

Development, Validation, and Effectiveness of Contextualized Learning Activity Sheets in Earth Science

Jeanlyn Sierra Antonio¹ and Edna Marie L. Mijares²

^{1,2}Bulusan High School, Bulusan, Sorsogon, Philippines

Abstract— This study aimed to develop and validate, the effectiveness of the contextualized learning activity sheets in Earth Science for Grade 11 HUMSS in Bulusan High School, for the school year, 2022-2023. It used the developmental method of research. The respondents were the thirty (30) Grade 11 HUMMS students in Bulusan High School, and five (5) experts teaching Science, randomly and purposively chosen respectively. The statistical tools utilized were the weighted mean and t-test for dependent samples.

The study revealed that the developed CLAS was successful in teaching Science concepts as supplementary instructional materials. Experts agreed that the instructional content used in the home and classroom learning environment is suitable and commendable. Also, the developed CLAS followed the standards set by the DepEd LRMS. Similarly, the developed Contextualized Learning Activity Sheets in Earth Science resulted in significant differences in the performance of the students as shown in the pretest and posttest results in terms of lessons in Geologic processes and hazards, Hydrometeorological phenomena and hazards, Marine and coastal processes and their effects.

It was recommended that the CLAS in Earth Science can be used to improve retention and mastery of the lesson of grade 11 HUMMS. The developed learning activity sheets for active, student-centered learning performance increase the quality of the period within the class and may be used by the teachers in improving students' academic performance specifically teachers of Bulusan Cluster.

It was also recommended that appropriate learning materials, like learning activity sheets and modules, be utilized to deliver the lessons. Learning and activities can be learner-independent by providing copies of the learning materials.

Future research on the creation of another instrument or collection of worksheets is encouraged to reinforce teaching various fields of science across different disciplines at different grade levels.

Keywords— development, validation, effectiveness, learning activity sheets, contextualized.

I. INTRODUCTION

Earth science is a discipline that involves the study of the natural world, including geology, meteorology, oceanography, and astronomy. The subject is essential in understanding the Earth's processes, its history, and its current state. In recent years, there has been an increasing interest in using contextualized learning activities in teaching earth science.

Contextualized learning is a type of teaching method that integrates real-life situations into the learning process. The use of CLAS is a common teaching strategy in many educational settings. It was designed to provide learners with guided and structured learning experiences and offered opportunities for students to apply the knowledge and skills they have learned in class to real-life situations. Overall, CLAS are a critical

tool for promoting student learning, engagement, and success.

The worldwide spread of the COVID-19 Pandemic affected all aspects of human beings, the school needs to temporarily shut down face-to-face classes, The Department of Education implemented learning modalities to address the student's learning needs (Samartin, International Journal of Scholars in Education 5 (1) 1-13, 2022). Meanwhile, the effectiveness of different instructional materials and teaching strategies, provides practical guidance for teachers and educators looking to improve student learning outcomes, (Hattie, Fisher & Frey, 2017).

According to a study by the Southeast Asian Ministers of Education Organization, some students perceive science to be difficult and boring (SEAMEO INNOTECH, 2017). In a study by the Philippine

Institute for Development Studies, it was found that students from low-income families are less likely to have access to science laboratories and equipment (Aldaba, 2016).

Meanwhile, contextualizing teaching to improve learning explored the benefits of understanding and retention of concepts. (Creamer & Eddy, 2016). Teachers play a vital role in the educative process. In low-income countries like the Philippines, quality learning and teaching material (LTM) can compensate for enhancing learning and improving student performance. (Jagannathan, 2018).

In an article written by Amita Legaspi of GMA News on June 2, 2014, the unavailability of learning materials is just one of the problems still bounding the country's K to 12 Basic Education Program. In the three years of its implementation. As of the school year 2012-2013, no instructional materials had been developed by DepEd for Senior High School modeling. To compensate, the SHS model schools use: 1) printed modules on digitized and online resources (83%) 2) printed text or workbooks (67%), and online resources (50%). (Solution Evaluation and Adaptation Unit (SEAU), 2015).

Many educators and graduate student-researchers have identified several factors behind the low performance in Science of Filipino students, including outdated curriculum, and lack of interest among students. (Bernardo, Dioso 2014, & Aldaba, 2016), insufficient funding for education allocates only 2.8% of its GDP to education, which is below the recommended 4-6% (World Bank, 2020) and shortage of science teachers especially in the rural areas. In a study by the Department of Education, it was found that there is a shortage of around 25,000 science and mathematics teachers in the country (GMA News Online, 2020). Another mentioned factor was language barrier (Philippine Statistics Authority, 2014).

As of today, the challenge in science education is on how to raise the level of achievement of the students. A mean percentage score (MPS) of 48.90 was earned by fourth-year students on the basis of the 2015 National Achievement Test (NAT) results. In the given achievement results of the five (5) subjects, science got the lowest MPS for the school year 2014-2015. As a result, the Department of Education (DepEd) released a memo that suggests improving the competencies required to raise all students' performance levels across the nation. A recommendation urges "providing

supplemental materials to strengthen the competencies of individuals in schools with more than one shift as means of extending time." ("NAT overview and 2015 test results", p 28). The low MPS in science got by Grade 10 students would mean low mastery of the learning competencies. When they entered senior high school, they would have a learning gap as a result. Moreover, it will show a negative reflection of the present state of our country's basic education program.

The Department of Education created the Learning Resources Management and Development System (LRMDS) to help with increased distribution and access to learning-teaching and professional development resources at the Region, Division, and School/Cluster levels of DepEd in order to address this lack of learning and teaching materials.

To date, 129 learning resources are available for senior high school of which 372 are for grade 11 and 210 are for grade 12. These resources include a curriculum guide, learning material and a teaching guide.

In the Division of Sorsogon Province, the performance of students in Science showed a remarkable increase. The overall MPS for Sorsogon on the National Achievement Test was 49.52% in SY 2014-2015 (Science Sorsogon (ASEP)) and 42.18% in SY 2012-2013, respectively. However, this result needs to be raised in order to meet the 75% MPs. The difficulty for educators and administrators is continually figuring out how to improve the NAT result.

Meanwhile, Bulusan High School obtained an average MPS rate of 65.73 % for the inclusive three school years for the National Achievement Test (NAT) in Science. In particular, the aforementioned school achieved an MPS rate in Science of 71.28% for the 2012-2013 school year, 79.89% in 2013-2014, and 46.03% in 2014-2015. Although, in the previous school years, the school attained a passing mean percentage score, the latter did not. Thus, the school may employ necessary interventions in order to sustain the accepted target mean percentage score of 75% by DepEd.

In the local arena, senior high school teachers in Bulusan Cluster have to be innovative and resourceful for the enhancement of teaching instruction. Some teachers brought textbooks from their own pockets and resort to the resources available online. In Bulusan High School, those who are teaching Earth Science share resources such as workbooks, teacher-made activity sheets, teaching guides, and others.

Furthermore, the need of learning materials in Earth Science for senior high school prompted the teacher-researcher to further enhance her contribution to the learning outcomes. Hence, the teacher-researcher thought of developing CLAS that can be used both by teachers and students in the teaching-learning process.

Moreover, this research aimed to improve student learning outcomes in Science of Grade 11 Senior High School students of Bulusan High School by utilizing teacher-made CLAS adapted from modules provided by the Department of Education. More importantly, the enthusiasm of the teachers to enhance the understanding of the students and the community as well on how to mitigate and adapt to these different hazards prompted the teacher-researcher to innovate and develop this study.

Statement of the Problem

This study aimed to develop, validate, and determine the effectiveness of the contextualized learning activity sheets in Earth Science for Grade 11 students at Bulusan High School, Division of Sorsogon Province, for the school year 2022- 2023.

Specifically, it sought to answer the following questions:

1. What learning materials in Earth Science could be developed along the following contents:
 - a. Geologic processes and hazards
 - b. Hydrometeorological phenomena and hazards; and
 - c. Marine and coastal processes and their effects
2. What is the validity of the developed learning materials based on DepEd LRMDs along:
 - a. Content
 - b. Format
 - c. Presentation and Organization
 - d. Accuracy
3. How effective are the developed contextualized learning activity sheets in improving the performance of the students along the identified topics in Earth Science?

II. METHODOLOGY

This study aimed to develop and validate the effectiveness of the contextualized learning activity sheets based on the performance in the pretest and posttest in Grade 11 Earth Science students of Bulusan High School, SY 2022-2023. Generally, the

developmental research method is the design in which this study was anchored.

In addition, the one-group pretest-posttest pre-experimental design was used to obtain the quantitative data, specifically to investigate the intervention pertaining to the utilization of the developed learning activity sheets. Also, this study was composed of 5 experts who validated the developed LAS using the validation tool adapted from DepEd LRMDs and 30 students as takers of the competency-based exam to test the effectiveness of the LAS. Further, the statistical tool employed in this research was the paired sample t-test.

The researcher conducted the study among grade 11 HUMSS students of Bulusan High School S.Y. 2022-2023 consisting of 30 students. On the other hand, five experts reviewed the Learning activity sheets; One University professor, two of them were Master teachers, and two science teachers teaching Earth Science for six years and above. In getting the target respondents, the researcher utilized her time and decided who would be the respondents. Grade 11 HUMSS students were utilized as the subject of the study.

The study used the following instruments: K-12 Curriculum Guide, (CG) Table of Specification (TOS) (Appendix E), Pretest/Posttest (Appendix F), Developed and Validated Learning Activity Sheets, Competency-based examination and DepEd Validation Tools for making instructional materials.

The Table of Specification (TOS) (Appendix E) showed equal distribution of items per skill/learning competency in the test. The included topics in Grade 11 Earth Science were Geological Processes and Hazards, Hydrometeorological Processes and Hazards, and Marine and Coastal Processes and their Effects.

Pretest/Post-test (Appendix F) is a forty-item multiple choice test that measures the learning gain/effect of the intervention. The teacher-made test was checked and validated by two (2) master teachers in Science and three (3) seasoned science teachers using an expert assessment tool (Appendix D). Most of them commented and suggested the parallelism of the test items to the learning competencies as well as to the revision of some questions to make them fit the target levels of skills. After some revisions were made to the pretest/posttest, the researcher consulted again the experts. Before the finalization, the researcher consulted her adviser for additional comments and suggestions.

After the finalization of the test, the test was readied for its dry run to determine its validity and reliability levels. The researcher requested permission from the school head to conduct a dry run. The letter of request to conduct a dry run was shown in Appendix A. A dry-run of the pretest was conducted on January 4, 2022, to 48 grade 12 GAS students who were not respondents to the study at Bulusan High School.

After the dry run, the researcher performed an item analysis to find out the number of items that need to be included, discarded, and revised. After the item analysis, out of the 80-item test on Grade 11 Earth Science, 40 items were removed from the test questions resulting in the final 40-item test (Appendix F). The final 40-item test was administered on January 09, 2022, to forty 48 Grade 11 GAS A students to test the reliability and acceptability of the teacher-made test using the Kuder-Richardson Formula 20 (KR20). The computed reliability coefficient was 0.701. This meant that the test questions were acceptable based on the scale adopted from the study of McGahee and Ball (2009). The learning activities and different assessment methods in the learning materials were adapted from the grade 11 Earth Science learning modules and other trade books in science.

The materials were developed in order to facilitate lessons using learning activity sheets that integrated the 7E's model such as Elicit, Engage, Explore, Explain, Elaborate, Extend and Evaluate. Elicit parts of the 7E's model are mostly composed of real pictures taken here in Bulusan

In conducting this research, permission was sought from the higher DepEd official from the Superintendent of Sorsogon Division, and from the principal of the school where the respondents are enrolled. The same permission is asked to all teachers concerned.

After the approval was granted, the researcher personally conducted the pretest on January 10, 2022, to the group. The respondents were given instructions on the manner of answering the test. They were given one hour to answer the 40-item multiple-choice test. The test papers and answer sheets were retrieved by the researcher right after the examination and the results were checked, recorded, and made available for statistical interpretation.

The class was scheduled at 4:00-5:00 PM. Orientation about the use of learning activity sheets was done in the first session using Learning Activity Sheet number

1. Upon meeting for instruction, the students engaged in a group discussion about the varied student-centered activities written in the Learning Activity Sheets. The identified topics learned by the respondents were geological processes and hazards, hydrometeorological phenomena and hazards, and marine and coastal process and their effects. These topics were taken from the K to 12 Curriculum Guide of DepEd.

After discussing all identified topics in natural hazards, mitigation, and adaptation posttest was administered on January 27, 2022, to the subject of the study. The respondents were oriented about the nature of the test. They were given enough time to answer the test questions. The test papers and answer sheets were collected right after the time had finished and subjected for checking and recording purposes. The data gathered were tallied, analyzed, and interpreted with the use of statistical tools to determine the level of performance and the difference in the performance in the pre-test and post-test. The entire duration of the activity lasted for 16 school days starting from the pretest to the posttest.

On the other hand, since the actual respondents developing the activity sheets were the science teachers, the researcher had a prior survey and interview with those concerned teachers regarding the topics in Earth Science. Through this, the importance of the topics in Earth Science about natural hazards, mitigation, and adaptation was revealed.

The checklists given to the evaluators were collected personally by the researcher. When all the data needed were retrieved, the researcher employed an appropriate statistical treatment and analysis.

The students' test results in the pre and post-tests were checked, tallied, analyzed, and interpreted. The weighted mean and t-test for dependent samples were used to determine the level of performance in the pretest and post-test. The researcher adopted the scale from DepEd Order No.8, s. 2015 to determine the performance level and description of the students in the pretest and post-test.

Performance Level	Description
96% - 100%	Outstanding
85% - 95%	Very Satisfactory
80% - 84%	Satisfactory
75% - 79%	Fairly Satisfactory
Below 75%	Did Not Meet the Expectations

To test whether there was a significant difference between scores in the pre-test and the post-test, the researcher employed paired t-test for dependent samples or paired sample t-test as a statistical tool.

III. RESULTS AND DISCUSSIONS

1. Development of Learning Activity Sheets

Contextualization is an important aspect of effective teaching and learning because it helps students understand the relevance of what they are learning, make connections between different concepts and skills, and develop critical thinking and problem-solving abilities.

This section discusses the development of contextualized learning activity sheets along the following topics a. geological processes and hazards, hydro-meteorological phenomena and hazards, marine and coastal processes and their effects.

The researcher created six contextualized learning activity sheets focused on Earth Science topics, designed to improve students' understanding and interest in the subject. The materials followed the 7Es instructional model, featuring parts such as eliciting, engaging, exploring, explaining, elaborating, evaluating, and extending. Studies have shown that using diagrams and pictures in the classroom can aid cognitive development and memory skills. Each activity sheet also contained the necessary components outlined in Regional Memorandum No. 86 s.2020, including learning skills from the MELC, objectives, activities, reflection, answer key, and reference. At the end of each topic, students were evaluated to encourage synthesis and reflection on the concepts learned and their application to everyday life.

Learning Activity Sheet 1

The Learning Activity Sheet (LAS) I entitled "Geologic Processes and Hazards Mitigation" focuses on teaching students about the various hazards brought by geologic processes and practical ways to cope with them through a contextualized approach. The LAS begins with an activity called "Identify Me," where students have to identify different geologic processes and their effects in their locality through pictures and guide questions. The LAS utilizes a contextualized approach throughout the learning process by providing hands-on experiences and activities that allow students to explore and apply concepts in meaningful and relevant ways. The LAS includes an explain and elaborate phase that covers essential learning competencies, and an evaluate phase

that challenges students to enumerate different hazards and their prevention. Finally, the extend phase requires students to make a poster to apply their understanding of the topic.

The LAS on Geologic Processes and Hazards Mitigation aims to enhance students' knowledge of geologic processes and the hazards they bring. The LAS utilizes a contextualized approach throughout the learning process, providing students with hands-on experiences and activities that allow them to apply concepts in meaningful ways. The LAS also covers essential learning competencies in the explain and elaborate phase and evaluates students' understanding of the topic in the evaluate phase. The extend phase requires students to make a poster to apply their understanding of the topic, developing their research, presentation, and critical thinking skills. Overall, the LAS provides an engaging and effective way to teach students about geologic processes and hazard mitigation.

Learning Activity Sheet 2

LAS 2 is about mapping the hazard-prone areas. To activate learners' interest in the topic, activities in elicit and engage part were provided. The contextualized approach takes place in this activity by letting the students locate their place and other places in Bulusan which are prone to geologic hazards.

Practical skills and real-life experience of the students are needed to accomplish the activity in the explore part as shown in plate 2. Hazards maps of Bulusan were provided, and the students were expected to trace the localities prone to hazards as shown in the photos. The pictures were obtained from the MDRRMO office and the concepts were taken from the internet sources and Earth science curriculum guide (CG) and teachers guide (TG). In the explain and elaborate phase as shown in plate 2, the proponent cited the meaning and highlighted the importance of the hazard map. The content of this phase was based on the curriculum guide and other ideas were taken from reliable sources from the internet.

In the evaluation phase, the learners were given the activities to be answered. The assessments provided were parallel to the activities. Illustrations and concepts were obtained from the MDRRMO office of Bulusan and from the internet respectively.

Learning Activity Sheet 3

The LAS on "Human Activities that Speed Up or Trigger Landslides" is an important lesson for students to understand the causes of landslides and how to

prevent them. The elicit and engage part of the lesson effectively encourages students to think critically and creatively about their own experiences with landslides. By allowing students to define the term based on their real-life applications, the researcher was able to tap into their prior knowledge and experiences, which is essential for effective learning. Furthermore, the use of hazard maps during the activity allows students to be more aware of the condition of their locality and the areas prone to landslides, promoting proper response and mitigation efforts for their safety and security.

The contextualized approach in the explore part of the lesson is also noteworthy. By relating the activity to the student's own experiences and using hazard maps from their municipality, the lesson becomes more relevant and meaningful to them. In the explain phase, the concepts were adopted from the curriculum guide, teaching guide, and module from the Department of Education, Region V, which ensures that the lesson aligns with the educational standards. Additionally, the use of illustrations on the different human activities that speed up landslides helps to attract the students' enthusiasm towards the topic.

Finally, the evaluate phase of the lesson provides an effective way to test the students' understanding of the topic. The assessment is based on the learning objectives and serves as a way to measure the student's progress and identify areas for improvement. Overall, the LAS on "Human Activities that Speed Up or Trigger Landslides" is well-structured, engaging, and effective in promoting student learning and understanding of the causes and prevention of landslides.

Learning Activity Sheet 4

LAS 4 was focused on the different types of hydro-meteorological hazards. In the elicit and engage phase, pictures and hazard maps were used to introduce the topic and guide the students. Asking questions was also used to increase their attention and focus. In the explore phase, maps were presented and guide questions were given for the students to discover their learning. Information in the explain phase was acquired from the curriculum guide and internet sources, and integration of the concepts was involved. Finally, a three-item identification and true or false type of test were made to evaluate the comprehension and learning of the students.

Overall, the LAS 4 aimed to educate students on the various hydro-meteorological hazards and how to identify them. The use of visual aids and questioning

strategies helped to enhance their learning and understanding. The evaluation activity was also done to assess their viewpoints and level of comprehension of the topic.

Learning Activity Sheet 5

In this lesson entitled "Coastal Processes," the teacher-researcher aimed to teach students about the various coastal problems and dangers that result from coastal erosion, submersion, and saltwater intrusion. The lesson began with the presentation of pictures showcasing the beautiful sceneries along the Bulusan coast to engage students in active participation during the discussion. The teacher then posed guide questions to elicit different ideas from the students. The explore phase involved three activities from the module provided by the Department of Education, Region V, which focused on the importance of coastal areas, types of coastal processes, and ways of coping with hazards brought by coastal processes. The explain and elaborate phases utilized concepts from the curriculum guide, teaching guide, and internet sources, which were discussed to enhance students' comprehension of the topic. Lastly, the evaluate and extend phases utilized multiple-choice and true or false tests to assess students' mastery of the lesson.

Furthermore, the lesson effectively engaged students in the learning process through various activities that catered to different learning styles. It also utilized different sources of information to enhance students' understanding of the topic. The assessment in the evaluate and extend phases ensured that students had a thorough understanding of the lesson's key concepts.

Learning Activity Sheet 6

The learning activity sheet entitled "Mitigation on the Impact of Land Development, Waste Disposal, and Construction of Structures on Control Coastal Processes" was developed to engage students in an active and lively learning environment. The activity was divided into four phases: elicit and engage, explore, explain and elaborate, and evaluation. In the elicit and engage phase, pictures were shown to be described by the students to connect the topic to the preceding lesson. Constructive ideas were stated based on the photos. The explore part showed the structures which help mitigate the impact of land development and other coastal structures. In the explain and elaborate phase, the researcher discussed the coastal processes that are inevitable occurrences driven by nature and amplified by human action. In the evaluation phase, questions

were constructed, and a graphic organizer was adopted from the learning module.

The study was based on the contextual learning theory by Hull (2019), which posits that learning occurs only when students process new information or knowledge in such a way that it makes sense to them in their own frames of reference. The developed learning activity sheets were aligned with the constructive learning theory, which prepares students for active and self-directed learning in academic life. Successful mitigation of coastal hazards requires preparedness by municipalities and individuals. Overall, the learning activity sheet provided an effective way to engage students in the topic and promote learning.

2. Validity of the developed learning materials based on DepEd LRMSDs.

The measurement of validity is significant before the wide use of the learning materials to ensure its readiness for utilization. Validity is crucial before utilizing instructional material because it ensures that the material accurately measures what is intended to measure. This is essential for ensuring that learners are receiving accurate information and that their learning outcomes are reliable. Without validity, the learning material may not be effective, and the learner’s progress may be hindered. This study used the Expert’s Validation Checklist (EVC) to obtain experts’ thoughts on the different aspects of the developed learning activity sheets in Grade 11 Science. The table below shows the mean rating obtained given by the experts.

Table 2A: Experts’ Rating on Content Quality

Factor A. CONTENT QUALITY	WM	DR
1. Content is suitable to the student’s level of development.	4.00	VS
2. Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended.	4.00	VS
3. Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem-solving, etc.	3.80	VS
4. Material is free of ideological, cultural, religious, racial, and gender biases and prejudices, helpfulness/teamwork/cooperation, respect, love of country, unity productive work, and honesty and trustworthiness.	4.00	VS
5. Material enhances the development of desirable values and traits such as (pride in being a Filipino, Scientific attitude and reasoning, desire for excellence, desire to learn new things and productive work.	4.00	VS
6. Material has the potential to arouse the interest of the target reader.	4.00	VS
7. Adequate warning/cautionary notes are provided in topics and activities where safety and health are of concern.	3.90	VS
Overall Weighted Mean	3.96	VS

Legend: WM- Weighted Mean DR – Descriptive Rating VS - Very Satisfactory

The result of the validation of the experts on the Content of the learning materials is shown in Table 2A. The findings were consistent with the findings of (Monding and Bunel’s,2021) study, which showed that the worksheets developed were effective instructional materials for teaching basic science 9 concepts. The instructional content for use in the school environment was appropriate and commendable, according to experts. Furthermore, as a result of their improved performance, the students were able to appreciate the

material in an interesting way through the developed worksheets.

As indicated by the weighted mean of 4, for indicators 1 and 6, the researcher believed that the learning activities were suited to the level of development of the students. Adapting instructional materials to their level of interest can help improve their learning outcomes and engagement with the materials.

Table 2B: Experts’ Rating on Format

FACTOR B. FORMAT	WM	DR
1. Prints		
1.1 Size of letters is appropriate to the intended user.	3.80	VS

1.2	Spaces between letters and words facilitate reading.	4.00	VS
1.3	Font is easy to read.	3.80	VS
1.4	Printing is of good quality (i.e. no broken letters, even density, correct alignment, properly placed screen registration).	3.70	VS
2. Illustrations			
2.1	Simple and easily recognizable.	3.90	VS
2.2	Clarify and supplement the text.	3.90	VS
2.3	Properly labeled or captioned (if applicable)	3.90	VS
2.4	Realistic/ appropriate colors.	3.90	VS
2.5	Attractive and appealing.	3.90	VS
2.6	Culturally relevant	3.90	VS
3. Design and Layout			
3.1	Attractive and pleasing to look at.	4.00	VS
3.2	Simple (i.e. does not distract the attention of the reader).	4.00	VS
3.3	Adequate illustration related to the text	3.90	VS
3.4	Harmonious blending of elements (e.g. illustrations and text).	3.90	VS
4. Paper and Binding			
4.1	Paper used contributes to easy reading.	3.80	VS
4.2	Durable binding to withstand frequent use.	3.90	VS
5. Size and weight of resource			
5.1	Easy to handle	4.00	VS
5.2	Relatively light	4.00	VS
Overall Weighted Mean		3.90	VS

Legend: WM- Weighted Mean DR – Descriptive Rating VS - Very Satisfactory

The respondents also agreed that the material was very satisfactory when comes to Format where teachers and students can use it properly and independently with a mean of 3.89, the format consists of essential parts such as print, illustrations, design and layout, paper and binding, and size and weight of resource. There was a slight correction on printing is of good quality with a weighted mean of 3.7. The items such as appropriate to

the intended user, adequate illustration in relation to the text, printing is of good quality, and durable binding to withstand frequent use obtained a weighted mean of 3.8 which is very satisfactory (VS). This implies that there was a slight problem in the prints, design, and layout, and paper binding. As indicated by the weighted mean, the researcher focused on these aspects when revising the learning activity sheets.

TABLE 2C: Experts' Rating on Presentation and Organization

FACTOR C. Presentation and Organization	WM	DR
1. Presentation is engaging, interesting, and understandable.	4.00	VS
2. There is a logical and smooth flow of ideas.	4.00	VS
3. Vocabulary level is adapted to the target reader's likely experience and level of understanding.	3.90	VS
4. Length of sentences is suited to the comprehension level of the target reader.	4.00	VS
5. Sentences and paragraph structure are varied and interesting to the target reader.	3.90	VS
Average	3.96	VS

Legend: WM- Weighted Mean DR – Descriptive Rating VS - Very Satisfactory

Meanwhile, Table 2C shows the weighted mean of indicators 1,2, and 4 which states that the presentation is engaging, interesting, and understandable, there is a logical and smooth flow of ideas and the length of sentences is suited to the comprehension level of the target reader respectively was 4.00 (VS). This clearly means that the experts perceived that the presentation

and organization were appropriate for Grade 11 students.

The result implies that the developed LAS can be effective in understanding basic concepts in Earth Science. It carried over the features and characteristics that would really help the users in the improvement of the teaching-learning process. The study verifies

Tabbers (2018) finding that the way information is presented and organized can have a significant impact on learning and persuasion. The study by Perez (2017) found that the organization and presentation the classes evaluated by students and instructors are highly accepted.

The above-mentioned studies are relevant to the present study since all dealt with the provision of instructional materials which are relevant, well presented, with clear language effective, and useful that will somehow help students in studying science. Using relevant instructional materials can help students stay motivated, understand concepts better, retain information longer, and receive differentiated instruction that meets their unique learning needs.

Meanwhile, slight errors in the vocabulary level and paragraph structures were observed, indicators 3 and 5 which have a weighted mean of 3.9. Using vocabulary that is within the learner’s level of competence and paragraph structures that is well organized are an important aspect of creating effective learning activity sheets, as these can improve comprehension, engagement, development, and confidence.

Therefore, proper indentation is an important aspect of formatting written work that helps to improve readability, organization, and professionalism. She argued that proper indentation lets students comprehend the content easily. (Nist, 2017). The researcher, knowing the significance of these observations, acted on the matter and made some necessary revisions to the output.

TABLE 2D: Experts’ Rating on Accuracy

FACTOR D. Accuracy	WM	DR
1. Conceptual errors.	3.90	VS
2. Factual errors.	3.90	VS
3. Grammatical errors.	3.90	VS
4. Computational Errors	4.00	VS
5. Obsolete information.	4.00	VS
6. Typographical and other minor errors (e.g. inappropriate unclear illustrations missing labels, wrong caption, etc.)	3.50	VS
Average	3.86	VS

Legend: WM- Weighted Mean DR – Descriptive Rating VS - Very Satisfactory

For Factor D: Accuracy it can be interpreted in the table that items pertaining to conceptual errors, factual errors, and grammatical errors obtained a general weighted mean of 3.86 very satisfactory. This means that slight corrections are made. Computational errors are not present in the tool. It obtained a perfect score of 4 described as not present. Whereas obsolete information

in item number five gained a perfect score of 4. Accuracy is crucial in developing learning activity sheets, as it helps to establish trust, enhances learning, reduces error, and promotes the application of learning. Therefore, it is essential to ensure that the information provided in learning activity sheets is accurate and reliable. (Huang and colleagues,2019)

TABLE 2E: Summary of Experts’ Rating

Criteria	Required Points	Points Earned	Remarks
A. Content Quality	21	27.70	Passed
B. Format	54	71.00	Passed
C. Presentation and Organization	15	20.00	Passed
D. Accuracy	20	23.70	Passed

With the given points and comments necessary for the improvement of developed learning activity sheets, content quality gained a total point of 27.70. According to LRMS Guidelines for Assessment and Evaluation, the resource must have a score of at least 21 out of 28 maximum points to pass. Therefore, the learning activity sheets are rated Passed along content quality.

Similarly, the Format gained a total point of 71 out of 72 which is the maximum point, it means that the materials made passed in this factor based on the expert’s validation.

Meanwhile, Presentation and Organization gained a total point of 20. Based on LRMS Guidelines for Assessment and Evaluation, the resource must have a

score of at least 15 points out of a maximum of 20 points to pass. This means that the resource material passed the validation of the experts.

Along with Accuracy, a total point of 23.70 was obtained. According to LRMS Guidelines for Assessment and Evaluation, the resource must have obtained 20 points to pass the evaluation. This means that the material passed the criteria.

However, all experts (100%) recommend the approval of the material for possible use in public schools provided that the corrections, and revisions included are made.

Hence, learning activity sheets had been revised based on the suggestions of the experts.

Table 2E summarizes the validity of the developed learning materials in terms of the aforementioned criteria.

It is clearly seen that the developed learning materials were very satisfactory in terms of the listed variables.

3. Effectiveness of the developed learning materials in improving the performance of the students in Earth Science.

Pretest and Posttest Performance of the Students. One of the major goals of the developed learning activity sheets is to enhance and enrich students' knowledge and skills in science specifically along natural hazards and mitigation. The lessons are intended for students who have difficulty answering the self-learning module or SMILE. The use of such contextualized learning activity sheets would help them cope with the instruction and consequently increase their level of performance. A 40-item teacher-made multiple-choice type of examination covering the three identified topics in earth science for grade 11 in the first quarter, SY: 2022-2023 was utilized to measure the performance of the students.

Finally, pretests and posttests were valuable tools for evaluating the effectiveness of learning intervention. By comparing the results of the pretest and posttest, educators can assess whether the intervention was successful in achieving its learning objectives, and make improvements for future iterations of the program. Table 3A shows the result of the pretest and posttest performance of the students.

Table 3A: Pretest and Posttest Performance of the Students

Topic	Pretest MPL	Description	Posttest MPL	Description
1. Geologic Processes and Hazards	63.33%	Did not meet the expectation	95.38%	Very Satisfactory
2. Hydrometeorological Processes and Hazards	70.00%	Did not meet the expectation	92.78%	Very Satisfactory
3. Marine and Coastal Processes and their Effects	62.22%	Did not meet the expectation	90.44%	Very Satisfactory
Over-all MPS	65.18%	Did not meet the expectation	92.87%	Very Satisfactory

The table above shows the results of the pre-test and post-test per topic administered to the HUMSS students. The mean of each test signifies that the student's performance increased at the end of the study. It is important to note that after the utilization of the developed learning materials obtained a high mean score.

Based on the mean percentage score, the score of the students on the pre-test was generally lower (65.18%) as compared with the result of their post-test (92.87%). This implies that the learning activity sheets may be effective in facilitating the learning process, and

students were able to assimilate and internalize the knowledge embedded in the instructional materials. Consequently, teachers utilized these materials as a tool for facilitating the learning process, with students playing an active role in their own learning while teachers act as facilitators of the educational process. It may represent the conceptual change in the students before and after utilizing the learning material.

Moreover, as experienced by the researcher during the employment of the developed learning materials, teacher-student interaction is very evident. Students showed interest during in-class group activities and

more importantly, they enjoy learning the topic. Teachers implemented strategies that could enhance the behavior of students like focusing on the class activities and time management, and adopting meta-cognitive strategies like providing feedback, assisting in reflection in pre-class learning, and group work facilitation in class. These were evident while employing the use of learning activity sheets.

According to Yap (2016) that contextual learning activities are effective in enhancing environmental education because they provide opportunities for learners to interact with their environment, observe and investigate local environmental issues, and develop

problem-solving skills. In addition, contextual learning activities help learners to develop a deeper understanding of the relationships between humans and the environment, and the impact of human activities on the environment.

Additionally, when students enjoyed their lessons, they were more likely to be motivated, engaged, and participate actively in class which can lead to improved academic performance. As stated by Reeve (2019), “Positive emotions, such as enjoyment, promote deep, engaged, and meaningful learning, and are likely to lead to enhanced academic achievement.”

TABLE 3B: Difference between the Pretest and Posttest Results of the Students along the Identified Topics

Statistical Bases	Topic 1 Geological Processes and Hazards	Topic 2 Hydrometeorological Processes and Hazards	Topic 3 Coastal Processes and Their Effects
Computed t-value	10.10	8.41	11.94
Decision on Ho	Reject	Reject	Reject
Conclusion	Significant	Significant	Significant

Legend: $\alpha=0.05$ $df= 29$ Critical Value = 2.045

Table 3B shows the difference between the pre-test and post-test results of the students. As reflected, the test value of 19.46 is greater than the critical value of 2.045 at a 0.05 level of significance with 29 degrees of freedom. Therefore, the null hypothesis was rejected. This means that there was a significant difference between the pretest and posttest performance of the students. This means that the posttest result is higher than the pretest result. It implies that the use of the developed learning materials may have improved students’ performance. According to Salehi, Aghababaei, & Hasani (2019) as revealed from their study that the use of learning material can significantly improve students’ learning achievement.

The table further shows that the students performed differently when they are exposed to learning activity sheets during the teaching proper. It showed that the post-test had better performances which may be attributed to the use of learning materials that might also facilitate the improvement of students’ performance.

The current analysis supports the results presented in Table 3B, which provides evidence for rejecting the null hypothesis, stating that there is no significant difference between the pretest and the posttest scores of the students. Furthermore, the study concludes that the

researcher-developed instructional materials may have a positive impact on the student’s academic performance. These findings suggest that the developed learning activity sheets are an effective tool for promoting performance and mastery levels in the subject.

The research demonstrates the value of incorporating instructional materials that are specifically designed to enhance students’ academic performance. The positive outcomes observed in this study underscore the importance of designing instructional materials that are tailored to meet the unique learning needs of students.

Additionally, the findings highlight the critical role that learning activity sheets play in facilitating the delivery of well-structured lessons, which can promote better learning. Finally, when instructional materials were used effectively, these sheets can enhance students’ learning outcomes and contribute to their overall academic success in earth science.

FINDINGS

Based on the analysis and interpretation of the data, the following findings were revealed.

1. Six (6) contextualized learning activity sheets in Earth Science were developed along a) Geologic processes and hazards b) Hydrometeorological

phenomena and hazards c) Marine and coastal processes and their effects.

2. The validation along content received the overall weighted mean of, which is interpreted as very satisfactory. The experts unanimously rated the six LAS with a weighted mean ranging from 3.86-4.00 which has a descriptive rating of very satisfactory. Along format, the overall weighted mean was 3.90, presentation and organization, 3.96, and accuracy gained a weighted mean of 3.86 which was interpreted as very satisfactory.
3. It revealed that at 0.05 level of significance and 29 degrees of freedom, the computed t-value of 10.10, 8.41, and 11.94 for topics Geological processes and hazards, hydrometeorological phenomena and hazards, and marine and coastal processes and their effects, respectively are higher than the critical value of 2.045. This meant that the null hypothesis was rejected. Therefore, the pretest and posttest performances of the group along the identified topics had a significant difference.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. The developed contextualized learning activity sheets in earth science were different hazards caused by geological processes, mapping the hazard-prone areas, human activities that speed up or trigger landslides, different hazards caused by hydrometeorological phenomena, coastal processes, and mitigation on the impact of land development, waste disposal, and construction of structures on control coastal processes. These LAS utilized 7E's which lead towards the attainment of most essential learning competencies.
2. The developed contextualized learning activity sheets are valid along content, format, presentation, organization, and accuracy based on DepEd LRMS.
3. The developed contextualized learning activity sheets in earth science showed a significant difference in the performance of the students as revealed in the pretest and posttest results in terms of lessons in Geological processes and hazards, hydrometeorological phenomena and hazards, and marine and coastal processes and their effects. The developed CLAS's, and adapted validation tool showed effectiveness in

terms of enhancing the level of performance of the students in Earth Science.

RECOMMENDATIONS

Based on the results and in the light of the findings and conclusions drawn, the following was recommended:

1. The developed contextualized learning activity sheets in earth science may be further enhanced through the integration of problem-based, project-based, and inquiry-based learning skills to improve the performance of the learners.
2. Constant modification and revision of the developed LAS may be done in teaching earth science to develop the desired learning competencies. Likewise, further validation using other tool and criteria are highly recommended.
3. The effectiveness of developed contextualized learning activity sheets may be further tested using pre and post-test assessments and expert reviews.
4. To support the teaching of different scientific disciplines across various academic strands and TVL strands in senior high school, future research on the development and validation of instructional materials is encouraged.

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