assessment to examine students' scores and responses and interpret the influence of environmental education on their learning.

3.6.2 - Qualitative Analysis

The principal's interview and some sections of the teachers' questionnaire yielded qualitative data. In addition, documents of teachers' lessons plan and students' portfolios were examined. Data were analyzed, coded, and categorized. A list of categories was developed such as: characteristics of grade ten's curriculum, approaches of local and global EE in formal and non formal contexts, teachers' attitude towards the EE program, and impact of EE program on students' knowledge, skills, attitudes, and behavior.

Table 3.2 Coding Categories in Teachers' Questionnaire

Curriculum before EE Intervention Program	Integration of EE Formal/ Nonformal Contexts	Teachers' Attitudes	Impact of EE on Students
Extent of EE integration	Infusion of new Environmental topics	Extent of EE integration	Knowledge
Environmental topics (Global and Local)	Teaching methods	Playing the role model	Skills
Role of EE integration in curriculum	Students' assessments	Impact of EE on students' future attitude and behavior	Attitudes
	Strengths/weaknesses of EE program	Environmental learning outcomes	behavior
		Enforcing environmental rules	Interests

Table 3.3 Coding Categories in Principal's Interview

Knowledge	Experience	Attitude	Evaluation
School mission	Environmental activities	Extent of EE integration	Impact on students' knowledge
School curriculum	Impact of environmental experience on EE	Playing the role model	Impact on students skills
School approach to EE		Impact of EE on students' future attitude and behavior	Impact on students attitudes
School privileges		Environmental learning outcomes	Impact on students behavior
Formal/ non formal EE integration		Enforcing environmental rules	Impact on other students and on the whole school

Then, data from the different instruments were triangulated. Frankel et al. (2012) found that "triangulation improves the quality of the data and the accuracy of the researcher's

interpretations” (p. 517). The three instruments, the student’s questionnaire, the teacher’s questionnaire, and the principal’s interview share common categories. The first category is how environmental education is integrated in the curriculum of grade ten. Questions in the student’s questionnaire are based on integration of EE in Arabic and English Languages, Chemistry, Biology, Social Studies, Sociology, and Economics subjects. Teacher’s questionnaire addresses questions to grade ten teachers to illustrate how they approach EE in the subjects they teach. Similarly, in the principal’s interview, questions are addressed to elaborate on school mission, school curriculum, and school approach to EE. The second category is the attitude towards environmental education which is found in the three instruments. The third category is the impact of EE on students’ knowledge, skills, attitudes, and behavior. Student’s questionnaire items are classified into knowledge, skills, attitudes, and behavior. Questions are addressed to grade ten teachers and the school’s principal to reflect their views on the impact of EE in the questionnaire and the interview.

In addition, students’ portfolios and grade ten teachers’ lesson plans present the infusion of local and global environmental topics such as: Ecosystems in Lebanon and in the world, Pine Trees in Lebanon, Natural Reserves in Lebanon, types of pollutants, and importance of forests in Lebanon. These environmental topics are integrated in Arabic and English Languages, Chemistry, Biology, Social Studies, Sociology, and Economics.

This chapter began with a description of the study’s design, methods used, participants, sampling, and administration procedures. Other sections included data instruments, validity and reliability in addition to data analysis. The next chapter presents the results of the analysis of the qualitative and quantitative data.

CHAPTER IV

RESULTS

This chapter presents the results of the study which are grouped under the two research questions:

1. How is environmental education integrated in the curriculum of grade ten?
2. How does environmental education program including Lebanon's Pine Forest unit influence grade 10 students' knowledge, skills, attitudes, and behavior?

To address the first question, qualitative data were collected from the principal interview, seven teachers' questionnaires, samples of teachers' lesson plans, and students' portfolios. To address the second question, qualitative and quantitative data were collected from the principal's interview, seven teachers' questionnaires, and students' pretest and posttest. Then, data were analyzed and classified into two main headings. The first one is the integration of environmental education in the curriculum of grade ten, and the second one is the impact of environmental education on students' knowledge, skills, attitudes, and behavior in grade ten.

4.1 - Integration of Environmental Education in the Curriculum

4.1.1 - Principal's Interview

Data results from the principal's interview show that he is an advocate of the school's EE in the school curriculum but finds it needs improvement. He said, "Although the school mission aims at developing the student academically, socially, ethically, and aesthetically,

and the new vision is heading towards a green school, students still need to be involved in class discussions, presentations, outdoor activities and projects in all subjects.” Therefore, the integration of the environmental education in the school curriculum is important. He focused on the specific privileges of the Green School that facilitate the implementation of environmental program and activities. The school is located in a serene and healthy environment away from noise pollution and rich in Pine Trees. In addition, he focused on the school’s approaches to EE that should be implemented in formal and non formal contexts in sciences and humanities.

Results also show that the principal’s practices and experiences created a role model for the students. He personally puts the garbage in the right container, supports the plans of developing a plantation field in the backyard of the school, practices hiking, and organizes cleanliness campaigns in Ras-Elmatn. He believes that students caring attitude towards environment should be a priority.

Moreover, the principal showed strong attitudes towards the following principles:

a) environmental awareness and positive behavior should be considered as learning outcomes of schooling similar to ethical and social objectives b) schools should issue and enforce rules regarding students’ environmental behavior similar to social conduct. On the other hand, he strongly disagreed that environmental education does not have any real impact on students’ future environmental behavior.

The results of the principal’s interview were significant in supporting the development of integration of environmental education in the school curricula and implementing new strategies to accomplish the objectives of the EE program.

4.1.2 - Teachers' Questionnaires

Qualitative data, collected from seven teachers of grade ten, were analyzed and classified into three categories: Grade ten's curriculum before EE program intervention, integration of EE in formal and non formal contexts, and teachers' attitudes. The results of the first two categories are illustrated in the following tables.

Table 4.1. Grade Ten's Curriculum before EE Program Intervention

Data Results		
Extent of EE Integration	Global/ Local Environmental Topics	EE Integration Role
-integration in Biology and Chemistry -limited integration in English Language, Geography, and Civic -Lack of integration in Physics, Sociology, and Economics.	-water pollution in Biology -types of pollution in Chemistry -environmental pollution in Civics -global warming in Geography and English Language - Lack of local environmental topics (Ecosystems in Lebanon)	Teachers' agreement on building: - caring and responsible attitudes towards the environment - eco-friendly characters -active contributions for solving environmental problems -sustainable development.

The results showed that grade ten teachers agreed on the ineffectiveness of EE in grade ten's curriculum before the intervention due to the limited global environmental topics and lack of local topics related to different ecosystems in Lebanon. They agreed on the importance of integrating of EE not only in Sciences but in Languages, Social Studies, Sociology, and Economics because of its positive effects on students' characters. Teachers

confirmed the need for establishing new strategies to develop the school curriculum and maximize the effectiveness of EE.

Table 4.2. Integration of EE in Formal and Non-Formal Contexts

Data Results			
Infusion of EE Topics	Teaching Methods	Assessments	Strengths/Weaknesses
<p>(Formal Context)</p> <ul style="list-style-type: none"> -biodiversity in Lebanon's forests -all types of pollution -human management of bees in forests -Pine Forests in Lebanon, -economic role of Pine Forests in Lebanon -Natural reserves and tourist sites in Lebanon -Role of governmental and nongovernmental organizations <p>(Nonformal Context)</p> <ul style="list-style-type: none"> -healthy food days, cleanliness campaigns, recycling, hiking, conducting interviews, planting trees in the school and in Ras-Elmatn 	<p>(Student-centered Learning Strategies)</p> <ul style="list-style-type: none"> -inquiry method -research method -discovery method -conductive/ deductive methods -cooperative learning -constructing models of projects -presentations/ lectures -field trips 	<ul style="list-style-type: none"> -informal assessment: observations, oral questions, students' responses -formal assessment: quizzes and tests -authentic assessment: portfolios and realistic learning experiences in outdoor activities 	<p>(Strengths)</p> <ul style="list-style-type: none"> -infusion of new local environmental unit across all the subjects and development of global environmental topics -authentic learning experiences -development of responsible and caring attitude <p>(Weaknesses)</p> <ul style="list-style-type: none"> -limited time for implementing the intensive intervention program

The results were significant in terms of content, teaching methods, and assessments. Grade ten teachers have infused new local environmental topics related to Pine Forests in Lebanon in Biology, Chemistry, Arabic and English Languages, Social Studies, Sociology, and Economics. Grade ten students were engaged in active learning experiences to achieve the objectives of the program such as: discover healthy and diseased trees, discover the pollutants in Ras-Elmatn river, identify renewable and non renewable resources in the mountain, construct a model of a wind mill to save the electric energy in the school, develop a model of natural reserves and touristic sites in Lebanon, design ads, and write essays and poems to increase environmental awareness. Also, in non formal contexts, students were engaged in outdoor activities and field trips to discover new knowledge of the current state of Lebanon's forests, and develop their communication skills, interpersonal skills, and solving problems skills. To evaluate students' environmental knowledge, skills, and attitudes, both authentic and traditional assessments were used weekly though students were under pressure in four months. The results of the integration of EE in formal and non formal contexts were significant because the three basic components of EE - knowledge, skills, and attitudes - were connected.

Moreover, data results revealed teachers positive attitude towards the school's EE program. Four teachers strongly agreed and two teachers agreed that environmental education should be highly integrated in school curricula and not only in sciences. The seven teachers strongly agreed that teachers should act as role models showing the eco-friendly attitude. Four teachers strongly disagreed and three teachers disagreed that EE does not have any real impact on students' future environmental behavior. Six teachers strongly agreed and one teacher agreed that environmental awareness and positive

behavior should be considered as learning outcomes of schooling similar to ethical and social objectives. Five teachers strongly agreed and one teacher agreed that the school should issue and enforce rules regarding students' environmental behavior similar to social conduct.

Data results showed that teachers' attitudes towards environmental intervention program were significant. They showed coherence and alignment along with the school's principal attitude to develop environmental education program in the school curriculum in formal and non formal contexts.

4.1.3 -Teachers' Lesson Plans

To strengthen the validity and the reliability of the qualitative data, four teachers' lesson plans were analyzed to describe the process of EE implementation in grade ten (Appendix IV).

The Biology teacher developed a lesson plan for the students to locate different types of pine trees and explain their ecological role, and recognize the healthy and diseased pine trees. These learning objectives were achieved and assessed in authentic learning experiences in the surrounding environment of the school.

The Chemistry teacher developed a lesson plan for the students to identify the role of recycling and do paper recycling. These learning objectives were achieved and assessed in the science lab of the school.

The English Language teacher developed a lesson for the students to write a poem to describe a natural scene and its effects on their mood and attitudes. These learning objectives were achieved and assessed in the media center of the school where students

presented their poetic work using power point software. Also, the Arabic teacher developed a lesson for the students to write an expository essay to illustrate the importance of the management of bees in the forest ecologically and economically. These learning objectives were achieved and assessed in the classroom.

The Sociology and Economic teachers developed lesson plans for the students to explain the importance of Pine Trees in the economic life of Lebanese families in the mountain and to identify the role of governmental and nongovernmental organizations in protecting the Pine Forest. These learning objectives were attained by conducting interviews with authorities in governmental and nongovernmental organizations, Ras-Elmatn municipality and Association for Forests, Development, and Conservation (AFDC).

4.1.4 - Students' Portfolios

Three samples of students' portfolios of different levels were analyzed to describe the environmental education program. After the intervention, the result of analyzing an outstanding portfolio showed that the student learned the three basic components of EE: about the environment, through the environment, and for the environment in sciences and humanities subjects. The portfolio was marked by the following characteristics: a) a green cover with a creative green logo to reflect on the theme of EE b) usage of recycled paper c) complete content of all the local and global environmental topics and activities infused in the subjects d) student's reflection on EE e) student's samples of recycled paper done in the lab and natural items collected on field trips (pines, stones, and leaves f) student's photos of hiking, planting trees, and natural scenery (Appendix V).

The result of analyzing a good portfolio showed that the student learned about the environment and for the environment in sciences and humanities subjects. It was marked by the following characteristics: a) a green cover b) complete content of all the local and global environmental topics and activities infused in the subjects c) student's photos of hiking, planting trees, and natural scenery.

The results of analyzing a satisfactory portfolio showed that the student learned about the environment only in sciences and humanities subjects. It was marked by a green cover and complete content of all the local and global environmental topics infused in the subjects.

4.1.5 - Student's Questionnaire

The results of analysing the qualitative and quantitative data of the student's questionnaire revealed the students' attainment of learning objectives of global and local environmental knowledge, skills, attitudes, and behavior in Languages, Chemistry, Biology, Social Studies, and Sociology. The first part of the questionnaire showed the integration of environmental knowledge in Languages, Social Studies, Chemistry and Biology. The second part showed the integration of environmental skills in Languages, Geography, and Chemistry. The third and fourth parts showed the positive environmental attitudes and behavior in all subjects.

The results of data analysis addressed the first question of the research study, the integration of EE in grade ten's curriculum in local, formal, and non formal contexts. The three basic components of EE – knowledge, skills, and attitudes – were interlinked in sciences and humanities subjects.

4.2 - Impact of EE Including Pine Tress Unit on Student’s Knowledge, Skills, Attitudes, and Behavior

4.2.1 - Principal’s Interview

The fourth category, resulting from the principal’s interview’s data, was evaluation. It reflected the principal’s views of the impact of integrating EE in school curriculum on students’ knowledge, skills, attitudes, and behavior. The principal pointed out that:

“I witnessed great enthusiasm when I listened to grade ten students. They absorbed the value of environmental education and looked happy and interactive sharing the environmental knowledge and skills, and reflecting on environmental problems in Lebanon.” He added that the impact of EE on grade ten students has extended to reach other students in intermediate and elementary classes when he saw them organizing some environmental activities such as: keeping water bottles caps and paper in the right bins for recycling, planting trees in the school garden on the Tree Day, and organizing Healthy Food Days.

Concerning the transformation of the school to an eco – friendly school, the principal pointed out:

“I expect many further green achievements from grade ten students and other ones because they believed in the value of EE and were ready to show positive attitudes and behavior to protect the environment. Thus, the integration of EE should be implemented not only in grade ten but in other grades as well.”

The results were significant because grade ten students were able to synthesize their new environmental knowledge to reflect on the environmental issues in Lebanon’s forests and use their skills to suggest and participate in developing solutions. Concerning the environmental attitudes and behavior, the results were significant because most of grade ten students showed the caring and responsible attitudes toward the environment in their outdoor activities affecting other students in the school.

4.2.2 - Teachers’ Questionnaires

Qualitative data were collected and analyzed in the fourth category, evaluation. It showed the seven teachers’ views of the impact of EE on students’ knowledge, skills, attitudes, and behavior. The results are illustrated in the table.

Table 4.3. Teachers’ Views of the Impact of EE on Students

Category/Code	Excellent	Very Good	Good	Satisfactory	Poor
Knowledge		2	4	1	
Investigation Skills		3	4		
Problem Solving Skills		1	2	3	
Participation in Activities		5	2		
Attitudes		3	2	2	
Behavior		3	2	2	
Interest		3	4		
Pine Forests in Lebanon		4	3		
Projects		5		1	
Field Trips	5	2			
Eco-friendly School	2	3	2		
Participation in Solving Environmental Problems		2	3	2	

According to teachers’ views, students showed excellent improvement in learning about forestry environment during the field trips and excellent interest in transforming the school into eco-friendly school. They showed very good improvement in knowledge acquisition, investigation skills, participation in environmental activities, attitudes, behavior, interests

while learning about Pine Forests in Lebanon. But, the improvement of problem solving skills was satisfactory.

4.2.3 - Pretest Students' Results

The results of the pretest, administered to grade ten students during the first week of December 2011, were classified in four sections: knowledge, skills, attitudes, and behaviours.

Students' Environmental knowledge

The quantitative results of the environmental knowledge were sub grouped into total environmental knowledge, local environmental knowledge, environmental terminology, natural resources knowledge, and ecology. The quantitative data, analyzed from constructing frequency distribution and histogram, showed that forty four students attained 50/100 while one student attained 54/100 regarding total environmental knowledge, and the mean was 21/100. Concerning the subgroups of the environmental knowledge section, the following results were stated (Appendix II):

- 1) Local environmental knowledge: the forty five students attained 50/100 and the mean was 8
- 2) Environmental terminology: forty three students attained 45/100, two students attained 50/100 and the mean was 11
- 3) Natural resources knowledge: twenty nine students attained 45/100, six students attained 50/100, four students attained 75/100, six students attained 100/100 and the mean was 29
- 4) Ecology: thirteen student attained 60/100, eight students attained 80/100, twenty four students attained 50/100 and the mean was 46/1

Students' Environmental Skills

By constructing frequency distribution and histogram, the results of environmental skills showed that one student attained 60/100, three students attained 50/100, forty one students attained 45/100, and the mean was 18/100 (Appendix II). The failing scores were found in environmental awareness skills, investigation skills, and management waste skills. In addition, low scores were found in plantation skills and reducing forest fire skills.

Students' Environmental Attitudes

Students' attitudes for the environmental study were classified into ten categories: the school green pledge, the role of municipality in protecting forest fires, the harsh penalties, wasting energy, environmental awareness, role of nongovernmental organizations, endangered species protection, role of recycling bins, harmful effects of building houses in forests, and prohibition of bird hunting. Categorical data were quantified using frequency distribution and percentage of responses (Appendix II). The results of students' positive environmental attitudes are illustrated in the following table.

Table 4.4 Students' Pretest Attitude Results

Categories	Percentage of Students with Positive Attitude
School Green Pledge	98%
Municipality Role - Forest Fires	97%
Environmental Awareness	91%
Harmful Effects of Building Houses in Forests	90%
Protection of Endangered Species	88%
Saving Energy	87%
Issuing Harsh Penalties to Protect Environment	85%
Nongovernmental Organizations Role	75%
Prohibition of Bird Hunting	72%
Recycling Bins Role	69%
Mean = 85%	

Students' Environmental Behavior

Categorical data of students' behavior were quantified using frequency distribution and percentage; the average of the positive behavior was 97% (Appendix II). Students showed their extent of positive behaviour in relation to the following categories: leaving the water running from the tap, putting all the wastes in the same container, being active in different environmental activities, informing people about pollution problems, enjoying planting trees, enjoying reading books on environmental issues, recycling, awareness against buying products made from fur and against having the light switch on even if no one is using it, and willingness to walk in order to reduce air pollution.

The results of the pretests in relation to students' environmental knowledge- local environmental knowledge, environmental terminology, natural resources knowledge, and ecology were insignificant. The results justify the importance of the environmental education intervention program. However, the results of the pretests in relation to students' environmental attitude and behavior were significant.

4.2.4 - Posttest Students' Results

The results of the posttest, administered to grade ten students during the last week of April 2012, were classified in four sections: knowledge, skills, attitudes, and behavior.

Students' Environmental knowledge

The qualitative results of the environmental knowledge were sub grouped into total environmental knowledge, local environmental knowledge, environmental terminology, natural resources knowledge, and ecology. The quantitative data, analyzed from

constructing frequency distribution and histogram (Appendix III), are illustrated in the following tables that show the comparison between pretest and post scores.

Table 4.5. Frequency Distribution of Students' Pretest and Posttest Scores

Total Environmental Knowledge			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
55	1	100	3
50	45	90	1
		85	6
		80	2
		75	2
		70	2
		65	2
		60	2
		55	8
		50	17

Table 4.6. Frequency Distribution of Students' Pretest and Posttest Scores

Local Environmental Knowledge			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
50	45	100	3
		95	3
		90	3
		85	1
		80	1
		70	2
		60	3
		55	4
		50	25

Table 4.7. Frequency Distribution of Students' Pretest and Posttest Scores

Environmental Terminology			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
50	45	100	2
		90	1
		80	4
		70	5
		60	3
		50	30

Table 4.8. Frequency Distribution of Students' Pretest and Posttest Scores

Natural Resources Knowledge			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
100	6	100	21
75	4	90	1
50	35	75	1
		70	1
		65	1
		50	20

Table 4.9. Frequency Distribution of Students' Pretest and Posttest Scores

Ecology			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
80	8	100	12
60	13	80	13
50	24	60	19
		50	1

Students' Environmental Skills

By constructing frequency distribution and histogram (Appendix III), the result of the comparison is illustrated in the table below.

Table 4.10. Frequency Distribution of Students' Pretest and Posttest Scores

Environmental Skills			
Student Score Pretest	Frequency	Student Score Posttest	Frequency
60	1	100	1
50	44	95	3
		85	2
		75	2
		70	4
		60	6
		50	27

Students' Environmental Attitudes

Students' attitudes for the environmental study were classified into ten categories: Green School's pledge, the role of municipality in protecting forest fires, harsh penalties, wasting

energy, environmental awareness, role of nongovernmental organizations, endangered species protection, role of recycling bins, harmful effects of building houses in forests, and prohibition of bird hunting. Categorical data were quantified using frequency distribution and percentage of responses (Appendix III). The results of students' positive environmental attitudes are illustrated in the following table.

Table 4.11. Posttest Students' Attitude Results

Categories	Percentage of Students with Positive Attitude
Environmental Awareness	98%
School Green Pledge	95%
Issuing Harsh Penalties to Protect Environment	93%
Municipality Role – Forest Fire	91%
Saving Energy	91%
Endangered Species Protection	91%
Harmful Effects of Building Houses in Forests	82%
Prohibition of Bird Hunting	82%
Recycling Bins Role	78%
Nongovernmental Organizations Role	64%
Mean = 87%	

Students' Environmental Behavior

Categorical data of students' behavior were quantified using frequency distribution and percentages, and the average of the positive behavior was 98% (Appendix III). Students showed their extent of positive behavior in relation to the following: leaving the water running from the tap, putting all the wastes in the same container, being active in different environmental activities, informing people about pollution problems, enjoying planting trees, enjoying reading books on environmental issues, recycling, awareness against buying products made from fur, and having the light switch on even if no one is using it, and willingness to walk in order to reduce air pollution. Students' posttest results were

significant. The mean of environmental knowledge, skills, attitudes, and behavior reflected improvement which is illustrated in the table below.

Table 4.12. Students’ Pretest/Posttest Means

Knowledge Pretest	Skills Pretest	Attitude Pretest	Behavior Pretest	Knowledge Posttest	Skills Posttest	Attitude Posttest	Behavior Posttest
21	18	85	97	56	46	87	98

The highest improvement was shown in the environmental knowledge in the following descending order: ecology, natural resources, local knowledge (Pine Forest), and terminology. Though environmental skills did not reach the passing average due to the limited time of the study, the improvement was significant. Concerning the environmental attitudes and behavior, the improvement was slight but both the pretest and post test scores were high.

To conclude this chapter, the analysis of qualitative and quantitative data collected from different resources: principal’s interview, teacher’s questionnaire, students’ pre and post tests, teacher’s lesson plans, and students’ portfolios showed significant results of this environmental study. The integration of environmental education including Pine Forest unit was implemented in grade ten’s curriculum in formal and non formal contexts, and the impact of EE intervention program on students’ knowledge, skills, attitudes, and behavior was significant.

In the next chapter, I will present the discussion of the results, the study’s limitations and recommendations, and the conclusion.

CHAPTER V

DISCUSSION

This chapter presents the discussion of the study findings by comparing the results to those found in the literature review. Also, it includes the limitations of the study, ethical concerns, and further suggestions. The discussion focuses on the significance of the findings to the development of environmental education in the school curriculum. In particular, it highlights the significance of the integration of environmental education and its impact on students' knowledge, skills, attitudes, and behavior. The development of the discussion is organized in three major headings.

5.1 - Integration of Environmental Education in the School Curriculum

This environmental study found that the integration of environmental education in the school curriculum is vital as (Roksandic et al., 2011) showed the importance of developing environmental education in the school curricula to increase students' ecological awareness and improve their environmental leadership skills. The significance of EE program is attributed to three main reasons. First, the integration of environmental education was implemented in the local context, pine forestry environment. Similar to the results of a study conducted in Mexico (Ruiz-Mallen et al., 2010) to maximize the effectiveness of EE, grade ten students in the Green School were more motivated and interested when they were exposed to authentic and meaningful learning experiences, which concern their community daily life, in the mountain where they live. Also, using *Teacher's Guide for Non Timber Forest Products* (Mansour, 2010) was an important resource for teachers to develop

strategies that helped students to construct ecological knowledge about Pine Forests in Lebanon and means of protection.

Second, the integration of environmental education was implemented in formal and non formal contexts because they complemented each other to preserve the environment and established sustainable development (Metin, 2010). Successfully, multiple approaches to formal environmental education were applied in the school such as: “infusion, imposition, and framing” (Alnewashi, 2003, pp. 25-26). For example, during the sociology sessions, environmental topics were infused in the curriculum to construct a questionnaire and interview questions about the role of governmental and nongovernmental organizations in Ras Elmatn to protect Pine Trees. Also, imposing a new curricular unit, Pine Forests, was another method to enhance students’ local environmental knowledge. This unit was integrated across grade ten’s subjects: Arabic Language, English Language, Biology, Chemistry, Social Studies, Sociology, and Economics. Thus, environmental education was developed in sciences as well as in humanities in line with suggestions presented by a research conducted in Thailand (Thathong, 2010). Third, the integration of EE in the school was marked by variable global and local environmental topics such as: air pollution, water pollution, global warming, biodiversity, ecology, saving energy, natural resources, health education, Pine Trees ecosystem, and solutions of environmental problems. Pre-service teachers in Turkey (Teksoz, Sahin, & Ertepinar, 2010) confirmed the importance of the variety of environmental topics which was an important element of developing the environmental education program in the Green School.

Non formal environmental education was a basic pillar of the program to reinforce its effectiveness. Students were involved in many extracurricular activities in collaboration

with their subject teachers and a nongovernmental organization, Association for Forests, Development and Conservation (AFDC). Following the suggestions of Alnewashi (2003), the approaches to non formal environmental education included “Cafeteria Approach”, “Workshops in Natural Setting Approach”, and “Environmental Action Approach”. Through the cafeteria approach, students’ interest was evident in developing publications, advertisements, and video clips to reflect and spread their environmental awareness on special days in the school and Ras-Elmatn community. Through the workshops in natural setting approach, students’ motivation was evident in discovering the natural resources of Pine Forests and practicing plantation. Through the environmental action approach, students’ critical thinking to find a solution to decrease the pollution of the school’s generator and save the electric energy was evident in constructing a model of a wind mill.

Third, the integration of environmental education in grade ten’s curriculum was marked by the three interconnected components: education about the environment, education in or through environment, and education for the environment (Harris & Blackwell, 1996; Palmer, 1998; Palmer & Neal, 1994; Said, Yahaya, & Ahmadoun, 2007; Thathong, 2010). With education about the environment, students developed their knowledge and understanding about biodiversity in Lebanon’s forests, human management of bees, Pine Forests in Lebanon, natural reserves and tourist sites in Lebanon, and the role of governmental and nongovernmental organizations in protecting the forests. With education in the environment, students improved their investigation and problem solving skills while recycling paper, planting Pine Trees, and demonstrating a model of a wind mill project. With education for the environment, students reinforced their caring and responsible attitudes and behavior by keeping the paper and plastic items in separate bins, planting

trees on school campus and Pine Trees in Ras-Elamtn, and organizing cleanliness campaigns and healthy food days.

5.2 - Impact of Environmental Education on Students' Knowledge, Skills, Attitudes, and Behavior

Similar to previous research findings (Makki et al., 2003) grade ten students had scarce environmental knowledge and skills but positive environmental attitudes and behavior before the intervention of EE program. It was evident in the student's pre test assessment results which led to several inferences. The implementation of environmental education in the Lebanese curriculum is ineffective though students are exposed to limited environmental topics in Biology, Chemistry, and Civics (Makki et al., 2003). In addition, grade ten teachers confirmed that local environmental topics and issues are missing in this Lebanese curriculum which justified students' low scores in this section of EE. However, students' environmental attitudes and behavior were highly positive which indicates that there is no correlation between environmental knowledge and attitude as it was found in another research (Makki et al., 2003).

Then, the intervention of environmental education program revealed a positive impact as evident by the post test assessment and students' portfolios. In agreement with other research studies conducted in other countries (Mifsud 2011; McBeth et al., 2011; Bartoshy et al., 2009; Boufhakereddine, 2007), the integration of environmental education across grade ten curriculum improved students' environmental knowledge, ecological awareness, thinking skills, social, and leadership skills. The positive impact of EE on students' knowledge was attributed not only to the curriculum itself but to the quality of instructional

methodologies. It was the quality of constructivist teaching where students were involved in authentic learning and meaningful experiences to explore and observe the local environment which is part of their daily concern (Ruiz-Mallen et al., 2010; Pauw et al., 2006; Janssen et al., 2011). Students' knowledge was improved because of the implementation of the environmental education theoretically and practically using effective teaching strategies: inquiry-oriented instruction, field study, and developing projects (Roksandic et al., 2011; Teksoz et al., 2010).

Consistent with previous research studies (BouJaoude et al., 2003; McBeth et al., 2011; Coertjens et al., 2006; Uzun et al., 2010) the environmental education program had positive impact on grade ten students' attitudes and behavior. Their interest, positive attitude, and behavior were evident when they were motivated to establish an environmental club to organize outdoor activities: healthy food days, planting trees, and separating waste items (paper and plastic) for recycling. This positive attitude was extended to influence other students in the school doing similar environmental activities. Further reinforcement of students' environmental attitudes and behavior in reality will be witnessed in the near future since 95% of the students showed highly positive attitude towards the establishment of the school's green pledge. The process of transformation the school into an eco-friendly school is done gradually.

5.3 - Limitations and Recommendations

The environmental study had two limitations. The first limitation was the time management. The intervention of the environmental program was employed in four months, January – April, under snowy weather conditions. Thus, some environmental activities were postponed several times, and the students were under pressure to complete them in a short period of time. So, grade ten teachers highly recommended implementing the environmental education program in three terms instead of one. The second limitation was the exclusion of the Math subject from the environmental program due to its rigid curriculum and the reluctant attitude of the teacher to change. Therefore, pre-service training sessions should be organized to help teachers improve their approaches to environmental education in the school curriculum.

Concerning educational research and ethics, it was my responsibility to abide the ethical principles: protection of the participants, confidentiality of data, and avoiding deception (Fraenkel et al., 2012). Participants' names were removed due to the absence of consent form, and no one had access to the research data. The study was conducted under safe conditions since neither teachers nor students were exposed to harm while doing outdoor activities. In addition, all the participants were informed about the purpose of the study and showed the attitudes of interest and enthusiasm.

In future research, it is essential to examine the impact of integrating local and global environmental education into school curricula in elementary and intermediate classes on students' knowledge, skills, attitudes, and behavior. Also, the long-term impact of environmental education should be assessed by implementing longitudinal studies spanning more than just a few months. Furthermore, it would be beneficial to establish

follow-up sustainable programs to reinforce and sustain the positive impact of implementing environmental programs on students' learning and achievement.

In conclusion, the intervention of environmental education in grade ten was effective because it was implemented in formal and non formal contexts empowered by the contextualization, authentic learning, and the interlinking of EE components: education about the environment, education in the environment, and education for the environment. In addition, the impact of EE was positive since it improved students' knowledge and skills, and reinforced their attitudes and behavior.

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APPENDICES

APPENDIX I

INSTRUMENTS

Principal's Interview

Environmental Education Program

I. Knowledge Questions

1. What does the school mission aim at?

2. How does the school accomplish the mission's objectives?

3. How does the school implement environmental education?

4. What privileges does the school enjoy and how does it contribute to developing environmental education?

5. To what extent is formal environmental education integrated in school curriculum?

5. Schools should include and enforce rules about student behavior towards environment alongside rules about student social conduct.

- a) Strongly agree
- b) Agree
- c) Disagree
- d) Strongly disagree

IV. Evaluation Questions

1. How do you evaluate and verify the impact of integrating environmental education across the school curriculum on students' knowledge, skills, attitudes, and behavior in grade ten?

2. How do you evaluate the impact of environmental knowledge, skills, attitudes, and behaviour of grade 10 students on the students in kindergarten, elementary, intermediate, and secondary classes?

3. To what extent do you think the environmental education program in grade 10 would transform the school to be an eco-friendly school?

Teacher's Questionnaire

Environmental Education Integration / Lebanon's Forests

A. Answer the following questions about the environmental education in the Green School curricula before the new intervention program.

1. What subject do you teach in grade 10?

2. To what extent do you think environmental education is integrated in the subject you teach?

3. What are the environmental topics incorporated in the subject you teach?

4. Does the subject you teach incorporate local environmental topics and issues? If yes, what are they? (e.g. Pine Forests)

5. Do you think the integration of environmental education across the school curriculum is important? Why?

B. Answer the questions to describe the integration of environmental education program in the subject you teach as the result of implementation.

1. What teaching methods/ strategies were effective to develop students' environmental knowledge? Why? [lecture, discussion, cooperative learning, lab, projects, inquiry, discover, others]

2. What teaching methods/ strategies were effective to develop students' skills? Why? [lecture, discussion, cooperative learning, lab, projects, inquiry, discover, others]

3. How did you assess student progress in relation to environmental knowledge, skills, attitudes, and behavior? Why?

-informal assessment (teacher observations, teacher questions/student responses, student interviews)

-alternative/authentic assessment (performance tasks, papers and projects, other portfolio entries)

- traditional assessment (teacher-made quizzes and tests)

- standardized assessment (state achievement tests, items taken from or similar in format to achievement tests)

4. Determine the strong and weak aspects of the program- Environmental Education across the School Curriculum.

5. What do you recommend to improve the integration of environmental education in the subject you teach?

C. Circle the best answer that most represents your attitude towards environmental education program implemented at school.

1. Global and local environmental issues and topics should have a high profile in school curricula, and not only in Science curricula.
 - e) Strongly agree
 - f) Agree
 - g) Disagree
 - h) Strongly disagree

2. Teachers should act as role models for their students with regard to their attitudes and behavior towards environment.
 - e) Strongly agree
 - f) Agree
 - g) Disagree
 - h) Strongly disagree

3. School environmental education does not have any real impact on students' future, environmental attitudes and behavior.
 - e) Strongly agree
 - f) Agree
 - g) Disagree
 - h) Strongly disagree

4. Environmental awareness and positive behavior towards environment should be regarded as desired outcomes of schooling that are just as important as other social and ethical objectives of schooling.
 - e) Strongly agree
 - f) Agree
 - g) Disagree
 - h) Strongly disagree

5. Schools should include and enforce rules about student behavior towards environment alongside rules about student social conduct.
 - e) Strongly agree
 - f) Agree
 - g) Disagree

D. Circle the best answer that describes the impact of integrating environmental education across school curriculum on students' knowledge, skills, attitudes, and behavior in grade ten.

1. Students' environmental knowledge has shown ----- improvement.
 - a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor

2. Students' inquiry or investigation skills in related to environmental problems or issues have shown ----- improvement.
 - a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor

3. Students' decision making or problem solving skills related to environmental issues resolutions have shown ----- improvement.
 - a) Excellent
 - b) Very good
 - c) Good d)
 - d) Satisfactory
 - e) Poor

4. Students have shown ----- participation in environmental activities or action plan.
 - a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor

5. Students' environmental attitudes have shown ----- improvement.
- a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor
6. Student's environmental behavior has shown ----- improvement.
- a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor
7. Students have shown ----- interest in learning about environmental topics.
- a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor
8. Students have shown ----- interest in learning more about Lebanon's Pine Forests.
- a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor
9. Students have shown ----- interest in doing environmental projects.
- a) Excellent
 - b) Very good
 - c) Good
 - d) Satisfactory
 - e) Poor

10. Students have shown ----- interest in going on field trips to learn more about forestry environment.

- a) Excellent
- b) Very Good
- c) Good
- d) Satisfactory
- e) Poor

11. Students have shown ----- interest in transforming the school into an eco-friendly school.

- a) Excellent
- b) Very Good
- c) Good
- d) Satisfactory
- e) Poor

12. Students have shown ----- interest in contributing to solving environmental problems in their community.

- a) Excellent
- b) Very good
- c) Good
- d) Satisfactory
- e) Poor

Student's Questionnaire

Pretest/Posttest

Environmental Education / Lebanon's Forests

❖ Knowledge Questions

I. Write (true) or (false) for each of the following statements. Then correct the false ones on the line.

1. An ecosystem is a biological environment consisting of all the organisms living in a particular area. -----
2. Healthy ecosystems are mainly necessary for maintaining and regulating atmospheric quality. -----
3. Ecologically sustainable development is a pattern of activities that meet the needs of the current generations without damaging the environment. -----
4. Forests play the ecological role in producing charcoal and collecting wood. -----
5. Major classes of forests in Lebanon are broad leaves and mixed forest. -----
6. The Stone pine forests in Lebanon are located in Metn, and Saida areas. -----
7. The decline of Lebanon's forests is due to major threats such as: insects and diseases, war, and tourism. -----
8. Horsh Ehden and Bentaël are tourism sites in Lebanon. -----
9. Bees' contribution to the Lebanese forests is 10%. -----
10. Human Management of bees is known as beekeeping or horticulture. -----

II. Identify the following terms:

a) Acid rains -----

b) Ozone layer-----

c) Landfills-----

d) Global Warming-----

e) Ecotourism -----

III. Complete the table below to list examples of fossil fuels and renewable resources.

Fossil Fuels	Renewable Resources
1.	1.
2.	2.

IV. Circle the letter of the response that correctly answers the question.

1. A small bird eats a butterfly that has been eating some nectar from a flower. Then the bird is eaten by a hawk. This is an example of:
 - a) mutualism
 - b) a food chain
 - c) competition
 - d) survival of the fittest

2. A fox dies. This creates a problem for:
 - a) the fleas that were drinking the fox's blood
 - b) the rabbit that has a nest nearby
 - c) another fox whose territory is nearby
 - d) an animal that hunts in the same area

3. The original source of energy for almost all living things is:
 - a) the sun
 - b) water
 - c) the soil
 - d) plants

4. After living things die, they decompose. As a result of this process, nutrients are:
 - a) released back into the environment to be recycled
 - b) destroyed by the bacteria of the decay
 - c) changed from nutrients to oxygen and water vapour
 - d) evaporated due to the heat produced during decomposition

5. A pollutant gets into an ecosystem and kills large numbers of insects. How might this affect the ecosystem?
 - a) Plants are not damaged so it does not affect the ecosystem.
 - b) It damages part of the ecosystem so it may affect the whole ecosystem.
 - c) It kills only insects so the other animals in the ecosystem stay healthy.
 - d) Most animal eat plants so it does not affect the ecosystem much.

❖ **Attitudes Questions**

Circle the best answer that most represents your attitude.

1. Developing a green pledge for our school environment is essential.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

2. The municipalities should increase control to reduce forest fires.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

3. Lebanese people should be informed more on environmental issues through all types of media.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

4. There should be harsh penalties for individuals who dump waste in the natural environments such as: forests, seas, rivers.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

5. Wasting energy through the unnecessary use of electrical appliances is unacceptable.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

6. It's not important for nongovernmental organizations to work on environmental issues.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

7. It's harmful for the environment to build houses in forest areas.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

8. It's necessary to protect endangered species.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

9. Recycling bins don't diminish environmental issues.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

10. Bird hunting should be prohibited.
 - a) Strongly agree
 - b) Agree
 - c) Disagree
 - d) Strongly disagree

❖ **Behavior Questions**

1. When I am brushing my teeth, I leave the water running from the tap.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

2. I put all the wastes in the same container.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

3. I am active in different environmental activities.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

4. I want to inform people about pollution problem.
 - a) Never
 - b) b) Sometimes
 - c) Often
 - d) Always

5. I enjoy planting a tree.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

6. I enjoy reading books and magazines on environmental issues.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

7. I ask my family to recycle some of the things we use.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

8. I ask my parents not to buy products made from animal fair.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

9. I have the light switch on even if no one is using it.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always

10. I am willing to walk to more places in order to reduce air pollution.
 - a) Never
 - b) Sometimes
 - c) Often
 - d) Always



APPENDIX II

PRETEST STUDENTS' KNOWLEDGE RESULTS

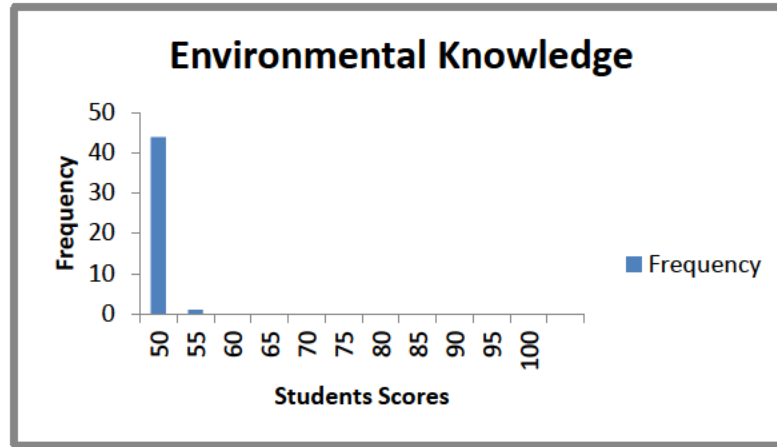


Figure 4.1. Total Knowledge Results

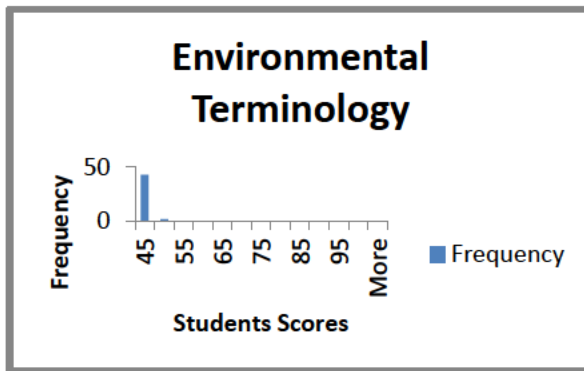


Figure 4.2. Terminology Results

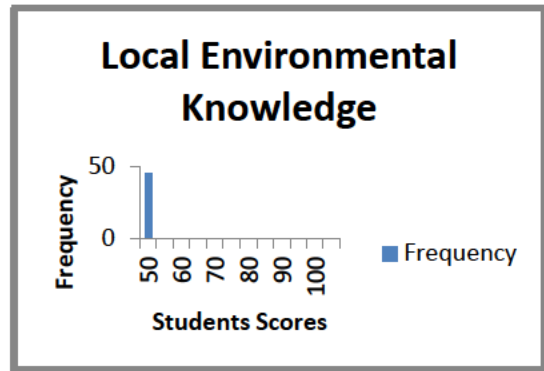


Figure 4.3. Local Knowledge Results

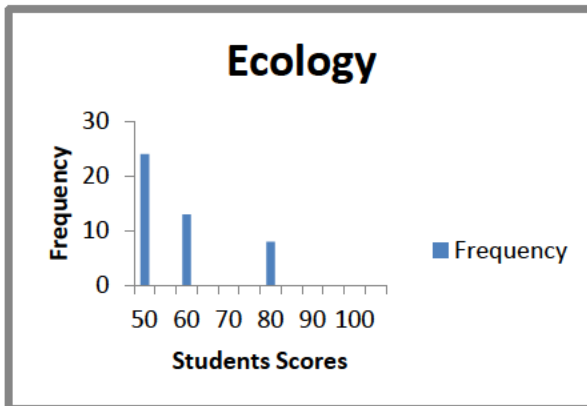


Figure 4.3. Ecology Results

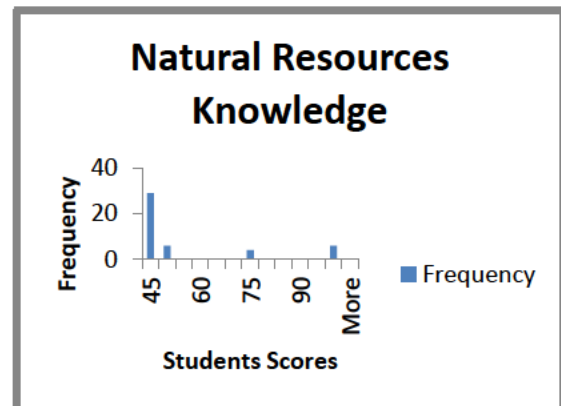


Figure 4.4. Natural Resources Results

Pretest Students' Skills Results

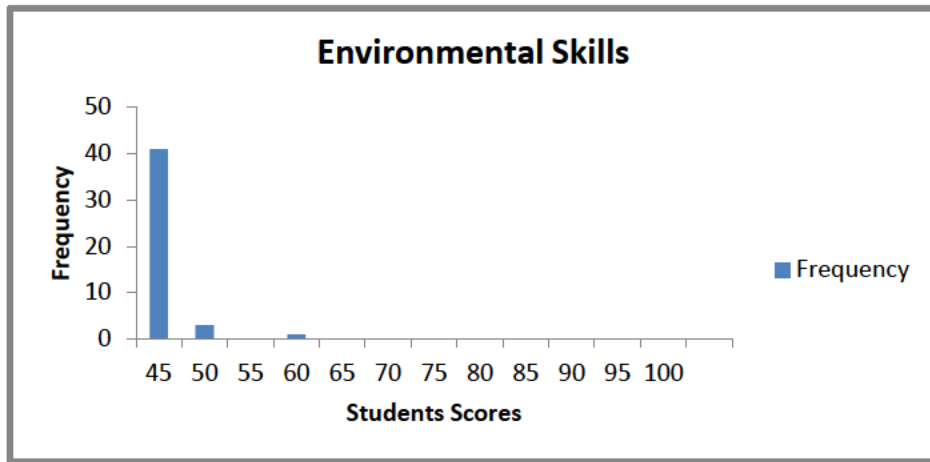


Figure 4.5. Skills Results

Pretest Students' Positive Behavior Result

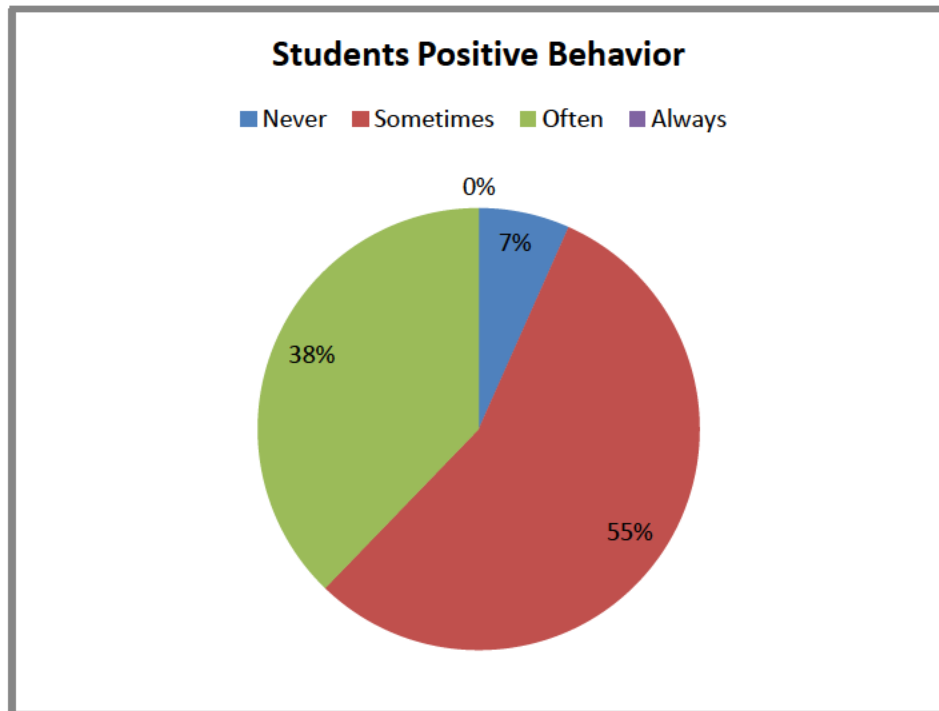


Figure 4.6. Behavior Results

Pretest Students' Attitudes Results

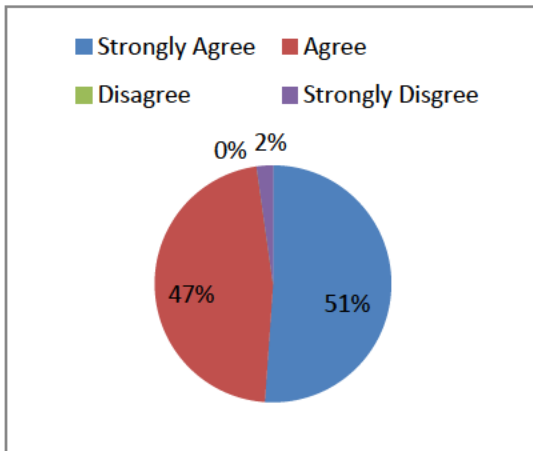


Figure 4.7. School Green Pledge

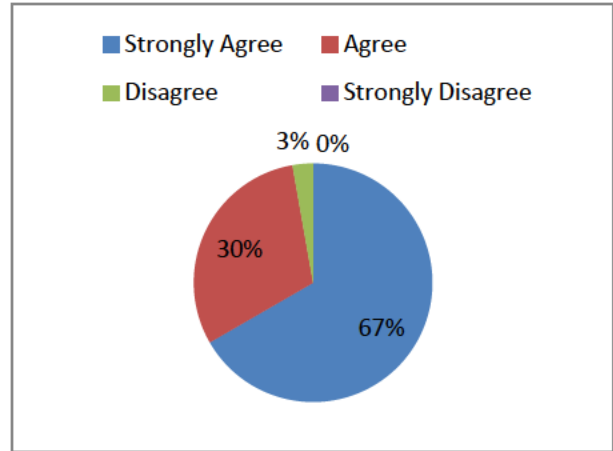


Figure 4.8. Municipality Role

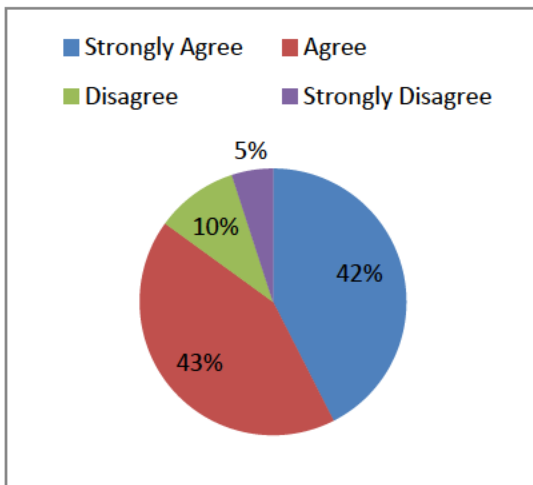


Figure 4.9. Harsh Penalties

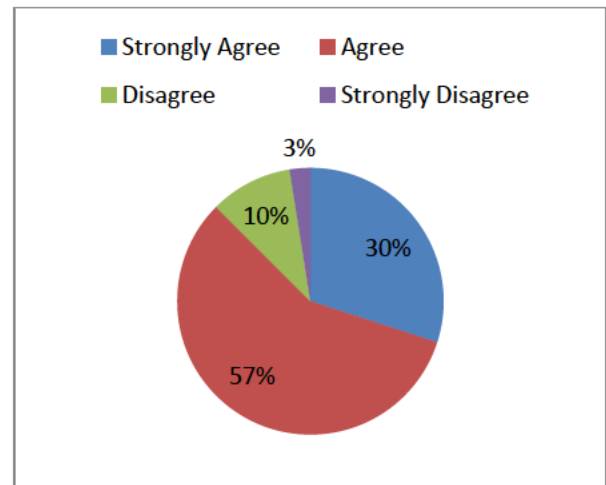


Figure 4.10. Against Wasting Energy

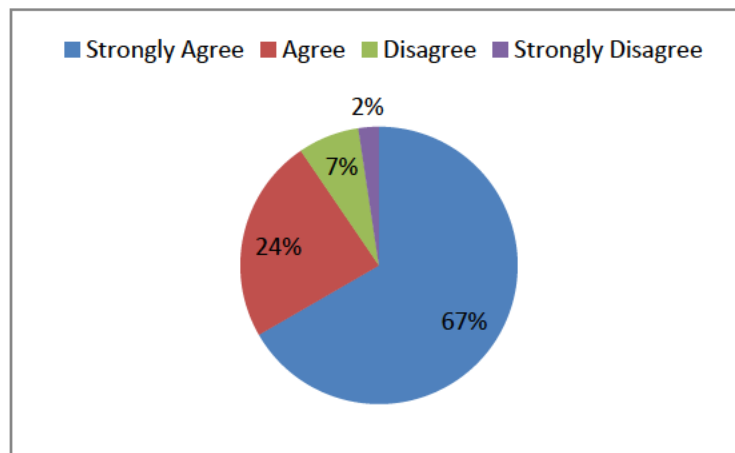


Figure 4.11. Environmental Awareness

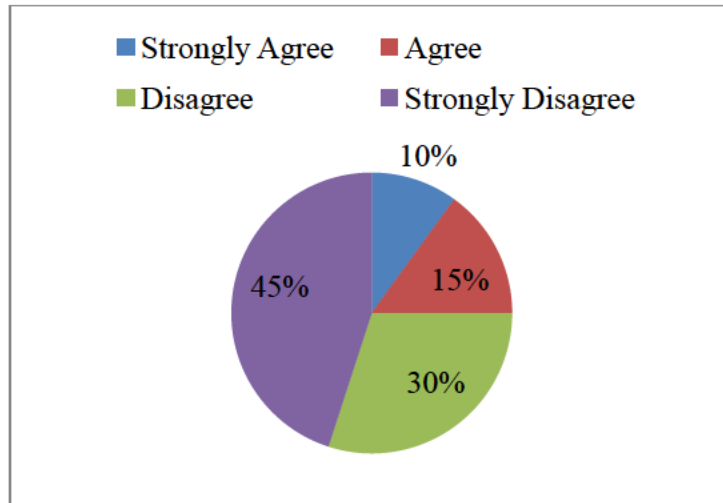


Figure 4.12. Nongovernmental Organizations Role

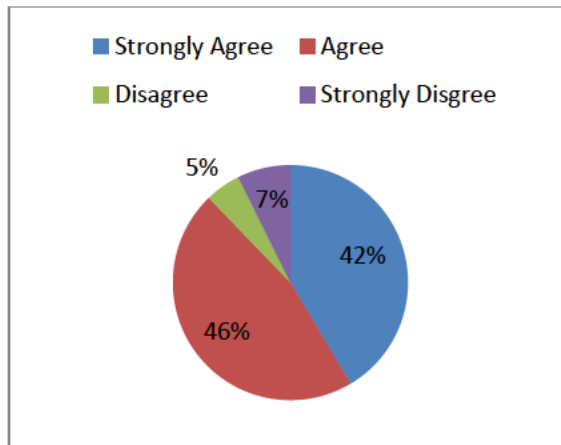


Figure 4.13. Endangered Species

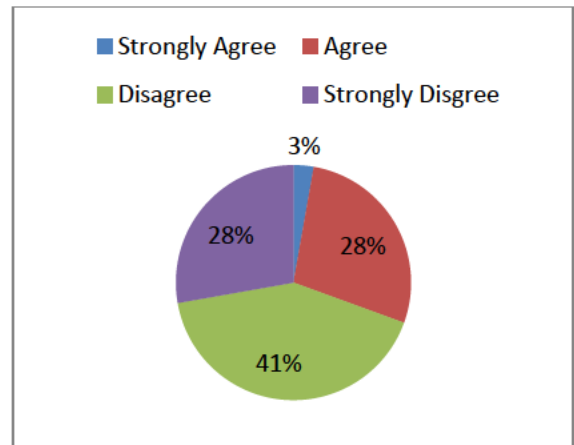


Figure 4.14. Recycling Bins

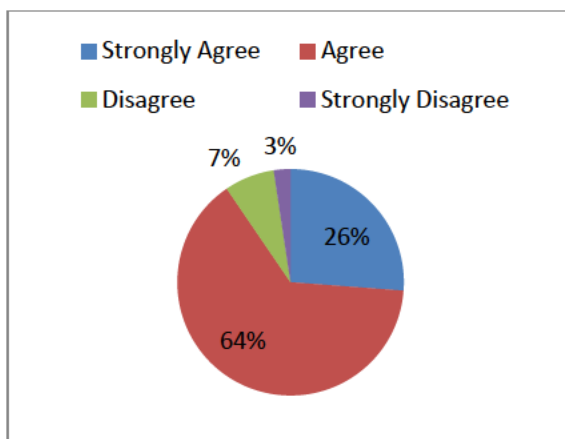


Figure 4.15. Building Houses in Forests

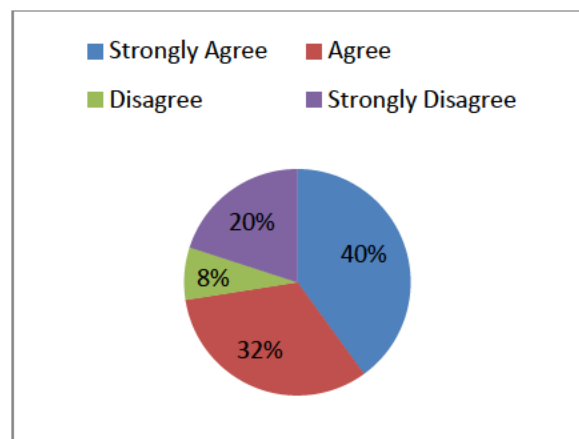


Figure 4.16. Bird Hunting

APPENDIX III

POSTEST STUDENTS' RESULTS

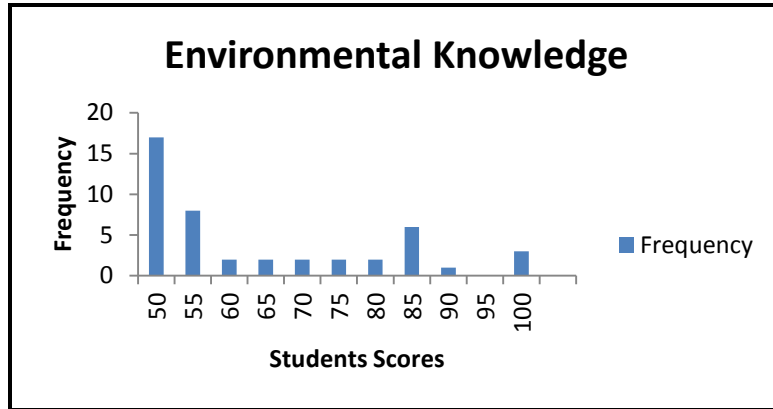


Figure 4.17. Total Knowledge Results

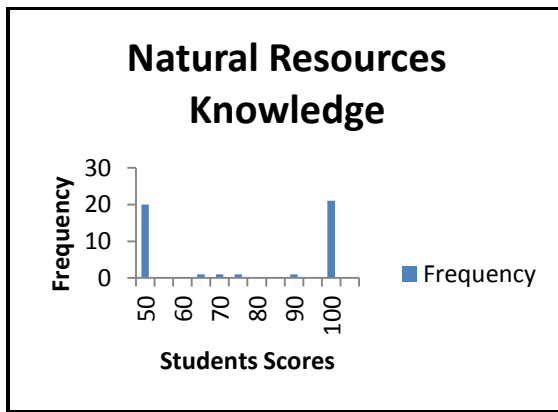


Figure 4.18. Natural Resources Results

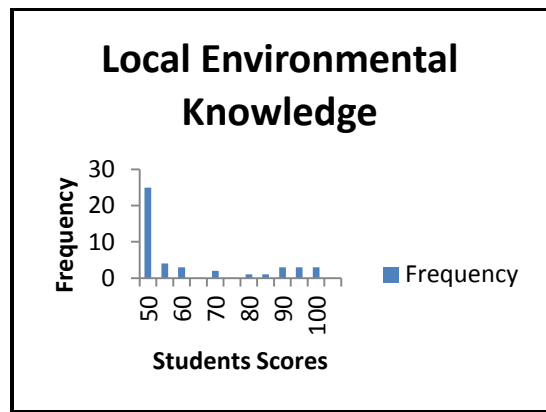


Figure 4.19. Local Knowledge Results

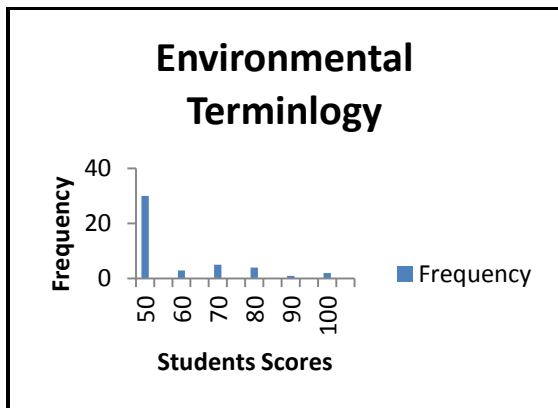


Figure 4.20. Terminology Results

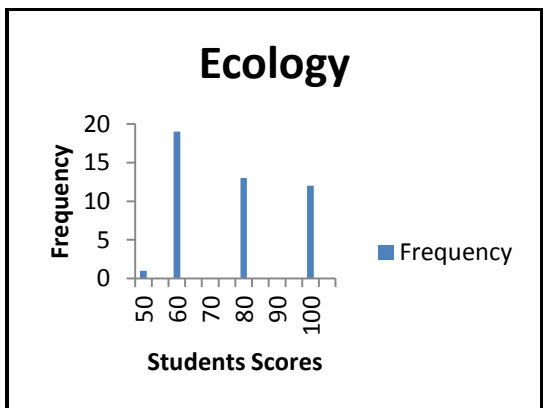


Figure 4.21. Ecology Results

Posttest Students' Skills Results

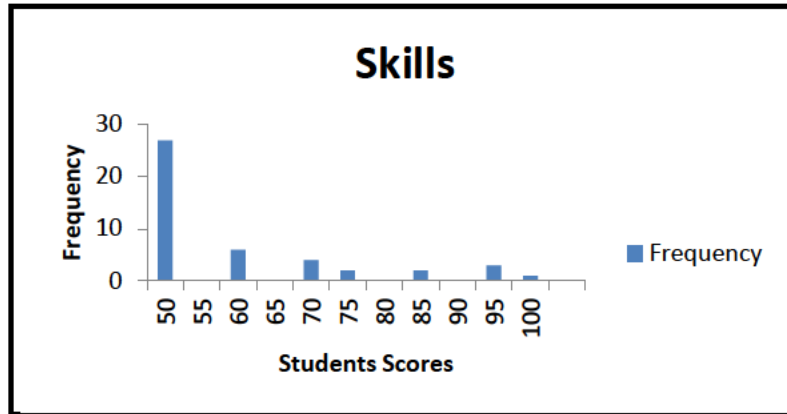


Figure 4.22. Skills Results

Posttest Students' Positive Behavior Results

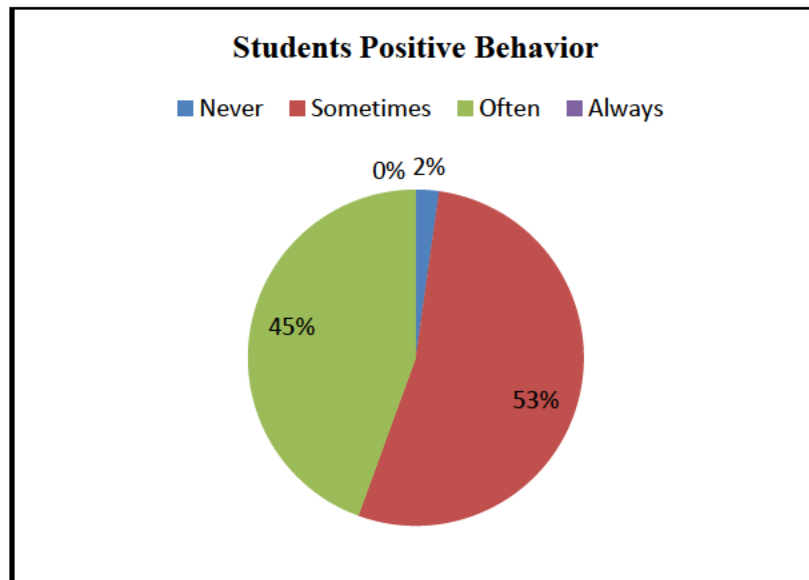


Figure 4.23. Behavior Results

Posttest Students' Attitudes Results

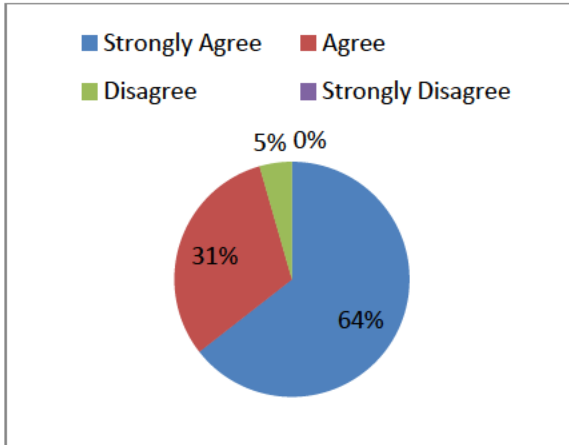


Figure 4.24. School Green Pledge

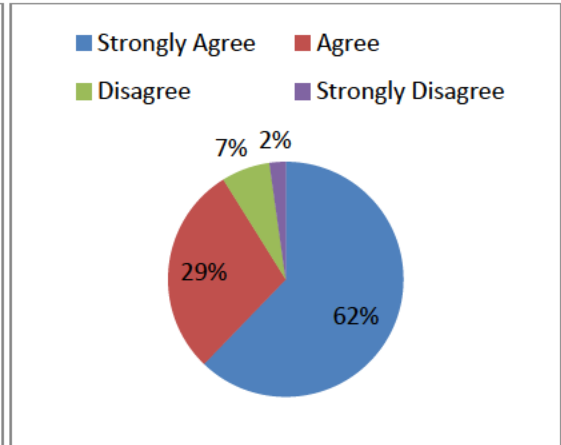


Figure 4.25. Municipality Role

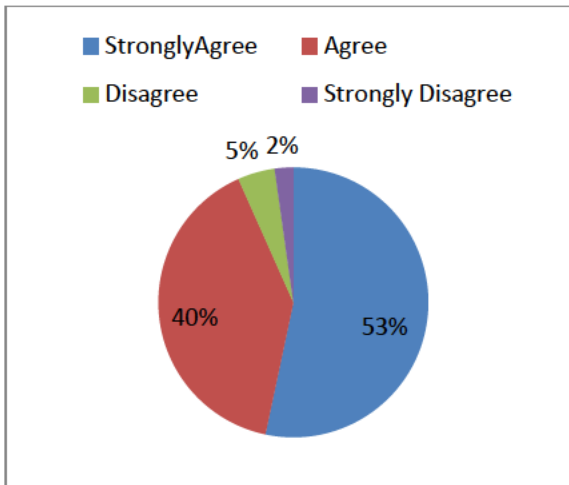


Figure 4.26 Harsh Penalties

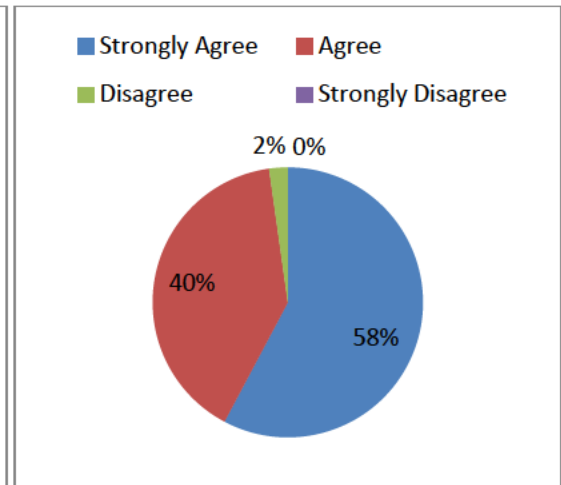


Figure 4.27. Environmental Awareness

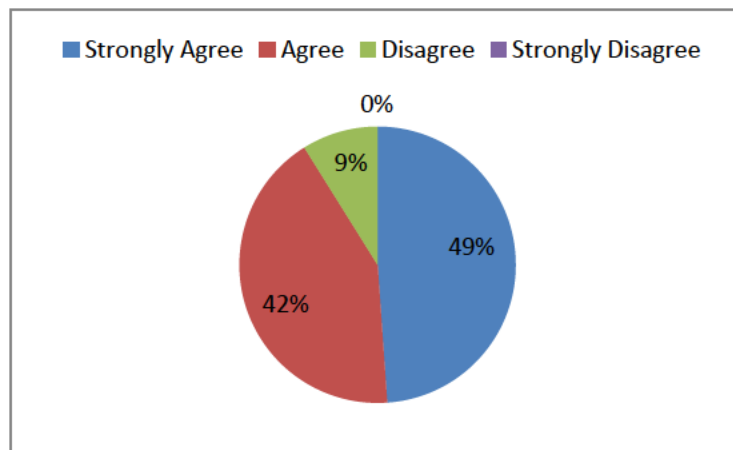


Figure 4.28. Wasting Energy

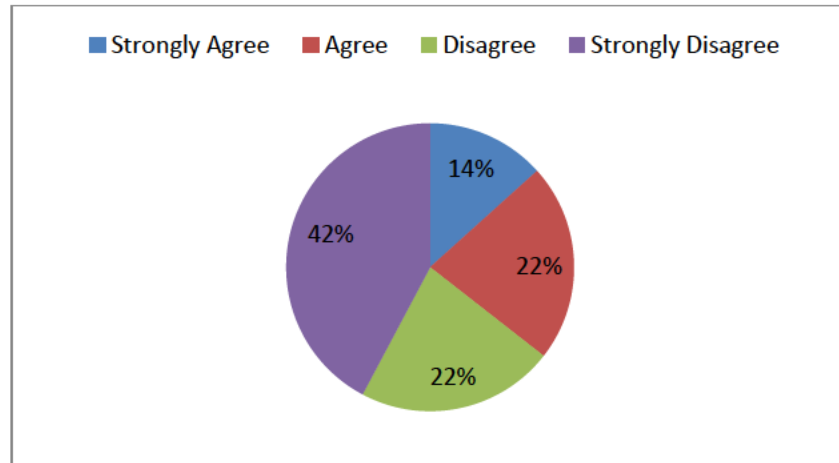


Figure 4.29. Nongovernmental Organizations

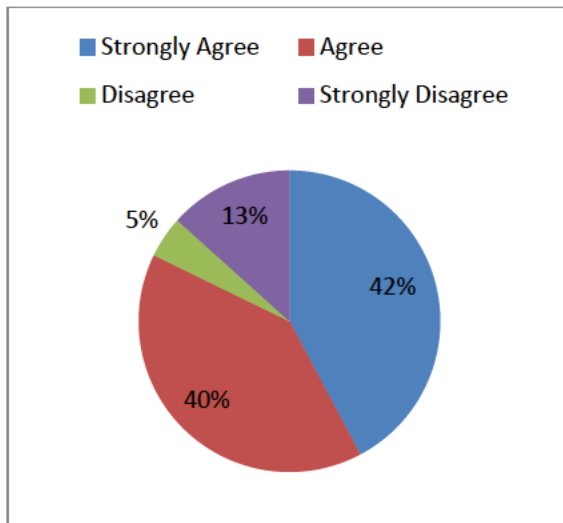


Figure 4.30. Bird Hunting

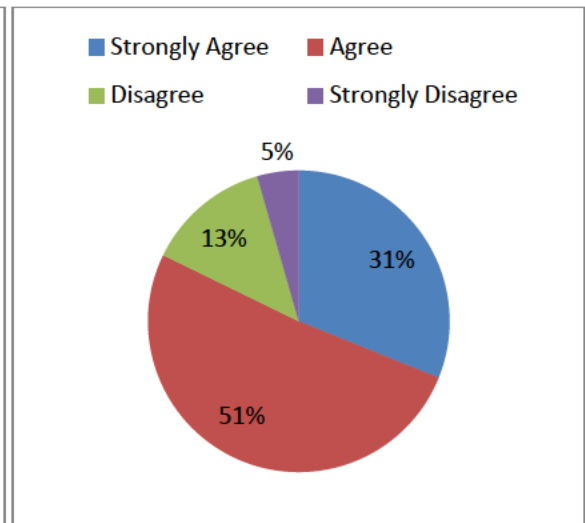


Figure 4.31. Building Houses in Forests

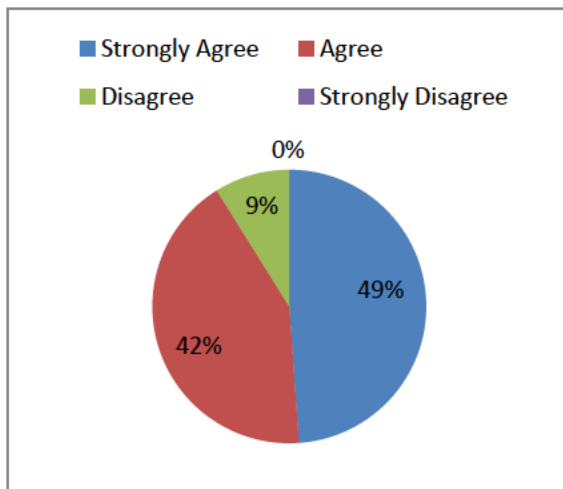


Figure 4.32. Species Protection

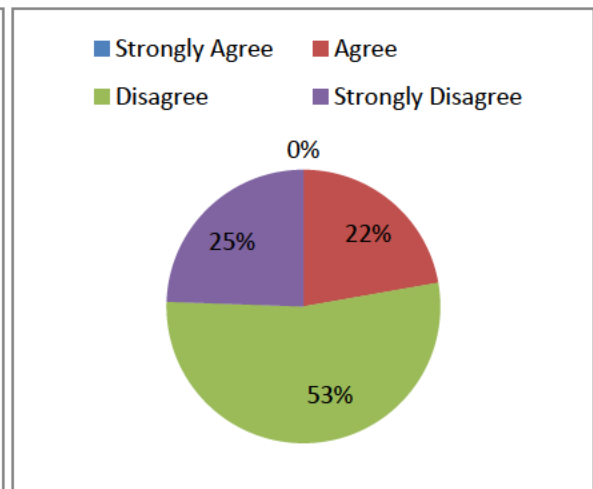


Figure 4.33. Recycling Bins

APPENDIX IV

TEACHERS' LESSON PLANS



برنامج التعليم البيئي (٢٠١١-٢٠١٢)

الصف:الثانوي الاول

الإسم :
المادة :لغة عربية

التقييم	طرق التعليم	عدد الساعات	الأهداف	الموضوع	الشهر
١- كتابة مقالة بنمط سردى ووصفى تتناول: - سبب القيام بهذا النشاط - كيفية الاستعداد له - كيفية سير العمل - ماذا تعلمنا ٢- اسئلة multiple choice حول المعلومات المكتسبة ٣- اعداد مجسم لخلية النحل يقدم في معرض العلوم	١- محاضرة مع power point وسيلة اولى للاستاذ المحاضر نديم هلال ٢- نشاط تطبيقي تضمن اعداد مجموعة من الاطعمة التي يدخل العسل في تكوينها بدلاً من السكر المصنّع ٣- الوسائل المعتمدة : العسل - المكسرات - الفواكه - رقائق الذرة - القشطة - رقائق العجين المحلاة بالعسل.	٦ ساعات	١- التعرف على النحل كثروة حرجية ذات اهمية واسعة بالنسبة للبيئة، للاسنان(غذاء ودواء)، وللانسان ٢- التعرف على حياة النحل وكيفية انتاج العسل ٣- التعرف على اهمية النباتات والنجاح في صناعة العسل ٤- التعرف على اهمى دور النحل في تلقيح النباتات ٥- التعرف على اهمية النحل كمصدر غذاء ودواء ٦- التعرف على الاهمية الاقتصادية للعسل	الثروة الحرجية غير الحطبية (النحل)	



برنامج التعليم البيئي (٢٠١١-٢٠١٢)

الصف:الثانوي الاول

الإسم :
المادة :إجتماعيات

التقييم	طرق التعليم	عدد الساعات	الأهداف	الموضوع	الشهر
من خلال تقديم البحث	بحث مع عرض صور ايضاحية	٣-٢ ساعات	يحدد الطالب عدد المحميات وانواعها واماكن تواجدها	المحميات الطبيعية في لبنان واهميتها	كانون ثاني
اسئلة في الامتحان	بحث	٣-٢ ساعات	يتمكن الطالب من التعرف على المواقع الطبيعية في لبنان وعلى ابرز خصائصها	المواقع الطبيعية في لبنان واماكن وجودها	شباط
من خلال تقديم البحث و اسئلة في الامتحان	بحث مع امكانية زيارة مواقع سياحية (ميدانياً)	٣-٢ ساعات	يحدد الطالب المواقع السياحية ويعرف على اهميتها الاقتصادية بالنسبة الى لبنان	المواقع السياحية في لبنان(مكانها وعددها)	آذار
التقييم على المجسم ومدى تطبيقه بشكل سليم			تشغيل مخيلة الطالب لتثبيت المعلومات في ذهنهم اكثر	تقديم مجسم عن الموضوع	نيسان



برنامج التعليم البيئي (٢٠١١-٢٠١٢)

الاسم :
المادة: علم اجتماع

الصف: الثانوي الاول

الشهر	الموضوع	الاهداف	عدد الساعات	طرق التعليم	التقييم
كانون الثاني	نظرة المجتمع الممتني الى الثروة الصنوبرية .	التعرف على: - أهمية أشجار الصنوبر. - أنواع هذه الأشجار . - من هي المؤسسات الأكثر اهتماماً بالبيئة. - ما دور المؤسسات الحكومية والغير حكومية في دعم هذه الثروة ،والى أي مدى تعمل على حماية البيئة ونشر التوعية البيئية بين الناس..	٢	- قذف أفكار - البحث - التوثيقي - الصور - طرح اسئلة حول البحث:ما هي انواع شجرة الصنوبر وما هي فوائد هذه الثمرة؟ - ما مدى تأثير هذه الثمرة على الوضع الاقتصادي والوضع الصحي؟ - الى أي مدى تلعب	
				دور في تحسين الوضع المعيشي؟ - من الضع الاكثر استفاده منه هذه الاشجار؟ - ما دور المؤسسات الحكومية والغير الحكومية في دعم هذه الثروة والمحافظة عليها؟	
شباط	فوائد أشجار الصنوبر الاقتصادية	التعرف على: - ما هي فوائد ثمرة الصنوبر. - ما مدى تأثير هذه الثمرة على الوضع الاقتصادي ودوره في تحسين الوضع المعيشي لأبناء المنطقة. - مدى تأثير الصنوبر على الوضع الصحي. - دور المؤسسات الحكومية غير الحكومية في حماية البيئة	٢	- دراسة ميدانية باستخدام تقنيات البحث الاجتماعي. (مقابلة واستمارة)	
أذار	دراسة ميدانية في منطقة المتن الاعلى حول فوائد شجرة الصنوبر.		٤	صياغة نهائية للبحث الميداني.	



Environmental Education Program 2011-2012

Subject: English Language

Grade Ten

Month	Topic(s)	Learning Objectives	Session (s)	Teaching Methods	Assessment approach(s)
Jan.	-Ecosystem -Lebanon Forests	-identify ecosystem, sustainable development, ecotourism -identify the tree species in Lebanon -designs posters, brochures, video clips, documents about forests -write persuasive essays	5-6	-Discussions -Presentation(s) -Field Trip	-Portfolios -Presentations
Feb. – Mar.	-Natural Heritage of Forests - Protecting the environment	-write a poem to describe the beauty of forests -write a persuasive essay about suggest solutions to environmental issues	6	-Cooperative learning work -Debate sessions	-Formal assessment (Exam)



ENVIRONMENTAL EDUCATION PROGRAM 2011-2012

Teacher's Name:

Class :GRADE 10

Subject : Chemistry

Month	Topics	Learning objectives	Session(s)	Teaching methods	Assessment Approach(s)
JANUARY & FEBRUARY	Acid rain Air pollution Water pollution	- Identify pollutants that affect the school environment and pine trees environment is Ras – Elmatn - List the harmful effects	6	- Inquiry oriented method - Discovery methods - Outdoor activities	Quizzes and class assessments



ENVIRONMENTAL EDUCATION PROGRAM 2011-2012

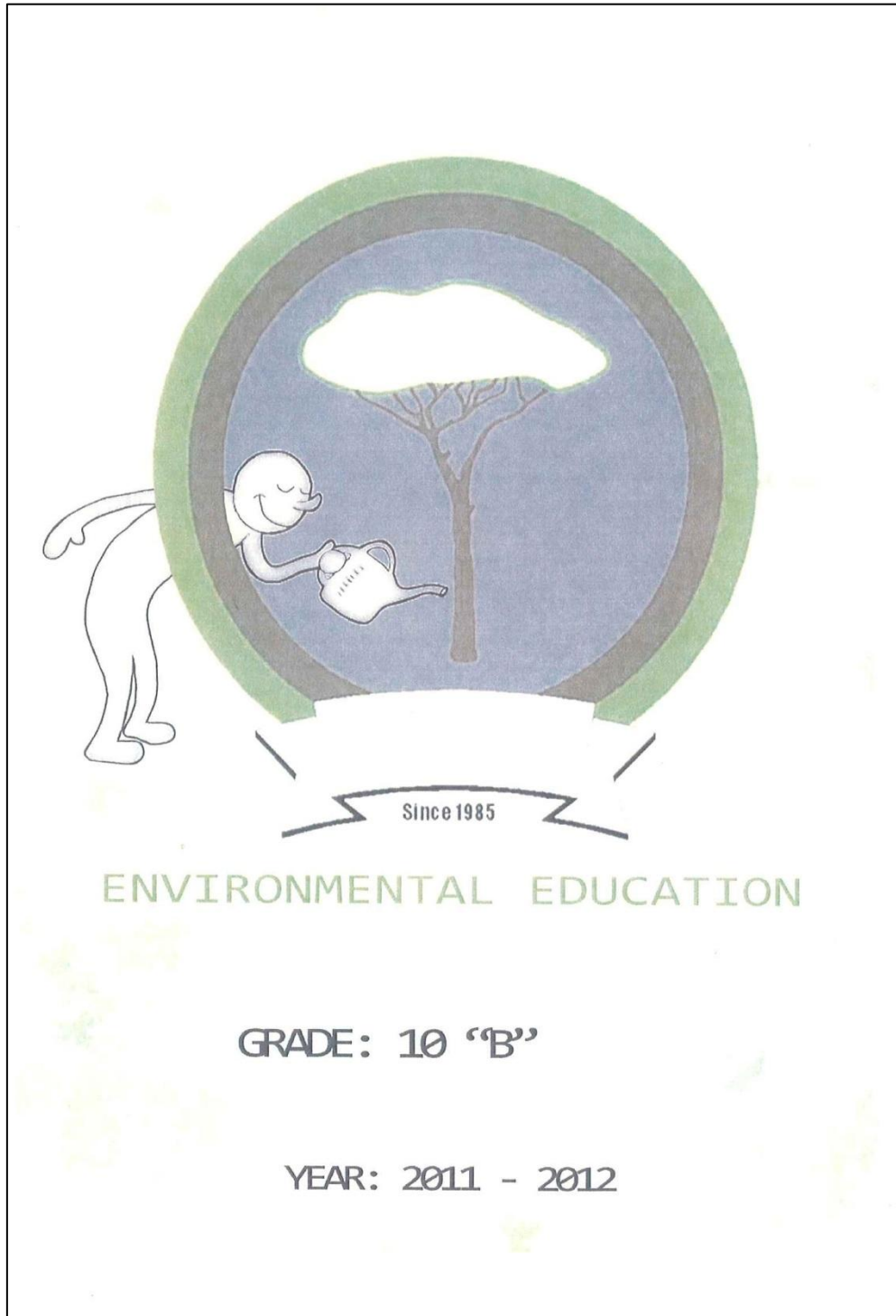
Teacher's Name:

Class : grade 10

Subject :Biology

Month	Topics	Learning objectives	Session(s)	Teaching methods	Assessment Approach(s)
MARCH & APRIL	Pine forests	<ul style="list-style-type: none">- Define : evergreen trees, pine trees, pine forests- Locate Lebanon Pine Trees- Explain pine trees ecological role- Recognize healthy / diseased pine trees	3	<ul style="list-style-type: none">- Ecology websites- Inquiry methods- Activities around the school and in Ras Elmatn	<ul style="list-style-type: none">- Quizzes- Outdoor assessments

APPENDIX V
STUDENT'S PORTFOLIO



الصنوبر





Black Pine, Austrian Pine



Bristlecone Pine



Eastern White Pine



Jack Pine



Lace Bark Pine



Pinyon



Ponderosa Pine

Appalling News!

It was our heaven, a serene exuberant place that relieved our pain, minimized our desperation, crushed our frustration, healed our sorrow, limited our negative thoughts, and returned our hope and faith. Until, all of sudden we heard that breaking news, the government has taken measures to destroy our place our area!

After we've heard that stolid news; that our area would just suddenly disappear due to the government's municipality, we decided to work hand in hand cooperatively to save it from those harmful hands. My dad gathered almost all of my village's men. My two sisters and I called all the villager's girls and boys and met under the largest and oldest tree in that peace of heaven. We were all flustered by that stolid news and wanted to do something in order to save our land, to save our childhood memories, our trees, birds and pets, our soil and roads, our pumping heart. So, we decided and planned to cooperate with the tree cutter. Hence, we visited him and gave him a brain wash. We told him about that piece of heaven, what it brought to us, what we gave it and what we gave us in return. We told him how we shared all those happy memories, the smiles and the tears, the laugh and the weeps. So, we did it and it worked! My dad and the others went to the government and assigned a lawyer to work on the situation, because this land is ours and no one in this world can ever take it from us or even try to destroy it! If they had done this, they could have killed me inside and damaged my dreams. This land was like a mother, a friend and lover. There, I spent the best part of my life! Oh, those harmful hands are always everywhere. They never think of the present generations or the future ones. They just need everything for money and they don't know what they might cause if we did not do the proper measures and steps.

We have worked hand in hand, youngest and eldest, kids and grandparents, rich and poor to save nature, and ourselves, as saving a baby from drowning in a deep profound dull sea. After this appalling scary news, we knew the importance of nature and the significance of working cooperatively hand in hand.

Earth Warrior

Earth is our home and our only shelter. And in order to preserve our survival and continuity , we must thrive in protecting nature. But the municipality of the government in Lebanon took a disastrous measure towards nature ; and that is why neighbors and I took several steps to put an end to such measure.

Nature is where we belong , and the proof for the existence of the glorious God. But unfortunately my government lacked this belief and decided to cut trees and replace them by cement blocks in al maten area and such measure will leave nature injured, bleeding calamities that will affect humans and Lebanese people. Trees act like the lungs of Lebanon, they provide us with oxygen gas . Moreover , they reduce air pollution and deliver to our bodies clean and healthy air. Furthermore, trees are the shelter of many birds and insects and their loss will definitely precipitate their migration or their extinction, which affects the balance of the ecosystem . In addition to that, trees are a very precious beauty that assuage the pain and draw a smile on all the al-maten villagers

For these several reasons and even more, we started our actions. First, we spreaded the news of this measure on Facebook ,in which we described the crime that the government is doing to nature. And on the very same website, we invited all the Lebanese citizens and environmentalists to a protest in Hammana main street. And in the march, hundreds of people raised flyers that expressed the firm rejecting attitudes of the citizens. Second, we negotiated the importance of such issues with environmentalists . And these environmentalists transferred the discussion on the LBC television in

“Kalam El Nass”, a well known program. In addition to that, we gathered information and distributed it to all the citizens. We contacted the AFDC association, which played a very important role.

Finally, and after we repeated the march for several times , the government reconsidered the decision and held an important meeting in which this decision was cancelled. We now celebrate a victory and are very thankful to all the help that we had received.



Flower

What is nature without a flower

And some rain to be its shower

Under the sun it embraces power

To be a majesty hour by hour

oooooooo

A best friend may not care

But a scent flower is always there

Storms are absolutely unfair

For a flower dies in despair

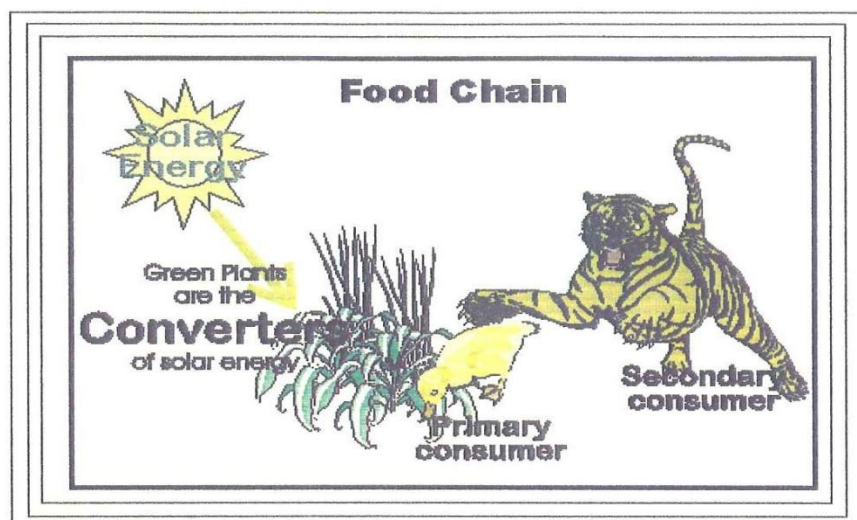
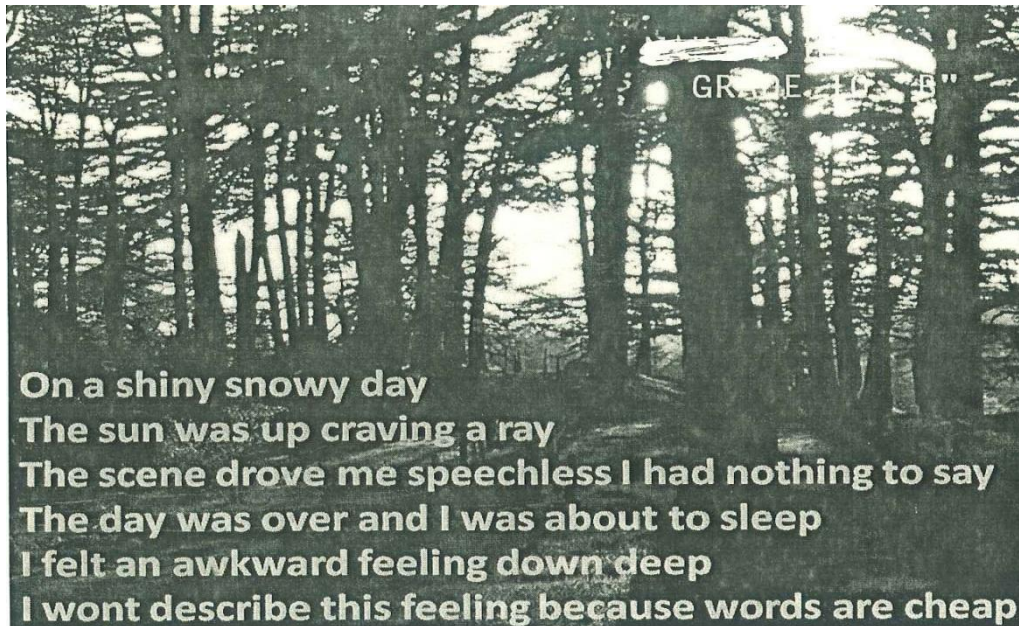
oooooooo

My love to nature is without an end

More valuable than a lover, than a friend

A helping hand to nature I extend

For nature is a stake, and that's no pretend



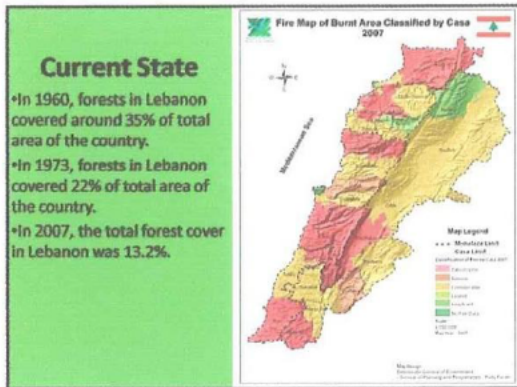
A **food chain** describes how energy in an ecosystem flows from one organism to another.

Almost all food chains begin with the Sun. Producers such as green grass; capture the sun's energy to make food. Animals that eat plants are called first-level consumers or **primary consumers**.

Second level consumers or **secondary consumers** eat other consumers.


- قدم نديم هلال محاضرة لنا صف العاشر.
لقد تعلمنا:
- (1) أن عمر النحل الطبيعي 50 مليون سنة
 - (2) العاملات هي التي تربي البيض للملكة، والملكة هي التي تجمع العسل والرحيق وخلال 5-12 يوم تجمع كمية كبيرة من الشمع
 - (3) الذكور عملهم التزاوج مع الملكة لإنتاج البيض
 - (4) إنتاج الخلية:
العسل
الذنج
الهلام الملكي
حبوب اللقاح
شمع العسل
سم النحل
 - (5) النباتات والازهار العاسلة
أزهار الرحيقية
أزهار تعطي حبوب الطلع
أزهار رحيقية وتعطي حبوب طلع بنفس الوقت
 - (6) أنواع النحل العاسلة
النحل البلدي (هادي أو شرس)
الأبطالي (النحل الهادي)
القوقازي الهادي والشقيل
الأفريقي
الكارنيولي (بين نحل القوقازي والايطالي)
 - (7) النحل القير عاسل :
النحل الطنان
الزنابير
 - (8) مكونات خلية النحل العاسل
الملكة
العاملات
الذكور
 - (9) اكتشفوا من ١٠٠٠٠ سنة قبل المسيح أنواع بيت النحل:
أولاً: كان من القصب
ثانياً: صنعوا بيت النحل من الطين
ثالثاً: أصبح مثل يومنا هذا من الخشب
 - (10) حجم الملكة مضاعفة حجم العاملات والذكور
تعيش الملكة 5 سنوات تقريباً هي الأنثى الوحيدة التي يمكن أن تتزوج وتبيض ١٠٠٠ تى ٥٠٠٠ بيضة يومياً
 - (11) فوائد النحل:
الطبيعية: تلقيح النباتات، التنوع البيولوجي
الصحية: العسل (قتاء ودواء)
الإقتصادية: عدد مربى النحل ٥٠٠٠ نحال
عدد القفران 100000 فقير
متوسط إنتاج القفير 10 كلع
حجم صادرات العسل ٤٠ طن
حجم إستيراد العسل ٤٠٠ طن

Forests Presentation



Causes Threaten Lebanon's Forests


- Forests fires
- Insects and diseases
- Urban expansion and changes in land use
- Quarries
- Wars
- Illegal felling
- Uncontrolled grazing
- Tourism



The image shows a photograph of a forest fire. Bright orange and yellow flames are visible, consuming trees and vegetation. The background is dark, suggesting a dense forest at night or in low light conditions.

Forests Classes and Species


Broadleaves/ oak species



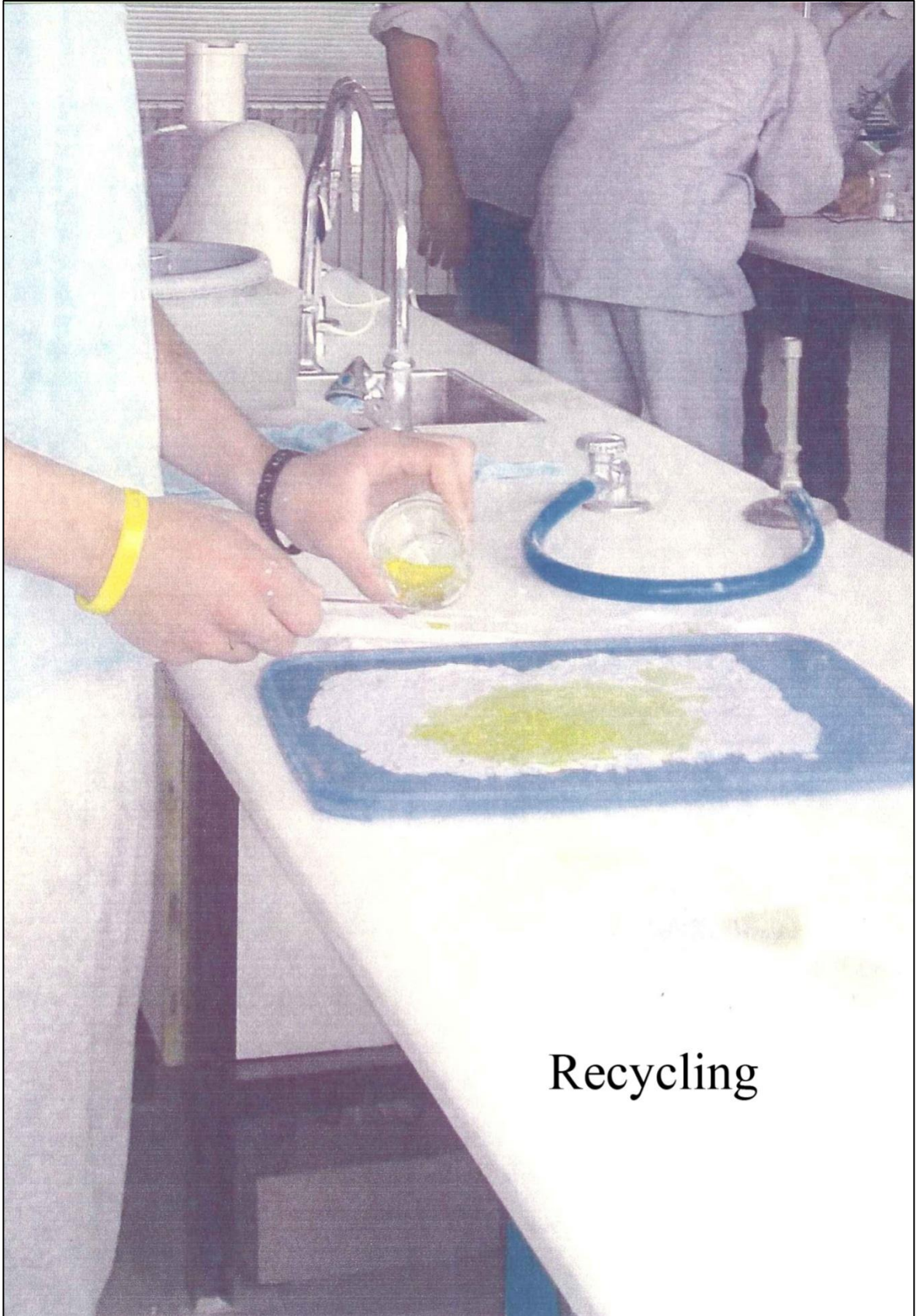
The image shows a photograph of a forest with large, mature trees. The trees have dense, green foliage and thick trunks, characteristic of oak species. The ground is covered in grass and fallen leaves, and there are some people visible in the distance, suggesting a park or a recreational area.

Forests Classes and Species

Coniferous/ mostly pines



The image shows a photograph of a forest with tall, thin trees. The trees have a conical shape and are covered in green needles, characteristic of pine species. The ground is covered in dry grass and fallen needles, and the overall atmosphere is misty or hazy.



Recycling

Green School – Ras-Elmatn



Environmental Club Objectives

- ❖ To expand environmental awareness and knowledge in the community
- ❖ To ensure that every individual has the right to gain values, attitudes, and skills needed to improve and protect the environment
- ❖ To appreciate and love nature
- ❖ To develop a new environmental holistic discipline in the community
- ❖ To participate in solving environmental problems
- ❖ To implement environmental projects: plantation, recycling, and cleanliness

