

Development of contextualized learning module on climate change for grade 9 learners

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Abstract

Keywords:

Climate change;
Contextualization;
Contextualized
learning module;

This Study aimed to develop a contextualized learning module on climate change for grade 9 learners. The developed learning module help to address both problems of scarcity of learning materials and to support for climate change preparedness, reduction and mitigation. It would give students a thorough knowledge and awareness of the topic climate change. It would be convenient for the learners to understand the relevance of the topic and substantiate their critical thinking considering that it is a contextualized module. The learning competencies outlined in the science curriculum guide and most essential learning competencies as the basis of this contextualized module. The needs assessment questionnaire and the develop contextualized Module underwent evaluation by a panel of experts. The develop contextualized module on climate change was rated very satisfactory with a mean 3.79. Consequently, this evaluation was thought to be a very good indicator that the develop module on climate change for grade 9 learners is ready to be implemented.

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Introduction

The Philippines Country Climate and Development Report 2022 (World Bank) disclose that multiple indices rank the Philippines as one of the countries most affected by extreme climate events. The country has experienced highly destructive typhoons almost annually for the past 10 years. Annual losses from typhoons have been estimated at 1.2 percent of GDP. World Bank Vice President for East Asia and Pacific, Manuela V. Ferro stated that the climate impacts threaten to significantly lower the country's GDP and the well-being of Filipinos by 2040. However, he argues that policy actions and investments, principally to protect valuable infrastructure from typhoons and to make agriculture more resilient through climate-smart measures, could reduce these negative climate impacts by two-thirds (ASEAN Disaster Information Network, 2022).

The Department of Education (DepEd), through the Disaster Risk Reduction and Management Service (DRRMS), renews its commitment to intensify climate literacy and support climate action in the basic education sector. One of their actions is the review and enhancement of learning materials with climate change competencies and support for teachers

in ensuring the transfer of learning at the start of the School Year (Philippines DepEd, n.d.). Consequently, in 2018 International Student Assessment (PISA) of the organization for economic Cooperation and Development (OECD) presented that the Philippines scored 353 in Math and 357 in science, which was much lower than the OECD average of 489 points (DepEd & PISA, 2018). As such data, the process of teaching and learning science, the results of PISA 2018, TIMSS 2019, and the yearly NAT reported that students in the Philippines have been performing poorly in national and international assessments in science. It further shows the lowering level of scientific literacy among students (OECD, 2018). One of the most dimensions of science are the process of doing science and scientific attitudes. k-12 program implementation is aimed at creating more skilled students with basic skills for lifelong learning and employment (Abragan et al., 2022).

The numerous study results showing the scarcity of textbooks in public schools made the Department of Education encourages all teachers to develop learning resources in order to utilize them in the teaching-learning process to augment the shortage of textbook and for better academic performance during learners' engagement to learning. Creating an original instrumental material in teaching science is by relating learning content to local information and materials from the learner's community is one of the main features of the k-12 curriculum that will enhance students' achievement (Gadia, 2023).

Given this, the development of contextualized learning modules on climate change for Grade 9 may help address both problems of the scarcity of learning materials, and the support for climate change preparedness and reduction. Nonetheless, it deems raise students' learning to a high proficiency level (Press Reader, 2017). The main purpose of the study was to identify the Needs Assessment on the level of Climate Change awareness of the Science Teacher and Local Residents as a bases in the development of a Contextualized Learning Module on Climate Change for grade 9 learners and to Develop a Contextualized Learning Module on Climate Change.

Method

The following describe the development of the Contextualized Learning Module on Climate Change for Grade 9 Learners. To determine the Needs for the Contextualizing of the Learning Module on Climate change, the researcher designed and developed a Needs Assessment questionnaire for the key informants consisting of five (5) science teachers and ten (10) Local residents. The question designed were based on the Learning Competencies from the most essential Learning Competencies (MELC) of DepEd. For the teacher questions included were the teaching-learning experiences and difficulties in teaching the Climate Change topics. On the other hands, the local residents' questions were based on their experiences and encountered problems focused on Climate Change. In developing the Contextualized Learning Module on Climate Change, the process of the development was comprised of eight (8) steps shown in the figure 1 below. The respondents of the study were (5) five science teacher and (10) ten local residents preferably in the flood prone area. Mean was used for the analysis of ratings in the needs assessment questionnaire, the developed contextualized learning module. For the qualitative part, the responses of the science teacher and the local residents in the needs assessment questionnaire were collected and subjected to content and thematic analysis.

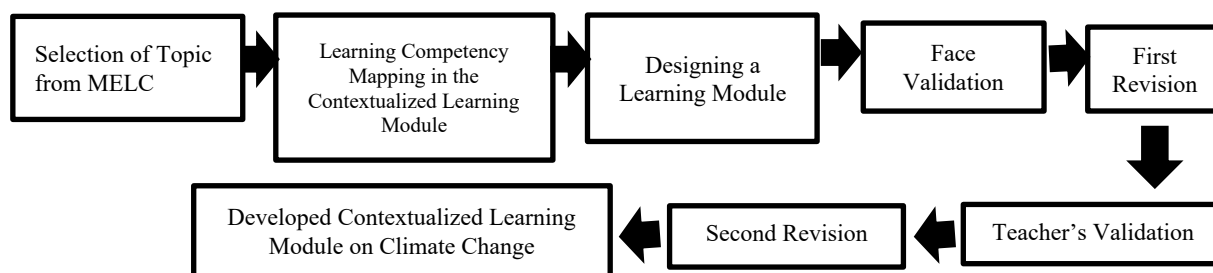


Figure 1. Development of the Contextualized Learning Module on Climate Change

Results and Discussion

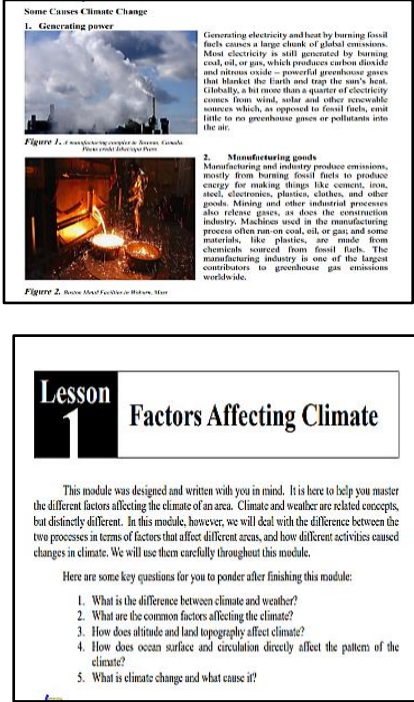
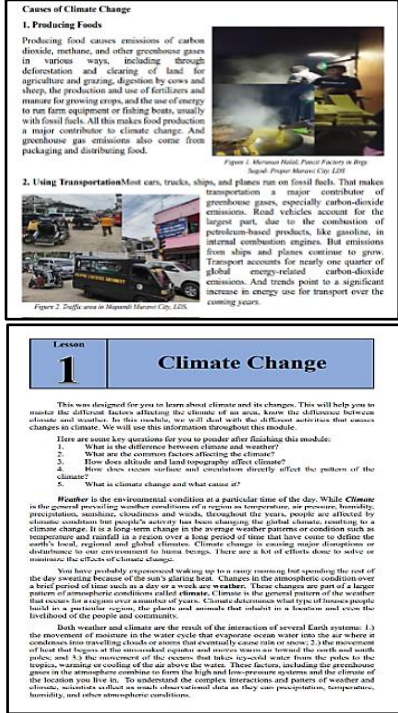
The research identified which topics on Climate Change would be used in the development of the Contextualized Module before developing the Contextualized Learning Module. The chosen topics and the activities included in the study was mapped into the learning competencies from the DepEd's MELC. The researcher adopted the steps in developing a learning module from DepEd (2020) (Philippines DepEd, n.d.). There were seven (7) elements in developing a learning module to be used by the researcher. The comments and suggestion of the evaluators were considered for the improvement of the developed contextualized climate change module.

Table 1. Summary of the Comments and Suggestions of the Evaluators in the Contextualized Learning Module on Climate Change

Before	Comments/Suggestion	After
There's no Cover Page	Cover page Include a cover page on the develop learning Module.	
	Table of contents Add the pre-test and post-test in the table of content with a unique title that much the design of the learning module.	

The first revision of the learning was then evaluated by the panel of evaluators consisting of teachers who had at least five (5) years of teaching experience.

Table 2. Summary of the Panel of Experts in the Contextualized Learning Module on Climate Change

Before	Comments/Suggestion	After
	The Content of the lesson must be Contextualized in which the examples must be existed in the locality. Improvement of the Introductory part of the learning module.	

Before utilization of the instrument, the comments and suggestions of the evaluators were considered for the improvement developed contextualized learning module on climate change. This developed and enhanced contextualized learning module on climate change was validated and used throughout the duration of the study. It followed again all the seven (7) elements from DepEd (2020).

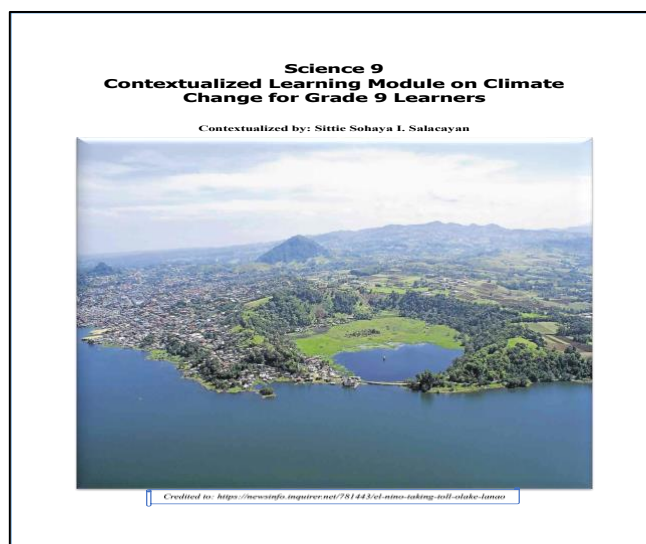


Figure 2. Contextualized Learning Module on Climate Change Cover page

The cover page of the developed contextualized learning module showed photos related to the lessons in the module. This was the overlooking view of Lake Lanao which signifies the beauty of Lanao del Sur. On the other hand, after evaluating the developed learning module, the panel of evaluators made no changes to the cover page.

Table of Content

	Page Number
Let's Assess!	3
LESSON 1: What is Climate Change?	8
☒ What I know!	11
☒ Do this!	9
☒ Think it more!	10
☒ What is it?	11
☒ Explore more!	17
☒ Let's connect!	17
LESSON 2: Factors that Affect Climate Change	19
☒ Let's Bank in!	19
☒ Let's Connect!	21
☒ What is it?	22
☒ Do this!	28
☒ What can I do?	28
☒ Think it more!	28
LESSON 3: Arising Sea Level	35
☒ Let's Bank in!	35
☒ What is it?	36
☒ Do this!	37
☒ What can I do?	38
☒ Think it more!	39
Let's Evaluate!	39
Reference	41

Figure 3. Contextualized Learning Module on Climate Change Table of Content

The table of contents served as a guide of what was inside the module and its corresponding page number. It has different elements in every lesson these were 1.) Let's Assess for Pre-test 2.) What I know 3.) Do this 4.) Think it more 5.) what is it 6.) Explore more 7.) Let's connect 8.) What can I do 9.) Let's Bank in 10.) Let's Evaluate for Post-test.

Let's Assess!

Part 1. Factors Affecting Climate

Directions: choose the letter of the best answer. Write the chosen letter on a separate sheet of paper.

- What do you call the physical attributes, surface shapes and features of a particular area?
 - Altitude
 - Latitude
 - Seismograph
 - Topography

Use the table to answer question number 2.

A scientist recorded the following data for different areas:

Areas	Mountain Range	Bodies of Water
A	Present	Present
B	Absent	Present
C	Absent	Present
D	Absent	Absent

- What is the coldest area?
 - A
 - B
 - C
 - D
- How do oceans affect the climate of an area?
 - The solar radiation is absorbed by ocean.
 - Ocean currents act much like a conveyor belt.
 - The ocean helps to distribute heat around the globe.
 - All of the above.
- Which of the following is the basis of classifying the types of climate of an area?
 - Air pollution, wind, and temperature
 - Precipitation, temperature, and wind

Figure 4. Pre-test/Post-test of the Contextualized Learning Module on Climate Change

Before the grade 9 learners work on the learning activities in the module, they were required to answer a pre-assessment that aimed to gather their prior knowledge on the topics of climate change. Results from the pre-test score will be compared to the post-test score after the intervention. According to (Kelly, 2019), comparing pre- and post-tests allows teachers to track student development from one class to the next, between topics, and even from day to day. Most forms of assessment must determine whether a student meets expectations after they've been taught, but these fail to account for prior knowledge and incremental progress.

Lesson 1	Climate Change
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This was designed to learn about climate and its changes. This will help you to master the different factors affecting the climate of an area, know the difference between climate and weather. In this module, we will deal with the different activities that causes changes in climate. We will use this information throughout this module.

Here are some key questions for you to ponder after finishing this module:

1. What is the difference between climate and weather?
2. What are the common factors affecting the climate?
3. What is climate change and what cause it?
4. How does altitude and land topography affect climate?
5. How does ocean surface and circulation directly affect the pattern of the climate?

 **What I know!**

CLIMATE and WEATHER

In this first module we are going to look out some of the basic concepts around weather and climate. Let's off by looking at some definition of common words in the climate change field, so we have a good understanding of these.



Tropical Climate

Figure 1. CLIMATE: What you Expect!



Rain

Figure 2. WEATHER: What you get!

First, It's really important to understand the difference between Weather and Climate. Climate is what you expect, but Weather is what you actually get on a day-to-day basis. Weather and Climate are part of a continuum.

Figure 5. Introduction in One of the Lessons in the Contextualized Learning Module on Climate Change

After the pre-test, Introductions were followed which includes an overview of the lesson in the learning module. The lesson was carefully aligned with learning competency specified in MELC's, and the pre-assessment results from the key informants. Most of the example provided are found in the locality as well as in the learning activities. According to (Biggs & Tang, 2011) and (Dioneda & Isagani, 2019), when designing a learning experience, course or program, it is important that there is a good fit between the learning outcomes, assessments, and teaching and learning activities; in other words, that the three components are aligned.

Think it more!

Direction: Observe, examine and identify the climate change that happened in this place based on the given situations.




Municipality of Bubong, LDS

Barangay Kilala Marawi City

Climate Change:

Possible causes:

Figure 6. Learning Activities of the Contextualized Learning Module on Climate Change

The learning activities used in this module were based on the local community. The target learning objectives were also obtained. Examples used in the instructions and learning process are mostly found in Lanao del Sur, specifically in the learners' locality. According to (Bruner, 2009) in his Discovery Learning theory, a method of Inquiry-Based Instruction, the theory encourages learners to build on past experiences and knowledge, use their intuition, imagination and creativity, and search for new information to discover facts, correlations and new truths. This support the study that the use of localized module was effective in enhancing the performance of the learners (Ballesteros, 2019). In this learning module, localization is used as a form of inquiry-based, that takes place in problem solving situations relating to climate change happening in their locality. Needs Assessment Survey Questionnaire of the Science Teachers and Local Residents presented in **Table 3**.

Table 3. Summary of the Responses on the Contextualizing Learning Module by the Science Teacher

Code	Mention	Responses
Describe factors that affect Climate	2	“Students did not relate the factors that affect about climate because they did not relate the relevance of the topic to their surrounding environment” N-ST2 “Most of the student did not familiar with the factors affect by climate as well as human activity included in the factors on climate change” N-ST5
Describe Climatic Phenomenon that occur on a global level		N-ST1, N-ST2, N-ST3, N-ST4, N-ST5 “Learners have no Difficulty in Describing Climatic Phenomenon that occur on a Global level”
Determine the factors that influence global climatic phenomenon		ST1, N-ST2, N-ST3, N-ST4, N-ST5 “There’s no difficulty for the learners to determine the factors that influence global climatic phenomenon”
Explain how ocean surface and circulation directly affect the pattern of climate around the world	1	N-ST1 “Some of the students are slow in catching up with the lessons, especially with topics that are intangible. More images/ illustration shown helps a lot in reinforcing knowledge plus discussion”
Explaining climate change; causes and effect	2	N-ST3: “Some of the student cannot explain climate change because they are not aware about it” N-ST4: “Some students hardly to understand, due to lack of prior knowledge of climate change”

Theme	Coded	Mention	Responses
Problems encountered in teaching the topic in the 3 rd quarter	Interest to the topic to have a Prior knowledge	5	N-ST1: “some students do not show interest to the topic because they have no prior knowledge about the topic” N-ST2: “Some students show less interest due to lack of prior knowledge” N-ST3: “Retaining interest of the learners when discussing intangible topics. Specifically on topics about climate change. Showing of illustration and images though helps but still needs other ways to maintain their interest” N-ST4: “As the time goes by, the students’ interest is decreasing in terms of learning, they are much focus on an extracurricular activity”

Modular approach help in teaching topics	Given ample time to learn Used different resources in learning	5	N-ST1: “Students are given enough time to study, adjust, and learn to the lesson. There are activities that are engaging enough that the students can answer and develop their skills in solving problems” N-ST2 “They give ample of time to read the lesson” N-ST3: “Modular approach gives a lot of help, especially in giving additional learning/reading resources to the learners. Modules are allowed to be brought home and is filled with activities that they can perform to augment the learnings they gained form the discussion” N-ST-4: “some students have a lot of resources to find with, in terms of doing their activities” N-ST5: “Most of the student are resourceful enough to learn certain topics”
opinion about Contextualization of topic	Favourable in Contextualizing certain lesson	5	N-ST1, N-ST2: “I ‘am in favour of the Contextualization of these topics because students now a days do not show interest if they cannot relate to it. And for them to realize that they can do something to lessen the effect of Climate Change” N-ST3: “Contextualization of the topics is a very good idea. Learners’ minds tend to wonder when they are given examples that are of their context. With this at hand, we are able to relate of the topic and the lesson will be more appreciated because of the familiarity of the situation within the topic. N-ST4: “Contextualizing have a lot of contribution in relating the lesson, and its relevance to the surrounding” N-ST5: “Contextualization made the lesson much easier to understand” N-ST5: “some students, did not attending the class, only exam they are present”

The summary of the responses on Contextualizing Learning Module was shown in table 1. the teachers were having difficulties in sustaining the interest of the learners. This implies that learners may not find any interest because they did not see the topic as relevant to them and not responsive to their needs (Kurniasari, 2018). Thus, contextualizing learning materials for teachers could help them arouse interest and sustain the focus of the learners by integrating applications of the topics into their daily existence. Materials for teachers could be prepared for inclusion in the curriculum of the study on the adaptation and mitigation process for climate change awareness, and Teacher’s strategies must include Outdoor activities related to the environment for the students to be aware and relate the relevance of the factors on climate change and to their community. This was because the researcher went through pre-assessments for the teachers that need to develop a learning module for the learners. According to (Holgado, 2018) said that DepEd encouraged teachers to use resources in their teaching. Localization is, according to him, is associated with familiarization, thus making instructions comprehensible.

Table 4. Summary of the Responses on Contextualizing Learning Module by the Local Residents

Theme	Coded for	Mention	Responses
Importance of Climate in your area	Better life come with good Climate	5	N-LR1, N-LR2, N-LR3, N-LR4, N-LR5: “Climate affect every aspect of our lives. If the climate is in good condition the lives of the people become easier and better. Better life come with good climate”
		5	N-LRT6, N-LR7, N-LR8, N-LR9, N-LR10: “Climate is important in a way that it would determine the livelihood and the activities that we may do or accomplish”
Observe any changes of the climate	Inconsistent of weather	10	N-LR1, N-LR2, N-LR3, N-LR4, N-LR5, N-LR6, N-LR7, N-LR8, N-LR9, N-LR10: “Yes, the temperature rise and drought are becoming longer that is why the lake lanao is in low level. If there’s a time that it will rain its very much rain full coming out, and flooding is the effect of so much rain full”
Difference of Climate before and at present	At present Unpredictable Climate compared before	9	N-LR1, N-LR2, N-LR3, N-LR4, N-LR5, N-LR6, N-LR7, N-LR8, N-LR9: “The climate before is cold and dry season is much shorter, compare nowadays where hot season and dry season occur frequently”
		1	N-LR10: “Before, even though there’s a change on the climate; sometimes hot or cold. People did not experience disease cause by changes of climate”

In summary, the response of the local residents who had been living for a decade believed that climate was important because a good climate means good and healthy living. Eight (8) out of ten responded that climate affects individuals and organisms in our environment. While two (2) had responded to the needs for preparedness, adaptation, and mitigation. The key informants had revealed that two (2) common observations they have in climate change are too hot earth temperature and flooding due to increased rainfalls, which could even happen to their barangay and to some neighboring places. World Bank (2013) report that at least 23 provinces are considered to be at high risk for disasters due to the hazards of climate change. Lanao del Sur was one of the provinces classified as very high risk for El Niño-induced droughts or abnormal increases in rainfall. According to (Gamon & Tagoranao, 2019) concluded in their study to ensure the relevance of the government policies with regard to sustainable development, the best practices that have been adopted by other regions, which are consistent with the mandate of sustainable development, should be introduced in order to redress issues related to environmental risks, man-made and natural disasters, and poverty reduction caused by climate change. Understanding the result of our actions and how to avoid detriment the environment is made easier by environmental awareness (Holthhuis & Nicole, 2015). Ecological awareness is a way of thinking about the world in terms of its independent natural and human systems, including a consideration of the consequences of human actions and interactions within the natural context (Baker et al., 2009; Laelasari & Rahmawati, 2020) .

The Developed Contextualized Learning Module underwent thorough evaluation by a panel of evaluators. A scoring Rubric Adapted from (Department of Education, 2020) was used.

This contained different components such as content, format, presentation and organization, and accuracy and up-to-datedness of information.

Table 5. summary of Experts' Rating of the Developed Contextualized Learning Module on Climate Change

Factors	Mean Rating	Description
Content	3.80	Very satisfactory
Format	3.85	Very satisfactory
Presentation and Organization	3.80	Very satisfactory
Accuracy and Up-To Datedness of Information	3.73	Very satisfactory
Overall average	3.79	Very satisfactory

The developed contextualized learning module was rated very satisfactory with a mean of 3.80 in terms of the content of the lesson. This means that the content is accurate for the learners. For the format, it was rated very satisfactory with a mean of 3.85. this is due to the fact that the formatting in the learning module was followed. Another is the presentation and organization of the lessons; it was also rated very satisfactory with a mean of 3.80. This means that the lessons used in the module are organized and well-presented to the learners. Lastly, in terms of accuracy and up-to-datedness of the information used, it was rated very satisfactory with a mean of 3.73. this means that information used in the module was updated and currently happening in the locality.

In summary, the overall rating of the developed learning module was rated very satisfactory with a mean of 3.79. As a result, the learning module developed was valid and could be used for implementation. The learning module can help learners become more informed and environmentally conscious of their surroundings, and it can benefit both students and teachers. This supports the study of (HadjiShaeef et al., 2024; Picardal & Marchee, 2022) who stated that employing a lesson within the context of the prevalent local environment, culture, and resources could aid teachers and students in understanding concepts. Further, (L et al., 2024; Mangorangka, 2023) argued that the use of the localized module was effective in enhancing the performance of the learners. (Ballesteros, 2019) the k-12 Basic Education program explicitly highlighted the use of localization and Contextualization as a novel method in science.

Conclusion

During the implementation of the Needs assessment survey questionnaire, it was found that there was a need to develop a Contextualized Learning Module on Climate Change considering the common needs faced by science teacher due to the scarcity of the Contextualized learning module as an alternative support to the teaching-learning of the students. Also, in the resident-participants found that the residents lack of awareness on the factors affecting climate in their locality. On the other hand, the developed contextualized learning Module was rated very satisfactory with a mean of .79. As a result, the learning module developed was valid and could be used for implementation. The learning module can help learners become more informed and environmentally conscious of their surroundings, and it can benefit both students and teachers.

Therefore, the researcher developed a Contextualized Learning Module on a Climate change to help address both problems of the scarcity of learning materials, and the support for climate change preparedness and reduction.

Credit Authorship Contribution Statement

Sittie Sohaya I. Salacayan: Conceptualizing, Writing-original draft, review and editing, implementation, data collection, initial data analyzation. **Monera Salic Hairulla:** Research Adviser, Supervision, Writing-review and Editing. **Sotero O. Malayao:** review & editing Supervision. **Edna B. Nabua:** Supervision, review & Editing, **Liza A. Adamat:** review &Editing, Conceptualizing.

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