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Combining Classroom Instruction, Community Service and Volunteerism: A Service-Learning Strategy in Engineering Education

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Highlights

- Incorporating community service to chemical engineering course
- There is positive response from the community
- There are positive impacts on the appreciation of the course, organization and interpersonal skills of the students

Abstract

With the demands for well-rounded and service- oriented engineers, engineering education sees the need to revolutionize approaches to learning. Students are exposed to different learning strategies and approaches to enable them to have a more holistic engineering education experience. One of these strategies is through service-learning which integrates community participation in the learning process of the students. With service learning, the student is trained to build rapport with stakeholders, develop their communication skills, appreciate their field, and convey their technical knowledge and expertise to the people in the community.

ChE 190 is a course on Plant Inspection and Seminar, a course offered for Chemical Engineering students in their fifth year. Following a new teaching approach, the instructors changed the usual practice of holding seminars in the classroom, seminars are organized with the aim to bring relevant information to the community. The students were asked to design seminars with the people in the community as their target audience. Topics are chosen and resource persons with the needed expertise are invited to address some community issues/problems by applying chemical engineering principles and concepts. The students organizing these seminars are also given the opportunity to apply and exercise their leadership and communication skills with the help of barangay officials and leaders.

The program exhibited a positive impact on the people in the community as shown in their responses to evaluation forms. The activity had a positive impact with respect to knowledge enhancement and character development of the students. The students demonstrated commendable organization and interpersonal skills that contributed to the success of these activities. Incorporating these activities in the Engineering courses would help the students prepare for their engineering and non-engineering roles in the future.

Key Words: Service-learning;chemical engineering; community service

1. Introduction

In 2001, the National Academy of Engineering (NAE) launched the Engineer of 2020 Project. This project is described as efforts to produce engineers adept in recent trends and technological advances. It aims to predict the role the engineers should play and how to achieve this thru engineering education. One of the requirements for the Education of the Engineer of 2020 is to shape engineering curriculum for 2020 so as to be responsive to the various learning styles attractive to different populations and provide full and well-rounded education (National Academy of Sciences, 2004).

Great efforts are made to achieve the aspirations indicated in this project. One of these is integrating service learning in the curriculum. Service-learning combines student learnings with community service with the spirit of volunteerism integrated in the course (Jacoby, 2015). Service-learning projects had positive impact on the student's public speaking efficiency and performance (McNatt, 2019), satisfaction in solving real problem, and a sense of deeper learning (Matzembacher et al., 2019). It can help develop teamwork, cultural responsivess, ethical practice and professiona skills of students (Crawford et al., 2017). Service learning approach contributes to the holistic learning of an engineering student. With this, the student is trained to build rapport with stakeholders, develop their communication skills and convey their technical knowledge and expertise to the people in the community.

The BS ChE curriculum of the School of Technology in the University of the Philippines Visayas has been designed to adapt to the demands of the current settings in the industries and technological advances. With this, it is revolutionizing its approach to align with outcomes-based education as mandated in the current Philippine education system.

ChE 190: Plant Inspection and Seminar is a course offered for Chemical Engineering students in their fifth year. The activities for this class include visit to factories and chemical plants, attendance to lectures and seminar, and organization of seminar. As a course requirement, the students are expected to be able to organize a seminar. The usual practice is that these seminars were conducted in school, and the target audience are the fellow chemical engineering students. For Academic Year 2018-2019, the instructors thought of changing the approach and to integrate community service in the course. The requirement is to bring this seminars into the community of their choice with topics based on the issues encountered in the Barangay. The students, together with the community leaders, identified the issues of the community and choose relevant topics that would be helpful to the community. At the end of the activity, this will help the community through knowledge transfer. Moreover, the students should be able to appreciate their role in the community as future chemical engineers. It also aims to help develop their organization and interpersonal skills.

2. Methods

ChE 190 class is composed of 15 students. The students were asked to form a group with 5 members. Each group were then asked to do the following activities.

2.1 Identification of target community.

The students were asked to choose a target barangay within the Municipality of Miag-ao. The considerations pointed out by the instructor are the accessibility of the community and the safety of the students and the participants since there are insurgencies reported in some barangays in Miag-ao.

2.2 Identification of issues and concerns in the Barangay.

Upon the approval of their seminar location, the students were asked to meet with the Brgy. Captain and Brgy. Officials. They were taught the proper interview decorum before they were deployed for interview. Through this interview, the students identified top five issues in these communities.

2.3 Choosing of topic for the seminar.

Each group were asked to present these issues to class. The instructor then reviewed the topics and chose the most relevant to the Chemical Engineering discipline. These topics were familiar to the students as they had taken subjects in Pollution Control and Environmental Management. From the chosen topic for each group, a program title was created. The program title is "Ikaw at Eco: Seminars on Environmental Management". Here are the specific topics for each seminar.

Seminar 1 (S1): Bubon Kahapon, Ilimnon Karon: A Seminar on Makeshift Purification and Filtration System of Potable Water from Groundwater Sources

Seminar 2 (S2): Trash Talk: A Solid Waste Management Seminar on the Proper Strategies and the Role of the Community living near the Miag-ao Sanitary Landfill

Seminar 3 (S3): Power Talk: A Seminar on Energy Conservation and Energy Status of Today

2.4 Preparation for the seminar.

Check list for seminar preparation were sent out and the students gave weekly updates as to the completion of the task in the list. This must be completed prior to the start of the seminar. The resource person/s for each seminar were identified and communications were forwarded to them. The speakers chosen by each group were experts in their respective fields.

2.5 Conduct of the seminar.

After all the preliminaries, the seminar proper was conducted. Aside from the speakers, the students also shared the techniques they have learned as chemical engineers to discuss some points relevant to the topics presented. For instance, in S1, the students taught the people how to construct a filtration system using materials that are readily available for them. In S3, the students discussed energy savings tips and demonstrated how to make an oil lamp using oil and salt.

2.6 Evaluation from the participants.

The participants were then asked to rate the seminar. The evaluation is divided into sections: rating for the resource person, for the training organization and the overall impact of the training. The translated evaluation form is shown in Figure 1a.

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ChE 190: Plant Inspection and Seminar
IKAW AT ECO: SEMINARS ON ENVIRONMENTAL MANAGEMENT

EVALUATION FORM

Title of Seminar: _____

Date and Time: _____ Venue: _____

Speaker/s: _____

Name of Evaluator: _____

	Excellent	Very Good	Good	Poor
A. The Trainer/ Resource Person				
1. Knowledgeable about the subject matter				
2. Able to explain the topics clearly and in an organized manner				
3. Maintained the participants' interest and attention				
B. The Seminar/Training Session				
1. Started and ended on time				
2. Systematic and Organize				
3. Taught me useful knowledge and skills				
C. What is your overall rating?				
D. If you are to suggest the next topic for seminar, what would it be?				
Remarks				

Thank you for participating in the seminar.

a

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IKAW at ECO: SEMINAR ON ENVIRONMENTAL MANAGEMENT
ChE 190
Post-Activity
EVALUATION FORM

Name: _____ Date: _____

To what extent had these activities and seminars contributed to your knowledge, skills, and personal development in the following areas?

	Very low	Low	Neither	High	Very High
	1	2	3	4	5
a. Acquiring a broad general education					
b. Acquiring chemical engineering education					
c. Applying chemical engineering concepts to the activities					
d. Acquiring job or work-related knowledge and skills					
e. Writing clearly and effectively					
f. Speaking clearly and effectively					
g. Thinking critically and analytically					
h. Analyzing quantitative environmental problems					
i. Working effectively with the others					
j. Learning effectively on your own					
k. Understanding yourself					
l. Understanding people of your community					
m. Contributing to the community					
n. Developing personal values					

How would you evaluate the entire educational experience through this activity?
□ Excellent □Good □Fair □Poor

How would you evaluate the overall impact of this activity to you?
□ Excellent □Good □Fair □Poor

How do you see this activity as compared to the classroom set-up?

_____
_____
_____

b

Figure 1. a.) Evaluation form for the participants. b.) Post-activity evaluation form for the students.

2.7 Evaluation from the students.

The students were asked to evaluate the impact of the activity to their engineering education and their character development. The evaluation form is shown in Figure 1b.

3. Results and Discussion

The impact of the study was measured based on the results of the evaluation of the participants and the students.

A total of 93 participants from these seminars were asked to evaluate the conduct of the seminar. The result of the evaluation of the overall impact of the seminar were summarized in Table 1.

Table 1. Result of evaluation from seminar participants.

Date	Seminar No.	No. of Attendees	Result of Evaluation	
			Percentage*	Summary of Comments
April 3, 2019	S1	35	100%	(1) Big help in explaining about water (2) It gives us good understanding of good water quality (3) We learned a lot (4) Thankful for choosing our barangay (5) Very useful in our lives
April 3, 2019	S2	24	87.6%	(1) Good because it taught how to make use of waste
April 10, 2019	S3	34	100%	(1) Good because we learned a lot (2) I love the seminar (3) Very interesting because the people here have little understanding about the topic

*Percentage of attendees with Very Good to Excellent Overall Seminar Rating

Table 1 shows the result of evaluation given by the participants. The overall impact of the seminar were reviewed and those that have ticked or rated the seminar from Very Good to Excellent were counted and were reflected in the table. Also included in the table is the summary of the comments made by the participants.

All fifteen (15) students of the class were asked to evaluate the activity with respect to knowledge enhancement and character development.

Identification of specific impact to each student had been evaluated through an open-ended question on the questionnaire, *"How do you see the activity as compared to classroom set-up?"*.

The following are the findings that were captured in this activity:

3.1 Understanding, awareness and willingness to aid the needs of the people in the community.

Figure 2 shows that a common perception among the student who participated in this activity was the better understanding of the situation of the community. Most of them had seen an outlet by imparting the learnings they gained from the classroom lectures and other technical skills to the community.

"This activity helps us see and experience what's there to be helped or improved. The activity is also like a classroom setup but is focused on the betterment of the community."

"This activity made me realize that most people is still not aware of our environmental problems and most of them thinks that these kind of problems is not a big one and nothing to worry about. Creating a seminar like this would help in spreading the knowledge we acquire in our classroom".

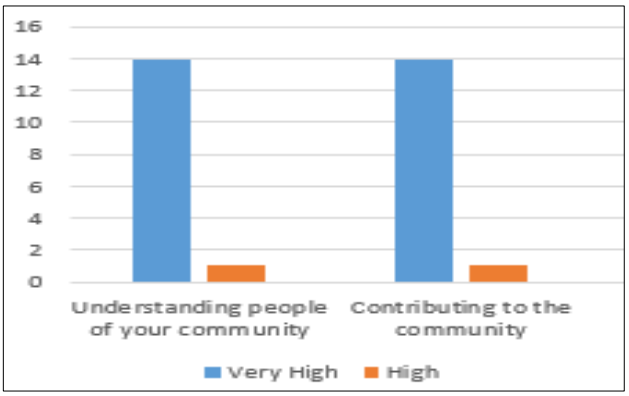

Figure 2. Community appreciation rating of the activity.

3.2 Knowledge enhancement impact of the activity.

As shown in Figure 3, through this activity, the students were able to appreciate their chemical engineering education and its relevance to community issues. They have gained additional knowledge through this exposure to the community.

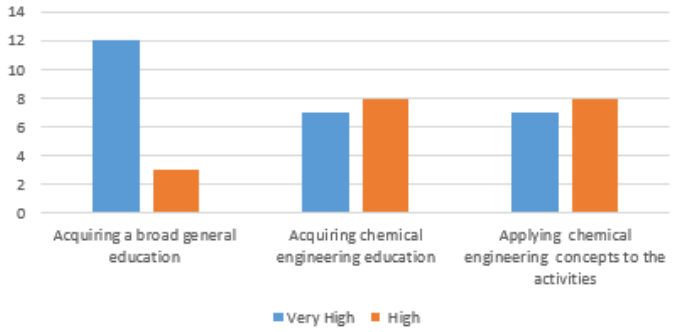

Figure 3. Knowledge enhancement rating of the activity.

3.3 Positive impact of the activity to the student.

Students also demonstrated positive sensitivity towards the goal of the activity. It was revealed that it made them more passionate and saw their capacity to do greater for the common good of the community. By having an opportunity to practice and exhibit their skills and their abilities, positive impact to the students can be achieved.

"Just being able to contribute to a community and impart the knowledge that we have learned in school is so worthwhile and inspiring not only for the people in the community but also for us, students….."

".....Personally, I would like to recommend having such activity in order to make an impact to the students, inspire them to help the community and the environment, and make them realize that learning isn't just for a test, but it is for something greater"

3.4 Impact on character development of the students.

Students also demonstrated that the activity was helpful to build their leadership skills and soft skills in engaging with their groupmates and other people.

" helping us build and learn something we cannot acquire just in sitting and listening to our teachers"

"*helpful in building leadership skills "*

Figure 4 shows that majority of the students rated the impact of the activity to their character development from high to very high. With the result, it is evident that this activity has a positive impact on the critical thinking, intrapersonal, and interpersonal skills of the students.

Figure 4. Self-development impact of the program.

Furthermore, Figure 5 showed that these activities have significant impacts on the students. All of the fifteen students rated the activity with good to excellent in terms of the education experience they gained and its overall impact to them.

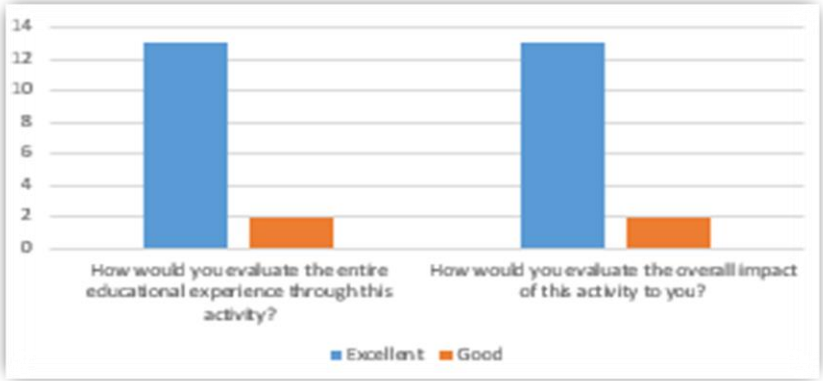

Figure 5. Overall impact of the activity to the students.

With their learning environment changed, they have adopted well as evident by the success of the seminars they have conducted. The showed confidence and good interpersonal skills in dealing and communicating with Brgy. Captains and Officials, the resource speakers and the people in the community. They exhibited good organization skills as well independence which are tools they will be bringing with them when they enter the work environment.

4. Conclusions

The program exhibited a positive impact on the people in the community as evident on their responses to the evaluation forms. The activity had a positive impact with respect to knowledge enhancement and character development of the students. The students showed commendable organization and interpersonal skills that contributed to the success of these activities. Incorporating these activities in the Engineering courses would help the students for their engineering and non-engineering roles in the future.

For further studies, it is recommended to extend student's exposure to this activities. The seminar and training may be extended so as to have a better output to be given to the community. Different topics should also be explored. Also, the activity should be done on a regular basis to measure its long-term to the community and the students. Moreover, more quantitative measures of the objectives should be set to have a better picture of its impact to the community and to the students.

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