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Service learning on disaster readiness and risk reduction information: perspectives from students and community members

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ABSTRACT

The study explored the conduct of a service learning (SL) activity by senior high school students (N=110) in disseminating information about Disaster Readiness and Risk Reduction (DRRR) to community participants (N=139). Senior high school students from a public sector senior high school in the Philippines conducted a community service learning activity. Before conducting the service learning activity, students determined the familiar disasters that the community participants commonly experienced and then developed the DRRR brochure. Students compiled their DRRR learning into a brochure and used it to discuss disaster mitigation with the community. Researchers used standardised tests and survey forms to determine the participants' pre and post-knowledge, skills and attitudes toward disasters. Quantitative results showed that both the student and community participants perceived that the service learning activity had allowed them to gain more knowledge on disaster mitigation with an overall Disaster Related Knowledge Questionnaire (DRKQ) of $p < 0.05$. Likewise, Civic Action and Skills Questionnaire (CASQ) revealed that the activity helped the students to improve their communication and social skills and the community participants' leadership skills at $p < 0.05$. The qualitative data showed that both the students and the community participants better understood the DRRR concepts and perceived that the service learning activity had benefited and taught them disaster mitigation.

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Introduction

The Philippines is a small country in Southeast Asia that is located along the equator. Based on recent data from National Mapping and Resource Information Authority (NAMRIA), it is an archipelago comprising 7 614 islands with an approximate land area of approximately 300 000 square kilometres (Barile, 2017). Because of its location at the equator, it is visited by almost twenty typhoons a year, with about 8-9 crossing the country (PAGASA 2021). Aside from these typhoons, the country is also frequently affected by Southwest Monsoons, which bring much rain, strong winds, and thunderstorms to different parts of the archipelago. As a result, the country and its people suffer yearly because of the adverse effects associated with these weather conditions. Farmers, fishermen,

office workers, people in business, students, and everyone is affected, especially those living in low-lying, coastal, flood plain and areas prone to landslides.

The country is moreover part of the Pacific Ring of Fire, which makes it prone to seismic activity and volcanic eruptions. There are a total of 24 active volcanoes in the country that have erupted within the last 600 years (Delos Reyes et al., 2018). The West Valley Fault, a 100-km fault line traversing the country's densest area, moves roughly every 400 years. Its last movement occurred in 1658, which is 364 years ago. This scenario means that the next movement might happen anytime soon, resulting in the death of an estimated 34 000 people and the collapse of 170 000 residential houses (Inocando, 2019). According to the Science Research Specialists of the Department of Science and Technology - Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS), everyone needs to be prepared for disaster mitigation.

Under DepEd Order No. 37 s. 2015, Disaster Readiness and Risk Reduction is taught as a course to senior high school students for one semester. According to the DRRR Teaching Guide (DEPED, 2016), the course focuses on applying scientific knowledge and solving practical problems in the context of a physical environment affected by a disaster. It is a course designed to bridge the gap between theoretical science and daily living and is an essential part of the sustainable development of one's economy and society. One of the goals of the 2030 Agenda for Sustainable Development, Goal 11, is to "Make cities and human settlements inclusive, resilient and sustainable." One way to achieve this is to mobilise global and regional campaigns seeking to mitigate disasters, strengthen public awareness and education, and promote a culture of responsible citizenship and disaster resilience (Hardoy et al., 2019).

Studies show that being unaware and not understanding the effects of hazards affect people's ability to adapt, respond and recover in times of disaster (Hoffmann & Blecha, 2020; UNICEF, 2011; Wisner, 2006). The UN Office of Disaster Risk Reduction, 2015, mentioned that one of the 2030 Agenda for Sustainable Development (SDG) targets is to promote education for sustainable development, building and upgrading education facilities and ensuring healthy lives, among other and acquiring knowledge and understanding its application in real life serves as the only effective way to prevent disasters or reducing their effects. This can be done by planning and designing comprehensive educational programmes for people to face disasters (Torani et al., 2019). Trained people can better protect themselves during disasters than others. Additionally, encouraging young people to ponder the importance of disaster preparedness and preventative measures can bridge the gap between knowledge and application (Bosschaart et al., 2016; Faber et al., 2014). Individuals familiar with the concepts of hazards and disasters at an early age can respond better and faster when disasters and accidents occur (Torani et al., 2019). Similarly, disaster education for women can increase education, awareness, and readiness among all family members, especially children (Hoffmann & Muttarak, 2017; O'Brien et al., 2006).

According to research, service learning is a form of experiential education that aims to address the needs of the community (Karla et al., 2017) with the help of the students together with a structured curriculum designed to bridge the gap between academic content and real-life situations (Kasinath & Chairman, 2013; Rusu, Copaci, & Soos, 2015). Service learning differs from other forms of experiential learning by its intention to benefit the community and the student participants (Sigmon & Pelletier, 1996). As a result, service-learning programmes usually have a positive influence on the participating community (Harrington, 2014; Lin et al., 2014; McMenamin, McGrath, & D'Eath, 2010; Mpofu, 2007; Salam, Iskandar, & Ibrahim, 2017) and in the university.

In the service-learning activity conducted by the students in the community, disaster readiness and awareness were shared and taught to the community participants. Students used their brochures to share knowledge and information about the effects of disasters (Appendix A) These brochures were developed by the students as their performance tasks and were checked by the DRRR teacher. Each member took part in explaining various disasters like earthquakes, floods, thunderstorms, and tsunamis. Students used English and *Tagalog* (the local language) to discuss the brochure's content since most community participants were more comfortable using *Taglish* (the

combined English and Tagalog). The students provided sample scenarios of disasters and asked the community about their best ideas to overcome and stay safe in the given situation. Students also used Web 2.0 tools like YouTube videos on disasters to improve learning engagement [Sahin-Topalcengiz & Yildirim, 2020, Kırıkkaya & Yıldırım, 2021], and to help the community visualise and understand various disasters' severity, intensity, and effect, and (Catindig, Prudente & Orillo, 2020). Community participants asked questions to clarify their thoughts. The activity aimed to educate the community to protect themselves and to reduce the effects of disasters in their area. According to research, disaster education is effective at all stages of the crisis and proper preparation could help in decreasing the number of casualties. Therefore, educational planning and preparing the community should be considered at this stage (Hoffmann & Muttarak, 2017; Rundmo & Nordfjærn, 2017; Wisner, 2006).

Rationale

Educating every family and household on disaster mitigation is one of the most effective ways to build a prepared society for the challenges of different disasters (Torani et al., 2019). In this study, the participants incorporated their knowledge of science and DRRR in their developed community preparedness plan through brochures to strengthen disaster mitigation. According to studies, this information and knowledge are easier to be understood and accepted by other people when provided with scientific explanations that are understandable and relevant to their interests (Hardoy et al., 2019). Likewise, it is important to inject a "science voice" (Shaw, Izumi, & Shi, 2016) and provide scientific explanations to the nature, cause and ways to be safe from different disasters.

Research Objectives

This research aims to use service learning as a platform to help different communities be aware and knowledgeable of the possible ways to survive and stay safe before, during, and after natural calamities. This research focused on the impact of conducting service learning on DRRR with integrating scientific concepts on the development of students and community participants' disaster knowledge, skills, and attitude. The study was limited to disasters commonly experienced by the local community. The preparation and the actual conduct of service learning lasted for only one semester, and the continuation of the activity to the following semester is upon the teachers' decision. Nevertheless, the study intended to provide data on the effects of service-learning activity on community participants, which needs to be presented and analysed in most research studies. The following questions are the problems of the study:

- 1) How did students manifest their understanding of Disaster Readiness and Risk Reduction (DRRR) concepts?
- 2) How did the students plan, implement, and evaluate the service learning activity as an application of their learning in the DRRR class?
- 3) How did the student and community participants perceive the benefits of service learning?

Methods

Samples

The researchers used convenience sampling that would represent the G12 students in their institution. The students were the G12 GAS (General Academic Strand) senior high school students who took DRRR in the academic year June 2019 – March 2020 at a public senior high school in Bacoor, Cavite, under the supervision of one of the researchers. These students had introductory physics, biology, and chemistry lessons in Junior High School – Grades 7 to Grade 10 – and physical science subject in Grade 11. As a result, they learned concepts on waves (types, parts, and properties), kinematics (motion, UAM), dynamics (forces, energy, momentum, COG), and electricity (Ohm's Law)

when they were in junior high school and Grade 11. This basic knowledge and information in natural and physical science are essential factors in understanding the nature of natural disasters.

The students chose their participants based on proximity to the institution (Figure 1). Aside from its accessibility, it is also where most student participants live. This way, their families will highly participate in the service-learning activity and, therefore, will be informed of the dos and don'ts before, during, and after a disaster. Figure 2 shows that 25% of the community participants declared they had attended a disaster readiness and risk reduction seminar before the service learning activity offered by their barangays, workplaces, or schools.

Figure 1

Distance of Community Participants from the Institution

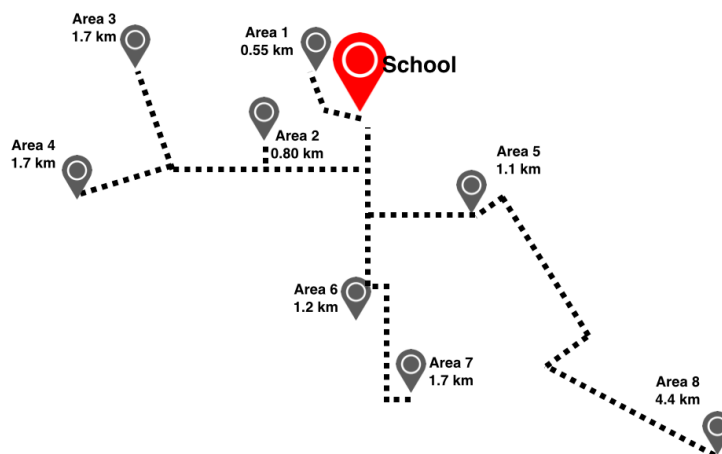
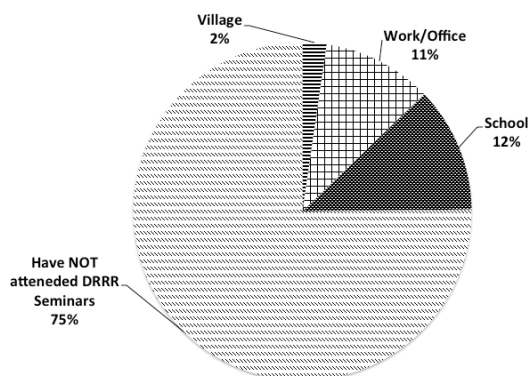


Figure 2

Community members who have attended DRRR seminars



Research Instruments

Assessing the Students and the Community Participants

The researchers used several tools to gather quantitative and qualitative data from student and community participants. The Disaster Related Knowledge Questionnaire (DRKQ) is a 20-item standardised test used to determine the participants' perceived disaster knowledge, preparedness and readiness, adaptation, awareness, and risk perception caused by different natural calamities (Tuladhar et al., 2015). The Civic Action and Skills Questionnaire or CASQ, a 44-item standardised test (Moely &

Mercer, 2002), and the Service-Learning Benefit Scale or SELEB, a 20-item standardised test (Toncar et al., 2006), were both used to measure the perceived civic action skills and attitude toward a disaster of the participants. The DRKQ and CASQ used a 5-point Likert Scale: five served as Strongly Agree, four as Agree, three as Neutral, two as Disagree, and one as Strongly Disagree. Likewise, the SELEB used a 7-point Likert Scale: seven served as Very Much So to 1 as Not at All. These instruments were pilot tested and administered for 20 minutes to 257 Grade 11 students in a public senior high school in the Philippines. Using SPSS and calculating the Cronbach alpha revealed that the reliability of the DRKQ, CASQ, and SELEB is 0.791, 0.924, and 0.923, respectively, suggesting that the target G12 participants can use the instruments.

Similarly, the Community Partner Service-Learning Evaluation Form or CPSLEF (Berea College, 2009), a survey questionnaire used by community participants to assess the student's performance during the service-learning activity, was translated into Filipino, together with DRKQ, SELEB and CASQ, to avoid context confusion. The instruments were translated with the help of experts in the field of language education. It was face validated by selected community partners using a 4-point Likert scale, with four being Most Likely and one as Not at All. Table 1 shows that the average response in each criterion is 3.5-4.0, meaning that the items are most likely acceptable and the items or questions are: a. readable, b. understandable, and c. its length is acceptable.

Table 1

Face Validation of Translated Instruments

Question	Average Response			
	CPSLEF	DRKQ	CASQ	SELEB
a. readable	3.8	4.0	3.6	4.0
b. understandable	4.0	3.7	3.5	3.8
c. acceptable length	3.6	3.8	3.5	4.0

Aside from the quantitative data, qualitative data were in the form of responses from the students on the Science Conceptual Understanding Questionnaire (SCUQ), guided reflections (R), narrative reports (N), and brochures (B). These instruments were researcher-made questions given to the students, except for the brochures. The SCUQ was a set of questions to determine the student's understanding of integrating science concepts on different DRRR topics (Catindig, Prudente, and Orillo 2020). Similarly, the qualitative data gathered from the community participants were responses in the CPSLEF.

DRRR Brochures

After the discussion of all the DRRR topics, the students started developing their brochures that contain the following criteria: nature of calamities, formation of different hazards, how to avoid or prevent the effect of disasters, things to prepare in case of disaster, and list of emergency contact/persons (Appendix A). These brochures were checked and graded by the DRRR teacher as their performance task and served as their prop in their service-learning activity.

Procedure

Pre-Service Learning

Permits were secured from the chosen institution before the researcher conducted the pilot testing to follow proper ethics guidelines. At the start of the teachers' pre-service in May 2019, the researcher started collaborating with the DRRR teacher to implement the students' service learning activity. As the semester began in June 2019, the researchers administered the students' pre-tests on

DRKQ, SCUQ, and SELEB. Similarly, in the middle of each topic discussion, SCUQ was given to the students, and researchers collected the responses a day before the scheduled formative test. After discussing all the DRRR topics, students developed their disaster preparedness plan through DRRR brochures.

Service Learning Activity Implementation

The researchers grouped the students into five, with ten members in each group. The students were allowed to choose their groupmates to work comfortably with each other (Lacey et al., 2020). The students conducted the service-learning activity in the community after class hours for one week and wrote their reflection notes at the end of each activity. Group leaders were assigned to ensure they would work efficiently – specific roles were identified (*ie.* Who will discuss, who will administer and guide the community participants in answering the pre and post-tests and evaluation forms, who will do the documentation, and who will take note of the comments and suggestions of the community members).

Post Service Learning

At the end of the service-learning activity, DRKQ, SELEB, and CASQ were administered to the students as post-tests. Students shared their own experiences and, as a group, answered the SCUQ to determine the extent of their learning of the scientific concepts of DRRR. Likewise, students accomplished their narrative report and collated their reflections. Interview through Facebook messenger was also conducted with some volunteers to expound on their experiences and uncover their feelings before, during, and after the service-learning activity.

Data Analysis

Quantitative data were analysed using a *t*-test to determine significant changes in the participants' perceived knowledge, skills, and attitude toward disaster before and after the service learning activity. The researchers analysed the qualitative data from student reflections, SCUQ, narrative reports, interviews, brochures, and communities' responses to CPSLEF through simultaneous and thematic coding. Appropriate and relevant verbal responses to every research question were manually coded and then sorted into emerging themes (Percy, Kostere, & Kostere, 2015) using Nvivo and Excel to provide explanations and enrich the analysis.

Results and Discussion

Students' Understanding of DRRR Concepts

The students' responses in the SCUQ, brochures, and reflections manifested their scientific understanding of some DRRR topics. These are some of the excerpts from the SCUQ (S) and reflection (R) of the students:

SC44: *"Unlike normal waves that are caused by winds, tsunamis are caused by the movement of energy water [sic] like for example volcanic eruption, submarine landslide or most commonly earthquake on the ocean floor releasing a massive amount of energy into the water."*

R41: *"The physics concepts involve per lesson helps me to further understand the lesson in DRR like for example is about fire and smoke, further explain why we need to crawl when there's an indoor fire and I used it as an example for them."*

The students used various science terms and concepts to describe the nature, cause, and possible preventions from the dangers brought by different disasters. For example, students used the concept of energy to explain how volcanic eruptions, landslides, or massive earthquakes could release

massive amounts of energy and be the cause of the occurrence of tsunamis. They also used the concept of density to discuss why crawling on knees is essential to prevent inhaling the smoke produced by a fire. Service learning positively affected science conceptual mastery (Finkelstein, 2004) and deeper understanding of the students (Ellerton et al., 2016).

Service Learning Activity

Likewise, the students' entries on the narrative reports (N) and responses in the interview (I) revealed how they planned, implemented, and evaluated the service-learning activity. These are some of the excerpts from the interview:

Planning

I1: "... brochure based on its content, **if it's concise, easy to understand and if it contains accuracy**. Tinignan rin po namin **if eye-catching and reader engaging.... salitan (take turns) po yung discussion during the activity.**"

I2: "... **complete informations** po about sa mga hazards and at the same time **madali po na intindihin** Bago po namin gawin yung activity **inassign po namin yung bawat (each) members...**"

I5: "... We **chose the brochure** based on the content, based on what we learned about the **lesson already discussed** and we chose it based on what we **easily understood** so basically all of the topic that **our teacher taught** were putted on that brochure we made."

Results showed that students planned the service-learning activity by choosing the content of the brochures. Since the students lived in the same locality as the community participants, the students were familiar with the different disasters they commonly experienced. They focused on disasters that they discussed in the classroom and checked the content of the brochures to see if the definitions and examples were scientifically correct. Lastly, student group leaders delegated the tasks to all the members of the group — who will discuss, administer the tests and evaluation, assist the community participants, and who will document the entire activity.

Implementation (Appendix B)

Likewise, some excerpts of the narrative reports (N) show how students implemented the service-learning activity in the community.

N25: "... In the afternoon, we go in **different houses in our village to discuss our brochure to the residence that contains information about the earthquake hydrometeorologicalhydrometeorological [sic] hazard and fire**"

N29 "... . If you see signs of water rising, **better turn off the main sources of electricity. Do keep your electric - powered items** stored in higher areas and refrain from using them during flood...."

The sample excerpts showed that the students went house to house to look for community participants. They mentioned that they used scientific terms and phrases to discuss and describe the brochures' content and provide basic examples. In a similar study, students used their IT knowledge and skills to meet the community's needs (Salam et al., 2017).

Evaluation

Additionally, below are some of the excerpts of the narrative reports (N), reflection (R), and interview responses (I) that show how students evaluated the service-learning activity.

I1 "...We would also like to set a guidelines for the brochure making .To make its content more consistent, avoid unnecessary information/ information overload, it make it free of inaccuracy."

N13: " After the discussion has finished some family gave us feedbacks in our discussion, they said to us **were excellent in our discussion** and we are able to discuss of **all the content of brochure.**"

R25: "They give us some feedback like "Ang gawaing ito ay *nakakatulong sa ibang mga tao na matutunan ang impormasyong ito tungkol sa mgadisaster (helpful to people to learn these information about disaster)* na mangyayari sa ating lugar...halimbawa, "ngayon ko lang nalaman na mas ligtas gumapang kapag lalabas sa nasusunog na bahay (I just learned that it's safer to crawl from a burning house)"

I2: "If given a *chance to improve*, we would *outline the course of discussion and practice it within the group or with the other groups*. We would also prepare an *ice breaker* for the participants so the listener would be *more engaged*..."

N28: "...this activity *help our family* to inform on how we prepare in case tragedy comes in our barangay especially to my family and we *have a lot of learning about your discussion* – a statement from one of the community participants."

The community participants shared with the students that they learned much from the discussions, what to do in a disaster and the scientific reasons behind disaster occurrences. Although the students were satisfied with their performances, they mentioned that the activity still needs improvement, especially regarding the "over information" and content of their brochures, their low self-confidence, and disorganization. Nevertheless, the activity helped the students evaluate their work and identify what to improve. In a similar study, the service-learning activity revealed students' difficulties in explaining the topics and aiding in discovering misconceptions (Finkelstein, 2000). Table 2 shows the perception of the students on the benefit of service learning in terms of (A) disaster-related knowledge, (B) disaster preparedness and readiness, (C) disaster adaptation, (D) disaster awareness, and (E) disaster risk perception.

Perceptions of the Benefits of Service Learning

Table 2

DRKQ – Knowledge of Students

DRKQ	Mean		p value
	Pre	Post	
A	2.76	3.20	p < 0.05
B	3.54	3.89	p < 0.05
C	3.34	3.63	p < 0.05
D	3.13	3.32	p > 0.05
E	2.75	3.25	p < 0.05
Overall	3.17	3.51	p < 0.05

Below are student sample transcripts from brochures (B), SCUQ responses (S), narrative reports (N), and reflections (R).

S31: "Better *go to the evacuation area* if the storm is not yet heavy"

I4: "...maging ligtas po sila sakali man pong dadating Yung THE BIG ONE."

Translated: "...they will be safe in case THE BIG ONE comes"

B9: "... Emergency Hotlines: Bureau of Fire, Coast Guard, DOTr, DPWH, DSWD, MMDA, NDRRMC, PAGASA, RedCross "

N15: "...I realized how important to share our knowledge or information to others. It would be best if the other *youth will continue this kind of project* in order to *spread the information* to many people..."

R41: "...it satisfied me a lot[sic]. And I *want to attend this kind of program* in the future."

R31: "... *hope she understands* what they can do for them. Hopefully, they will do [sic] our service learning activity and hopefully they *will apply what they have learned*."

Table 2 shows that the activity significantly increased the students' disaster-related knowledge (A), disaster preparedness and readiness (B), disaster adaptation (C), and disaster risk

perception (E) at $p < 0.05$. This data shows that students perceived that they learned the different signs when a disaster might happen (A), that their community is ready and prepared for any disaster (B), that they have adapted and were aware of the evacuation and disaster-prone areas (C), and that disaster will still happen in the future (E). These changes might result from students and community partners spending time with each other and sharing knowledge and experience on disaster mitigation. Likewise, the qualitative data supported the results revealing that students shared with the community participants the different signs of when a disaster might happen and how to prepare and be safe from disasters. During the discussion of the brochures, students used their scientific knowledge to provide explanations and examples of what a disaster is and how to avoid its adverse effects. In the narrative report, one student mentioned that the activity made him realise the importance of sharing disaster mitigation knowledge with the community. However, the student's awareness of DRRR campaigns in their locality (D) remained the same. In a similar study, results showed that the locality of Las Pinas had exposed its people to disaster campaigns (Mamon et al., 2017) more than the community members of this study, Bacoar City.

Table 3

CASQ – Skills-Related Results of Students

DRKQ		Mean		p value
		Pre	Post	
A	Civic Action Skills	3.57	3.96	$p < 0.05$
B	Interpersonal and Problem-Solving Skills	3.60	3.93	$p < 0.05$
C	Political Awareness	3.27	3.55	$p > 0.05$
D	Leadership Skills	3.46	3.62	$p > 0.05$
Overall		3.48	3.76	$p < 0.05$

Table 4

SELEB – Skills-Related Results of Students

DRKQ		Mean		p value
		Pre	Post	
A	Practical	4.87	5.29	$p < 0.05$
B	Interpersonal and Problem-Solving Skills	5.43	5.63	$p > 0.05$
D	Personal Responsibility	5.27	5.61	$p > 0.05$
Overall		5.19	5.51	$p > 0.05$

Below are student sample transcripts from SCUQ responses (S), and reflections (R).

R41: "... fire and smoke going up, further explain why we need to crawl when there's an indoor fire...it satisfied me a lot. And I want to attend this kind of program in the future."

R26: "... more interesting when we do this in seminar form. I am sure that the people who are interested will attend and the group will lead the seminar."

R42: "...I found out that not every person know about those safety precautions when a disaster occurs.. and I think that every barangay (village) should have a seminar about Disaster."

S34: "... it is ironic that metal is a good conductor of electricity but could also [sic] used to protect yourself from not getting struck by lightning...your car made up of metal could help you..."

The results of CASQ and SELEB, as shown by Tables 3 and 4, showed that students evaluated themselves as someone to be involved in community service (CASQ-A), as someone who can listen, work cooperatively, make friends, take the role of the other, think logically and solve problems (CASQ-B, SELEB-B), and as someone who can apply their knowledge in real life situation (SELEB-A). These are parallel to the qualitative data in which students were transformed and were able to discuss, communicate well, and solve problems in front of people whom they do not know, which is consistent

with other studies (e.g., Ellerton et al., 2016; Hébert & Hauf, 2015; Salam et al., 2017). Similarly, students were able to share their knowledge in DRRR and were able to explain some topics scientifically. Lastly, they expressed that they wanted to conduct and attend DRRR seminars in the future. This study also showed that students evaluated themselves as having low awareness of the current and political issues on DRRR (CASQ-C) and could not lead effectively (CASQ-D, SELEB-D). This result might be because most students prefer to explore social media than read newspapers (Gok, 2015) watch news programs. Likewise, engaging with the news in this era becomes hard work, requiring students to evaluate if the sources and the news represent the truth (Head et al., 2019).

Table 5

CASQ – Attitude-Related Results of Students

CASQ		Mean		p value
		Pre	Post	
E	Social Justice Attitudes	3.54	3.79	p > 0.05
F	Diversity Attitudes	3.59	3.79	p > 0.05
Overall		3.57	3.79	p > 0.05

Table 6

SELEB – Attitude-Related Results of Students

DRKQ		Mean		p value
		Pre	Post	
C	Citizenship	4.73	5.06	p > 0.05

Below are student sample transcripts from SCUQ responses (S) and reflections (R).

R19: *"There were members of the family that are not taking it seriously just because we are students."*

R27: *"... I hope that every family that we conducted a service learning activity will use the information we give so that they will be safe."*

R4: *"It is quite fun and tiring at the same time, but it was all worth it because we get to share some knowledge about DRRR and preventive tips that will eventually save them if a natural disaster occurs."*

I3: *"... may cooperation tlaga kami And narealize din po namin na hindi lang yun basta activity nakatulong din po kami sa iba kasi may iba po na nagpasalam at talaga sa amin sa pagbibigay namin ng mga tips and things to do pag may disaster."*

Regarding the benefit of service learning on students' attitudes, Table 5 and Table 6 show that students recognise that people need to be aware that problems must be solved in their community, especially regarding disaster preparedness (CASQ-E). The qualitative data also showed that students agreed that all the information and knowledge shared with the community was helpful and could save lives. Similarly, students recognised that people have different interests and priorities in life (CASQ-F). Qualitative data showed that students encountered challenges like being ignored and rejected because the community members needed to be more interested or busy. Despite that, everyone in their group remained cooperative and gave their best. Lastly, results showed that students perceived that their activity could not make a difference in the world (SELEB-D). Narratives, interviews, and reflections show that they recognised that most community partners were unaware of disaster preparedness, readiness, and risk reductions. They also suggested that every village should conduct a seminar like their service learning activity to educate the community. Given these realizations, they might think there was a long way to go to spread awareness of disaster, and it will take time to help everyone.

Table 7*DRKQ – Knowledge of Community Participants*

DRKQ	Mean		p value
	Pre	Post	
A	3.18	3.65	p < 0.05
B	3.49	3.91	p < 0.05
C	3.24	3.69	p < 0.05
D	3.13	3.60	p < 0.05
E	2.89	3.35	p < 0.05
Overall	3.20	3.67	p < 0.05

Below are community participants' sample transcripts from CPSLEF (C).

CPSLEF6: “.. our family have **learned on how we make our life safety [sic]** and how we **prepare the food** that easy to open and **the emergency kit** in case of one of our family was in accident.”

CPSLEF25: “Ang gawaing ito ay nakakatulong sa ibang mga tao na matutunan ang impormasyong ito tungkol sa mgadisaster na mangyayari sa ating lugar... ngayon ko lang nalaman na mas ligtas gumapang kapag lalabas sa nasusunog na bahay”

Translated: “This activity helps other people to learn information about disasters that may happen in our area... I just learned that it is safer to crawl out of a burning house”

In terms of the benefit of service learning to the community participants' knowledge, Table 7 shows that the activity had significantly increased the community participants' disaster-related knowledge (A), disaster preparedness and readiness (B), disasters adaptation (C), disaster awareness (D) and disaster risk perception (E) at $p < 0.05$. This result means that the community participants perceived that they were significantly more aware of when a disaster might happen (A), that their community and the government are perceived to be ready and prepared for any disaster (B), that they have adapted and were aware of the evacuation areas and disaster-prone areas (C), that they were conscious of the issues of DRRR and actively participate on campaigns (D), and that disasters will still happen in the future (E). Furthermore, the qualitative data supported these results in which community participants mentioned that they learned how to prepare and be safe in case of disasters, that the discussion of the brochures helped them understand DRRR better, and that the activity could make their community a safer place to live.

Table 8*CASQ – Skills-Related Results of Community Participants*

DRKQ		Mean		p value
		Pre	Post	
A	Civic Action Skills	3.66	3.99	p < 0.05
B	Interpersonal and Problem-Solving Skills	3.71	3.97	p < 0.05
C	Political Awareness	3.43	3.80	p < 0.05
D	Leadership Skills	3.34	3.75	p < 0.05
Overall		3.53	3.88	p < 0.05

Table 9*SELEB – Skills-Related Results of Community Participants*

DRKQ		Mean		p value
		Pre	Post	
A	Practical	4.93	5.78	$p < 0.05$
B	Interpersonal and Problem-Solving Skills	5.23	6.07	$p < 0.05$
D	Personal Responsibility	4.98	5.59	$p < 0.05$
Overall		4.98	5.81	$p < 0.05$

Below are community participants' sample transcripts from CPSLEF (C).

CPSLEF63: *"maibabahagi ko ang aking kaalaman sa aking pamilya at makakatulong sa pagligtas ng ibang taong apektado"*

Translated: "I can share my knowledge with my family and help save other affected people"

CPSLEF118: *"... sapat na kaalaman at ideya sa pagharap ng natalakay mula sa brochure"*

Translated: "... enough knowledge and ideas to deal with what was discussed from the brochure"

CPSLEF28: *"... this activity help our family to inform [sic] on how we prepare in case there [sic] tragedy comes in our barangay (village) especially to my family and we have a lot of [sic] learning about your discussion."*

CPSLEF40: *"go to squatters' area and share about DRRR."*

In terms of the benefit of service learning activity in civic action skills, tables 8 and 9 show that the service learning activity has significantly increased the community participants' civic action skills (CASQ-A), Interpersonal and problem-solving skills (CASQ-B, SELEB-B), political awareness (CASQ-C), leadership skills (CASQ-D, SELEB-D) and practical skills (SELEB-A) at $p < 0.05$. This result means that the community participants have significantly evaluated themselves as someone who will be involved in community service, as someone who can listen, work cooperatively, make friends, take the role of the other, think logically and solve problems, someone who has the awareness on current events and political issues, especially with regards to DRRR, someone who can lead effectively, and someone who can apply their knowledge in real life situations. Furthermore, the qualitative data supported and revealed that the community participants listened and learned a lot from the brochures, that the activity and the information received would help them survive the effects of disasters, and that the activity has helped them develop the ability to lead others to safety.

Table 10*CASQ – Attitude-Related Results of Community Participants*

CASQ		Mean		p value
		Pre	Post	
E	Social Justice Attitudes	3.49	3.89	$p < 0.05$
F	Diversity Attitudes	3.50	3.87	$p < 0.05$
Overall		3.50	3.88	$p < 0.05$

Table 11*CASQ – Attitude-Related Results of Community Participants*

DRKQ		Mean		p value
		Pre	Post	
C	Citizenship	4.87	5.84	$p < 0.05$

Below are community participants' sample transcripts from CPSLEF (C).

CPSLEF27: *"... it would help us to increase our skills and knowledge to survive whatever there could be disaster."*

CPSLEF124: *"Kami ay naabala ng iba dahil may ginagawa kami ng mga oras na iyon pero para makatulong nakining kami"*

Translated: "We were interrupted by others because we were doing something at that time, but we listened to help"

In terms of the benefit of service learning activity in attitudes, Tables 10 and 11 show that the service learning activity has significantly increased the community participants' social justice attitudes, diversity attitudes, and citizenship at $p < 0.05$. This result means that the community participants agreed that the people need to be aware that problems must be solved in the community, especially regarding DRRR. Likewise, they agreed that people have different interests and priorities in life. Lastly, the community participants believed that they could make a difference in this world. Responses from CPSLEF supported these results in which the community participants agreed that all the information shared by the students was helpful and could save people's lives. Additionally, the transcripts showed that the community agreed they have different interests and priorities from the students, supporting the results of their responses in CASQ.

Conclusion

Students manifested their science understanding in DRRR by using science words and terms to describe and explain the nature, cause, possible preventions, and ways to survive the dangers of different disasters. They planned a service-learning activity by choosing the best brochure from what the members have developed, with the correct and appropriate integration of scientific explanations of DRRR, implemented by defining and discussing the nature, cause, and possible preventions of the dangers caused by different disasters to various households; and evaluated it to be successful teaching and learning of DRRR. In terms of the benefit of service learning, students perceived that disasters happen anytime and that the use of scientific concepts on DRRR has informed and prepared them for any disasters; that the activity has helped them improve their communication and social skills and has inspired them to attend and conduct DRR seminars; and that the activity is one way of solving community problems despite the differences in culture, interests, and priorities. Likewise, the community participants perceived that science helped them better understand and learn various concepts on DRRR, which will contribute to making their community safer and better; that they have cooperated and listened very well in the conducted activity, it can lead others to safety in times of disasters; and agreed that the activity was helpful and could save the life of people in times of disaster. Furthermore, the community participants appreciated the students' efforts in sharing their knowledge and information on disasters despite the differences in culture, interests, and priorities.

Limitations and Recommendations

The DRRR lessons in the study were limited to the disasters that the community participants commonly experienced in their area, which focused on floods, typhoons/thunderstorms, tsunamis, earthquakes, and fires. For future studies, the researcher suggests exploring other DRRR topics to broaden the horizon of the brochure. For example, consider including volcano and other geological and hydrometeorological hazards since the country is in the Pacific Ring of Fire and at the equator. This inclusion would expand the students' understanding of DRRR and allow them to explore and discover more ways to teach and discuss DRRR topics. Additionally, conduct a face-to-face interview if the situation permits to broaden the survey responses of the students and community participants to analyse better the results in which the students and community participants developed disaster-related knowledge, civic action skills, and attitudes toward disasters. Unfortunately, due to the

current COVID-19 pandemic, the researcher could not conduct a face-to-face interview with the students and the community participants. Also, the numbers of student interviewees were limited because only some students had Internet connections at home to answer the interview questions. Face-to-face interviews could expand and give a broader interpretation of the participant's responses in the survey, and short responses and their facial expressions and reactions could give meaning to written responses.

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Appendix

Appendix A Sample Brochure

Brochure 1 (Outside)



FOLLOW THESE 7 SAFETY TIPS: BEFORE AND AFTER A BIG QUAKE


1. Make a plan to keep your family safe

2. Have an emergency kit ready to go

3. Learn how to use your home's fuse and breaker boxes

4. STOP, DROP, COVER AND HOLD during an earthquake

5. Drive cautiously and stop at all intersections

6. Always assume downed power lines are energized and dangerous

7. If you see any downed power lines, stay away and call 911


For more information on how to stay safe during an earthquake, visit SCE.COM/STAYSAFE

WHAT TO DO?

BEFORE AN EARTHQUAKE


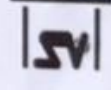

- Familiarize the evacuation areas of your place.
- Prepare an emergency kit.
- Conduct an earthquake drill.
- Know the fault lines of your area.
- Check the sturdiness of your home.
- Plan out a meeting place with your family.



DURING AN EARTHQUAKE


DROP COVER AND HOLD

- Stay Calm.
- Stay away from windows.
- Stay away from tall buildings.



AFTER AN EARTHQUAKE

- Be Alert and Cautious.
- Expect Aftershocks.
- Check yourself and family for injuries.
- Stay out of damaged areas.



Brochure 2
(Three-Fold Outside)

Dealing With Disaster

Before

- Know the risks and warning signs, including those specific to your region.
- Purchase insurance, including flood insurance, which is not part of your homeowner's policy.
- Develop an evacuation and communication plan.
- Assemble a disaster supplies kit.

During

- Put your plan into action.
- Take care of your loved ones.
- Volunteer to help others.
- Follow the advice of first responders.

After

- Be careful around debris and safety hazards.
- Repair damaged property.
- Take steps to prevent or reduce future loss.

BUILD A KIT

Include enough food, water, and medical supplies for your needs in your emergency kit to last for at least 72 hours.

READY.GOV/MYPLAN

The 4 Steps of Disaster Preparedness

- 1 Identify Risk
- 2 Develop A Plan
- 3 Implement & Train
- 4 Be a Leader in Your Community

HOTLINES TO CALL IN CASE OF EMERGENCY

EMERGENCY HOTLINE: 911	DOT 7890 (632) 726-6255	MMDA 136 (632) 911-5061 to 64
BUREAU OF FIRE (632) 426-0219 (632) 426-3812	DPWH 165-02 (632) 304-3713 (632) 304-3904	NDRRMC (632) 434-2696
COAST GUARD (632) 527-3877	DSWD (632) 932-2573	RED CROSS 143

DISASTER READINESS AND RISK REDUCTION

SUBMITTED BY:

GAS 12-C

SUBMITTED TO:

ORILLO

(Inside)

EARTHQUAKE

EARTHQUAKE

An earthquake is the shaking of the surface of the Earth. Earthquakes are usually quite brief, but may repeat. The sudden release of tension in the tectonic plates sends waves of energy that travel through the Earth.

Main causes of earthquakes

- **Volcanic Eruptions**
The main cause of earthquake is volcanic eruptions.
- **Tectonic Movements**
The surface of the earth consists of some plates, comprising of the upper mantle
- **Geological Faults**
A geological fault is known as the displacement of plates of their original plane.

HYDROMETEOROLOGICAL

Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

HYDRO METEOROLOGICAL HAZARDS

Tropical cyclones	Thunderstorms	Hailstorms	Tornadoes
Blizzards	Heavy snowfalls	Avalanches	Coastal storm surges
Fresh floods	Drought	Heatwaves	Cold spells

HYDROMETEOROLOGICAL HAZARDS

TYPHOON FLOOD
THUNDERSTORM EL NIÑO
FLASHFLOOD LA NIÑA
COASTAL STORM SURGES

FIRE

Is the rapid oxidation of a material in the exothermic chemical process of combustion, releasing heat, light, and various reaction products.

How Can I Prevent a House Fire?

- Keep the stove and oven clear. Kitchens are the most common places for house fires
- Stay in the kitchen. Don't leave a hot cooking surface unattended
- Check the dryer
- Maintain electrical cords
- Know your shutoffs
- Store flammable products properly
- Be careful with candles
- Be a conscientious smoker
- Use the fireplace responsible

Appendix B

Students went house-to-house for the service learning activity

