

Development of a Learning Packet in Biodiversity to Enhance Students' Conceptual Understanding

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Abstract

The study developed a learning packet in biodiversity as a supplementary instructional material in teaching the least learned competency in biodiversity for grade 10 students, with the purpose of enhancing their conceptual understanding in it. The supplementary instructional material provides self-regulated performance-based learning activities to engage students in the learning process. The developed learning packet was evaluated and rated very satisfactory with an overall average mean of 3.81 by five DepEd science teachers' evaluators using the adapted rating sheet for print resources by the department of education. Evaluators' comments and suggestions were incorporated for the enhancement of the developed learning packet. The results of the development of the learning packet about biodiversity as a supplementary instructional material will be clarify through three aspects. These included 1) determining the least learned competency, 2) determining the needs assessment, 3) development of activities in the learning packet, and 4) validation of the developed learning packet.

Keywords: biodiversity, learning packet, understanding

1. Introduction

The Department of Education's evaluation found insufficient mastery of basic science competencies among Filipino students, as evidenced by the Philippines' bottom rankings in PISA 2018 and TIMSS 2019 international assessments, with scores well below the participating countries' averages.

A significant factor contributing to low mastery in science, particularly biology, is the lack of core knowledge among students. Großschedl et al. (2014) noted that educators struggle to help students develop a solid understanding of the subject. Additionally, Santos et al. (2021) identified that grade 10 students had the least mastery in explaining how species diversity enhances adaptability and survival in changing environments, as well as in understanding evolution. The study attributed this low mastery to several factors, including insufficient prior knowledge, lack of interest, depression, inadequate computational skills, poor conceptual understanding, weak recall, and teachers' inability to cover lessons thoroughly due to time constraints.

In line with this, the Philippine education system has undergone significant changes driven by government policies, technological advancements, and societal factors aimed at enhancing teaching and learning. A key topic among educators, policymakers, and researchers is students' ability to direct their own learning despite time constraints. Researchers argue that self-regulation is crucial for effective learning, decision-making, problem-solving, and classroom management (Boekaerts & Corno, 2005). Consequently, a primary goal of modern education is to help students develop self-regulation skills that enhance their learning during school years (Sahranavard et al., 2018).

To address time constraints due to shortened class periods, the study developed a learning packet as a supplementary instructional material to support both teachers and students in the teaching-learning process. Instructional materials are essential for materializing teaching and learning. To achieve teaching-learning objectives, these materials must be carefully selected, prepared, and critically designed. Tety (2016) emphasized that instructional materials are key to teachers' and students' performance. The availability, adequacy, and relevance of instructional materials in classrooms can influence the quality of teaching, positively impacting students' learning and academic performance.

2. Objectives of the Study

This study was aimed at the following objectives:

- 2.1. To develop a learning packet as a supplementary instructional material in teaching and learning the least learned competency in science for grade 10 learners.
- 2.2. To validate the developed learning packet by the five science teachers from the Department of Education.
- 2.3. To provide teachers with a supplementary instructional material in teaching the least learned competency for Grade 10.

3. Method

The development of the learning packet about biodiversity as a supplementary instructional material, the researchers followed the following steps: (a) determining the least learned competency and its alignment in the most essential learning competency (MELCs), (b) determining the need assessment of the science teachers and school administrators, (c) development of the learning packet, (d) validation, and (e) revision of the developed learning packet.

The study both utilized the quantitative and qualitative methods of research in order to validate the quality of the development of a learning packet about biodiversity. The five teachers will also reflect the quality data to improve the learning packets regarding on the most essential learning competencies (MELCs). The five teachers' comments provided the information for determining the least learned competency, need assessment, learning activities about biodiversity, species diversity, importance of species diversity, and threats to biodiversity and ways to conserve it.

The five teachers will also evaluate the overview factors for quality of a learning packets through the rating sheet for printed resources adapted from the Philippines Department of Education. These factors included content, format (e.g. prints, illustrations, design and layout, paper and binding, size and weight of resources), presentation and organization, and accuracy and up-to-datedness of information. Then, each factor of learning packet interpretation will be categorized into four categories. These included 1) not satisfactory for factor average mean falling into 1.00 – 1.74, 2) poor for factor average mean falling into 1.75 – 2.49, 3) satisfactory for factor average mean falling into 2.50 – 3.24, 4) very satisfactory for factor average mean falling into 3.25 – 4.00.

4. Results and Discussions

The results of the development of the learning packet about biodiversity as a supplementary instructional material will be clarify through three aspects. These included 1) determining the least learned competency, 2) determining the needs assessment, 3) development of activities in the learning packet, and 4) validation of the developed learning packet.

4.1 Determining the Least Learned Competency and its Alignment in the MELCs

The content covered in the learning packet was anchored on the least learned competency in science 10 based on the study of Santos, et al (2021). Aligning this with the most essential learning competencies, the researchers created performance-based learning activities which will engage the students in the learning process thereby enhancing their conceptual understanding in the long run.

Table 1 Most Essential Learning Competency Determination for Learning Packet Development

Quarter	Content Standard <i>The learners demonstrate understanding of ...</i>	Performance Standard <i>The learners should be able to ...</i>	Most Learning Competencies (MELCs)	Essential Duration	Kto12 CG Code
3rd	1. The influence of biodiversity on the stability of ecosystems	Write an essay on the importance of adaptation as a mechanism for the survival of a species	Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments.	Week 7	S10LT-IIIh-41

4.2 Determining the Needs Assessment of the Science Teachers and School Administrators

The needs assessment was administered to three in-service science teachers and two school administrators which revealed the needs to develop a learning packet on the least learned competency in biodiversity for grade 10.

Table 2 Excerpts of the Key Informants' Responses in the Needs Assessment

Responses	Codes	Category
STNA1, STNA2, & STNA3: Explaining how species diversity increases the probability of adaptation and survival of organisms in changing environments.	Difficult competency to teach	Teaching Difficulties
STNA2: We need time to explain Biodiversity and incorporate into genetics to appreciate its value.	Comments/ Remarks	Teaching Difficulties
STNA3: The shortened period per subject makes it hard to reach this competency.		

Table 2 Excerpts of the Key Informants' Responses in the Needs Assessment (Cont'd.)

Responses	Code	Category
STNA1: In preventing the declining of all living things thru human activities.	Problems encountered in teaching biodiversity	Teaching Difficulties
STNA2: Teaching Biodiversity is nice especially if we have a lot of time for teaching. School activity that bothers us will hamper efficient teaching.		
STNA3: Due to short period we sometimes not able to reach this lesson in the quarter		
STNA1: Yes, it is just similar to ILMP which monitor the performance of the learners as an intervention. STNA2: Learning packets can be used for students who can manage learning without teacher in front of them. But for students that needs reading its difficult. STNA3: It is somewhat related to SLA. DCNA: Yes, it is a special study on a given topic for the learners to work on their own pace. SPNA: Like an intervention to aid learning.	Learning Packet Familiarity	Familiarity of the Learning Packet
STNA1: Best for teacher to increase the performance of students. STNA2: It is nice to have it especially if the students have many resources. STNA3: A good strategy. Provided resources are already ready to maximize the use of time	Performance-based Learning	Openness for performance-based Learning
STNA3: A good strategy. Provided resources are already ready to maximize the use of time. STNA1: Yes, when students need intervention. STNA2: Yes, if the students have the necessary resources needed. STNA3: Yes, because you can observe the learners' development, or there is a significant progress in their performance. DCNA: Yes, when there is a need for intervention for the learners. SPNA: Will depend upon teacher's decision.	Intervention	Openness for Learning Packet Utilization

The needs assessment from the school administrators (n=2), and science teachers (n=3) revealed that the most difficult competency to teach in science 10 was on “explaining how species diversity increases the probability of adaptation and survival of organisms in changing environments” which was in unison with the findings in the study of Santos, et al (2021). Accordingly, contributing factors leading to the difficulty in teaching this competency was due to shortened period, and other school related activities which resulted in failure to teach this competency and worst not being able to reach this part of the lesson considering it is on the last part of the third grading quarter. In light of these findings, key informants of the needs assessment expressed their openness to the utilization of a learning packet as a supplementary instructional material in teaching and learning the said least learned competency for science 10. The developed learning packet was crafted based on the most essential learning competencies provided by the department of education. The purpose of which is to allow the students to continue learning somewhat

independently from their teachers with the performance-based activities provided in the supplementary instructional material despite time constraints.

4.3 Development of Activities in the Learning Packet

After the competency to be covered was determined and aligned on the most essential learning competencies (MELCs), after the needs assessment was analyzed, the learning packet was developed.

Table 3 Most Essential Learning Competency Mapping of the Developed Learning Packet

Science Topic (Lesson Focus)	Most Essential Learning Competency	Scientific Learning Objectives <i>At the end of this lesson, the students are expected to ...</i>	Learning Activities
1. Biodiversity		Explain the concept of biodiversity.	Activity 1: <i>Objective Test</i> Activity 2: <i>Concept Mapping</i>
2. Species Diversity		Explain how species diversity promotes the probability of adaptation and survival of organisms in changing environments.	Activity 1: <i>Objective Test</i> Activity 2: <i>Outdoor Activity: Species Evenness versus Species Richness</i>
3. Importance of Species Diversity	Explain how species diversity increases the probability of adaptation and survival of organisms in changing environments.	Explain how important species diversity is in increasing the probability of adaptation and survival of organisms in changing environments.	Activity 1: <i>Slogan Making</i>
4. Threats to Biodiversity and Ways to Conserve It		Determine the threats to species diversity which affects their probability of adaptation and survival in changing environments and demonstrate the ways on how to conserve it	Activity 2: <i>Journal Writing: An Essay Activity Explaining their Slogan Output</i>

4.4 Validation of the Developed Learning Packet

After the learning packet was developed, it was then subjected for expert's validation in the presence of five in-service science teachers from the Department of Education in which evaluation revealed a "very satisfactory" result. The evaluation rating sheet for print resources used by the evaluators was adapted from the Department of Education.

Table 4 Learning Packet Evaluation Results by the In-service Science Teachers

Factors	Rating mean	Interpretation
1. Content	3.53	Very Satisfactory
2. Format		
2.1 Prints	4	Very Satisfactory
2.2 Illustrations	3.72	Very Satisfactory
2.3 Design and Layout	3.75	Very Satisfactory
2.4 Paper and Binding	4	Very Satisfactory
2.5 Size and Weight of Resources	4	Very Satisfactory
3. Presentation and Organization	3.87	Very Satisfactory
4. Accuracy and Up-to-datedness of Information	3.94	Very Satisfactory
<i>Overall Average Mean</i>	<i>3.81</i>	<i>Very Satisfactory</i>

The five in-service science teachers evaluated the learning packet in terms of its content, format, presentation and organization, and accuracy and up-to-datedness of information. The evaluation result revealed a “very satisfactory” evaluation.

4.5 Revision

From the evaluation rating sheet for print resources used to evaluate the learning packet, the researchers analyze and synthesize the comments and suggestions of the evaluators to improve and revise the content, format, presentation and organization, and accuracy and up-to-datedness of information.

5. Conclusion

The developed learning packet had an overall average mean of 3.81 which had a very satisfactory interpretation, the highest interpretation rating with respect to the adapted evaluation rating sheet for print resources. In-service science teachers evaluated the learning packet in terms of the following factors: (a) content, (b) format which was subdivided into five aspects: (b.1) prints, (b.2) illustrations, (b.3) design and layout, (b.4) paper and binding, and (b.5) size and weight of resources were rated and interpreted as very satisfactory by the evaluators.

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References

Ajoke, A. R. (2017). The Importance of Instructional Materials in Teaching English as a Second Language. *International Journal of Humanities and Social Science Invention*, 6, 36-44. <http://www.ijhssi.org>

Boekaerts, M., & Corno, L. (2005). Self-Regulation in the Classroom: A Perspective on Assessment and Intervention. *Applied Psychology: An International Review*, 54(2), 199–231. <https://doi.org/10.1111/j.1464-0597.2005.00205.x>

Department of Education 2015 Evaluation Rating Sheet for Print Resources.
https://deped-ne.net.ph/wp-content/uploads/2022/05/DM_No_167_s_2021-Evaluation-Rating-Sheets-for-Learning-Resources.pdf

PISA 2018 National Report of the Philippines.
<https://www.deped.gov.ph/wpcontent/uploads/2019/12/PISA-2018- Philippine-NationalReport.pdf>

Großschedl, J., Mahler, D., Kleickmann, T., & Harms, U. (2014b). Content-Related Knowledge of Biology Teachers from Secondary Schools: Structure and learning opportunities. *International Journal of Science Education*, 36(14), 2335–2366. <https://doi.org/10.1080/09500693.2014.923949>

Santos, J. T. D., Lim, R. R., & Rogayan, D. V. Jr. (2021). Least mastered competencies in biology: Basis for instructional intervention. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 7(2), 208-221. <https://doi.org/10.22219/jpbi.v7i3.17106>

Tety, John Lawrence (2016) Role of Instructional Materials in Academic Performance in Community Secondary Schools in Rombo District". Masters thesis, The Open University of Tanzania. <http://repository.out.ac.tz/id/eprint/1829>

Sahranavard, S., Miri, M. R., & Salehiniya, H. (2018). The relationship between self-regulation and educational performance in students. *Journal of Education and Health Promotion*, 7(1), 154. https://doi.org/10.4103/jehp.jehp_93_18