



Service Learning as a Pedagogy in Achieving Sustainable Development Goal (SDG) 13: Climate Action

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Abstract: Climate change impacts affected many populations globally, particularly the vulnerable sectors (e.g., youth, elderly, urban poor, and farmers). This is mainly because of harmful human activities and some natural events which continue together with the COVID-19 pandemic. In this regard, service learning (SL) was seen as one of the many academic service tools that could aid in climate action now and even in post-pandemic. This study looks into the case of several SL classes and projects and how it contributes to the achievement of Sustainable Development Goal (SDG) number 13, Climate Action. SL is a pedagogy that integrates service activities in the lessons of particular courses and disciplines. This study used the Triangulation method through focus group discussion, activity evaluation tools, and desktop review. Results stated that the classes on Occupational Safety and Health, and Medical Parasitology have raised awareness to all its stakeholders on Disaster Risk Reduction and Management (DRRM) and Public Health, respectively. In addition, this study recommends several strategies that could further enhance the involvement of SL classes towards the achievement of SDG 13.

Keywords: Service learning; Climate change; Climate action; Sustainable development goals

Introduction

Achieving the Sustainable Development Goals (SDG) is one key factor for a successful Community Engagement initiative. SDGs cover a broad range of socio-economic development issues, including poverty, hunger, health, education, climate change, gender equality, water and sanitation, energy, social justice, environment, and urbanization. It has been described as one of the most significant global efforts made to advance well-being while recognizing the planet's ecological limits (Ramos *et al.*, 2018). In July 2014, the United Nations (UN) General Assembly Open Working Group (OWG) proposed a document containing 17 goals to be put forward for the General Assembly's approval in September 2015. This document set the ground for the new SDGs and the global

development agenda spanning from 2015-2030 (2018). These are the 17 SDGs:

Sustainable Development Goals	
Goal 1.	End poverty in all its forms everywhere
Goal 2.	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3.	Ensure healthy lives and promote well-being for all at all ages
Goal 4.	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5.	Achieve gender equality and empower all women and girls
Goal 6.	Ensure availability and sustainable management of water and sanitation for all
Goal 7.	Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8.	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10.	Reduce inequality within and among countries
Goal 11.	Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12.	Ensure sustainable consumption and production patterns
Goal 13.	Take urgent action to combat climate change and its impacts
Goal 14.	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15.	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16.	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17.	Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

Figure 1: 17 Sustainable Development Goals (*Transforming our world: The 2030 agenda for sustainable development* 2015)

An important key to the SDG agenda is partnership and linkages, ensuring that public and private organizations work together for the common good. One partner that is often rarely discussed in SDGs is that of the academic institutions (Neary & Osborne, 2018). Academic institutions are uniquely placed to lead the cross-sectoral implementation of the SDGs, providing an invaluable source of expertise in research and education on all aspects of the SDGs, in addition to being widely considered as neutral and influential players (El-Jardali *et al.*, 2018). Moreover, it plays a role in bridging available human, organizational, and material resources with community needs.

Specifically, education has an important role in addressing the causes and effects of climate change and is vital in the achievement of targets under SDG 13 (take urgent action to combat climate change and its impacts). The impacts of climate change and extreme events depend largely on how we give attention to the education system (UNEP, 2012; UNESCO, 2013/2014), the World Bank (2010) notes that “incorporating climate change education in school curricula is a first step. Developing a new cadre of professionals to tackle the complex problems posed by climate change is equally important. Finally, an educated citizenry is essential to facilitate change”. Moreover, education is a key in raising awareness and promoting behavioral change for climate change mitigation and adaptation. It helps reduce the vulnerability and increase the capacity of communities by enabling individuals to make informed decisions (Reid, 2019). Climate change is considered as a natural event, but it is drastically showing negative effects due to harmful human activities that resulted in accelerated changes in atmospheric conditions. It is threatening to every organism on Earth, especially to us, humans (Short *et al.*, 2017). Which is why it is important for us to be educated about the ABCs of climate change and on how we can be part of climate action.

De La Salle University (DLSU), one of the leading universities in the Philippines, is a case in point. Its community engagement programs are anchored on the priorities of the UN on international development. DLSU, through its Center for Social Concern and Action (COSCA), focuses its partnership with neighboring communities in the areas of education, environment, health, and social entrepreneurship which are in line with specific SDGs (Roldan, 2018). This means that in the programs under COSCA it is a standard that the projects and activities should respond to a particular SDG.

One of the programs in COSCA is the Service-Learning Program. Service-Learning is indeed a great pedagogy in every educational institution. It is a way by which students can practice what they have learned and at the same time hone the values that are essentials in living life meaningfully. It enhances the learning of the students seeing how relevant their courses and skills are in certain activities (Cordero *et al.*, 2021.) Therefore, in this program a certain service is attached to a course and the service should be a

solution to a certain SDG condition of the Partner Organization. Two courses sought a potential to directly respond to SDG 13, specifically on strengthening resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. The 2 Courses are Medical Parasitology (MDPARAS) of the College of Science and Occupational Safety and Health Course (OCCHSAF) of the College of Engineering.

This study focused on showing the specific contributions of service-learning courses for the achievement of the SDG 13 and aimed to recommend strategies that could further enhance the involvement of SL classes towards the achievement of SDGs. The SL classes mentioned in this study are expected to contribute to the following SDG 13 targets:

- Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters.
- Integrate climate change measures into policies, strategies, and planning.
- Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning.

Methodology

The researchers used methodological triangulation in the conduct of the study. Methodological triangulation is an attempt to improve validity by combining various techniques in one study. Triangulation provides researchers with several important opportunities. Most importantly, it allows researchers to be more confident of their results. This is the overall strength of the multimethod design. Triangulation can play many other constructive roles as well. It can stimulate the creation of inventive methods, new ways of capturing a problem to balance with conventional data-collection methods (Jick, 1979).

There are two types of methodological triangulation: 'across method' and 'within method'. Across-method studies combine quantitative and qualitative data collection techniques, which is also used in this study. Qualitative methods are explanatory and textual, and include passive observation, participant observation and open-ended interviews or analysis of patient diaries. Quantitative methods include statistical analysis of outcomes or questionnaires, collected by

standardized scales or measures and expressed numerically (Bekhet & Zausznewski, 2012).

The specific methods/activities used in this study are the following:

1. Online Focus Group Discussion

The researchers gather a qualitative date of the study by inviting ten students. Three students have undertaken the medical parasitology course (MDPARAS) and seven students have taken the Occupational Safety and Health Course (OCCHSAF). One potential drawback in focus group discussion is the lack of guarantee that all those recruited will attend the discussion. To overcome this, it is recommended that researchers may over-recruit by 10–25%. Ten participants are therefore considered large enough to gain a variety of perspectives and small enough not to become disorderly or fragmented (O.Nyumba et al., 2018).

The Focal Group Discussion extorts the data of the level of awareness on SDG13 and confirms the results of the analysis method. The Focal Group Discussion is done via Zoom app. This Focal group is also known as Online Focal Group (OFG) From the class experiences with Zoom, necessitated by COVID-19, participants learned that ensuring comfort and active participation through different online learning tools are key. From the moderator perspective, preparation, rapport building, and utilizing Zoom's features made the OFGs successful (Falter et al. 2022). The researchers analyzed the results of the OFG using semantical content analysis, specifically the attribution analysis. Attribution analysis, examines the frequency with which certain characterizations or descriptors are used. This can be a simple counting exercise, but the emphasis is on adjectives, adverbs, descriptive phrases, and qualifiers rather than the targets of these parts of speech (Stewart & Shamdasani, 2015 p. 119).

2. Analysis in Student Reflections

The Students of OCCHSAF and MDPRAS also submitted reflection papers. Reflection papers are requirements for the Service Learning activities. The definition of service learning also highlights the importance of reflection. Reflection is the "intentional consideration of an experience in light of particular learning objectives. The presumption is that community service does not necessarily, in and of itself, produce learning. Reflection activities

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provide the bridge between the community service activities and the educational content of the course. Reflection activities direct the student's attention to new interpretations of events and provide a means through which the community service can be studied and interpreted, much as a text is read and studied for deeper understanding (Hatcher & Bringle, 1997). Frequency analysis was used to analyze the reflection papers of 168 students. 81 students of MDPARAS and 87 students of OCCHSAF. Frequency Analysis is a part of descriptive statistics. In statistics, frequency is the number of times an event occurs. Frequency Analysis is an important area of statistics that deals with the number of occurrences and analyzes measures of central tendency, dispersion, percentiles, etc (Research Optimus, 2013).

3. Desktop Review

Literature reviews play an important role as a foundation for all types of research. They can serve as a basis for knowledge development, create guidelines for policy and practice, provide evidence of an effect, and, if well conducted, have the capacity to engender new ideas and directions for a particular field (Snyder, 2019). The researchers relate the desktop literature to the results of the frequency analysis.

Results and Discussion

A. Measure of awareness and knowledge on climate change and action

The students were asked to rate their awareness and knowledge on climate change and action through the use of the following Likert Scale:

- 1 - not aware
- 2 - slightly aware
- 3 - somewhat aware
- 4 - moderately aware
- 5 - extremely aware

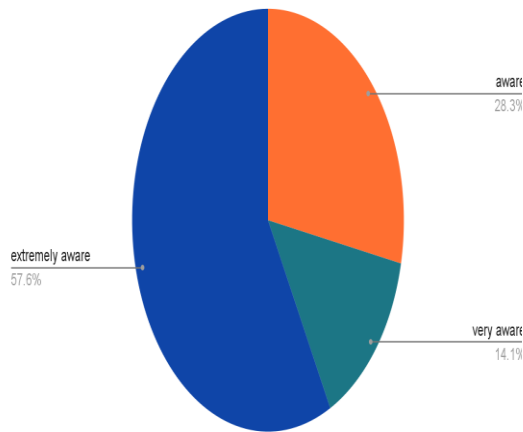
Results showed that 100% of the students are aware about climate change and action with most of them (57.6%) extremely aware (see Figure 2) . The result is a good foundation of advocating climate action in the academic sector, especially in the student population. When asked about their knowledge and basis of their awareness, some of them provided technical information, some related

it to sustainability, and some recognized that we are part of the problem and the solution. Presented below are excerpts of their responses:

“Climate change is one of the results of uncontrolled utilization of resources without regards to sustainability practices.”

“That it's still a problem we're facing right now and should immediately be addressed before even more of the repercussions catch up to us”

“Climate change results in the rise in temperature, which in turn may influence the prevalence of natural disasters that includes drought, wildfires, storms, and floods. As a result, immediate action must be taken in order to ensure that the aforementioned effects of climate change would not impose a much more greater danger in comparison to what is already taking place.”



OCCHSAF: 87
MDPARAS: 81
Total: 168 students

Figure 2. Student’s Awareness and Knowledge of SDG 13

B. The SL Projects as a response to the Course Objectives and SDG 13

MDPARAS (Medical Parasitology and Immunology)

This is a 3-unit lecture course that provides students an understanding of the general biology, life cycles, modes of transmission, and pathogenesis of important human and animal parasites ranging from protozoan to helminths. Emphasis is given to parasitic Neglected Tropical Diseases (pNTDs) endemic in the Philippines and considered to be of public health importance. This course has a service-learning component where students experience “real world” and applied opportunities integrating classroom learning with meaningful and effective service in a poor/ marginalized community.

It is important to examine the relationship of climate change and parasitology to prevent adverse impact on human health and the natural ecosystem. Several studies proved that climate change has effects on parasitism and diseases, and this may translate through food webs which can directly or indirectly affect human health and socio-economic status (Marcogliese, 2008). Climate change, infectious diseases, and poor healthcare systems are major challenges in developing countries like the Philippines. And it is expected that along with the increasing temperature is the

development of arthropod vectors that are carriers of parasitic organisms and parasites. Moreover, there is also an increase in the range of reservoir hosts, vector abundance, biting rates, and parasitic transmission rates if the climate is warmer (Short *et al.*, 2017).

The projects done in the MDPARAS course was to provide learning materials about parasites for different partner institutions and organizations that handle different types of communities. There are 4 types of community partners: fishing community, farming community. Home for the elderly and elementary school. The materials focused on caring for the environment to prevent contracting the parasites and the remedies if ever one is infested with parasites



Figure 3: Samples of the learning materials produced for Medical Parasitology

OCCHSAF (Occupational Safety and Health)

This course aims to foster an understanding on the moral responsibility of industrial engineer to safety and health. Systems analysis and design techniques will be applied in the context of improving a company's/ institution's safety practices.

The working population is one of the sectors which are directly exposed to the impacts of climate change, hence, there is a need to understand climate change vis-a-vis the improvement of the working conditions and environment. Agricultural workers, construction workers, emergency responders, fishermen, paramedics, transportation workers are some population which are heavily affected by climate change (particularly exposure to increasing heat, air pollution, extreme weather events, and rise in sea level) OCCHSAF together with Service Learning is an important pedagogy tool to identify the effective plans to mitigate, respond, and adapt to the impacts of climate change in terms of occupational health and safety (e.g., risk assessment, disaster preparedness, and emergency response) (Kiefer *et al.*, 2017).

The projects for the OCCHSAF are Safety Audit Assessment of the facilities of 5 schools. 2 from Manila City and 3 from Laguna province. The Students presented their projects to the administrators of the partner institutions. The Content of the Audit Assessment is the 1) school profile, 2) current safety practices, 3) hazard identification, 4) risk assessments, 5) information dissemination measures, 6) replacement and repairs of hazards, 7) cost-benefit analysis, and 8) alternative solutions to prevent accident and health risks in the school facilities.

Hazard Identification

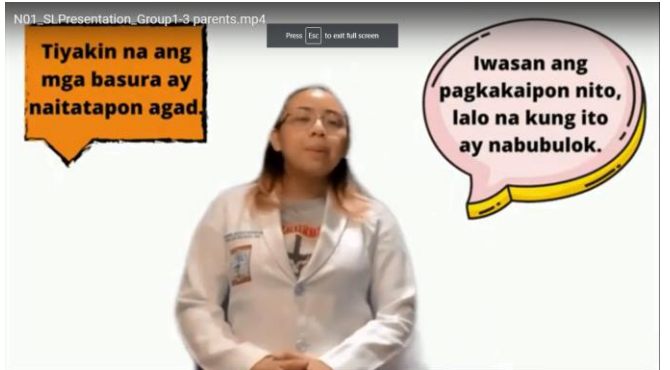
- Identify any problems that deviate from safety standards
- Determine any problems that are in violation of safety, health, and ethical standards

Five Main Parts:

1. Incorrect electrical outlets and wiring,
2. Inadequate emergency and fire safety preparedness
3. Lack of accessibility for first aid kit,
4. Improper design for school zone area
5. Inadequate building condition.

Costs Associated with Hazards

COST ANALYSIS					
Problem	Hazard	Solution	Item	Unit Cost	Total Cost
Tripping and falling on the floor	Uneven flooring	Reinstall tiling to be even	Glazed Tile Installation Service	Php 853.00/Sqm	Php 12,795
	Broken stairs	Fix broken staircase tiles	Glazed Tile Installation Service Parts	Php 853.00/Sqm Php 300	Php 8,530
Electrocution upon contact or short circuits	Exposed live wire	Install junction box or cover using electric tape	Electrician Service Fee	64.21/Hr	Php 364.21
	Electrical panel switches are not labeled	Add proper labels to electrical panel switches			
Getting burnt or trapped indoors due to a fire breakout	Expired fire extinguishers	Add new fire extinguishers	10lb Fire Extinguisher	Php 1250/container	Php 25,000.00
	Lack of fire extinguisher in room with cooking appliances	Add a fire extinguisher to room with cooking	Sprinkler System	Php 100/Sqm	Php 1,000,000.00
	Lack of sprinklers	Install sprinklers in every room	Installation Fee	64.21/Hr	Php 513.68



COST-BENEFIT ANALYSIS			
COSTS			
Particulars	Quantity	Unit Cost	Total Cost
Metal bars	32.5 meters	Php 200	Php 6,500.00
Welding rod	20 pieces	Php 4.3	Php 86.00
Outdoor grit tapes	15 meters	Php 36.8	Php 552.00
Labor	1 technician	Php 561.04	Php 1,122.08
Total			Php 8,260.08
BENEFIT			
Everyone's safety			
*Improvements will not generate profit or directly contribute to the service provided that allows the inflow of cash			

*estimated and retrieved from different online sources (access to check or compare prices in actual stores is limited due to the pandemic)

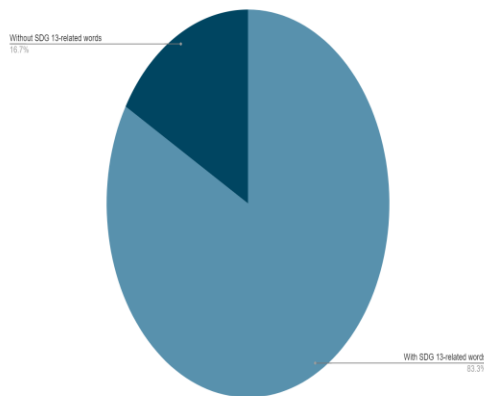
*location of the products/ services to be purchased, which may affect shipping and transportation expenses, and other overhead costs, such as electricity, were excluded

*It was assumed that the laborers own the necessary equipment in installing the materials thus, renting was also excluded

Figure 4: Samples of the learning materials produced for Occupational Safety and Health

C. SDG 13 in the Student Responses

Majority of the students have included climate change/action-related words in their reflection papers (83.3%) (see Figure 5). Some of the SDG 13-related words are exposure, risk, sustainability, disaster preparedness, hygiene, disease, infections, and environment. The high results only proves that the students have a sense of knowledge about climate change and/or climate action.



OCCHSAF: 87
MDPARAS: 81
Total: 168 students

Figure 5. SDG 13 in student reflection papers

In support of the climate change/action-related words that the students put in their reflection papers, they were also asked through a

survey about the relation of their course to SDG 13. The responses of the students are in parallel with the relationship between climate change and parasitology / occupational health and safety which are presented in several literature. Shown below are some verbatim responses of the students:

“I believe that OSH is related through providing safe and responsible methods for taking action. This is in relation to SDG 13 due to the objectives to lessen climate change impacts. OSH can be able to contribute to the climate.”

Proper disposal of chemicals reduce environmental effects. Knowledge on plant safety mitigate accidents and consequently environmental emissions. With every company's responsibility to ensure the health and safety of its people, and with every employee's responsibility to observe good workplace behavior - both employer and employee could hand-in-hand do something to alleviate climate change. Companies could promote workplace culture that benefit the planet, and the employees could do their part and comply. With all, or the majority, of companies working towards a greener future, there could be a possibility of overcoming climate change.”

“It allows for proper operation of systems that minimizes wastes and hazards in the environment. Proposed intervention should align with environmental standards. Without the knowledge of OSH learned in OCCHSAF, not only people, also the environment is endangered.”

Furthermore, the students were asked how Service-Learning pedagogy contributes to climate action through their respective courses. Their responses showed that indeed they had a deeper understanding of climate change as well as their

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personal actions that may contribute to its negative impacts after undergoing Service Learning. This is also supported by more exposure and experience provided through the learning process and activities. By becoming aware of their environment and personal actions, they are now more critical in thinking of solutions for climate change. Presented below are some of the students' responses:

“Through service-learning, people would be more aware of the impact of their actions, prompting and inspiring others towards doing more acts of service. We become more aware of our surroundings and in the communities therefore we develop the consciousness to do what is right

“SL can contribute to climate action by making students informed about the impact of products and processes to the environment.
Brings awareness, makes us learn through experience.”

The results show that Service-Learning is a pedagogy that enhances awareness of the relevance of engineering and science courses to the society. Service-learning is a type of experiential education where the students learn through "real-world" experiences that meet a community's needs⁴. In the engineering curriculum, other forms of experiential learning include projects, clinics, internships, laboratory classes, field trips. Moreover, service-learning promotes student understanding of the impact of engineering solutions in a global/societal context (Piechota & Nambisan).

Conclusion and Recommendations

MDPARAS and OCCHSAF courses tagged along with Service Learning are seen as effective pedagogy tools that contribute to the achievement of SDG 13. Through MDPARAS, the relationship of climate change impacts to parasitology can be learned. While in OCCHSAF, the students can have a better understanding of the importance of risk assessment, disaster preparedness, and emergency response in the workplace, especially for those who have a working population who are vulnerable to the impacts of climate change.

Results showed that 100% of the students are aware about climate change and action, with 57.6% who are extremely aware. It is evident that the implementation of Service-Learning (SL) (education) in courses like OCCHSAF and MDPARAS increases the impact of student learning and understanding of SDG 13. This also enables students to accomplish comprehensive projects for the partner communities. Frequencies (83.3%) show that reflections of the students are grounded on environment and community engagement related initiatives.

The researchers recommendation is to incorporate climate education in other courses to be able to broaden the knowledge and perception of the students about climate change. Education is a vital tool for the successful involvement of the students in climate action. Moreover, this study can be improved through the conduct of the same study in other courses that advocate SDG 13 enhanced by the use of Service Learning. Choosing specific partner communities that have SDG 13 issues and organizations that advocate climate action is also important in the practice of SL in the courses.

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(RE)IMAGINING THE ARTS IN THE POST-PANDEMIC RECOVERY

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