The Effect of Environmental Project Based Learning on Increasing Pre service teachers' Green-Citizenship

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Abstract

This action research studied the impact of special environmental education course that included project- based learning skills within cross disciplinarily context; on pre-service teachers' green-citizenship and their application of project based learning skills. The sample studied consisted of 162 second and third year primary pre-service teachers, of different subjects, in the Lebanese University, Faculty of Pedagogy, First Branch, UNESCO. Results were collected using three different tools: A pre-test and post-test were completed using a questionnaire to measure participants' environmental knowledge, practice, and attitudes, and a rubric to evaluate project- based learning skills, and the rate of paper recycling performed by student teachers for measuring environmental commitment. Qualitative and quantitative results showed that there was a significant improvement in the level of pre-service teachers' green-citizenship. The implications of this study endorsed the importance of pre-service environmental education training as criteria for teacher green-citizenship certification.

لقد درس هذا البحث الإجرائي تأثير منهج التربية البيئيّة المعدّل الذي شمل مهارات التعلم القائم على المشاريع ضمن سياق اندماج التخصّصات؛ على المواطنة الخضراء لدى الطلاب المعلمين. تناولت عينة الدراسة 162 طالبا من السنة الثانية والثالثة لجميع اختصاصات التعليم الابتدائي في الجامعة اللبنانية، كلية التربية، الفرع الأوّل، اليونسكو. تم جمع النتائج وفقا لثلاث أدوات مختلفة: استمارة لاختبار ما قبل وما بعد التعلم لقياس المعرفة, الممارسات, و المواقف البيئيّة ، جدول محكات لتقييم المهارات من خلال المشاريع المنجزة ، ومعدل إعادة تدوير الورق الذي أنجزه الطلاب المعلمين لقياس التزامهم البيئي, وأظهرت النتائج الكمية والنوعية أن هناك تحسنا كبيرا في مستوى المواطنة الخضراء عند الطلاب المعلمين. أكدت هذه الدراسة أهمية التدريب على التربية البيئية كمعيارلحصول المعلّم على شهادة في المواطنة الخضراء.

"A passive and ignorant citizenry will never create a sustainable world."
Andrew Gaines

The technological and industrial advances and breakthroughs around the world continue to move at a rapid pace, which exerts ever-increasing pressure on the natural environment, leading to air, water, and land pollution. The international community now acknowledges that human activities and their byproducts are responsible for changes in global weather patterns that endanger biodiversity, increase the probability of natural disasters, and may eventually threaten our very existence. At the realization that his type of development is not sustainable (Ministry of Education Georgia 2012), educators and stakeholders have become more aware of the vital role they have to play in conceptualizing environmental issues and developing cognitive frameworks concerning the environment. Environmental Education (EE) in teacher education has been a priority since the end of the twentieth century (UNESCO-UNEP, 1990). New theories and teaching techniques have emerged for applying skills and strategies that translate EE to practical contexts (Petegam, Bliek and De Pauw, 2007).

1. Theoretical part

2.1. Environmental Education

Dating back to the 1970, many international conferences addressed the environmental crisis. Starting with "the united nations conference on human environment "in Stockholm 1972 that declared 7 proclamations and 26 principles to "inspire and guide the people of the world in preservation and enhancement of the human environment" (UNEP, 1972)

Soon after, in 1975, Belgrade charter was declared as an outcome of an international workshop on EE in Belgrade. The charter was built on Stockholm declaration and suggested goals, objectives and guided principles of EE programs. The table below summarizes the outcomes of the Belgrade charter.

Goals	To develop a world population who is aware of, and concerned about, the environment and its associated problems, and who has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.
Objectives	1. Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems. 2. Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

	3. Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement. 4. Skills: to help individuals and social groups acquire the skills for solving environmental problems. 5. Evaluation ability: to help individuals and social groups evaluate environmental measures and education programs in terms of ecological, political, economic, social, esthetic and educational factors. 6. Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems
Audience	1. The formal education sector: including pre-school, primary, secondary and higher education students, as well as teachers and environmental professionals in training and retraining; 2. The non-formal education sector: including youth and adults, individually or collectively from all segments of the population, such as the family, workers, managers and decision makers, in environmental as well as non-environmental fields.

The frequently cited Belgrade Charter (UNESCO-UNEP 1976) provides a goal statement that is the generally accepted definition of EE. In 1977, the Intergovernmental Conference on Environmental Education in Tbilisi, Georgia, highlighted the role of Environmental Education in preserving and improving the global environment, and resulted with The Tiblisi Declaration that provided three objectives for EE ;

•to foster clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas;

•to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;

•to create new patterns of behavior of individuals, groups, and society as a whole towards the environment, and to build upon the Belgrade Charter (Disinger and Howe 1990; Stone 1989), (UNESCO, 1978).

That comprehensive framework for the delivery of EE included elements of informal and formal educational settings. Consequently, competencies needed for an effective EE were identified (Stone 1989; Wilke et al. 1987), focused on Knowledge, attitudes and practices, and included:

- The ability to select, utilize, and implement EE curricular programs;
- An understanding of the goals of EE;
- The ability to infuse EE into the curriculum;
- Knowledge in environmental issues and concepts;
- The ability to investigate and evaluate environmental issues;

- The knowledge and skill in taking environmental action

The above framework of EE suggests that individuals should reflect on their own behavior, and acquire the appropriate knowledge and skills in order to change their attitudes and values, either "for" or "with" the environment. Abou Ali (2011) considered that the main challenge in EE is to reform the curriculum in order to insure the link between environment, economy and society and provide a dynamicity of the concept of sustainable development.

2.2. Sustainable development (SD)

Today, the specific challenges facing education and training in tackling the problem of people's aggressive behavior towards the social and natural environment are the social-ethical exploitation of resources, good environmental practices in everyday life, the demand for real environmental policies, clean technology…. This worldview of sustainable development defined by the Brundtland Commission as "meeting the needs of the present generations without compromising the possibility of future generations to respond to their own needs" enables individuals to be more aware, and more responsible. There are 3 core pillars of sustainable development: the environment, the economic, and the social (WCED 1978).

2.3. Environmental or green citizenship

Dobson (2003) defines environmental citizenship as citizenship virtues that involve exercising environmental rights and carrying out ecological responsibilities. Cogan and Derricott (2000) had used the working definition for "citizenship" as a set of characteristics of the citizen who encompasses the educational, political, socio-cultural and economic dimensions at the local, national and international levels. The concept of citizenship also contains a "sense of knowledge, skills, values and dispositions that, ideally, citizens should possess" (Cogan and Derricott, 2000, p.2). This implies that the environmental citizen would utilize his sense of knowledge, skills and values in the educational, socio-cultural, political and economic dimensions towards sustainability of the environment in which he exists.

2.4. Dominant Approaches to Environmental Education and Sustainability

The history of Environmental sustainability education can be traced back to the 1960s' concept of environmental education (Gough, 2006). The process has led to the emergence of three dominant interrelated approaches known as education about, in/through, and for the environment (Hart, 2004; Huckle, 1983; Palmer, 1998). Education about the environment emphasizes the teaching of facts, concepts and generalizations about environmental

patterns, processes and problems. Education in or through the environment uses the environment as a medium for education (Evans, Whitehouse, & Hickey, 2012). Education for the environment takes a socially critical educational approach to integrate goals for conservation, social justice, appropriate development and democracy, in order to promote informed and active concern for the quality and preservation of social ecological systems (Fien, 2001, 2004; Huckle, 1983; Palmer, 1998). The three approaches embed an overlapping and blending of a set of knowledge, skills, attitudes and ideologies within elements of concern, experiences and action (Bennett & Heafner, 2004). However, it is considered that education about and in the environment provides knowledge, awareness and concern for the environment without necessarily generating action (Jenkins, 1999/2000; Robottom, 1987), whereas education for the environment focuses on values, ethics and problem-solving skills which then act as catalysts for action and social change (Fien, 2001).

Powers (2004) suggested that the key element to increase the impact of EE professional development and employ the "multiplier effect", where teachers are taught and the knowledge is multiplied by their students being taught, is in the pre-service teachers preparation program. Previous research shows that most teachers are unaware of the underlying theoretical issues concerning EE and the concept of sustainable development (Cross, 1998; Summers, Kruger, & Childs, 2000). In addition, teachers generally see EE as an instrument for a predetermined goal, which is environmentally responsible behavior, rather than as an ongoing process of development. Teachers of non-science disciplines are not effectively trained to achieve this process in their classrooms (Petegam, Bliek and De Pauw, 2007). Research studies reported that in most cases, few EE programs reach the desired outcomes because of the ineffective teaching and learning strategies and the lack of commitment to EE (MacDonald & Domingous, 2010).

2.5. Environmental Project-based learning

Environmental project-based learning (E-PBL) offers opportunities for pre-service teachers to actively explore and address environmental challenges, while building skills in teamwork and communication, research, data collection and analysis, community engagement, and reflection. E-PBL enables and requires pre-service teachers' to develop knowledge and skills while investigating issues in their environmental context (NEEF 2015).

Research problem

At the Lebanese University, faculty of Education, pre-service teachers undergo a comprehensive program where some courses are discipline-

specific, and others are common for all graduates. The Environmental Education course is a mandatory one, implemented to second and third year pre-service teachers of all disciplines. It includes knowledge about many ecological factors and processes.

Being the instructor of the EE course for the last 5 years, the researcher found that pre-service teachers are not developing the required competencies of EE recommended by the framework (Stone 1989; Wilke et al. 1987), where the need to change teaching strategies was urging.

The current study investigates the effectiveness of the E-PBL on the development of the competencies recommended by the framework, and illustrated as knowledge, attitude and practice.

The research question:

Does a curriculum based on the use of E-PBL enhance pre-service teachers' knowledge of, attitude to and practice towards the environment?

3. Methodology

This study shows the impact of the curriculum based on the use of E-PBL (appendix1) on the knowledge, practices and attitudes of pre-service teachers to sustainable development and consequently to green-citizenship. This article is an action research where the qualitative data analysis involves making sense of patterns, themes, regularities and categories.

3.1. Participants

The participants in this research are 162 first and second year pre-service teachers in science, math, languages and early childhood education in the Lebanese University, Faculty of Pedagogy, First Branch, and 60 post-graduate students who finished their BS degree from the Lebanese University, Faculty of Science, and started their masters at the Lebanese University, Faculty of Pedagogy. The selection of the participants is justified by the fact that the Lebanese University is working on curriculum redesign for Quality Assurance in Higher Education (TLQAA, 2013).

3.2. Tools

A valid open-ended questionnaire (appendix2) was used, and included three types of questions based on the kind of measurement. Type A measures participants' knowledge, and consists of 6 questions (1 to 6). Type B measures participants' attitudes, and consists of 2 questions (7, 8), and type C measures participants' practice and consists of 2 questions (9 &10). The questionnaire was given as a pretest and post-test for the 162 pre-service teachers and as an evaluative (diagnostic) test for the 60 post-graduate students. A rubric (appendix 3) for projects was used to evaluate participants' skills and their group work.

3.3. Procedure

During the academic year 2013-2014, an EE curriculum based on the use of E-PBL was implemented to 162 pre-service teachers, after they were pre-tested, and 60 post-graduate students, who were evaluated by the same questionnaire to test their knowledge, attitude and practice toward the environment. The EE curriculum based on the use of P-BBL was altered in three dimensions: objectives, strategies and assessments. The objectives of this curriculum included more education for sustainable development related items. To reach the desired outcomes, the researcher focused on project-based strategies through inquiry and environmental activities such as environmental field trips, films and videos, plantation, exhibitions, interviews with environmental experts and NGOs, collecting papers for recycling, and environmental events. As for the assessment, it wasn't limited to the summative test at the end of the course, but included an evaluative rubric for the projects, the recycling rate measured at the end of the year (appendix4), and the quality of the environmental activities done by participants during the environmental day that was held at the Faculty Of Pedagogy, First Branch, Unesco. In addition, a Facebook page (www.facebook.com/itstimetogogreenmind) was created to post all environmental activities performed by students throughout the course.

2.1. Validity and reliability

In this qualitative research, triangulation is used, through which the impact of the intervention was measured by different ways: the pre-post test questionnaire, the project rubric, the rate of collected papers for recycling, and the quality of the environmental activities done by participants in the environmental day that was performed in the Lebanese University, Faculty Of Pedagogy, First Branch, UNESCO. The triangulation used increases the validity and reliability of this research.

2.2. Ethics

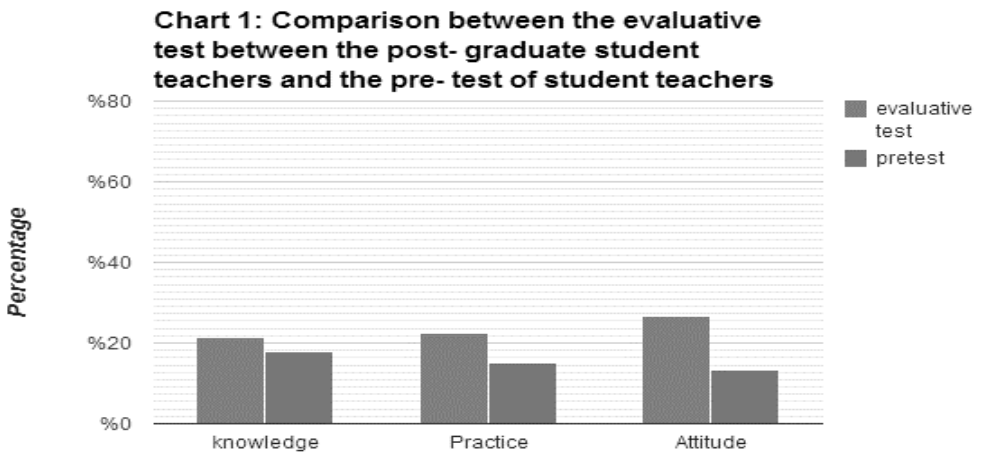
Permission was taken to apply the questionnaire to participants. A formal proposal was prepared to the Director to have the permission for the environmental day and for collecting paper for recycling.

3. Results and Interpretation

The results of the pre-test of the pre-service teachers and the diagnostic test of the post-graduate students are very close to each other and they appear to be low (referred to chart1). This implies that the pre-service teachers as well as the post-graduate students had low average of knowledge, practice, and attitude towards sustainable development and consequently towards green citizenship.

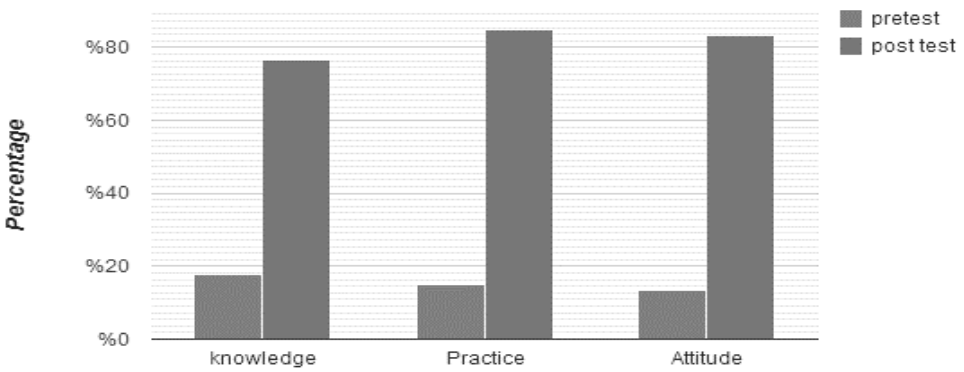
A more detailed analysis of the questionnaire given to pre-service teachers and post-graduate students showed that they don't precisely know the definition of the environment (question 1) nor the environmental education (question 2); they mostly have the misconception that environment is only reduced to nature without taking into account the social and economic axes to the concept. They also couldn't identify all the environmental problems (question 3, 4), however, they only stated pollution as the only frequent environmental problem.

The post-graduate students and pre-service teachers were barely able to define the main concepts of the environmental education (question 6) like green house effect, ozone layer depletion, pollution, and renewable and non-renewable energy. They had no idea about sustainable development, biodiversity, waste management, and climate change. Moreover, rare environmental activities done were mentioned (question 10), which also reflected that even in schools, teachers do not accord enough interest to environmental activities that could be integrated in curriculum disciplines, which might increase students' motivation to care about the environment and to solve its problems. They showed devalued commitment towards green citizenship (questions 7, 8, 9), which was revealed by the ignorance of their responsibility towards their environment. They rendered all the responsibility upon the government without considering the roles of other stakeholders in their communities, like municipalities and non-governmental organizations.



However, the results of the post-test, after the intervention of the new curriculum, showed a significant increase in knowledge, practice and attitude of the pre-service teachers (referred to chart 2).

Chart 2: Comparison between the pretest and post test of student teachers



The pre-service teachers were able to define correctly the environment and environmental education. They were more capable to identify environmental problems, and define major environmental concepts. They showed more commitment towards green citizenship, by being aware of their responsibility to prevent environmental problems, and find solutions to these problems.

The main cause of such positive impact was the modified curriculum, which includes the project-based learning strategy that was planned according to 6 steps. The projects focused on environmental problems in the participants' communities. The participants had to 1) define the problem and identify the information needed, 2) find the most appropriate information-seeking strategies (interviews with experts or citizens or NGOs…), 3) synthesize and evaluate the gathered information, 4) Suggest solutions for the problem 5) design activities for students relevant to the chosen problem, and that could be integrated into the curriculum standards, 6) communicate the outcomes of the project through an interactive presentation with an optional product (video, power point, poster, brochure, workshop, play, debate…) The projects were evaluated based on the designed rubric, which is divided into 10 criteria. As a result, participants frequently demonstrated commitment to team-work, personal responsibilities and tasks, and expressed and constructed ideas in writing to a wide array of audiences in a clear, concise and correct fashion. They spoke correctly, eloquently and effectively before a variety of audiences for multiple purposes, gathered, analyzed, and synthesized information in a variety of contexts, collected data from variety of reliable resources through interviews and researching, and actively and respectfully contributed to a team to solve problems while working towards a common goal. They applied computation, measurement, estimation and data evaluation in various settings, explored different perspectives on global,

cultural and local issues and values, leading to action in their communities, created products through projects that examined, synthesized, and justified content acquired in the specific content area, and selected and utilized appropriate technology to effectively perform a variety of tasks.

The environmental day that was organized in the Lebanese University- Faculty of Pedagogy- First Branch- UNESCO in March 28th, 2014 had revealed participants' improvement in their green citizenship through demonstrating their projects after learning the modified EE course. Many environmental activities were held by pre-service teachers that day as they presented some of their projects. Some of the pre-service teachers presented some art products done by used objects. 30 flowering plants were planted in the campus of the university. A cedar tree was granted from the administrators of the Barouk Cedar Reserve. Special Lebanese Schools were invited to present their environmental projects on this day to be good models for the student teachers' future integration strategies.

The school projects were really inspiring, and included inventions like the production of electricity from urine which was officially patented, as well as demonstrations like a solar heater made up of soda cans and a dripping system that saves water during irrigation. At the end of the day, participants surveyed audience green citizenship by using the Carbon Footprint worksheet (appendix 5).

The positive impact of the curriculum based on the use of E-PBL on students' commitment towards green citizenship was also demonstrated by the 75% increase in the rate of paper collection for recycling from one semester (before the implementation of the EE course) to another. This increase was evidenced by the report provided by T.E.R.R.E. Liban, the NGO that was responsible for paper recycling in order to save trees.

5. Conclusion and Recommendation

It could be concluded that the EE curriculum based on the use of E-PBL implemented at the Faculty of Pedagogy, first branch, UNESCO, increased pre-service teachers' green citizenship that includes environmental knowledge, attitude and practice. The issue of the "future" has been ever-present in green thinking and practice. The notion that "past generations have done nothing for us, so we don't have to do anything for the future generations" must be discarded. Green citizenship is the "low-hanging fruit" - of individual behavioral change, diligent recycling, home insulation, and turning off TV sets instead of leaving them on standby (Hayward, 2012). Applying that curriculum in EE is recommended, and training workshops for instructors should be planned and performed to insure effective implementation of the curriculum.

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Appendices:

Appendix 1: The curriculum of environmental education based on E-PBL

1. **General Objectives:**
   - Transform green attitudes from student teachers to students
   - To make student teachers aware of the current local and global environmental problems.
   - Explain the impact of humans on their environment and their responsibilities toward a sustainable development

2. Intended Learning Objectives:

- Define environment and list the factors affecting it.
- Define pollution and identify its kinds and consequences on environment.
- Define Global warming and climate change and identify the factors causing them.
- Describe the different types of waste and their treatment through recycling.
- Define Environmental education and clarify its impact in creating a good citizen.
- Define Sustainability and relate it to environmental education
- Differentiate between renewable and non renewable energy.
- Introduce the curriculum objectives relevant to environmental education.
- Prepare learning activities (indoor and outdoor) to fulfill environmental education objectives.
- Identify the major problems related to the environment in Lebanon

2. Course Outline:

Week	Content	Method Used	Materials
1	Introduction: Definition of Environment (Nature (Ecology), Society, Economy) and factors affecting it (4P: Pollution, Poverty, Population, and Peace)	Brainstorming Discussion	PPT
2-3-4	Model Of Environmental Interaction through pollution - Definition Of Pollution - Kind of pollution - Effect of pollution on environmental factors, e.g. biodiversity (Global warming and climate change)	- Discussion about film - Document Analysis - Documentary film analysis	- Film - Documents and PPT, Posters, -Documentary Film

5-6	Finding a solution for pollution problem: Recycling	- Project-Based Learning	- PPT, Models, Videos
7	Definition Importance of Environmental Education	-Discussion, and Reflections	-Journal
8-9	Modeling Sustainability: Renewable and non-renewable Energy and defining Education for sustainable development	- Project-Based learning	PPT, Videos
10-11	Survey of Environmental Education Curriculum and design relevant teaching activities	- Discussion and research	Lesson plan form- CRDP Environmental curriculum and Toolkit
12-13	Presenting Expected Projects	Various	Various

Appendix 2: the questionnaire

For the development of the environmental education curriculum in Lebanon for the development of environmental good citizen, kindly complete the following questions,

There is no need to write your names on this survey. Thank you for your cooperation.

1. What is your understanding about Environmental education?
2. What is your understanding about Environment?
3. Do you think that the environment has changed in Lebanon and in the world?
4. List some factors the negatively affect the environment.
5. Name some problems that negatively affect the Lebanese Environment.
6. Define the following terms:
    - Global warming:
    - Ozone layer depletion
    - Biodiversity:
    - Pollution:
    - Renewable and Non- Renewable resources:
    - Waste Management:
    - Sustainable Development:
    - Desertification:
    - Climate change:
7. Who, do you think, is responsible for protecting the environment in Lebanon?
8. How does it affect human health when the environment becomes worse?
9. List some of the daily practices that you do to protect the environment.
10. Throughout your studying (nursery to university), what environmental activities did you do in the following places?
    - School: School(‘s) Name(s):
    - University: Name(s) of University/Universities:
    - Organization: Name(s) of organization(s):
    - Other:

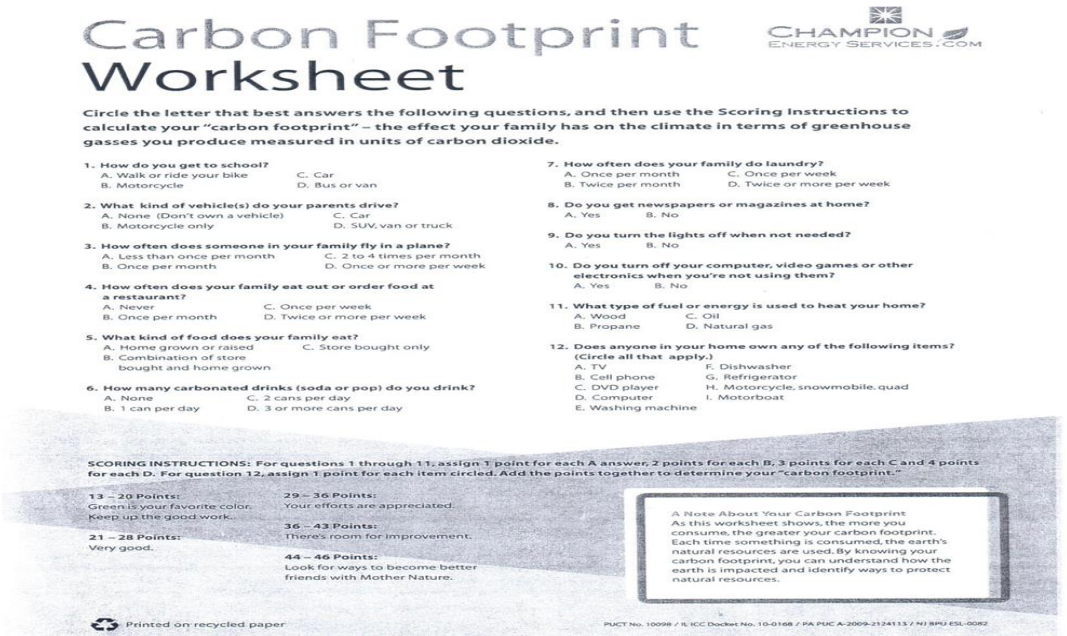
Appendix 3: Evaluation Rubric for Student Teachers' Project

Total: _____/ 100

Criteria	Needs Improvement (0)	Satisfactory (5)	Advanced (10)
Work Ethic	The student rarely demonstrates commitment to his/her team, personal responsibilities and tasks	The student frequently demonstrates commitment to his/her team, personal responsibilities and tasks	The student demonstrates all time commitment to his/her team, Personal responsibilities and Tasks
Written Communication	The student effectively expresses and Constructs ideas in writing.	The student effectively expresses and constructs ideas in writing clearly	The student effectively expresses and Constructs ideas in writing clearly concisely and correctly to a variety of Audiences
Oral Communication	The student speaks correctly.	The student speaks correctly and eloquently.	The student speaks correctly, eloquently And effectively before a variety of audiences to multiple purposes
Critical Thinking	The student gathers information in a variety of contexts	The student gathers, and analyzes information in a variety of contexts	The student gathers, analyzes, and Synthesizes information in a variety of contexts
Collaboration	The student rarely contributes to a team to solve problems while working towards a common goal.	The student passively contributes to a team to solve problems while working towards a common goal.	The student actively and respectfully contributes to a team to solve problems while working towards a common goal.
Data Collection	The student doesn't Apply computation, measurement, estimation and data evaluation in various settings.	The student rarely applies computation, measurement, estimation and data evaluation in various settings.	The student applies computation, measurement, Estimation and data evaluation in various settings.
Global and Community Engagement	The student explores Different perspectives on global, cultural and local issues.	The student explores Different perspectives on global, cultural and local issues and values. .	The student explores Different perspectives on global, cultural and local issues and values, leading to action in his/her community. .

Content	Student creates class Activities that do not cope with content Knowledge and Skills of Lebanese Curriculum Standards.	Student creates class Activities that cope with content Knowledge and Skills of Lebanese Curriculum Standards	Student creates effective class Activities that cope with content Knowledge and Skills of Lebanese Curriculum Standards
Technology Literacy	The student doesn't select and utilize technology to effectively perform a variety of tasks.	The student selects and utilizes technology to effectively perform a variety of tasks.	The student selects and utilizes appropriate technology to effectively perform a variety of tasks.

Appendix 4: Food print worksheet



Carbon Footprint Worksheet

CHAMPION ENERGY SERVICES.COM

Circle the letter that best answers the following questions, and then use the Scoring Instructions to calculate your "carbon footprint" – the effect your family has on the climate in terms of greenhouse gasses you produce measured in units of carbon dioxide.

1. How do you get to school?
   A. Walk or ride your bike C. Car
   B. Motorcycle D. Bus or van
2. What kind of vehicle(s) do your parents drive?
   A. None (Don't own a vehicle) C. Car
   B. Motorcycle only D. SUV, van or truck
3. How often does someone in your family fly in a plane?
   A. Less than once per month C. 2 to 4 times per month
   B. Once per month D. Once or more per week
4. How often does your family eat out or order food at a restaurant?
   A. Never C. Once per week
   B. Once per month D. Twice or more per week
5. What kind of food does your family eat?
   A. Home grown or raised C. Store bought only
   B. Combination of store bought and home grown
6. How many carbonated drinks (soda or pop) do you drink?
   A. None C. 2 cans per day
   B. 1 can per day D. 3 or more cans per day
7. How often does your family do laundry?
   A. Once per month C. Once per week
   B. Twice per month D. Twice or more per week
8. Do you get newspapers or magazines at home?
   A. Yes B. No
9. Do you turn the lights off when not needed?
   A. Yes B. No
10. Do you turn off your computer, video games or other electronics when you're not using them?
    A. Yes B. No
11. What type of fuel or energy is used to heat your home?
    A. Wood C. Oil
    B. Propane D. Natural gas
12. Does anyone in your home own any of the following items? (Circle all that apply.)
    A. TV F. Dishwasher
    B. Cell phone G. Refrigerator
    C. DVD player H. Motorcycle, snowmobile, quad
    D. Computer I. Motorboat
    E. Washing machine

SCORING INSTRUCTIONS: For questions 1 through 11, assign 1 point for each A answer, 2 points for each B, 3 points for each C and 4 points for each D. For question 12, assign 1 point for each item circled. Add the points together to determine your "carbon footprint."

13 – 20 Points: Green is your favorite color. Keep up the good work.

21 – 28 Points: Very good.

29 – 36 Points: Your efforts are appreciated.

36 – 43 Points: There's room for improvement.

44 – 46 Points: Look for ways to become better friends with Mother Nature.

A Note About Your Carbon Footprint
As this worksheet shows, the more you consume, the greater your carbon footprint. Each time something is consumed, the earth's natural resources are used. By knowing your carbon footprint, you can understand how the earth is impacted and identify ways to protect natural resources.

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Appendix 5: Certificate

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RECOPAPER

CERTIFICATE OF APPRECIATION

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