

Revisiting Tagbanua Practices as a Bases For Developing of Instructional Materials in Physics

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Abstract— Culture-based teaching materials stressed the significance of incorporating experience and culture into the school curriculum to maintain the area's cultural groups' practices and traditions. A well-defined position that should encapsulate the creation of culturally relevant instructional materials with culture serving as the unifying factor that connects student relationships and learning. This endeavor can serve as a wake-up call for all science teachers, showing how culture can be an effective tool for increasing students' success on the lesson being taught. Tagbanua is home to a diverse range of economic activities, arts, celebrations, and sports, all of which may serve as a starting point for creating instructional materials for General Physics 1. These facets of Tagbanua activities can be integrated into General Physics 1 lessons using the Department of Education's Most Essential Learning Competencies. Students can be provided with instructional materials such as activity sheets and worksheets. As a result, it is recommended that worksheets and activity sheets be developed and tested to determine their effectiveness in assisting students in learning Physics and fostering an appreciation for Tagbanua culture.

Keywords—Tagbanua, Tagbanua Practices, Instructional Materials, Physics, Most Essential Learning Competencies (MELCs)

I. INTRODUCTION

Achieving the country's science curriculum priorities is a significant concern for all science teachers. The new curriculum necessitates creating a new set of techniques and methods for successfully developing science literacy. To meet the needs of the twenty-first century and achieve this national goal, teachers must be skilled and innovative. The Department of Education puts too much effort into improving the performance, meeting the learners' needs, and keeping pace with other countries. Despite that, the Philippines remains at the bottom line among other nations. The just reported standard assessment for education; the Philippines ranked second to the lowest in Mathematics and Science. There are a lot of factors to be considered for this low performance. One of the reasons cited is the differentiation of cultures, beliefs, customs, practices, traditions, and ethnicities.

The Philippines is a country with different cultures. It is also the country of a varied indigenous population with its customs and values [1]. The Episcopal Commission on Indigenous Peoples (ECIP) warned in a consolidated report that teachers teaching pupils from various cultural backgrounds might overlook some students' cultures. [2]. Several works of literature pointed out culture has a

significant role in the teaching-learning process, especially in science subjects. It serves as the foundation and a key factor of teacher's innovativeness to maximize students' sensory connections and provide meaning to students' learning [3]. Thus, it creates a more vital link between the culture and the process of teaching and learning.

Learning science means gaining science culture, according to cultural anthropology. Various authors suggested a cultural-based instructional material to unlock the students' understanding of Physics, the design of contextual learning by exemplifying their daily experiences. Culture-based instructional materials emphasized the value of integrating the knowledge system and culture in the school curriculum to preserve the customs and traditions of the area's cultural groups. Using the native language that all can understand, belief systems and practices with integral scientific links and frameworks in conjunction with civic standards and traditions can be used in science lessons [1].

The above ideas gave researchers a clearly defined standpoint that should embody the development of cultural-based instructional materials in culture as the unifying factor that merges student relations to learning. This venture can serve as a wake-up call to all science teachers, demonstrating how culture can be a valuable tool

for improving students' learning performance with the lesson taught. It focuses primarily on using culture-relevant activities to enhance student performance and achievement.

This study was intended to revisit the Tagbanua practices and assess the Most Essential Learning Competencies in Physics released by the Department of Education, where the researcher will develop cultural-based instructional materials.

II. RELATED WORK

The Tagbanua Tribe

The name Tagbanua is derived from "tiga banua", which means "people of the village". The Tagbanua tribe is one of the Philippines' oldest and most culturally diverse groups. They are primarily found in central and northern Palawan, one of the Philippines' southern islands [4]. The Tagbanua people live in Palawan Island, located between Mindoro and Borneo, on both the eastern and western coasts. The population density is higher in the broader lowlands to the east of the island's mountainside, which climbs 760 m to 900 m. The few mountain villages are relatively new, dating from the 18th century. Tagbanua also lives off the island's northern tip on the Calamian Islands. In the 1980s, the ethnic community totaled 14,000 persons, while the Calamian dialect had approximately 8,000 speakers in 1990. According to the 2000 census, Tagbanua people made up 2.15 percent of Palawan's population (almost 16,000 people) [5]. The Tagbanua is Palawan's most populous ethnic group, with an estimated population of 11,472 people [6].

Tagbanuas practice Slash-and-burn agriculture, which cultivates dry maize, rice, taro, sweet potato, millet, and cassava. The second most important economic activity is fishing. Cattle and pigs are kept for religious feasts, whereas buffalos are raised for transportation and slaughter [7]. They typically sell Manila copal, split rattan, local rice, jungle honey, and edible bird nests scavenged from caves at great danger.

Pasigem (riddles) and ugtulen (folk tales) are part of Tagbanua's cultural heritage, which entertains children and educates them about social standards and history. They enjoy playing the Jew's harp, the *tambul* (drum), and the *tipanu* (bamboo flute), and the guitar piques their interest. The sound of *gongs* is a popular complement to celebrations.

The Tagbanua traditional peoples group filed an ancestral property claim on about 1,700 acres of forest and highland properties to safeguard their agricultural interests [8]. They banned non-Tagbanua from conducting any commercial activities in the disputed territories to protect their interests. The Tagbanua avoided outside cultural influence by isolating themselves, allowing them to continue to practice their traditional subsistence practices with greater freedom [9]. Economic activities such as hunting, farming,

and gathering were established as tools of survival. Agriculture has ruled the global economy throughout human history [10]. These systems have been improved and evolved, but no system is perfect. Swidden agriculture, especially rice production, remained the essential traditional subsistence activity. The need for money influenced some of their gathering activities [8]. Essentially, the Tagbanua subsisted on swidden fields and other farming activities while gathering forest products. All Tagbanua rice farmers began planting their fields when their parents gave them seeds, either when they married or reached the age of adult responsibility [8]. In their late fifties, most of these farmers acquired upland farming through their parents, who might take them to the farm first to observe, assist, and work on their plots.

Physics Subject

Physics is a subject offered in the K-12 program from Grade 7 to 12. However, it is being provided in spiral progression in Grade 7 to 10 and only offered to Science, Technology Engineering, and Mathematics students for Grade 11 and 12. Physics is frequently considered by students as cognitively demanding, challenging, and unpleasant, even though even the sharpest students appreciate and survive the course [11]. Most students have traditionally thought of physics as a complex subject or field of study, owing to the mathematical principles involved [12].

Currently, physics education in the Philippines is increasingly a theoretical practice. It was practiced solely as a body of material to be transferred to their students, encouraged by the design of the evaluation technique, which only tests the ability to remember [13]. Teachers' functions in physics include selecting the approach, planning lectures, and developing the most suitable instructional material using adequate laboratory facilities and resources [14]. Thus, the progress of learners in a subject is contingent upon the compatibility of students and teachers and the teaching materials and resources.

Culture and Physics

The Department of Education (DepEd) is embarking on a significant attempt to bridge the gap and efficiency of primary education. As stated in the 2011-2016 Philippine Development Plan, the Basic Education Sector Reform Agenda (BESRA) and as one of the country's effort to reaching MDG/EFA goals, K-12 Basic Education Program (K-12) was formed [15]. Indigenization is a term that refers to the process of increasing a population of learners' curriculum competencies, educational instruments, and teaching-learning processes. It is about their biogeographic, historical, and sociocultural contexts.

Teachers should design instructional materials which will aid in the understanding of conceptual knowledge of students [16]. Instructional materials are thought to have an important part in the teaching and learning process. It improves students' ability to remember things. The performance of pupils is directly tied to the availability of

relevant teaching materials [17]. Students' learning resources have a significant impact on their academic success [18].

On the other hand, epistemology is a field of philosophy dealing with the study of knowledge and beliefs [19]. In some research, the epistemological assumptions of the students have a significant influence on their learning. It is believed that environments that help students grow their value systems can help them learn more effectively [11].

According to studies, cultural context learning is linked to students' meaning formation and knowledge production, which influences their method of identifying and understanding the world [20] [21] [22] [23]. Culture defines as an unseen lens through which reality is viewed. It can be a collection of ideas, beliefs, behaviors, and environmental orientation and susceptibility, which can be material, including resources and technologies, or intangible, such as ideals, practices, and customs like national games [24]. Many people believe that using real-life examples and experiences to teach physics entices students and challenges their past knowledge, potentially leading to more knowledge acquisition with a challenging conceptualization.

III. METHODOLOGY

This research concentrates on the Tagbanua Tribe regarding their economic Activities, arts, games, and celebrations. Interviews and community immersion were used to profile their practices. To ensure and triangulate the data collected during the interview, researchers immersed themselves in the Tagbanua community for a week. The discussion was documented. Ethical standards were practiced by seeking approval from the elders or chieftain of the ethnic groups to participate in this study.

Furthermore, the Most Essential Learning Competencies (MELCS) in General Physics I was evaluated and analyzed to decide which topics were linked with a cultural practice to develop culturally-based instructional materials. For validation, the researchers consulted for corrections, feedback, recommendations, expert practitioners, and professionals in Physics such as the division supervisor in science, master teachers, and the like.



Coding for descriptive labels, sorting for patterns, generalizing constructs and hypotheses was done, which served as the basis in developing instructional materials appropriate to the culture and the competencies in physics.


IV. RESULTS AND DISCUSSION

The study attempted to revisit the Tagbanua practices regarding their economic activities, arts, celebrations, and games. The results highlight the discussion in terms of Tagbanua practices, learning competencies in General Physics I where culturally-based instructional materials can be developed. Tagbanua practices can be used in

developing instructional materials in General Physics I, and contextualized learning materials can be designed to incorporate Tagbanua practices.

Table 1. Tagbanua Practices and their Description

Practices	DESCRIPTION
Economic Activities	
Farming (Pagkaingin)	Pagkaingin started with the clearance of trees and other vegetation. It's usually finished by January to prepare the land for burning in the dry climate of February – March [8].
Hunting (Pigsticking)	Wild boar hunting is armed with spears and accompanied by dogs. Pigsticking is a type of pig hunting carried out on foot by individuals or parties of spearmen. The crossguard on the boar spear was occasionally used to prevent the angry animal from driving its punctured body straight down into the ground to strike its killer before succumbing.
Pagayantok (Rattan gathering)	The canes are pull down by hands and cut with a bolo (machete) [25][26].
Mandepdep (Manila copal/bagtik/almaciga gathering) Mandepdep (Manila copal/bagtik/almaciga gathering)	Almaciga resin is used to make coatings, sealants, soaps, paints, paper coatings, flooring, shoe polish, floor wax, polymer, repelling materials, paper sizing, and various other items. It is utilized as incense in religious traditions and fuel, lighting, bonding materials, and insect smudge in the local community [27].
ARTS	
DESCRIPTION	
Dances (kendar)	<i>Pagdidiwata – A thanking people</i> The babaylan, or priestess, was the centre of a condensed portrayal of an ancient nine-day rite of gratitude among the Tagbanuas of Palawan for a farming season.
	<i>Sagayan – The dance of wooing and acceptance</i> A wooing dance in which the enamored man places his piz fabric on the ground as a signal of requesting the lady's hand. The lady also puts her fabric on top of the man's cloth to indicate her consent.
	<i>Turayan – Fight of Eagle</i> It is a kind of dance that imitates the eagle fighting.
	<i>Soryano – The Pleasure of the chase</i> The Tagbanua people of Palawan perform a courtship dance in which the men furiously follow and convince the ladies to face them. The ladies respond by turning away in the opposite direction, transforming the dance into spirited pursuit.
MUSIC	
DESCRIPTION	
- Agong	Agong is a musical instrument with a fist-sized hub in the middle and a circumference of 112 feet. The node is struck with a stick coated with fabric sheets, and the system works.
- Babandil	A piece of music that is similar to the agong but only has a depth of around four inches. The beater is constructed of softwood and is used to play it. It has a gentler tone than the gong. 
- Gimbal	A musical instrument that sounds like a snare drum but is not quite as loud. It is a hollow tree that stands 1½ feet tall, has a diameter of five to ten inches, and is wrapped in dried goatskin on one end. It is performed by alternately striking the four fingers simultaneously. In other circumstances, a couple of wooden sticks, both 10 inches in length and one foot diameter, are used alternately. 

CELEBRATIONS	DESCRIPTION
Daraet Festival	<i>Daraet</i> is one of the Tagbanua and Pala'wan tribes' several festivities. Drums, gongs, and cymbals are frequently seen and used. Although older tribal members still have and utilize bamboo flutes, a native variant of the banjo, and other string instruments, they are becoming increasingly rare.
Tarek Festival	<i>Tarek Festival</i> The festival, which takes place on days when the moon is full, celebrates the traditions of Palawan's indigenous peoples. It is a war dance that's intended to ward off evil spirits that endanger people's safety, as well as a ceremonial begging for the gods' continuous support and abundance.
Pagdidiwata Ritual Festival	<i>Pagdiwata Ritual Festival</i> is an annual celebration in which Palawan people acknowledge and show their gratitude to the gods while also seeking the gods' assistance in curing disease and those in need and offering prayers for departed loved ones. People with significant health problems also attend the ceremony, where their family regards them as a spiritual channel.
GAMES	DESCRIPTION
- Pasil (Woodentops) 	<i>Pasil or wooden tops</i> is made of pure wood carved into tops, as shown in the picture. It is played by letting the toy spin for a long time. It became a part of a festival of the Tagbanua where there is a competition of this game. The owner of the wooden top with a long time of spin will be declared as a winner. It can also be played by colliding the wooden tops, and the last standing will be the winner.
- Kardang/Bamboo pole	<i>Kardang or bamboo pole</i> means an outdoor game with a bamboo stilt. To perform the kardang, players need to have a pair of equal-length bamboo poles and a foot-size stepladder to act as the player's feet platform. game with a bamboo stilt. To perform the kardang, players need to have a pair of equal-length bamboo poles and a foot-size stepladder to act as the player's feet platform. The bamboo is 10 feet off the ground. Kadang-kadang is a racing game. Before commencing the game, players should form two 100-meter parallel lines to act as the beginning and end line and then label each 25-meter line. Each squad needs four players. The players are placed, so the first player stands behind the starting position, while the second person stands behind the line's 25th point, the third player behind the 50th label, and the fourth player waits behind the 75th label. The game's rule is easy. The player stands with his stilts on the signal "get set." At the "go" signal, the first player climbs on his stilts and walks to the 25th mark. Upon reaching the point, he gets off the stilts and hands them down to the next player, who is doing the same when at the 50th mark. The very same pattern goes with the following players till they complete. A player loses twice before reaching the goal line or hops off the stilt after two steps.

After a careful study and thorough evaluation of the *Most Essential Learning Competencies* issued by the Department of Education through DepEd Memorandum No. 89, s. 2020, the table below shows how the Tagbanua practices are integrated into it that can be used in designing

Instructional Materials in General Physics 1. It outlines the various activities associated with specific learning competencies and the instructional materials that will be designed.

Table 2. Tagbanua Practices, Learning Competencies, and Proposed Instructional Learning Materials

TAGBANUA PRACTICEA	MOST ESSENTIAL LEARNING COMPETENCIES	PROPOSED INSTRUCTIONAL MATERIALS
ECONOMIC ACTIVITIES		
<ul style="list-style-type: none"> - Farming (Pagkaingin) - Hunting (Boar Hunting) - Pagyayantok (Rattan gathering) - Mandepdep (Manila copal/bagtik/almaciga gathering) 	<p>Learning Code: <i>STEM_GP12V-Ia-9</i></p> <p>Learning Competencies: - "Perform addition of vectors" (Deped, 2020)</p> <p>Learning Code: <i>STEM_GP12V-Ia-9</i></p> <p>Learning Competencies: - "Perform addition of vectors" (Deped, 2020)</p> <p>Learning Code: <i>STEM_GP12Kin-Ib-12</i></p> <p>Learning Competencies: - "Convert a verbal description of a physical situation involving uniform acceleration in one dimension into a mathematical description" (Deped, 2020)</p> <p>Learning Code: <i>STEM_GP12KINib-14</i></p> <p>Learning Competencies: - "Interpret displacement and velocity, respectively, as areas under a velocity vs. time and acceleration vs. time curves" (Deped, 2020)</p>	Worksheet
ARTS		
Dances	<p>Learning Code: <i>STEM_GP12KIN-Ic-20</i></p> <p>Learning Competencies: - "Describe motion using the concept of relative velocities in 1D and 2D" (Deped, 2020)</p> <p>Learning Code: <i>STEM_GP12KIN-Ic-26</i></p> <p>Learning Competencies: - "Solve problems involving two-dimensional motion in contexts such as, but not limited to ledge jumping, movie stunts, basketball, safe locations during firework displays, and Ferris wheels" (Deped, 2020)</p>	Worksheet
Music	<p>Learning Code: <i>STEM_GP12PMIId-31</i></p> <p>Learning Competencies: - "Define mechanical wave, longitudinal wave, transverse wave, a periodic wave, and sinusoidal wave" (Deped, 2020)</p> <p>Learning Code: <i>STEM_GP12PMIId-32</i></p> <p>Learning Competencies:</p>	Worksheet and Activity Sheet

	<p>“From a given sinusoidal wave function, infer the speed, wavelength, frequency, period, direction, and wavenumber.” (Deped, 2020)</p>				<p>properties of static friction and kinetic friction” (Deped, 2020) Learning Code: <i>STEM_GP12N-Ie-38</i> Learning Competencies: - “Solve problems using Newton’s Laws of motion in contexts such as, but not limited to, ropes and pulleys, the design of mobile sculptures, transport of loads on conveyor belts, the force needed to move stalled vehicles, determination of safe driving speeds on banked curved roads” (Deped, 2020) Learning Code: <i>STEM_GP12WE-Ihi-56</i> Learning Competencies: - “Differentiate center of mass and geometric center” (Deped, 2020) Learning Code: <i>STEM_GP12MMICi-63</i> Learning Competencies: - “Solve problems involving the center of mass, impulse, and momentum in contexts such as, but not limited to, rocket motion, vehicle collisions, and ping-pong” (Deped, 2020) Learning Code: <i>STEM_GP12REDIIa-1</i> Learning Competencies: - “Calculate the moment of inertia about a given axis of single-object and multiple-object systems” (Deped, 2020) Learning Code: <i>STEM_GP12REDIIa-3</i> Learning Competencies: - “Calculate magnitude and direction of torque using the definition of torque as a cross-product” (Deped, 2020) Learning Code: <i>STEM_GP12REDIIa-4</i> Learning Competencies: - “Describe rotational quantities using vectors” (Deped, 2020) Learning Code: <i>STEM_GP12REDIIa-6</i> Learning Competencies: - “Apply the rotational kinematic relations for systems with constant angular accelerations” (Deped, 2020) Learning Code: <i>STEM_GP12RE DIIa-9</i> Learning Competencies: - “Determine angular momentum of different systems” (Deped, 2020) Learning Code:</p>	
CELEBRATIONS						
<ul style="list-style-type: none"> - <i>Daraet</i> - <i>Pagdiwata Ritual Festival</i> - <i>Tarek</i> 	<p>Learning Code: <i>STEM_GP12MWSIIe-34</i> Learning Competencies: - “Apply the inverse-square relation between the intensity of waves and the distance from the source” (Deped, 2020) Learning Code: <i>STEM_GP12MWSIIe-35</i> Learning Competencies: - “Describe qualitatively and quantitatively the superposition of waves” (Deped, 2020) Learning Code: <i>STEM_GP12MWSIIe-36</i> Learning Competencies: - “Apply the condition for standing waves on a String” (Deped, 2020) Learning Code: <i>STEM_GP12MWSIIe-37</i> Learning Competencies: - “Relate the frequency (source dependent) and wavelength of sound with the motion of the source and the listener” (Deped, 2020)</p>	Activity Sheet				
GAMES						
<ul style="list-style-type: none"> - <i>Pasil (Woodentops)</i> - <i>Kardang (Bamboo Pole)</i> 	<p>Learning Code: <i>STEM_GP12KIN-Ic-25</i> Learning Competencies: “Infer quantities associated with circular motion such tangential velocity, centripetal acceleration, tangential acceleration, a radius of curvature” tangential velocity, centripetal acceleration, tangential acceleration, a radius of curvature” (Deped, 2020) Learning Code: <i>STEM_GP12N-Id-31</i> Learning Competencies: - “Identify action-reaction pairs” (Deped, 2020) Learning Code: <i>STEM_GP12N-Ie-33</i> Learning Competencies: - “Apply Newton’s 1st law to obtain quantitative and qualitative conclusions about the contact and noncontact forces acting on a body in equilibrium” (Deped, 2020) Learning Code: <i>STEM_GP12N-Ie-34</i> Learning Competencies: - “Differentiate the</p>	Activity Sheet			<ul style="list-style-type: none"> - <i>Pasil (Woodentops)</i> - <i>Kardang (Bamboo Pole)</i> 	

<p>- Pasil (Woodentops) Kardang (Bamboo Pole)</p>	<p><i>STEM_GPI2N-Ie-36</i> Learning Competencies: - “Apply Newton’s 2nd law and kinematics to obtain quantitative and qualitative conclusions about the velocity and acceleration of one or more bodies, and the contact and noncontact forces acting on one or more bodies” (Deped, 2020) Learning Code: <i>STEM_GPI2WE-If-41</i> Learning Competencies: - “Determine the work done by a force acting on a system” (Deped, 2020) Learning Code: <i>STEM_GPI2WE-Ig-48</i> Learning Competencies: “Relate the gravitational potential energy of a system or object to the configuration of the system” (Deped, 2020) Learning Code: <i>STEM_GPI2WE-Ig-49</i> Learning Competencies: - “Relate the elastic potential energy of a system or object to the configuration of the system” (Deped, 2020) Learning Code: <i>STEM_GPI2WE-Ihi-55</i> Learning Competencies: - “Solve problems involving work, energy, and power in contexts such as, but not limited to, bungee jumping, design of rollercoasters, number of people required to build structures such as the Great Pyramids and the rice terraces; power and energy requirements of human activities such as sleeping vs. sitting vs. standing, running vs. walking” (Deped, 2020) Learning Code: <i>STEM_GPI2G-Iib-16</i> Learning Competencies: - “Use Newton’s law of gravitation to infer gravitational force, weight, and acceleration due to gravity” (Deped, 2020) Learning Code: <i>STEM_GPI2Red Iib- 18</i> Learning Competencies: - “Discuss the physical significance of the gravitational field” (Deped, 2020) Learning Code: <i>STEM_GPI2Red-Iib- 19</i> Learning Competencies: “Apply the concept of</p>	<p>Activity Sheet</p>
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	gravitational potential energy in physics problems” (Deped, 2020)	
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V. CONCLUSION AND FUTURE SCOPE

Tagbanua has a wide range of practices regarding their economic activities, arts, celebrations, and games. On the other hand, by evaluating the most essential learning skills issued by the Department of Education through a DepEd Memorandum, it may be inferred that selected learning skills can be linked to Tagbanua's daily activities and practices. Those practices they have might be a basis for generating general physics education content. It can be customized to General Physics 1 classes. Instructional resources like activity sheets and worksheets can be prepared for student use.

As a result, it is advised that worksheets and activity sheets be developed and assessed to assess how well they enable students to study physics and appreciate Tagbanua culture. Competencies issued by DepEd through a memorandum, it can be concluded that there are chosen learning competencies that can be tied up to the daily activities and practices of Tagbanua. Those practices that they have could be a basis in developing instructional material in General Physics 1. It can be adapted and incorporated into General Physics 1 lessons. Instructional materials such as activity sheets and worksheets may be created for student's usage. As a result, it is suggested that the worksheets and activity sheets be generated and evaluated to see how successful they are in helping students learn Physics and generating appreciation for Tagbanua culture.

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