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ORCID ID: <https://orcid.org/0000-0001-6884-3504>

Culture-Based Lesson Exemplar (CBLE) on least mastered learning competencies in science 4

Lovely Joy G. Simon: Instructor I, Mariano Marcos State University, Laboratory Elementary School
Virgilio Ericson G. Baptista: Head Teacher VI, Ilocos Norte College of Arts and Trades, Schools Division of Ilocos Norte

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ABSTRACT

This study presents the development of a Culture-Based Lesson Exemplar (CBLE) in Science 4, strategically tailored to address the least mastered learning competencies, with the aim of elevating learners' proficiency. Employing a Research and Development (R&D) methodology, the research conducted an actual count of Public Grade 4 Science teachers from the Schools Division of Ilocos Norte (SDOIN), Schools Division of the City of Batac (SDCB), and Schools Division Office of Laoag City as its respondents. To address the research objectives, three research instruments were employed: a survey-questionnaire, content validation, and a level of acceptability assessment. The CBLE in Science 4 is meticulously crafted to facilitate teachers' guided comprehension of scientific concepts and enhance Grade 4 pupils' mastery of the subject matter. This instructional material seamlessly integrates local icons, narratives, resources, and scenarios that reflect the rich Ilocano culture while preserving the core scientific concepts. The CBLE underwent rigorous content validation, encompassing objectives, content alignment, values formation, technical attributes, and instructional quality. Furthermore, its level of acceptability was gauged through the input of a group of end-users. The research findings indicate that the proposed CBLE demonstrates very high validity and garners a high level of acceptability. Consequently, this meticulously developed material serves as an invaluable supplementary resource for educators aiming to enhance the mastery, performance, and comprehension of Grade 4 learners in science. The validation process yielded an overall mean rating of 4.75, affirming the practical utility and quality of the developed material for educational purposes.

JEL Classification: D23; O15

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Introduction

In response to global demands for effective science education and considering the Philippines' underperforming status in international educational assessments, this study aimed to address the critical

* Corresponding author. ORCID ID: 0000-0002-9693-1541

need for innovative teaching approaches (Latham, 2012). The research sought to bridge the gap between past classroom practices and students' previously low academic achievement by introducing a Culture-Based Lesson Exemplar (CBLE) in science 4. The CBLE leveraged the contextualization and localization principles outlined in RA 10533, utilizing the rich tapestry of Ilocano culture to enhance learners' engagement and comprehension of scientific concepts.

While cultural integration proved to be a promising strategy, it also underscored the necessity for teacher development in contextualization (Papaieronymou, 2011). The study originated from the researcher's first-hand experience as a teacher, identifying the challenges faced in Grade 4 instruction and recognizing the pressing need for culturally grounded pedagogical approaches to ignite students' interest and improve their understanding of science.

Literature review

The purpose of the literature review is to expand and deepen the understanding of the concept and theories of the current study which will help establish the theories of the study to be investigated. The result of the review is presented thematically according to the theme of the current study.

Culture-based education

The concept of cultural education has undergone significant development in response to the historical legacy of Western colonial education and its profound impact. Researchers have employed diverse terminologies to characterize culture-oriented education, emphasizing its intrinsic connections to the principles of respect, appropriation, and cultural sensitivity (Gay, 2010). In the contemporary educational landscape, a fundamental imperative is the recognition of diverse perspectives, skills, and cultural richness. This imperative aims to cultivate a learning environment that not only acknowledges but actively respects and integrates this diversity (Singh & Espinoza-Herold, 2019).

Culture-based education as a tool for learning

Culture plays a pivotal role in shaping thought and equipping individuals with diverse tools for understanding the world. Learning experiences that hold personal meaning and significance are crucial for effective education. Students are more engaged with content that resonates with their cultural background (Pecson, 2014).

Historical perspectives on culture-based education:

Visionary leaders such as Mahatma Gandhi and Julius Nyerere discerned the transformative potential of culture-based education in achieving political autonomy. Gandhi fervently advocated for the adoption of Indian culture-based education to supplant the British system, emphasizing the importance of practical knowledge and local skills (Khubchandani, 2018). Similarly, Julius Nyerere implemented a parallel model in Tanzania, with a focus on self-employment training and mother-tongue instruction. The evolution of culture-based education has since unfolded in nuanced ways to address the unique cultural contexts across regions (Singh & Espinoza-Herold, 2019). This historical perspective sheds light on the

enduring relevance and adaptability of culture-based educational approaches in diverse socio-political landscapes.

The impact of culture-based education

Numerous studies have consistently shown that Culture-Based Education (CBE) has the potential to elevate critical awareness, foster respect for diversity, and enhance interpersonal relationships, all while promoting cultural knowledge (Singh & Espinoza-Herold, 2019). UNESCO (n.d.) has consistently advocated for the integration of indigenous knowledge into education, aiming to advance cultural diversity and encourage the active participation of minority communities. These findings underscore the importance of incorporating cultural perspectives into educational frameworks to promote holistic development and inclusivity.

Cultural responsiveness in education

Cultural responsiveness is characterized as the capacity to understand and appreciate individuals from one's own culture as well as other cultures (NCCA, 2019). It is imperative for teachers to undergo training in cultural awareness to establish a classroom atmosphere where students feel esteemed and motivated to engage in learning (Educators Team at Understood, n. d.). This approach not only cultivates a sense of belonging for students from diverse backgrounds but also facilitates effective communication among teachers, students, and parents. Such cultural competence in education is essential for creating inclusive and supportive learning environments.

Advantages of Culturally Responsive Teaching (CRT)

Culturally Responsive Teaching (CRT) offers substantial benefits to students by advocating for student-centered learning, preventing narrow-minded teaching, and fostering cultural competence. CRT is well-aligned with the principles of Universal Design for Learning (UDL), thereby ensuring equitable learning opportunities for all students. Moreover, CRT facilitates students' understanding of diverse perspectives, appreciation for the strengths of others, and the development of empathy. This integrated approach not only enhances educational inclusivity but also cultivates a more holistic and empathetic learning environment (Educators Team at Understood, n.d.)

Cultural competence in education

Cultural competence entails the ability to comprehend, interact, and communicate effectively with individuals from diverse cultural backgrounds. Culturally responsive teaching exemplifies cultural competence through pedagogical approaches that recognize diversity and cater to the learning needs of students from various cultural backgrounds. The cultivation of cultural competence contributes to the establishment of an inclusive classroom environment, fostering a sense of belonging and promoting national identity (Perso & Hayward, 2015).

The significance of culture-based education

Culture is recognized as the cornerstone of education, playing a pivotal role in cultivating a sense of belonging, identity, and community participation. Education rooted in culture offers students a profound

understanding and appreciation of their cultural heritage, history, and artistic expressions. This approach empowers students to evolve into global citizens while fostering a sense of passionate nationalism and patriotism. Embracing culture in education not only enriches the learning experience but also contributes to the development of well-rounded individuals with a deep connection to their roots and a broader perspective on the world (Significance of Culture-based Education, 2014).

The integration of culture-based education

In the Philippines, culture-based education is an integral component of the curriculum, underscoring the significance of culture in the teaching and learning process. This educational approach establishes a crucial connection between cultural values and the educational framework, fostering a sense of national pride and identity. By incorporating cultural elements into the curriculum, the Philippines recognizes the profound impact of cultural awareness on the holistic development of individuals and the cultivation of a strong national identity (Significance of Culture-based Education, 2014).

Role of science in the curriculum

In the Philippines, the K-12 Enhanced Basic Education Curriculum integrates science and technology into various facets of life, encompassing the social, economic, personal, and ethical dimensions. This curriculum actively promotes a robust interconnection between science and technology while also emphasizing the preservation of cultural heritage. The integrated approach aims to ensure that students not only acquire scientific and technological knowledge but also understand the broader implications and applications of these fields within the context of their culture and society (DepEd, 2016).

Scope of elementary science curriculum

The elementary science curriculum in the Philippines places a strong emphasis on cultivating fundamental skills of scientific inquiry. This approach enables students to apply their acquired knowledge to maintain good health, protect the environment, and implement safety measures. The curriculum is structured around two key stage standards, both aimed at fostering the development of essential scientific skills among students. This framework ensures that students not only acquire theoretical knowledge but also gain practical and applicable skills for real-world (DepEd, 2016).

Contextualization in teaching and learning

Contextualization is the process of presenting lessons within a meaningful and relevant context, aiming to enhance student engagement and understanding. This approach aligns seamlessly with the preservation of culture, local history, and identity. By embedding educational content in a context that resonates with students' lives and surroundings, contextualization not only deepens comprehension but also contributes to the preservation and appreciation of cultural heritage. This approach acknowledges the importance of connecting learning to students' lived experiences and broader cultural contexts (Gavilan College, 2013).

Localization in teaching and learning

Localization is the process of adapting education to the local context and values, with the aim of promoting local relevance and autonomy in education (Wang, 2016). This approach encourages a strong connection between schools and local communities, fostering self-determination in education and shaping learners' qualities for active learning. By integrating local perspectives and values into the educational framework, localization not only enhances the relevance of education but also empowers communities to actively participate in and influence the learning process. This approach acknowledges the importance of tailoring education to the unique characteristics and needs of the local environment (Geo-Jaja, 2016).

The relevance and benefits of contextualization and localization

The mandate of the Department of Education (DepEd) to protect and promote culture-based education aligns seamlessly with the principles of contextualization and localization, emphasizing the crucial role of culturally relevant and responsive education. These approaches empower students and communities, enabling them to take a more active role in their educational journey (Geo-Jaja, 2016). Localization and contextualization of the curriculum offer a myriad of valuable benefits in education. These advantages encompass increased cultural sensitivity achieved through the incorporation of local cultural elements. Furthermore, they enable personalization to cater to individual student needs and backgrounds (Tomlinson & Masahura, 2014). Additionally, these approaches facilitate easy access to relevant resources and materials aligned with students' environments, thereby enhancing the curriculum's relevance to their daily lives and fostering ownership of the learning process among educators and the local community (Smith, 2016). Moreover, these approaches enhance student engagement by connecting learning to real-world situations, improve memory and understanding of concepts by relating them to students' experiences, and positively impact learner performance, leading to proficiency in subjects (Ballesteros, 2015; Satriani, Emilia, & Gunawan, 2012). They also promote lifelong learning outcomes and address the needs of 21st-century learners, making education comprehensive and adaptable (De Lara, 2017).

Finally, when integrated with localization and contextualization, culture-based activities lead to higher achievement as they render science concepts and skills more relevant, suitable, and systematically organized for improved comprehension and retention (Tumaneng, 2010). In summary, the adoption of these educational strategies not only respects and preserves cultural heritage but also enhances the overall effectiveness and inclusivity of the educational system.

Conceptual framework

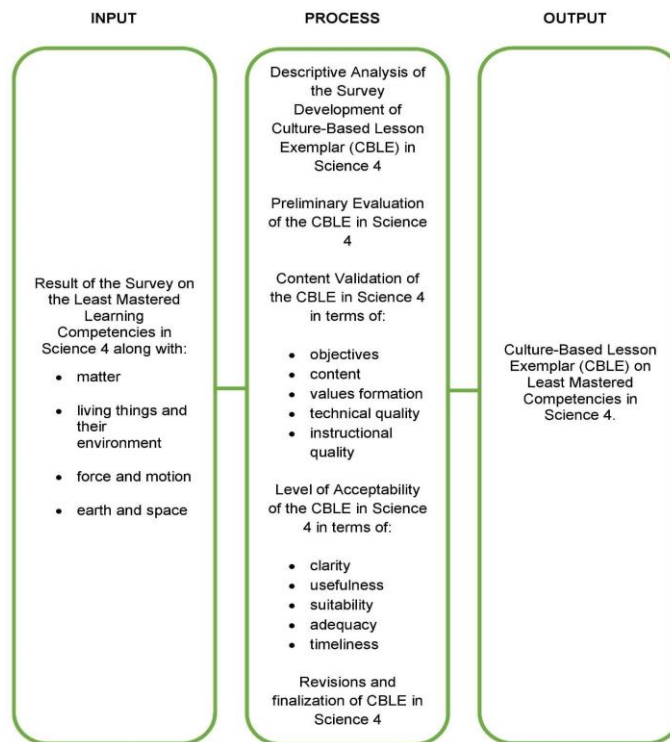


Figure1: The study's conceptual framework follows the Input-Process-Output (IPO) model. The research yielded a validated Culture-Based Lesson Exemplar targeting the least mastered learning competencies in science 4.

Statement of the problem

This study developed a Culture-Based Lesson Exemplar (CBLE) for the least mastered learning competencies in science 4.

Specifically, it answered the following questions:

1. What are the least mastered learning competencies in science 4?
2. What material can be developed to improve the least mastered learning competencies of learners?
3. What is the content validity of the CBLE in terms of:
 - a. objectives;
 - b. content;
 - c. values formation;
 - d. technical quality; and
 - e. instructional quality?

4. What is the level of acceptability of the CBLE in terms of:
- a. clarity;
 - b. usefulness;
 - c. suitability;
 - d. adequacy; and
 - e. timeliness?

Research methodology

This section outlines the research design and stages employed to develop a validated Culture-Based Lesson Exemplar in Science 4, including data sources, population and sampling, data collection procedures, and tools for data analysis, while presenting a detailed breakdown of each stage in the research and development (R&D) process.

Research design

This study employed the Research and Development (R&D) model, consisting of three stages: planning, development, and validation, which provides a comprehensive view of the situation, justifies current practices, identifies issues, and describes variable relationships (Cristobal & Cristobal, 2015). This design was well-suited for guiding the development of a Culture-Based Lesson Exemplar aimed at enhancing Grade 4 learners' mastery of Science 4 competencies.

Locale of the study

This study was conducted in the Schools Division of the City of Batac (SDCB), Schools Division Office of Laoag City (SDOLC), and Schools Division of Ilocos Norte (SDOIN). These three schools' division include elementary schools where the pool of respondents was derived.

Population and sampling

This study targeted Grade 4 Science teachers from the Schools Divisions of the City of Batac (SDCB), Schools Division Office of Laoag City (SDOLC), and Schools Division of Ilocos Norte (SDOIN) during the 2020-2021 school year. Initially aiming for a total enumeration of all 379 public Grade 4 science teachers, it encountered challenges due to the ongoing health crisis. Only 300 teachers were able to respond, resulting in a 79.16% response rate. This lower rate is attributed to movement restrictions and limited internet connectivity, particularly in remote areas. Consequently, the study adopted a sampling method based on the actual count.

Data gathering instruments

The study employed three primary data collection tools. Firstly, an electronic survey checklist was utilized to gather information on the least mastered learning competencies in Science 4. This checklist consisted of two parts: Part I focused on gathering teacher profile data, while Part II evaluated learner mastery using a 3-point Likert scale. Secondly, a content validation instrument was employed to assess the Culture-Based Lesson Exemplar's content validity across five components. Lastly, an Evaluation Instrument was used to gauge the acceptability level of the lesson exemplar, concentrating on the least

mastered competencies in Science 4. This instrument comprised five components: clarity, usefulness, suitability, adequacy, and timeliness, with respondents rating each component on a five-point scale, ranging from one indicating the lowest level to five indicating the highest level of validation. The rating scale for the Evaluation Instrument was adapted from a previous study by Natividad (2020), with some item revisions made to align with the study's specific objectives.

Statistical treatment of data

This study used frequency counts, percentages, and means with qualitative descriptions. Meanwhile, the perception of public grade 4 science teachers on the mastery level of their pupils in the different learning competencies was analyzed and interpreted using the range of means and descriptive interpretation below:

<i>Range of Means</i>	<i>Descriptive Interpretation</i>
2.51 - 3.00	<i>Mastered</i>
1.51 - 2.50	<i>Nearly Mastered</i>
1.00 - 1.50	<i>Least Mastered</i>

The range of means with the corresponding descriptive interpretation was used to analyze and interpret the content validity of the Culture-based Lesson Exemplar (CBLE) in Science 4 as shown below:

<i>Range of Means</i>	<i>Descriptive Interpretation</i>
4.51-5.00	<i>Very Highly Valid (VHV)</i>
3.51-4.50	<i>Highly Valid (HV)</i>
2.51-3.50	<i>Moderately Valid (MV)</i>
1.51-2.50	<i>Slightly Valid (SV)</i>
1.00-1.50	<i>Not Valid (NV)</i>

Finally, the following range of means with their corresponding descriptive interpretations was used to determine the CBLE's level of acceptability.

<i>Range of Means</i>	<i>Descriptive interpretation</i>
4.51 – 5.00	<i>Very Highly Acceptable (VHA)</i>
3.51 – 4.50	<i>Highly Acceptable (HA)</i>
2.51 – 3.50	<i>Moderately Acceptable (MA)</i>
1.51 – 2.50	<i>Slightly Acceptable (SA)</i>
1.00 – 1.50	<i>Not Acceptable (NA)</i>

Ethical procedures

The research began after the ethics committee reviewed and approved the paper to ensure it followed ethical guidelines and would not cause harm to people or the environment.

Data presentation and analysis

The presentation of the findings followed the arrangement of the statement of the problem.

1. What are the least mastered learning competencies in Science 4?

Table 1. Summary of least, mastered competencies in science

Content area	Composite mean	Descriptive interpretation
Matter	2.49	NM
Living things and their environment	2.22	NM
Force and motion	2.24	NM
Earth and space	2.25	NM
Overall Mean	2.30	NM

Legend:

Range of Means	Descriptive interpretation
2.51 – 3.00	<i>Mastered (M)</i>
1.51 – 2.50	<i>Nearly Mastered (NM)</i>
1.00 – 1.50	<i>Least Mastered (LM)</i>

Table 1 summarizes competencies, showing a general rating of nearly mastered with an overall mean of 2.30. Achieving mastery requires additional effort, emphasizing the importance of localizing the curriculum. Contextualization emerges as a potent teaching strategy, fostering active student learning by connecting ideas to real-life experiences.

Summary of results on teachers' evaluation of students' level of mastery on Smith's (2016) study underscores the benefits of this approach, emphasizing students' responsiveness, increased engagement when lessons directly relate to their lives, and the broader applicability for parents, pupils, and the community. A shift is advocated, moving beyond simplistic book provision to a deeper understanding of the connection between learners' lived experiences and the social context embedded in educational materials.

2. What material can be developed to improve the least mastered learning competencies of learners?

The study ventured in the development of contextualized lesson exemplars in Science 4 containing the perceived least mastered learning competencies. The material integrated the local cultural icons in Ilocos Norte for the learners to fully understand the scientific concepts. Localizing the lesson deepens understanding by connecting the experiences of the learners to the concepts being discussed.

3. What is the content validity of the CBLE in terms of:

- a. objectives;
- b. content;
- c. values formation;
- d. technical quality; and
- e. instructional quality?

Table 3. Summary of content validity of CBLE

Indicators	Mean	DI
a. objectives	4.63	VHV
b. content	4.66	VHV
c. values formation	5.00	HV
d. technical quality	4.74	VHV
e. instructional quality	4.73	VHV
Overall Mean	4.75	VHV

Legend:

<i>Range of Means</i>	<i>Descriptive Interpretation</i>
4.51-5.00	<i>Very Highly Valid (VHV)</i>
3.51-4.50	<i>Highly Valid (HV)</i>
2.51-3.50	<i>Moderately Valid (MV)</i>
1.51-2.50	<i>Slightly Valid (SV)</i>
1.00-1.50	<i>Not Valid (NV)</i>

The CBLE's objectives receive a very high overall validity rating of 4.75, with specific and student-centered objectives scoring the highest mean of 4.80. This emphasizes the transformative impact of student-centered activities on teaching. The content evaluation yields a highly valid composite mean of 4.66, with indicators highlighting exceptional validity, aligning with DepEd's aim of promoting scientific education for informed citizenship. Validation of intervention materials achieves a perfect composite mean of 5.00 for value formation, highlighting its suitability for Science 4 instruction. Additionally, the technical and instructional qualities of the CBLE attain a very high validity rating of 4.74 and 4.73 respectively, attributed to its engaging nature and effective use of visuals for information retention and real-life application.

4. What is the level of acceptability of the CBLE in terms of:

- clarity;
- usefulness;
- suitability;
- adequacy; and
- timeliness?

Table 4. Summary of acceptability of the CBLE

Indicators	Mean	DI
a. clarity	4.32	HA
b. usefulness	4.46	HA
c. sustainability	4.44	HA
d. adequacy	4.31	HA
e. timeliness	4.32	HA

Composite Mean	4.37	HA
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Legend:

<i>Range of Means</i>	<i>Descriptive interpretation</i>
4.51 – 5.00	<i>Very Highly Acceptable (VHA)</i>
3.51 – 4.50	<i>Highly Acceptable (HA)</i>
2.51 – 3.50	<i>Moderately Acceptable (MA)</i>
1.51 – 2.50	<i>Slightly Acceptable (SA)</i>
1.00 – 1.50	<i>Not Acceptable (NA)</i>

The CBLE excels in clarity with a composite mean of 4.32 as shown in Table 4, offering clear presentation and contextualized elements. It proves highly useful, scoring 4.46, facilitating effective teaching and learning. The intervention plan receives positive scores for suitability (4.31 to 4.55) and adequacy, emphasizing alignment with user needs and appropriate skill development. In terms of contextualization and localization, the material achieves a mean of 4.32, employing relevant activities and timely assessments, echoing career and technical education practices, emphasizing real-world connections.

Results and discussion

The study reveals a nearly mastered competency level in the Matter domain for Grade 4 pupils, with indicators 4, 5, and 6 rated as nearly mastered, and indicators 1, 2, and 3 classified as mastered. In the context of Living Things and Their Environment, a strong understanding is indicated, with all indicators, except for one, falling under the nearly mastered category. A similar trend is observed in the domains of Force, Motion, and Energy, as well as Earth and

Space Competency, suggesting familiarity with the subject matter but room for improvement in mastery levels. To address this, contextualized lesson exemplars were developed, integrating local cultural icons in Ilocos Norte to deepen understanding and relevance. The validation of the Competency-Based Learning Material (CBLE) highlights its high validity and suitability as an instructional tool, with particular emphasis on specific and student-centered objectives. Additionally, the technical qualities of the CBLE contribute to effective information retention and application. The study underscores the importance of contextualization and localization in science education, with recommendations for further exploration of teaching strategies and ongoing professional development for teachers to enhance instructional practices and student outcomes.

Conclusions

The study reveals a generally high competency level among Grade 4 pupils in science, highlighting the need for improved connections between scientific concepts and students' lives. Contextualized lesson exemplars, integrating local cultural icons, offer promise for deepening understanding. The Competency-Based Learning Material (CBLE) demonstrates high validity and acceptability, emphasizing its potential effectiveness in enhancing science education. Contextualization and

localization are crucial for curriculum relevance, with recommendations including ongoing implementation and refinement of contextualized lesson exemplars and professional development for teachers. Future research should explore the long-term impact of contextualized learning materials and continuously assess teaching strategies for sustained improvements in science education outcomes.

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All authors agree to publish the paper and there conflicting of interest.

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