

Conference Paper

# Enhancing Students' Environmental Knowledge and Attitudes Through Community-Based Learning

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## Abstract

One of the ultimate goals of education is to provide strategies that will promote knowledge transfer, wherein the students realize the relevance and applications of the subject matter in their lives. In environmental education, the concern is not only the enhancement of the students' conceptual understanding, but also the development of awareness and concern for the environment. Community-based learning in environmental education is a pedagogical approach that is based on the premise that students learn to connect environmental concepts with the real world, hence, creating meaningful learning experience. This study aims to design and evaluate community-based approach in learning environmental science for senior high school students. The mixed method approach was used in this study, which was done through quasi-experimental design and qualitative analysis of the students' written responses to open-ended questions. Two groups of students have participated in this study: (I) the traditional learning group and; (II) the community-based learning group. Results revealed an improved academic performance based on the gain score analysis wherein the community-based learning group had a statistically significant higher achievement than the traditional learning group. Moreover, the development of more positive environmental attitudes was also observed in the community-based learning group. In addition, the role of the community members appeared to be significant in the learning process, based on the students' responses to the open-ended questions. In learning real environmental issues, community-based learning is a promising approach in enhancing students' environmental knowledge, and in developing more positive environmental attitudes. Moreover, this approach provides an opportunity for personal and social growth, and the development of one's sense of responsibility and accountability.

**Keywords:** community-based learning; environment attitudes; environmental education; environmental knowledge; mixed method approach

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## 1. Introduction

Education plays an important role in developing students' knowledge of the environment, as well as skills that can be used to address issues and concerns, which are relevant to their communities [1]. With the ecological backlashes that humanity has been experiencing, it opens the opportunity to reflect about what the future could bring to the human race [2]. Educators can employ appropriate strategies that can motivate students to develop pro-environmental attitudes and help them realize the significance of conservation and protection of nature's bounty [3]. The mission of education is connected with societal issues, and environmental issue is one of the four key challenges facing this generation. Students show more concern to societal and environmental issues that have relevance to their personal lives [4]. Moreover, highly-engaging and enjoyable learning experiences can boost the students' interests, allowing them to become producers, rather than merely consumers of knowledge, which can help them excel in both academic and/or extra-curricular activities [5]-[7].

One of the pedagogical approaches by which students can be connected to the real world is through community-based learning (CBL). Community-based learning promotes learning experiences that are relatable to students' lives and their communities, hence extending the learning beyond the walls of their classrooms, and making them realize the relevance and applications of the subject matter [1]. Exposure to community-based learning activities allows students to learn together with their peers, as well as with the guide of their families and other members of the community of which they are part. Learning is done in the community after classroom instruction has taken place, enabling the learners to develop and apply functional skills [7], [8].

Community-based learning can be used in environmental education since the students' community forms part of their environment. In addition, the available resources in their community can be used to create learning opportunities, which can connect the classroom with the real world. The generally accepted goal of environmental education is *"to influence behavior and to develop active citizenship"* [9]-[15]. The framework of education *about, in, and for* the environment organizes experiences within an environmental education program. Education *about* the environment focuses on the students' conceptual understanding of the environment and enables them to grasp the idea of sustainability. Education *in* the environment connects the students with a place to develop awareness of the environment. It allows the students to get to know well the community where they live, work, and learn. Education *for* the environment promotes

a lifestyle change that supports the harmless use of environmental resources, developing values of love, concern, and responsibility. As a result, students acquire essential skills in making informed decisions and taking purpose-driven actions concerning the environment. [16]-[19].

Several studies in the past have shown the efficacy of community-based learning approach in the development of meaningful learning experiences. In the Chicago River Project done in 2001, the school-community partnership was given emphasis as it served as an agent for the students to easily learn science concepts such as water conservation, recycling, soil erosion and water quality, with the help of their community. Aside from knowing concepts, the most important real-life learning that the students gained is the realization that they can make a difference in their community. The connection between formal and informal science learning was identified as one of the key principles in attaining a successful school-community partnership [20]. This finding supports the idea that educational institutions must work toward community-building relationships that foster skills development and excellence among learners [21].

In a separate study done by Quitadamo et al. [22], community-based instruction was used to see its effects on the critical thinking skills of the students in general biology courses. Results from the study showed significant gains in higher order thinking skills, with large gains in national percentile rank. A large gain in critical thinking and analysis, inference, and evaluation skills was also noted. It is apparent that community-based strategies offer promising alternatives to traditional lecture and laboratory methods, because they contribute considerably to the enhancement of critical-thinking skills and attainment of other essential learning outcomes in general biology courses.

Lisowski and Disinger [23] reported that the exposure to community-based activities can enhance students' conceptual understanding in ecology, based on the statistically significant posttest gains. Thus, the instructional approach used was positively related to the posttest gains.

Environmental issues are everybody's concern regardless of one's status, gender or age. This impelled researchers to utilize community-based learning approach in enhancing the students' knowledge about water pollution as an important environmental issue, as well as in developing students' positive environmental attitudes. In line with the goals of the Philippine K-12 curriculum, community-based learning approach can provide an opportunity for the students to be environment- and conservation-literate, and be productive members of the society.

## 2. Objectives of the Study

This study investigated the effects of community-based learning approach on students' environmental knowledge and attitudes. Specifically, this study aimed to analyze the students' academic performance based on gain scores, as well as their environmental attitudes through descriptive statistics. Moreover, the students' perceptions regarding their community experiences were analyzed qualitatively.

## 3. Materials and Methods

The mixed method approach was used in this study, which involved the collection and analysis of quantitative and qualitative data. In the quantitative part of this study, the quasi-experimental design was used in determining the effect of community-based learning in the academic performance of the students. In addition, the students' attitudes towards environmental issues were also quantitatively measured by using Likert-type scale attitudinal questionnaire. On the other hand, the qualitative part of this study was based from the students' written-responses on open-ended questions formulated by the researchers. The questions attempted to probe the two groups' perceptions on their learning experiences, as well as the experimental group's perceptions on the role of the community to their understanding of water pollution.

### 3.1. Participants

The participants of this study were senior high school students from a Catholic school in Manila, Philippines. A total of sixty-six (66) students participated in this study, and two (2) groups were established, having equal numbers of participants: (I) the traditional learning group and; (II) the community-based learning group. The IQ scores and pretest scores were used as the basis for matching the two groups, to ensure that the two groups' cognitive abilities do not differ significantly.

### 3.2. Instruments

Instructional materials. The instructional materials used for both traditional and community-based learning groups contain the same lessons, content standards and specific learning outcomes. These materials were validated by Science educators

based on the following criteria: (a) goals and objectives; (b) learning activities; (c) resources and; (d) assessment techniques.

Pretest and posttest items. Written examinations were given to the students to measure their understanding on water pollution. The examination is a researcher-made fifty-item multiple-choice type of test, which contains questions about hydrosphere and water pollution. Pilot-testing was done prior to the administration of the exam to the research subjects. Each item was then subjected to item analysis in terms of index of difficulty and discrimination index.

Attitudinal questionnaire. A twenty-item attitudinal questionnaire was given to the participants to measure their attitudes towards environmental issues. The questionnaire is a Likert-type scale, and is adapted and modified from the works of Kose et al. [24] and Ugulu et al. [25] on the students' environmental attitudes. The participants rated the given statements based on their personal views by using fixed responses such as: 1 = *Strongly Disagree*; 2 = *Somewhat Disagree*; 3 = *Neither Agree Nor Disagree*; 4 = *Somewhat Agree*; 5 = *Strongly Agree*.

Open-ended questionnaires. A 10-item questionnaire containing open-ended questions was given to the participants of each group, to qualitatively analyze their perceptions on their learning experiences. The students were given ample time to answer each question and were allowed to express their thoughts freely by using any language that they are comfortable with.

### 3.3. Community-based learning procedure

The water pollution as one of the environmental hazards was the main focus of the discussion. Also, water pollution was the basis for all community-based activities done. The community-based approach in teaching and learning involves the following key qualities: activities are community-based, collaborative, information-based, and action-oriented [26]. To satisfy these key qualities, the participants were subjected to four activities: (1) physico-chemical analysis of water from the site, which allowed the students to be familiar with a site in their community where a problem in water pollution exists; (2) survey of the residents' perceptions on their role in the community, which enabled the students to gather information about the possible point sources of water pollution in the community; (3) clean-up drive, to take actions in the water pollution existing in their community and collaborate with the other members of their community and; (4) presentation of the gathered information from the community,

which was used as the basis for devising possible corrective measures that were suggested to the local community members and officials to minimize the effects of environmental hazards.

### 3.4. Data analysis

In the analysis of the students' academic performance based on the gain scores, Hake's [27] normalized gain score formula was used.

In addition, inferential statistics such as the independent samples *t* test was used in determining any significant difference between the mean gain scores of the two groups. The *p*-value approach was used as the basis for decision whether the data are statistically significant or not. The level of significance ( $\alpha$ ) was set at 0.05.

In the students' environmental attitudes, students' responses were analyzed through mean values, and these values were interpreted through the use of descriptors with their corresponding scales such as *Very Positive* (4.1 – 5.0); *Positive* (3.1 – 4.0); *Moderately Positive* (2.1 – 3.0); *Negative* (1.1 – 2.0) and; *Very Negative* (below 1.0). Also, independent samples *t* test was used to determine any significant difference between the environmental attitudes of each group.

For the qualitative analysis, three hundred twenty (320) students' responses to open-ended questions were coded with NVivo software to identify the converging themes of the students' ideas. The analysis resulted into the generation of Word Cloud (Figures 1 and 2).

## 4. Results and Discussion

Gain score analysis describes the improvement of scores, from pretest to posttest, after the intervention was given [27]. Table 1 shows the summary analysis of gain scores of the traditional learning group and community-based learning group. Based on the calculated mean values, the experimental group has a higher mean gain score (0.283) than the control group (0.146). This variation in the mean gain scores was further analyzed through *t* testing, to determine if the difference is statistically significant. Since  $t(61) = 4.598$ ,  $p < .001$ , it implies that there is a significant difference between the gain scores of the traditional learning group and community-based learning group. The significant difference between the gain scores of traditional learning group and

community-based learning group shows that the community-based approach caused a positive effect on students' environmental knowledge.

TABLE 1: Gain Scores Analysis.

Group	x	s	t value	df	p-value
Control	0.146	0.106			
Experimental	0.283	0.134	4.598	61	<.001
n = 33   $x_1 - x_2$   = 0.137					

The higher mean gain score of the experimental group indicates a better academic performance due to the community-based approach used in this study. This finding confirms earlier research by Astin and Sax [28] that students who had participated in community-based service program showed enhanced academic performance based on their grade point average (GPA). Moreover, exposure in community-based service program, whether the type of service is related to education, human needs, public safety, or environment, also enhanced students' skills in critical thinking and problem solving [28]. In addition to this research are the findings of Vogelgesang and Astin [29]. Their findings showed that a "generic" community service approach have positive effects on students' academic outcomes, which are based on GPA, critical thinking skills, and writing skills. The students who participated in community-based activities have higher academic achievement than the traditional group, therefore, community-based service learning appears to have a stronger effect on students' academic performance.

Table 2 shows the summary of the students' responses on the statements on attitudinal questionnaire pertaining to their attitudes towards environmental issues. The mean values shown in the table such as 4.227 and 4.567 for the traditional learning group and community-based learning group respectively, indicates that the two groups have *Very Positive* attitudes towards environmental issues. While the two groups have similar attitudes towards environmental issues after the intervention, the independent samples *t* test revealed that there is a significant difference in the attitudinal scores between the two groups.

The values  $t(64) = 6.322$ ;  $p < 0.001$  indicates a significant difference in the attitudinal scores of the traditional learning group and community-based learning group. The statements in Table 3 are the specific statements in which the two groups had varied responses, showing community-based learning group having higher values of response. This further indicates that the exposure of the students to community-based

TABLE 2: Summary of Students' Environmental Attitudes.

Group	x	s	t value	df	p-value
Control	4.227	0.224			
Experimental	4.567	0.212	6.322	64	<.001
n = 33   x1 - x2   = 0.339					

activities have positively affect the students' attitudes, resulting into a *Very Positive* attitude towards environmental issues.

These findings provide compelling evidence on the effects of community-based approach in students' environmental attitudes. In a similar study wherein community-based service approach was used, working in a specific site significantly increased students' commitment to participate in programs that aims to help clean up the environment [28]. Environmental accountability is one of the attitudes related to civic responsibility. Students who participated in community-based activities, whether course-related or not, tend to have enhanced sense of civic and social responsibilities, hence, they become more committed in helping others and serving their communities [28], [30].

The qualitative analysis performed in this study was based on the responses of the traditional learners and community-based learners on the open-ended questionnaire. Figure 1 shows the most frequently used words from the learners' coded responses. Based on the figure, the most prominent words are "pollution", "environment", "water", and "learned". These terms are related to the concepts discussed in class, such as water environment, water pollution and its causes, and water conservation. This cluster of terms reflects intellectual and academic development of the traditional learning group. This signifies that the group's cognition was centered on the main concepts that were discussed in class.

In comparison, Figure 2 shows the Word Cloud generated from the responses of community-based learning group. Top words include "environment", "learned", "community", "classroom", "activities", "help", "make", and "understand". These terms reflect social growth and development among students. Community-based activities helped the students build relationships with other members of the community and interact positively with others, hence, building social connections. "Help" and "make" are focused on actively engaging in societal issues, which allow the students to give significant contributions through their own visions of societal well-being. Students' engagement with academic-related service that contributes to recognized community needs



TABLE 3: Students' Attitudes Towards Environmental Issues.

STATEMENTS	TRADITIONAL LEARNING			COMMUNITY-BASED LEARNING		
	Scores	Descriptors	% Agree	Scores	Descriptors	% Agree
*Some species are unnecessary for the environment.	3.55	Positive	61	4.24	Very Positive	88
*The government should give permission for building, on touristic purpose, in national parks and forests.	3.82	Positive	64	4.45	Very Positive	94
*The media news about polluted seas, rivers and lakes are exaggerated.	3.55	Positive	58	4.36	Very Positive	97
*The extinction of insects such as flies is useful for the environment.	3.61	Positive	64	4.48	Very Positive	100
Excess nitrogen is a severe problem in an aquatic resource.	4.03	Positive	76	4.33	Very Positive	94
Excess phosphorus is a severe problem in an aquatic resource.	4.00	Positive	73	4.36	Very Positive	94
For a liveable environment, I can work voluntarily for a long time if needed.	4.00	Positive	76	4.42	Very Positive	91
<b>Weighted Mean</b>	<b>3.79</b>	<b>POSITIVE</b>		<b>4.37</b>	<b>Very Positive</b>	

Note: Asterisk (\*) means that the score was reversed.

provides students with opportunity to have a deeper understanding of the subject matter, a broader sense of the relevance of the discipline, and an enhanced sense of personal values and social responsibility [31]

In the affective domain, the students develop care for the environment, as they became more aware of the actual condition of their surroundings. The common response among the students includes “*sense of happiness and fulfilment*”. This influence complements with the very positive environmental attitudes of the students.

Community-based activities allow the students to perform concrete actions to address environmental issues present in their community. Furthermore, the community-based experiences provide them to have meaningful learning, not only through improving academic performance, but also through connecting the classroom with the realities of life in the community. This study affirms earlier research by Mitchell et al. [30], which says that community-based experiences provide students with more structured reflection and insights on their learning. Also, the learners’





Treating the community as a resource of learning can lead the students to develop realizations that can serve as part of their life-long learning. In community-based learning approach, students see the connection between school, community, and out-of-classroom activities, thus influencing their environmental knowledge and attitudes.

The role of the members of the community is an important aspect of community-based learning, since they can help the students recognize and develop deeper understanding of realities happening in their surroundings. Moreover, a strong connection between the school and the community is beneficial not only to the students, but also to the entire community. The exposure to activities that connect classroom and real world enables learners to apply what they know, which could help in solving local environmental problems.

Based on the aforementioned findings, it is suggested that schools should consider applying community-based learning in environmental science and in other programs where it can be appropriately applied, rather than having field trips that appear to be recreational activities in nature. This should be used as an opportunity to employ community-based learning within the immediate vicinity of the school, to address relevant issues that concern the community.

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