

The Use of Culture-Based Module Integrating Folk Hunting Practices in Cagraray Island, Philippines for Teaching Biodiversity

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Abstract

Students assimilate learning when they see strong connection between their prior knowledge and the new information. The trend of culture-based education is grounded on the practices of inclusive education where students must feel the sense of belonging inside the classroom by using their cognitive structure, their culture, as a medium for instruction. Founded on the existing accounts in the literature, this study aims to use the developed culture-based module integrating folk hunting practices of *Cagraray* island, Philippines for teaching Biodiversity. It was implemented to 2 Grade 9 sections through quasi-experimental design at Cawayan National High School. The data revealed significantly higher scores in experimental group ($p < 0.05$) than the control group indicating effectiveness of the developed culture-based module vis-à-vis the module prescribed by Department of Education (DepEd). Likewise, positive attitude was developed for culture-based learning in the experimental group. An educational framework culled from the findings of the study suggested the need to incorporate activities that produce concrete evidences to calibrate motivation, scaffold learning, and correct misconceptions. The study concluded the efficacy of culture-based module in developing students' conceptual understanding and attitude for learning. It is recommended to venture on other facets of culture with relevance and entry points in lesson development across fields of learning.

Keywords: Culture-Based Education; Cagraray island; Hunting; Inclusive Education; Biodiversity; Modules.

1. Context of the Study

Science education is perceived as a relevant aspect of personal, civic, and economic lives [1]. Its assessment is necessary to communicate the expectations and attainment of expected outcomes via measuring the degree of scientific learning.

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Bombarded with local and international assessments, science has been one of the critical areas that is always measured to ensure that everyone works at par with the standards of the policy. In Philippines, science is considered as one of the subject waterloos. National Achievement Test (NAT) test scores consistently ranked science as the least mastered discipline among 6 assessed learning areas from 2004 to 2012 [2]. Consistent with this report, result of the recently concluded 2019 Trends in International Mathematics and Science Survey (TIMSS) ranked the Philippines at the bottom among 58 participating countries both in science and in mathematics [3]. Despite the amplification of science instruction throughout the world, the Philippines constantly lagged behind following the results from many national and international assessments. Numerous attempts have also been made to bring change into the way science is taught while proposals for remodeling science teaching are adapted to improve academic learning [4,5]. One proposal was the implementation of K-12 curriculum in response to the preceding failure of Philippines in 2003 TIMSS [6]. With the aim for enhancing the quality of basic education in the country, the K-12 curriculum encourages the use of teaching strategies like the integration of culture-based approach across all instructions. In fact, the K-12 curriculum is culture-friendly [7].

1.1 Theoretical Underpinnings of Culture-Based Instruction

In the field of psychology, culture-based learning is supported by Piaget's theory asserting that assimilation of learning occurs when the new experience/information is relevant to the schema of the child [8]. In science education, this assumed that instruction must always makes use of whatever is known to the learner dealing with the child's culture as medium of instruction. In fact, reference [9] contended that *"It is important for science educators to understand the fundamental, culturally based beliefs about the world that learners bring to the class, and how these beliefs are supported by learner's cultures, because science education is successful only to the extent that science can find a niche in the cognitive and socio-cultural milieu of learners"*. Giving premium to the active role of culture as an aid in developing scientific learning among students, the use of culture in designing instruction also advocates for inclusive education. This further indicates the need to probe on existing cultural practices to contextualize lessons in science for students to establish connection to the lessons.

1.2 Literature and Related Works

In Cagraray island, the culture is enriched with practices passed from different generations. Dominantly under Municipality of Bacacay, the island is connected to the mainland area by a bridge spanning the narrowest portion of Sula Channel [10]. Due to its geographical location and isolation, it has brought the island with colorful cultural practices which include food preparation, farming and fishing practices, folk medicine, indigenous weather forecasting, and hunting practices [11]. One research attempt was made on integrating the fishing practices of Cagraray island in lesson development where findings concluded the progress of conceptual understanding of students and their cultural appreciation [12]. Furthermore, the pool of literature has already testified for the effectiveness of culture-based instruction in developing conceptual understanding like studies integrating farming practices [13], dances [14], music [15], legend [16], and festival activities and games [17]. Though the present study follows a parallel attempt on using hunting practices for module development, it has been long encouraged by Department of Education to use culture in designing lessons and teaching materials.

To this day, prepared self-learning modules were context-based [18] but there is a limited resource for culture-based modules since it requires thorough and specific ethnography of the school locale. One of the secondary public schools located in Cagraray island is Cawayan National High School which serves as the biggest catchment school of more than 11 surrounding *barangays*. Represented by different sub-cultural groups, this school served as the locale of the study for the implementation of learning module integrating the culture of folk hunting practices for teaching Biodiversity. This was implemented in 2 sections of Grade 9 level for which the learning competency for biodiversity was integrated.

2. Objectives of the Study

The present study primarily aims to implement the developed culture-based module using folk hunting practices of *Cagraray* island as a resource. Specifically, it aims to answer the following specific research goals:

- 2.1. Measure the mastery level of conceptual understanding of learners using culture-based modules for Biodiversity (experimental) vis-à-vis the comparison group;
- 2.2. Determine the significance of difference in mastery level between pretest and posttest, and experimental and comparison groups;
- 2.3. Determine the effect of culture-based instruction in the attitude for culture-based learning of students in science; and
- 2.4. Create an educational framework culled from the findings of culture-based learning.

3. Research Methodology

This quantitative study was implemented via quasi-experimental design at Cawayan National High School. Implemented to 2 heterogeneous sections from Grade 9 level, experimental group was treated with the innovated culture-based module whereas the control group used the prescribed Learners' Materials (LM) by Department of Education. In addition to these learning materials used in the study, a 25-item multiple choice-type test was also used for both groups, whereas journal was exclusively utilized by the experimental group. Sources of the data were the (1) pretest and posttest scores generated in the test, and (2) narratives of experiences from the journal. Experimental and comparison groups were represented with 45 students each as subjects of the study. A letter of permission from the parents of subjects was secured for ethical reasons and conduct. Prior to module development, an ethnography was conducted to consolidate the hunting practices of the *Cagraray* island across all *barangays* of the island to saturate hunting practices data. Delivery of the modules was directed simultaneous to the distribution of subjects' learning kit for distance learning modality during the pandemic. For research objective 2.1. on mastery level, scores from pretest and posttest of experimental and comparison groups were tabulate for comparison of mean gains. Descriptive statistics through mean and percentages was used to deduce the information from the raw scores. To measure the mastery level of the cast of scores, Table 1 [19] was utilized.

Table 1: Descriptive equivalent of scores in pretest and posttest.

Percentage Range	Mastery Level
96-100%	Mastered
86-95%	Closely Approximating Mastery
66-85%	Moving Towards Mastery
35-65%	Average
15-34%	Low
5-14%	Very Low
0-4%	Absolutely No Mastery

For research objective 2.2. on significance of difference in scores, inferential statistics through a series of *t*-test was conducted to determine the significance of difference between scores in pretest and posttest, and scores in experimental and comparison groups. Implication analysis was also conducted to determine the inference of the data. For research objective 2.3. on attitude for culture-based learning, interpretative analysis through content approach was used to analyze the qualitative experiences of the students through narratives written in journals regarding their attitude for culture-based learning. Likewise, this was treated as supports to the quantitative findings. Implication analysis was also conducted to conclude the connotation of the narrative findings. For research objective 2.4. on the creation of educational framework, developmental approach was employed to build an educational framework for culture-based learning based from the findings of the study. Results of the study were only limited to the context of the students and topic used for module development.

4. Results

The following narratives were the significant findings of the study on the implementation of the developed culture-based module at Cawayan National High School.

4.1. The Developed Culture-Based Module on Folk Hunting Practices

The developed culture-based module was gleaned from the folk hunting practices of *Cagraray* island. This was done by evaluating the relevance of the identified folk hunting practices manifesting an entry point in the learning competency for biodiversity sought to be learned by the students. Table 2 summarizes the use of these relevant folk hunting practices in scaffolding the biodiversity topics with its corresponding evaluation result from the experts for module development.

The scale from reference [20] was adapted to rate the appropriateness of the folk hunting practices in elucidating the biodiversity topics. The evaluation revealed that the developed culture-based module was promising enough to work in parallel with the module provided by the Department of Education. This further signifies that no topic was omitted and overlooked in the process of developing the culture-based module. Nevertheless, the evaluation result signified the feasibility of folk hunting practices of *Cagraray* island as media for developing modules in biodiversity. Furthermore, this shows that the culture of hunting practices in the locale were appropriate springboards to connect the experiences of students in the community in relation to the attainment of learning competency in science for biodiversity.

Table 2: The structure of the developed culture-based module integrating folk hunting practices of *Cagraray* island for teaching biodiversity, and evaluation results of experts.

Folk Hunting Practices ^a	Biodiversity Topics in the Module	M	Descriptive Equivalent
<i>Pagsilo</i> (Use of traps for hunting monitor lizards)	Extinction	3.74	Very Appropriate
<i>Pagdinamita</i> (Dynamite fishing)			
<i>Paghikot</i> (The use of fish nets)	Biodiversity Population and	3.80	Very Appropriate
<i>Pagbu-bo</i> (The use of cages for hunting crabs)	Limiting Factors and Carrying Capacity	3.27	Appropriate
<i>Pagkate</i> (Baiting birds)	Threatened and Endangered Species	3.60	Very Appropriate
<i>Pagdinamita</i> (Dynamite fishing)			
<i>Pag-uring</i> (The use of mangrove for making coal)	Environmental Problems	4.00	Very Appropriate
<i>Pagmariw-bariw</i> (The use of sea grass for industrial consumption)			

^a Author's Translation

4.2. Measurement of Conceptual Understanding on the Use of the Culture-Based Module

After the lesson was implemented, the result of pre-test and post-test scores was tabulated from experimental and comparison groups. Table 3 shows the summary of scores in the use of culture-based module vis-à-vis the prescribed module by Department of Education.

Table 3: Assessment result from pretest and posttest of Experimental and Comparison Groups

Groups	Pretest ^a			Posttest ^a			Mean gain
	M score	M percentage	Description	M score	M percentage	Description	
Experimental	14.89	59.56%	Average	20.76	83.02%	Moving towards mastery	5.87
Comparison	15.56	62.22%	Average	19.22	76.889%	Moving towards mastery	3.67

^aMaximum point score equivalent to 25

Measurement of the cognitive level of the students was measured by the use of a 25-point test on pretest and posttest following the topics embedded in the lesson for biodiversity. The data revealed an increase in the measurement of cognitive level of the students after the implementation of the modules. Though both groups have pretest description of *average mastery* and leaped into posttest description of *moving towards mastery*,

superior cognitive increase was shown in the experimental group as indicated by the mean gain compared to the comparison group [exp. (5.87)>comp. (3.67)].

The National Achievement Test (NAT) mandates 75% Mean Performance Level for all schools in the Philippines to be considered as a qualifier in the academically performing schools [21]. The attainment of *moving towards mastery* at a higher quantitative rate than the established benchmark is a connotation that the culture-based module is substantial enough in the achievement of the expectations of the policy. Furthermore, the result suggested that the module offers understanding of the topics drawn from culture and policy implementation which may be adopted by other schools. Consistent with the findings in the literature, same results were produced by the culture-based related studies noting improved levels of conceptual understanding of students [22,23,24]. Accounts in the findings testified for the truthfulness of the theoretical underpinnings presuming the power of schema and culture for the absorption of new learning. Likewise, the understanding of the concepts embedded in the lesson was able to suffice the learning gap between culture and science as reflected in the improved levels of mastery level scores, thus conceptual understanding was observed to develop. The innovated culture-based module was not made to deface nor impair the prescribed module by DepEd but was made as an alternative to indigenous groups on using folk knowledge in constructing new learning. Nevertheless, data showed that both treatments improved the cognitive understanding of the students on biodiversity with culture-based module casting the optimal mean gain. Based from these findings, it was concluded that the development of culture-based lessons caused positive impact on the improvements of conceptual understanding, and can be used as a potential medium for improving academic achievement. It is recommended to further investigate the influence of the culture-based module on other learning outcomes like metacognition, learning independence, correcting misconception, and cultural appreciation, which are significant limitations of the current study.

4.3. Significance of Difference of the Assessment

Using series of *t*-test, the result of the comparison of scores from pretest and posttest across groups was tabulated in Table 4.

Table 4: Comparison of scores in pretest and posttest between groups**.

	Experimental		Comparison	
	<i>Pretest</i>	<i>Posttest</i>	<i>Pretest</i>	<i>Posttest</i>
Experimental	<i>Pretest</i>	6.07E-19	0.129	6.28E-10
	<i>Posttest</i>		6.51E-13	0.001
Comparison	<i>Pretest</i>			2.61E-13
	<i>Posttest</i>			

** $p=0.01$

In the pretest, the data showed similarity in the level of conceptual understanding ($p>0.01$) of both experimental and comparison groups. This result of pretest is a good entry point to establish the implementation of the developed culture-based lesson since bias in the advancement of cognitive level was not observed in any of the

groups. After the execution of the modules, posttest result showed a significant difference in the mean of scores in comparison and experimental groups ($p < 0.01$), indicating variance in the effect of the treatments on the learning outcomes of the students. Reviewing the mean of scores shown in Table 3, it was implied that experimental group scored significantly higher than the comparison group, as further supported by the mean gains. This statistical analysis affirmed the effective use of culture-based module in the experimental group compared to the module prescribed by the Department of Education though descriptive attainment of *moving towards mastery* is the same to both groups. This emphasized the success of using culture as a learning medium in the development of instructional materials for boosting mastery level and conceptual understanding of the students. Nonetheless, pretest and posttest results for experimental and comparison groups showed improvement in conceptual understanding regardless of the intervention used ($p < 0.01$). Notwithstanding the observed positive and higher effects of culture-based module, a significant difference in pre-posttest result ($p < 0.05$) was also obtained from the use of prescribed module from Department of Education connoting that the combined use of two learning materials can boost optimal conceptual understanding of learners. This puts premium to the effect of the learning materials in boosting the conceptual understanding of the students regardless of the material integrated feature. Moreover, this statistical inference attested for the aforementioned account that the developed culture-based material is not made to offend the prescribed learning materials but to supplement approaches for many alternatives in learning science.

4.4. Attitudinal Effect of the Learning Experiences for Culture-Based Module

Journals of the students were reviewed regarding the attitudinal formation and disposition on the use of folk hunting practices integrated in module for biodiversity topics. One significant finding was the ability of the students to do paradigm shift on the destructive effects of cultural practices on the environment. Responses revealed that most of the students became mindful on bridging the potential effects of the cultural practice following the concepts in science learned. Enlightenment was perceived by the students where attitude for learning culture-based lesson became positive towards learning the topic. In the question as to how students feel about the folk hunting practices of the area, most of them responded using the observed consequences of the practices based from the result of the activities in module through processing, and Higher Order Thinking Skills (HOTS). Sample journal entries were shown below;

Journal entry 1:

Garu nakonsenya ako kang mga tigpaparagiribong pagdakop kang mga hayop sa salang paagi. Siguro matutuparan kaini ang samuyang kapunawan, pero mawawaraan man ki pagkaon ang samuyang maarabot na henerasyon. Ang sobra palan na pagkunsumo pwedeng ika-apekto kang iba man na hayup. Sana dae lamang mag-abot sa punto na maubos ang mga hayup asin pangangaipuhan kang mga maabot na henerasyon unong sa salang pagkunso ngunyan...Kaipuhan na atamanon ang dagat asin baguhon ang sistema kang pagsira ngani matadaan man su mga maabot na henerasyon'

Author's Translation:

'I felt guilty on the erroneous method for hunting animals. It might suffice the hunger of the people, but it compromises the food of our upcoming generation. Excessive consumption can affect other organisms. Hopefully, it will not come to a time where there will be no animals and food to eat for the future generation due to erroneous consumption of present...We need to take care of the sea and change our fishing practices to support the needs of future generation'

Journal entry 2:

'Sabi sa activity, ang pagkaubos kang sarong organismo pwedeng makaapekto sa populayon kang saro man na organismo. Kaya man palan su mga hanit sa bakawanan nagdidiit na sana dahil sa pagputol kang bakawan ta tig-gigibong pang-gatong'. Makamundo man pero dapat pagkontrolon ining pangangahoy ngani dae lamang maapektuhan ang iba pang organism na naka-asa man sa hanit'

Author's Translation:

'According to the activity, the depletion of one organism affects other organisms. That explains why the mud crabs in the mangrove forest become diminished due to cutting of mangroves for fuel. It is sad to think but we must control cutting down mangroves to avoid further effect on other organisms relying on crabs' Another finding for the attitudinal change of the student is the grounding of paradigm shift on the results of the activities in the module. Therefore, evidences play a vital role in the development of new information and correcting misconception (see underline sentence in the sample response). This concept has been discussed by reference [25] who noted that concrete evidences shall be strong enough to cause cognitive changes in the perception of the student. This is similar to the concept of cognitive dissonance where students were motivated to learn to settle down their experienced cognitive discomfort due to concrete evidences they observed that contradict to their existing cognitive structure. This is supported by the accounts in the literature revealing change in attitude when opposing beliefs occur brought by dissonance [26]. The context of the study showed that resolving of cognitive discomfort was guided by the elimination of the concept that does not conform to the observed evidences of the students. In this study, the theory on the power of evidence was verified denoting usage of activity outcomes as basis for correcting knowledge and new information absorption. Nevertheless, journal responses also showed positive feedback and activity engagement especially for passive learners.

4.5. Educational Framework for Culture-Based Learning

Derived from the findings of the study an educational framework that articulates culture-based learning was expounded. The said framework is deemed significant in the development of conceptual understanding among the learners and gives emphasis on significant predictor that will lead to the development of conceptual outcomes that gave opportunities for learners to construct meaning only through active engagement with hands-on learning activities. The information they receive becomes highly reactive for it meaningfully bridges their prior knowledge to the new information thus paving the way for knowledge construction through accommodation of new information. Culture-based teaching further takes into account the importance of

generating information through activity evidences that learners will discover and perceive during the lesson proper. Evidences must be concrete and product of simulation where learners can perfectly visualize the concepts embedded in the task or activity. When the generated evidence contradicts with the prior knowledge or the new ones, motivation to learn becomes vivid in settling conflicting knowledge, hence correcting misconceptions. Said framework is parallel to the psychology of learning which indicates that when new environment is introduced to an existing one, mind creates a cognitive conflict where it makes a contrast of new versus old in the subconscious mind yet arousal to learn is more vivid [27]. When mind is aroused, it finds ways to settle its experienced varying loads of information and settle on the most concrete one. The said psychology theory supports the culture- based learning which emphasizes that learning must integrate activities that will generate evidences to steer towards the understanding of concepts previously learned so as to further enlighten the learners of the concepts the activity would like to convey. The figure below is the scheme of the educational framework for culture-based teaching and learning.

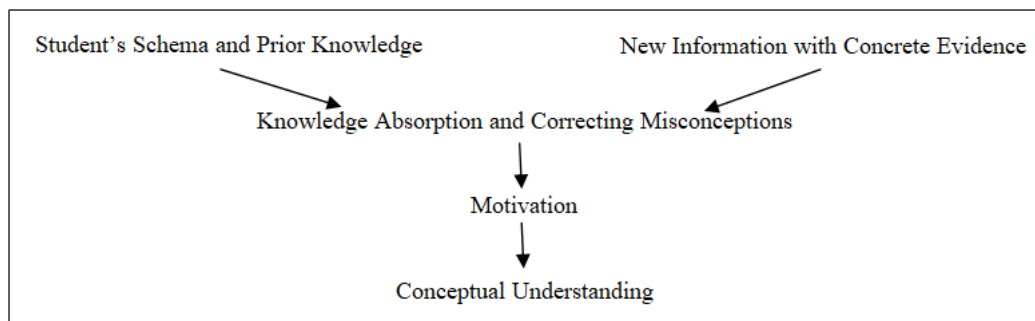


Figure 1: The Educational Framework for Culture-Based Learning

5. Discussion

The aim of the study was to develop culture-based module integrating the folk hunting practices of *Cagraray* island, Philippines for teaching biodiversity. The same previously documented attempts were also conducted integrating the use of culture in learning material development [28,29,30]. The findings of the current study primarily tested the effect of culture-based instruction in the development of conceptual understanding and attitude of students in culture-based learning. Results revealed positive learning outcomes as compared to the prescribed learning material supplied by Department of Education. Local studies have also documented harmonious findings indicating positive effect of culture- or context-based instruction in learning science [31]. Consistent with the previously documented studies, they have also indicated positive effects of culture/context based instruction in the development of metacognition, critical thinking, higher order thinking skills, science process skills, and on gender and development [32,33]. This holds true to the assumption that the current research also impacted similar results though the concern focuses only on measuring the conceptual understanding and attitude for learning. Therefore, the current study must be retested for its effect in other learning outcomes following parallel assumptions from previously documented studies. Furthermore, foreign studies like the one by references [34,35,36] have implied similar positive results of integrating culture/context instruction in developing learning. Consolidating the result of the current study and the pool of literature, it

testifies for the truthfulness of Piaget's claim on the assimilation and accommodation of learning when students see relevance of the instruction to their cognitive structure or schema. The viewpoints taken from findings showed that pedagogy in teaching should reflect the nature of the school children in the sense that it must develop continuum of teaching to reinforce and develop optimal learning. Serving as an eye opener to many educational reformers, the innovation of culture-based learning tool must be given devotion and attention if education aims to bridge learning gaps between standardization of learning competencies vis-à-vis life experiences and elements of students' living. In fact, many records in the body of literature indicated the influence of culture-based education in developing motivation to learn [37,38]. This presumed that motivation to learn becomes vivid when students see the relevance of the instruction in their day-to-day living. Another significant finding of the current study is the reliance of the students on concrete evidences of the instruction to recalibrate their learning and correction of misconception. In fact, reference [39] noted the active role of evidence in teaching through "*monitoring student progress and evaluate teaching effectiveness*". Prior knowledge is hard to change especially if it has been part of students' lives, practices and beliefs. Reference [40] noted that accurate prior knowledge aids in learning whereas an erroneous one hinders learning. This testifies that when new learning contradicts with the prior knowledge, cognitive dissonance occurs. According to reference [41], contradicting beliefs (cognitive dissonance) can be settled by adding up information and new beliefs. The literature on prior knowledge and new information puts significance to the active role of evidence in promoting learning- an assumption which was testified true by the current research. This concludes that culture-based instruction must be accompanied with solid facts and evidences to promote conceptual change from misconception to scientific literacy. The use of evidences in learning can aid in the correction of previously learned erroneous knowledge brought by learned practices and assimilation from whom the students believed the "more knowledgeable others". Therefore, teachers need to dedicate time and effort in designing relevant teaching approaches that produce evidences strong enough to blast misconceptions.

6. Conclusion

The quest for providing solutions on the mastery problems of students has battled educational reformers for many years. The use of many teaching approaches was perceived useful in promoting conceptual understanding and development of attitude. Culture plays a significant role in the progress of learning of students by virtue of relating prior knowledge to the present ones. This was integrated in the use of culture-based instruction probing on the learned culture of students for lesson development. In this study, folk hunting practices of *Cagraray* island, Philippines was used in the development of culture-based module in teaching biodiversity. The development of this module was deemed effective in developing conceptual understanding of the students, and their attitude for culture-based learning. This implies the important function of culture in establishing learning as entry point of the students in the new information they are sought to learn. Educational framework for culture-based learning suggested the need to use activities that produce concrete evidences to develop motivation and scaffold learning.

7. Limitations and Future Scope

The findings of the study were only appropriate to the students of *Cagraray* island since the culture embedded

in module development was taken from the its locale. Therefore, usage of the developed culture-based module cannot guarantee effectiveness when applied in different contexts unless similarity in the culture of folk hunting practices is observed.

The study has proven the effectiveness of integrating folk hunting practices in culture-based module for teaching biodiversity. Therefore, it is recommended to further venture on other cultural facets of *Cagraray* Island and its integration or relevance in the learning competencies of science. Supplementary studies may be conducted on the effect or impact of culture-based instruction in other learning outcomes.

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