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Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience

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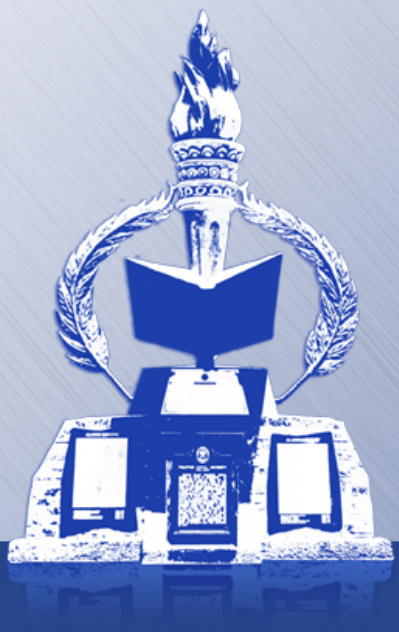

CONTEXTUALIZING PHYSICS INSTRUCTION FOR INDIGENOUS PEOPLE: THE MANGYAN EXPERIENCE

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DEDICATION

To Thirdy

My one great love, strength, and inspiration.

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ABSTRACT

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Title:	CONTEXTUALIZING PHYSICS INSTRUCTION FOR INDIGENOUS PEOPLE: THE MANGYAN EXPERIENCE
Key Concepts:	CONTEXTUALIZATION, PHYSICS INSTRUCTION, MANGYAN
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Mangyans are indigenous people endemic in Mindoro. In the western part, the Tao-buhid tribe is the most prevalent. These groups of people are commonly marginalized because of lack of formal education. Specialized education has been a suggestion that will focus on the culture, beliefs, and tradition of the group. The creation of an education that maximizes the use of their daily routine. Physics is a branch of science that has a lot of practical applications in daily living. Subtlety, the indigenous people of Mindoro have Physics applications in their daily rituals that they are not aware of. The researcher utilized the strengths of contextualization for Mangyans to better appreciate the concepts of science e.g, in Physics. The study made use of the Embedded Experimental Design. It is a mixed method research design wherein quantitative results were the main sources of data, augmented by the results of the qualitative documents. The approach was tested in both the science performance and learning motivation of Grade 7 and Grade 8 Mangyan students. Reflective journals and semi-structured interviews reinforced the results. The t-test

calculated for both science performance (mean =12.48; 15.44, t (24) = -4.23, p=0.000) and learning motivation (mean = 2.95; 3.38, t (24) = -6.66, p= 0.000) had a significant effect before and after the exposure to the contextualized approach. On the other hand, reflective journals and the semi-structured interviews revealed that Mangyan students enjoyed the approach because they can relate the concepts to their daily lives. It was therefore concluded that the contextualized approach is successful on its goal of contributing to the science performance and learning motivation of Mangyan students in Physics.

Chapter 1

The Problem and Literature Review

Background of the Study

Mangyans are the ethnic group in Mindoro. There are six to eight groups of the tribe in the province; Hanunoo, Buhid, Taobuid, Tadyawan, Alangan, Iraya, Ratagnon, and Bangon. Ratagnon are the most prevalent tribe while Taobuhid or the Batangan occupy mostly the western section. They are simple people who practice shifting cultivation of rice, corn, vegetables, and tubers. The swidden agriculture or slash-burn agriculture (kaingin as the native term) is the most common practice of farming of the tribe (Askeland, Bull & Mittelmarck, 2010). According to Bawagan (2010), Mangyan communities are subject to discrimination, exploitation, and oppression by the lowland populace leaving them in poverty. In fact, because of poverty and irrelevant teaching, only a few had the chance to continue formal schooling. Mangyan education should have the following characteristics ; (1) the essentials are taught; (2) attention pays to tribal ecological skills; (3) tribal culture is respected; (4) there are age and number limits; (5) teachers know and respect tribal culture; (6) parents are consulted; and (7) communication skills as described by Fabella and Calda (2012). Though our country is one of the first in Asia to pass a law recognizing the needs of indigenous people, the Indigenous People Right Act of 1997, still these group of people are considered being the most impoverished and marginalized sector of the society (Abejuela, 2006). The status of education is worse since the public school system is still inaccessible to few of these communities because of mountainous geography (Cornelio & de Castro, 2015; ECIP, 2002). Indigenous students are not suitable to be placed in the mainstream

level of education because of the lack of cultural integration in schools and more often than not they are bullied and discriminated (ECIP, 2002;Sense ASEAN, 2016). The United Nation sets the inclusive education of indigenous people as one of their main priorities (UN Conference, 2014). Inclusive education is described as "education for all students" regardless of any challenges they may have. It adheres to the cause of quality instruction, interventions, and supports that enable students to meet success in the core curriculum (McManis, 2017). The United Conference in 2014 revealed that even though efforts are made through the Millennium Development Goals (MDGs), not all learners benefit equally. Marginalized groups including indigenous people were left behind. Also, the meeting reiterated Article 14 of the UN Declaration on the Rights of Indigenous Peoples which states that "Indigenous peoples have the right to establish and control their educational systems and institutions providing education in their own languages, in a manner appropriate to their cultural methods of teaching and learning." To realize this right, full inclusion to the inclusive education of indigenous people (IP) must be strengthened.

The Department of Education (DepEd) recognizes the indigenous people's right that is why IP education is fully included in the enhanced basic education curriculum. Science is one of the core subjects in the K-12 curriculum and considers being essential. Science links the societal causes such as technology, industry, and sustainability (UNESCO, 2009). As early as grade school, students are expected to develop and nurture their critical thinking skills through observation, experimentation, exploration, and investigation. No matter how much our curriculum designers neatly pressed science education in the country, issues and concerns considering the low performance of students are prevalent (Dela Cruz, 2017; Jalmasco, 2014;

Marinas, 2002; SEI-DOST & UP-NISMED, 2011; Tan, 2009). The low performance is reflected in the annual National Achievement Test (NAT) results both in elementary and high school and international surveys such as Trends in International Mathematics and Science Study (TIMSS) which may be linked to the following factors: (1) lack of functional science laboratories (Jalmasco, 2014; Dela Cruz, 2017; Tan, 2009), (2) insufficient number of qualified teachers (Marinas, 2002; Tan, 2009: DOST-SEI-UP-NISMED, 2011), (3) overloaded and congested curriculum (Marinas, 2002; Tan, 2009) and (4) lack of quality textbooks and instructional materials (Tan, 2009). The DOST-SEI and UP-NISMED (2011) designed a framework to address the issue of declining science performance in the country. The report states that in creating a scientifically, technologically, environmentally literate and productive members of the society, a curriculum must focus on knowledge relevant to the real world and encompasses methods of inquiry. The "Science for All" of UNESCO (2010) views that everyone inclusive of the Indigenous community must have access to quality basic science education in fighting poverty and improving the quality of life.

Accordingly, the science subject in the Enhanced K-12 Basic Education curriculum faced major reform to address the overloading and congestion issue. The subject will not start until the third grade and is in spiral progression. The four quarters are divided into major topics such as Earth and Space, Living Things and their Environment (Biology), Matter (Chemistry) and Force, Motion and Energy (Physics). The Physics subject is viewed by many as difficult since it needs to associate ideas into mathematical or graphic representations (Ornek, Robinson &Haugan, 2008). Further, Ekici (2016) said that one reason that makes Physics difficult and complicated is that students cannot apply the concepts and calculations in real-life scenes. They can solve

mathematical problems but they cannot relate it to practical situations. Equally important, he pointed out that it is a general fact that Physics is a subject which is challenging to learn and teach. From here, the choice of teaching methods plays also an important role (Stefan & Ciomos, 2010) in delivering the instruction. In the Philippine setting, the low mean percentage score (MPS) of students in the science subject in the National Achievement Test (NAT) is a solid reflection of the subject's difficulty. And it is alarming for the teachers to think of ways to solve the degrading Physics situation (Jalmasco, 2014). Practicable works and hands-on activities offer a good deal of providing answers to the issue. Learning by doing and experience is vital to one's learning and views (Musasia, Ocholla & Sakwa, 2016). Correspondingly, one important notice to address this particular issue is about sustainability. According to UNESCO (2012), sustainability is a worldview for pondering a future in which natural, social and financial contemplation are adjusted in the quest for advancement and a moved forward personal satisfaction. In 2017, the organization set the 17 Sustainable Development Goals (SDGs) in which it includes a goal for quality education. It was stated that quality and lifelong learning must be promoted through inclusive and equitable quality education. Moreover, Irina Bokova , Director-General of UNESCO as mentioned in the paper (2017) stressed out that education has a duty to be in apparatus with 21st century difficulties and needs, furthermore, cultivate the correct sorts of qualities and aptitudes that will prompt feasible and comprehensive development, and serene living respectively. Specific objectives were given to achieve sustainability in education. These are as follows: (1) the learner understands the important of culture in achieving sustainability, (2) the learner is able to recognize the intrinsic value of education and to analyze and identify their own learning needs in their personal development, and (3) the learner is able to

use all opportunities for their own education throughout their life, and to apply the acquired knowledge in every situation to promote sustainable development. In brief, the inclusion of sustainability in the teaching-learning process of the Physics subject specifically for those tribal learners is a great idea. One strategy to address and strengthen sustainable education is through contextualization.

Contextualization is adapting the curriculum in ways meaningful and useful to the students (Rathburn, 2016). This particular process was mentioned in R.A. 10533 or the Enhanced Basic Education Act of 2013. It was stated under Section 10.2 that curriculum shall be contextualized and global. The curriculum shall be flexible enough to enable and allow schools to localize, indigenize, and enhance the curriculum based on their respective educational and social contexts. Contextualization according to Garin, Reyes, Domantay, and Rosals (2016) can be done in all learning areas; it maximizes materials, activities, events, and issues that are readily available in the local environment; to contextualize, teachers must use authentic materials, and anchor teaching in the context of learners' lives. Morever, culturally contextualize education motivates students to know more about their cultural heritage in order to appreciate and understand other cultural heritage.

Mangyans and learning Physics are two different entities that should be unified to achieve the Department of Education's goal of quality "Science Education for All". Understanding the culture of these people and their way of life through investigation on how they apply science in their context may be a good start. This may also voice out concerns about sustainable education. In the process, the framework of science among Mangyans will not only be expanded but more importantly will be sustained and improved. Through contextualization,

the group of Indigenous Mangyans will have an opportunity to set up their baseline in coping up with the basic education laid by the Department. Thus, creating a contextualized teaching approach will help indigenous students specifically the Mangyans to relate the concepts in their daily life and preserve their culture through science.

Literature Review

Philippine K-12 Science Curriculum

Teaching Approaches in K-12 Science

Before implementing the Enhanced basic curriculum, the DOST-SEI and UP-NISMED (2011) released a report which assessed and evaluated the existing science curriculum in the country. The results are consistent with the alarming results of National Achievement Test (NAT) and international surveys such as the Trends in Mathematics and Science Study (TIMSS). The document raised essential questions about the curriculum, an example is that, "Does science in basic education help students become informed citizens so they can engage in wise decision making about issues that involve science and technology now and when they become decision makers in government and industry?" The report further cited that the curriculum is not aligned with the needs of our industries and students must know the process of "learning to learn". According to DOST-SEI and UP-NISMED , the following are the key features in addressing the condition of science education in the country; (1) Science is for everyone, (2) Science is both context and process, (3) School science should emphasis depth not breadth, coherence rather than fragmentation, and use evidence in modeling explanation, (4) School science should display a commitment in developing a culture of science, (5) School science should promote the strong

link between science and technology, including indigenous schools, and (6) School science should recognize that science and technology reflect, influence and shape our culture. These guidelines conform with the recommendations of the conference of UNESCO in Budapest in 2009, which reiterated that everyone is entitled to quality basic science education in the world to make them good decision makers and improve the quality of life. In fact, the science curriculum in the country experienced major adjustments when the Enhanced basic curriculum was implemented. The framework of DOST-SEI and UP-NISMED took into consideration solving concerns about school curriculum, teaching-learning processes and instructional materials which are major contributors to low science performance. From the old curriculum, Basic Education Curriculum (BEC), science at the secondary level were offered with specific disciplines for each of the year levels. Integrated Science for first year students, Biology is for the second year, Chemistry for the third year and Physics in the fourth year level. In the new curriculum, arrangement of topics in science is in spiral progression to address congestion and overloaded competencies (Montebon, 2014). In the new curriculum, the spiral progression approach was introduced. In this approach, the scope and sequence of the content are developed such that concepts and skills are revisited at each grade level with increasing depth (Ferido, 2013). There were expectations that learning is extended, broadened, and increased in-depth each time the concept is revisited. About delivery and instruction, learner-centered approach and methods are encouraged (Montebon, 2014; Ferido, 2013) such as inquiry-based science teaching. The design of the science curriculum is to target three important concerns which are (1) inquiry skills (2) content and connections and (3) scientific attitudes and values.

Also, Cabansag (2014) stated that school stakeholders such parents, teachers, and students have high hopes in the new science curriculum. Expectations such as developing the 21st century learners holistically who can apply their skills in daily life situations for improving life were pointed out.

The DepEd discussion paper (2010) pointed out that the new curriculum offers changes in both content and instruction. Nationwide pieces of training were conducted for public school teachers to input the content of the new curriculum and revisit their teaching pedagogies. Since the science curriculum aims to develop scientific literacy, and decision-making skills among its learners (Ferido, 2013; Montebon, 2014), it is, therefore, a must that teachers employ approaches that will develop these skills.

Science as an essential subject in school has its connection to various aspects of society, industry, and technology; therefore planning and performing of the content's delivery must be taken care of. Approaches, strategies, and methods in teaching science have been explored by several researchers in the field. However, the rise of modern technology proposes more challenges on the teachers in the field. Teachers do not only deal with the challenges of the new science curriculum but also to developing the 21st-century skills of the students.

Ferido (2013) on her presentation further mentioned pairing the science curriculum to the learner-centered approach in which students are given tasks that will enable the full optimization of their knowledge and skills in making sound judgments and solving problems. Pedagogies in the K-12 curriculum in the 21st century should cater to the needs of the students to develop their critical thinking skills so they can apply science concepts given a parallel or different situation.

The Department of Education (2012) through their K-12 Basic Education Program Toolkit laid out the pedagogical approaches that are fitting to use in the science curriculum. These are integrative, constructivist, inquiry-based, reflective and collaborative. Integrative is thematic or interdisciplinary approach where there are ideas that overlap within two or more subject concern. One area reinforces learning on the other. Contextualization is an example of integrating real-life situations on the learning concepts for further and better understanding. In constructivist, learners learn and compose the concept based on their understanding of their experience. It is an active approach exposing the students in performing activities. Inquiry-based approach in which learners have the responsibility for their own learning by inquiring and seeking an answer for problems laid out by the teacher. Scientific inquiry is the best tool to develop their critical thinking, investigative and problem-solving skills. Reflective approach is self-assessment and self-evaluation where learners assess them on what, how and why they are doing such in the classroom. It is a model for learners to improve or change their learning. Collaborative learning is a social activity and better results are acquired if students brainstormed about their outputs. Collaborative approach is one method of promoting teamwork in the classroom

In addition, Resurrecion and Adanza (2015) enumerated collaborative learning, peer tutoring and outcome-based performances as students' activities in the classroom. These are anchored still on the spiral progression approach of the curriculum, which starts with simple ideas to complex ones.

Physics Education

Physics is one part of the science curriculum. Physics is a fundamental science dealing with two major units such matter and energy and its connection with each other. Paul Hewitt (2003) stated learning Physics is easy and fun if you understand the intertwined ideas of things and can make a mathematical representation of those. However, opposite is happening in the field. There are struggles on Physics education resulting to the low number of enrollees in the tertiary level (Musasia, Ocholla & Sakwa, 2016), and negative behavior towards the subject (Bayar & Kerns, 2015). Various researchers have already confirmed that students find the subject difficult because of several reasons such as formulas and calculations with explanations (Ornek, Robinson & Haugan, 2008), rambling solutions and understanding (Ekici, 2016) and teacher factor (Stefan & Ciomos, 2010). Due to these conditions, Physics is one of the learning concerns that is subject to many studies and targets the introduction of innovative strategies and approaches.

In 2013, McDermott addresses the issue by researching a discipline-based approach to improving the teaching of Physics. The study revealed that the mode of instruction has improved learning of university students. Practical work and activities were the main focus of the study of Musasia, Ocholla, and Sakwa (2016) and Aderonmu and Obafemi (2015).They stressed out that traditional methods or teacher-centered are the main culprits of the low number of students taking Physics as a course. Utilizing practical activities is efficient in learning the subject. Technology-based methods are the concentration of the researches of Kotluk and Kocakaya (2016) and Su and Yeh (2014).

Equally important, Kotluk and Kocakaya (2016) evaluated the effectiveness of digital storytelling in Physics instruction. The tool was used in distance education. The pre-service teachers who uploaded the videos on YouTube evaluated the strategy. The study showed that using digital storytelling is successful in sending information. In 2014, Su and Yeh explored the use of integrated animations and its effect on both the learning and attitudes of students in learning Physics.

In the Philippines, the condition of Physics education is parallel with other countries. Orleans (2007) described the condition of Physics education in the country. He listed several reasons that contributed to the status of Physics education in the country (1) quality of teachers especially in rural areas (2) inadequate instructional materials and (3) fragmented curriculum. Some of these factors still hold true today.

Contextualization in Science Education

R.A. 10533 or the Enhanced Basic Education Act of 2013 includes as provision the contextualization of learning materials. For a successful delivery of instruction, the law states that "the curriculum shall be contextualized and global, and shall be flexible enough to enable and allow schools to localize and indigenize, and enhance the same based on their respective educational and social contexts. The production of locally created teaching materials shall also be encouraged". The principle of contextualization is familiar to public school teachers since it is already embedded in the department's mission which states, "To protect and promote the right of every Filipino to quality, equitable, culture-based, and complete basic education…" Also, the concept of contextualization is being specified in the provisions of our 1987 Philippine

Constitution particularly on Article XIV, Section 14 of the 1987 Philippine Constitution which states that "The State shall foster the preservation, enrichment, and dynamic evolution of a Filipino national culture based on the principle of unity in diversity in a climate of free artistic and intellectual expression" and Article XIV, Section 5. (1), which states that "The State shall take into account regional and sectorial needs and conditions and shall encourage local planning in the development of educational policies and programs."

Contextualization is a process of connecting academic skills to specific content that is meaningful and useful to the students (Rathburn, 2015). Moreover, contextualizing science instruction involves utilizing students' prior knowledge and everyday experiences as a catalyst for understanding challenging science concepts (Rivet & Krajcik, 2004). It is a diverse family of instructional strategies designed to more seamlessly link learning fundamental skills and academic or occupational content by focusing teaching and learning squarely on concrete applications in a specific context that is of interest to the students (Mazzco, Rab & Alssid, 2003). Further, contextualization heightens the materials, activities, events, and issues that are readily available in a given environment (Garin, Reyes, & Domantay, 2017). It also adheres to making the lesson flexible, fit, creative, relevant, meaningful and adaptive to the level of students' understanding and instructional needs (Pecson, 2014). In 1991, Cobern mentioned on his study that education should be reformed and schools should encourage and promote learner-centered approach of teaching. He stated that constructivism offers a wide range of characteristics for this particular reformation. But this specific intervention needed a foundation hence, the term contextual constructivism was coined. Contextual constructivism according to Cobern (1991) is

a mixture of learner-centered approach and the content is taught in a way the students are familiar and can relate to.

Bleicher (1993) presented a paper in a conference with a major finding that there is a difference on the capacity in learning science on students' doing activities on school labs between students working in university labs during summer break. It calls his attention that a contextualized environment is the major cause for this account. Koul (1997) probed the curricular materials in India. He noted that a contextualized curriculum is a powerful tool for addressing the nature of science and technology in school curricula in the place. Rathburn's study in 2015 revealed a significant feature of contextualized learning. She made mention that the process influence the students' capacities to connect with their learning and their lives. Bilican, Cakiroglu & Oztekin (2015) on the other hand, stated the importance of contextualization on a meaningful understanding about science. The pre-service teachers who were the respondents of the study showed improvement on understanding about science. In 2007, Lubben, Campbell and Dlamini conducted a study in Swaziland about contextualizing science topics such as circuit-electricity and air and respiratory processes. They concluded that lessons, curriculum content, and teaching methods should be locally relevant. Follow-up research was piloted by Campbell and Lubben in 2010 explored ways in which Swazi junior secondary school pupils who have been taught a contextualized science course dealt with everyday science-based situations. In particular, the paper documented pupils' written explanations of everyday actions in terms of an awareness of the social and economic implications of science; their skills in designing an experiment to solve an everyday dilemma; and their abilities to draw on relevant science concepts to solve everyday problems. As a result, suggestions were made to increase the

effectiveness of contextualized teaching in dealing with everyday situations. In addition, Rivet (2003) addresses these gaps in the literature by exploring teachers' efforts to contextualize instruction in two urban middle school project-based science classrooms, looking particularly at how teachers and students utilized the contextualizing aspects of the project and its relationship to learning. Major findings of the study include teachers' successful use of contextualizing features throughout the extended project in urban classrooms, students' engagement with the contextualizing features which brought forward their prior ideas and experiences during instruction, and a significantly large correlation between students' use contextualizing features during instruction and their performance on science learning assessments. Developmental research was made by Rivet and Krajcik in 2004 about contextualization and project-based learning. The study tapped the prior knowledge and experiences activated during a project-based science unit in two urban middle school classrooms. A selection of contextualizing lessons was videotaped and stimulated recall interviews were conducted with target students about their thinking during instruction. The findings of the study began to identify a classification of contextualizing features in terms of the types of student thinking generated during instruction, which can inform the design of materials and professional development to foster and support contextualizing instruction in science classrooms.

From studies steered in the middle school, contextualization was also the subject of researches in the university. Holman and Piling (2004) tested the effectiveness of contextualization in Thermodynamics. The subject was chosen since it is considered as a theoretical area of undergraduate chemistry. The researchers had initial evaluation that the approach increased the appeal of thermodynamics and improved learning of fundamental

principles. As evidence of this, Perin in 2011 stated that the process of contextualizing curriculum content has the potential to accelerate the progress of academically underprepared college students.

Academic Performance and Learning Motivation

According to Amasuomo (2014), academic performance is the outcome of education; it is the extent to which a student, teacher or institution has achieved their educational goals. Thus performance is characterized by performance on tests associated with coursework and the performance of students on other types of examinations. Motivation on the other hand is defined as the direction, persistence, and amount of effort expended by an individual to achieve a specified outcome (Thacker, 2002). Moreover, he explained that human performance be it academic or occupational is directed by several factors.

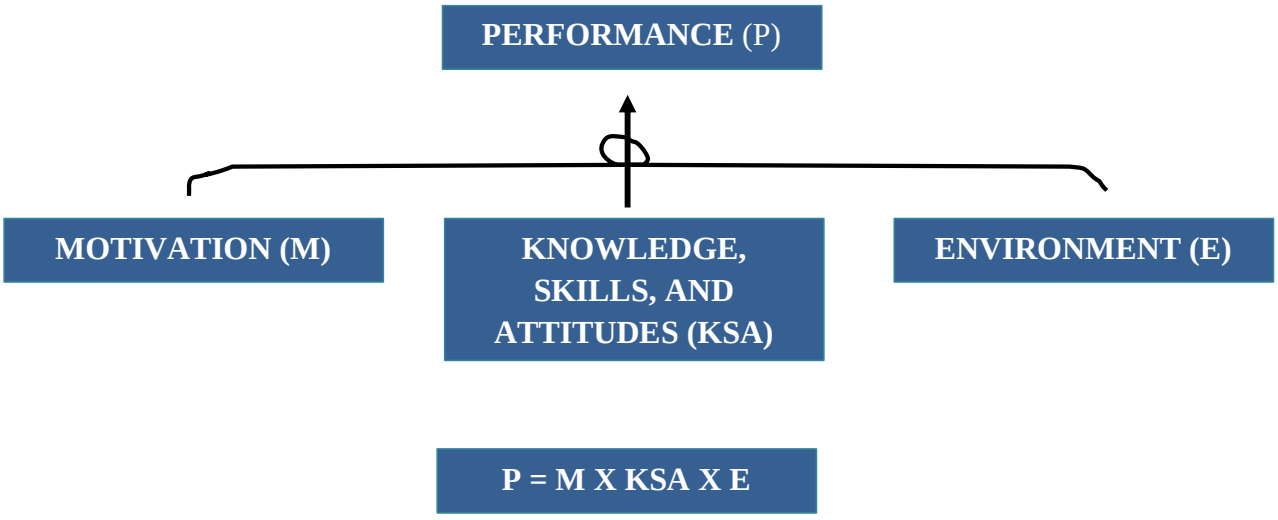


Figure 1. Factors Determining Human Performance. (Adapted from Thacker, E. (2002). Chapter 2: Learning Motivation and Performance. p. 214)

Figure 1 depicts a general performance model. This model indicates that a person's performance (P) depends on the interaction of motivation (M), KSAs, and environment (E). Motivation arises from your wants and beliefs regarding the best to satisfy those wants. Each motivation and KSAs are a part of your memory and thinking systems (i.e., psychological feature structure). Environment refers to the physical surroundings during which performance should occur, as well as barriers and aids to performance in addition as objects and events (cues) that you just may see as indicating that your performance will be rewarded. Each of the factors M, KSA, and E in the figure will influence performance, however the mixture of those factors determines the person's overall performance. The weakest factor, then, limits the probability of participating in any activity. As an example, regardless of however knowledgeable or skilful a person is, if he/she is not driven to perform the activity—or worse, are intended to not perform it—then he/she will not. If the environment doesn't support the activity or blocks it, then it doesn't matter however motivated or knowledgeable the person is—he/she won't do it.

The correlation between learning motivation and academic performance had been explored by many researchers in the field. The following studies do not imply that there was a direct connection found between academic performance and the learning motivation of students. Schick and Phillipson (2009) investigated the role played by general intelligence in German students attending the Gymnasium schools. Results of the study revealed that the greatest predictors of learning motivation were variables related to personal identity, rather than intelligence. It was therefore concluded that learning motivation is a moderator variable of intellectual achievement for students with intellectual giftedness, rather than an inherent

component of giftedness. Further, Llabao, Sagun, Tamangan, Pattalitan, Dupa and Bautista in 2016 concluded in their study that there are no significant differences on the motivations of the respondents in learning science except for extrinsic motivation when grouped by sex and task value when grouped by curriculum year and except for extrinsic motivation, the types of motivation in science learning are not related to the academic performances of the respondents. These results were confirmed by the study conducted by Aydin (2015). The study aimed to analyze the relationship between high school students' self-efficacy, perceptions regarding biology, the metacognitive strategies they use in this course and their academic motivation in learning biology. According to the study results, the use of metacognitive strategies and self-efficacy made a positive and significant prediction of students' intrisic motivation to learn biology. Moreover, self-efficacy made a negative prediction of academic motivation, and it did not predict extrinsic motivation. The use of metacognitive strategies did not predict academic motivation, and it positively and significantly predicted extrinsic motivation. Additional related study by Darbyshire and Haarms (2015) attempted to identify how the sub components of motivation impact on academic performance utilizing an established tool, Motivated Strategies for Learning Questionnaire (MSLQ). Intrinsic value (MSLQIN) was positively related to academic performance for all culture and socio economic variables tested. This indicated that students with a positive motivation towards the curriculum content, students who were motivated to learn the content are more engaged in deeper level comprehension. This linkage indicates that students who are either interested in the subject material, or believe it is important to them, developed higher levels of self-control and ultimately higher performance. Yurdugul and Cetin (2015), considered the learning procedure and the learning results to explored the impacts of

learning process on learning results. Moreover, they mulled over the two measurements of learning results as a) perception of learning, and b) performances of learning, respectively. Likewise, they researched the connection between students' impression of learning and execution of learning. Results showed autonomous learners (those with deep strategy and motivation) have better perceived learning outcomes. However, having deep motivation and high perception of learning is not necessarily correlated with high performance. Korpershoek (2016) explored to what extent school motivation and school commitment contributed to the explanation of students' academic achievement in addition to the effect of students' cognitive capacities, (2) to find out whether school commitment mediated the relation between school motivation and academic achievement, and (3) to find out whether school motivation mediated the relation between school commitment and academic achievement. The results showed small effects of performance (+), social (+), and extrinsic (-) motivation on academic achievement in addition to students' cognitive capacities. A very small negative effect was found for in-depth exploration. In-depth exploration mediated the motivation – achievement relationships to a limited extent.

Various research studies claimed that learning motivation and academic performance are directly proportional with one another given that the respondents were exploring new technology. In 2013, Lin and Jou, proposed a study about a learning surroundings supported by well-known web applications to supplement classroom teaching and learning activities, assist instructors in facilitating student learning and participation, and help improve student learning motivation and performance. Experimental results disclosed that students had higher learning motivation and participation when using the planned web application supported learning environment throughout and after class because it gave them access to adequate learning support.

Likewise, Wichadee and Pattanapichet (2015) conducted a study to find out what impact a digital game had on students' learning performance and motivation. A quasi-experimental study was performed with two groups of students. The experimental group was taught using the digital game Kahoot whereas the control group was taught with the conventional method. The experimental group obtained higher scores than the control group, and the motivation of students in the experimental group was much higher than that of the control group. In addition, the results of a survey indicated that students had positive attitudes towards application of digital games in language learning. Nayir (2017) agreed with the results of the researches above claiming that students' motivation level is important for active engagement in class. Addition to this is the mastery-oriented learning that had a significant effect on all dimensions of class engagement.

Mangyan as cultural community in the Philippines

Mangyan is a group of indigenous people in the country. They are local inhabitants of the island of Mindoro. They are divided into 6 to 8 tribes namely Hanunuo, Taubuhid/ Batangan, Ratagnon, Alangan, Buhid, Tadyawan, Bangon, and Iraya. Each of the tribes carries their own set of culture and language (Askeland, Bull &Mittelmarck, 2010; Dichoso, n.d.).Mangyans usually reside in the mountainous areas of the province which is strongly rooted in a historical backdrop. These indigenous people's comfort zone is the mountain because they considered mountains as the safest place for them.

> "It's safe here. Safe from lowlanders who force us to work in the mahogany forests for little or no pay, and beat us if we refuse. They treat us like animals. Some of them even believe that we Mangyans have tails! When we hear these people coming we disappear deep into the forest. No wonder the great grandfathers left the lowlands to live up here in the jungle-covered hills. It's safe".

(Transcribed by Davis, 1998, p. 30, cited by Askeland, Bull &Mittelmarck, 2010).

Mangyans forced themselves to live in the mountains to avoid discrimination and abuse from lowland populace. Because they lack proper education, they are abused of their ignorance (Calda, 2008).

Though they believe in one Supreme Being, Mangyans still believe on the concepts of spirits. They say, there are bad spirits everywhere especially in the forest. These entities create bad incidents if they misbehave.

> _____"—I and my family just worshiped gods in nature. But [the] more spirits we believed, the more we were fearful… The spirits are everywhere in nature. For example, Bukao is a bad spirit. We cannot see him. He is living in the rock, in the spring, in big trees like Baliti and other big trees in the forest. When you roam in the forest and get sick, it is caused by Bukao. So when you go to the forest or jungle you must be quiet. You should not speak bad words. You will surely get sick… When I go to the forest to get some wood or food I will not misbehave there. It is frightening, something might happen to me*". (Transcribed by Ramschie, 2008, p 45, cited by cited by Askeland, Bull &Mittelmarck, 2010).*

Mangyans, due to lack of formal education, and their location that is far from the civilized community are oblivious. These group of people still believes in legends and afraid to try new things that are foreign to them. Hesitations to try these things are dominant in the tribe. They are unaware of the ways of living of the lowland populace. Early marriage is also a concern. The following excerpts show this.

> "—We had to hide further up the mountain again yesterday. We heard that the government doctors were in the area looking for people. My cousin says they come with sharp sticks and shove them into your arm. Why would they do that? I remember the old One said it might be a good thing. Someone told him it was to keep the children from getting sick. But how do you know? It could be something very bad". *(Transcribed by Davis, 1998, p. 96, cited by Askeland, Bull &Mittelmarck, 2010).*

> "—It is time for me to have a wife. I know the one I will choose. She's from the village across the river where my cousin lives. He says she is not spoken for, so after the rice is planted I'll go and bring her here. Why do I want this one? Because she is strong. When I visited my cousin I watched her work. She is not large, but she can dig sweet potatoes faster than anyone, and she can carry five bamboo tubes of water from her headband. Five! She's a quiet one, but she laughs. I would like a wife that laughs. I think she'll want to come with me. The second day I was with her village she made herself very clean in the river and even put a flower in her hair. That's a good sign." *(Davis, 1998, p. 50, cited by Askeland, Bull &Mittelmarck, 2010).*

This group of indigenous people has boundless respect for their culture and tradition. In 2008, Oroza examined to break down how the different components of correspondence implanted in the social practices of Hanunuo-Mangyans on natural resources management (NRM) capacity to moderate their common resources. Discoveries demonstrate that the Hanunuo-Mangyans' practices in dealing with their common resources were represented by social convictions and customs that included contributions to spirits accepted to be gatekeepers of regular assets. Chosen older folks were considered as having the endowment of having the capacity to chat with otherworldly watchmen of common assets. The methods of and materials or devices for contributions fluctuated for normal waterways, lands, wild creatures and woodland. They additionally trusted that the tweeting of the feathered creatures and the sounds that reptiles and geckos set aside a few minutes of the day have implications on whether great or misfortune is anticipated. Because of their social convictions and conventions, their administration rehearses were attached up to a sound standards. For example, utilization of stakes for boundary; experimenting with a couple of moments on a plot to check plant reasonableness and soil fruitfulness before mass planting; utilization of flame breaks when clearing territories to prevent occasion fires; planting of bamboos on disintegrated regions; no pursuing within reproducing season and security of creature's living space to continue the presence of wild creatures. Social

rehearsed for common benefit the executives were sourced basically from older folks, with messages transferred figuratively through offering and recognition of customs as channels. The materials and mechanisms utilized and in addition the way toward completing the offering passed on the messages on how they respect and regard nature and its otherworldly watchmen. Through comprehensive festivals, they soaked up the exercises and genuine practices they should share to different individuals from the network especially to the second era of senior citizens who are relied upon to carry on the convention. There was no immediate verbal exchange of messages from the old to the more youthful age. The senior citizens were viewed as wellspring heads of learning and in this way, filled in as their believable and all around regarded source/show and in addition relational medium concerning sound characteristic asset the board. Hanunuo-Mangyan culture as a methods for imparting common asset the board rehearses has been considered as simple to pursue since it is unconstrained; simple to execute as it binds together than partitions and depends on regard for senior citizens and not control based expert. Then again, it is powerless to impact of outer powers, for example, government approaches, presentation of new information and religion.

Due to their attachment to their locality and respect to the preservation of their culture, still Mangyans had minimal chances into getting a formal education (Virola, 2015). Only few tribal families had sent their children to school. This is because of several factors such as (1) lack of schools near their area (Salamat, 2013), (2) poverty. Most Mangyans are underpaid and often abused of their work and services offered (Virola, 2015), and schools encounter numerous problems such as the limited budget and children being burdened by hunger or hours' distance from the school (Salamat, 2013). Despite all these odds, Lintawagin (Virola, 2015) stated that all

Mangyans want is for their children to learn believing that education is the greatest parents' legacy and defend their ancestral lands from the educated, rich and powerful.

Mangyan Science

Mangyans are group of indigenous people that has a very rich culture, beliefs and traditions. Among these traditions were practically governed by science concepts; but because of their lack of formal schooling these science-related traditions were not further explained and understood. Postma (1985) discussed one important science concept that Mangyans have it in practice –time. Mangyans used the "Calendar of Nature" in estimating time of the day, months and seasons in a year, and even the length of an activity. As Postma, stressed out, these indigenous people lack formal schooling that is why they do not know how to tell time using clocks and other devices. They utilized methods that are unique and meaningful to them. Mangyan also knows how to tell seasons based on what they are experiencing with the environment. Hot, humid days give them the dry season and rainy weather for the rainy season. They also based their predictions on animal behaviors. The northwest monsoon (habagat) and southwest monsoon (amihan) concepts provide them the notion of months. If the amihan is already prevailing, it means to them that Christmas time is near and they to go down the lowland community to ask for goods.

Mangyans are agriculturists. They practiced kaingin or the swidden method of farming. It is an agricultural system of cultivating land for variety of purposes characterized by cutting down and burning of trees (Rodriguez, 2015). Further, most people believed that this type of farming contributes to deforestation and infertility of the land in the long run. But according to

the Dr. Wolfram Dressler of the University of Melbourne (2015) there are different types of swidden systems. The Mangyans ways of farming were on smaller-scale and planted only by non-permanent crops, and if it with permanent crops, families will still allow the forests to regrow for usually more than four years, and sometimes longer in other areas. United Nations Framework Convention on Climate Change (UNFCC) as mentioned by Rodriguez (2015) in her report stated that shifting cultivation is the manner of swidden agriculture of the Mangyans. Shifting cultivation is a form of land use characterized by alternation between a short span of cultivation and a comparatively long span of natural or improved fallow. It uses regular, cyclical shifting of fields. It involves removal of the fallow vegetation by – normally but not exclusively – using fire. This typical activity of the Mangyans is a good example of a science-related tradition wherein even though they are not taught in the formal school on how to conserve and protect the biodiversity of a particular place, they were still practicing it.

Mangyans are good hunters. They were knowledgeable of different plants in hunting different animals such as birds and wild cats (Mandia, 2004). The flowering branches of baltuntong (Clerodendrum macrostegium) and tigaw (Callicarpa candicans) are best for bird blinds whereas the fruiting branches of likso (Artabotrys sp.) whose fruits are edible are best for trapping wildcats. The roots of tubli (Derris elliptica), tuba (Croton tiglium), sibalao (Derris heptaphylla), bayati (Anamirta cocculus) and tigaw are usuallu pounded and soaked in the middle of rivers particularly during dry season when waters are low to poison and stupefy the many fishes, shrimps, and eels found there. It is an implication that Mangyans are specific with the various plants in their place and using the unique characteristics of each plant for their hunting purposes.

Mangyan's fire-making is governed by science concepts as well. Mandia (2004) described Mangyan starts a fire using the bolo, mutya, and kumbad. They vigorously strike a muyta (flint stone) with a bolo that produces a spark that kindles fine rattan or wood shavings (kumbad). They use the resin of almeciga (A. philippinensis) to keep their fireplace smoldering and providing light and heat throughout the cold nights of their mountain altitudes.

Syntheses

The Enhanced K-12 basic education curriculum aims to produce learners who are globally competitive and productive citizens. Reformation of the science curriculum using spiral progression approach, where the arrangement of the topics is from basic to complex, was stressed. This method emphasize the decongestion of the curriculum and advocates depth over breadth. The Department of Education also encourages educators to use pedagogies such as constructivist, collaborative, integrative, reflective and inquiry-based. In this way, the goal of the new curriculum to produce scientifically literate students with the mastery of concept and may apply in on real-life situations, can be achieved. Physics education in the country has faced many challenges, issues, and concerns. Physics is a subject that deals with mathematical concepts where students connect conceptual understanding through mathematical or graphic representations. Sustainable education could be an answer to the issue at hand. It is through this process where equitable quality education is conducted for learners' lifelong learning. And with sustainability comes inclusivity of a particular place or race. Inclusive education is defined as placing education through a context the learner could appreciate. It is interconnected with the process of contextualization. Contextualization is a method of adapting the curriculum in a

setting meant to the learners. The new curriculum reassures the practice of contextualization for genuine learning to happen in the classroom.

Indigenous people like the Mangyans of Mindoro are not exempted in the curriculum reformation. Resiliency and focus on the Mangyans way life, culture and tradition should be the foundation for the delivery of science education. The strength of contextualized learning would be a great help for these indigenous group to consume their way or technique in living in learning Physics and preserving or sustaining their culture as well. The researcher adopted a working model termed 4PSR (Problem, Predict, Process, Product, Solution and Reflections) which described as the contextualized education. It aims to bridge the gap between mainstream and IP students. The six (6) essential elements will be valuable for the target respondents. The main objective of the study is to provide quality science education among IP students through the proposed teaching approach.

Framework of the Study

The contextualized approach in Physics is a means to address the goal of the new science curriculum in producing scientifically literate individuals. UNESCO (2010) defines scientific literacy as the knowledge and skills gained by the students that they will develop the ability to apply it in real life context. Physics is difficult for the students because of the Physics idea itself, the way in which Physics course is taught, and Physics problems which are sometimes vague (Ornek, Robinson & Haugan, 2008). The chance of the learners to experience it helps them understand the concepts (Musasia, Ocholla & Sakwa, 2016). Contextualization offers a good deal in providing these experiences. It has roots in the constructivist theory of learning that gives

priority to activities in which students explore resources that will enable them to solve a given problem. Further, in enabling the students to apply these experiences on daily life basis, it should be presented in a context that they can understand and grasp. The Department of Education's encouragement of contextualization to its constituents is reflected on R.A. 10533. It is the process of adapting the curriculum into context; making sense of information from the situation or location in which the information was found.

The teaching approach is built around three (3) essential dimensions; the Physics content, Mangyan science context, and the cross-cutting concepts. The Physics content is aligned with the K-12 Science Curriculum Guide provided by DepEd. Physics is labeled as Force, Motion, and Energy in the guide. The 7th Grade Physics is composed of topics like Constant and Uniformly Accelerated Motions, Waves, Sounds, Light, Heat, and Electricity. The 8th grade Physics meanwhile is composed of topics such as Laws of Motion, Work, Power and Energy, Sound, Light, Heat, Electricity and Magnetism. The basis in selecting the topics that were included in the contextualized approach was dependent on the dominant activities of the Mangyans in the community. The content of the contextualized approach was incorporated into their daily routines and practices. The Mangyan Science Context is a body of culture, beliefs, and tradition of these indigenous people that is governed by science concepts. It can be simply described as science in a Mangyan community setting. The sources of these contexts could be found in books and articles that have observed the Mangyans way of life or a direct observation of their activities in the community by interviewing them. The cross-cutting concepts are defined as connections across two differing disciplinary area (NGSS, 2013). In the framework, the cross-cutting concepts are the bridges that unify the Physics content and the Mangyan science context.

There are seven cross cutting concepts that may or may not be present between Physics content and Mangyan science context: (1) Patterns, (2) Cause and effect; Mechanism and explanation, (3) Scale, proportion and quantity, (4) System and system models, (5) Energy and matter: Flow, cycles and conservation, (6) Structure and function and (7) Stability and change.

In the framework, the contextualized approach is governed by the three (3) essential domains that are presented in a cyclic manner. The following figure shows the conceptual framework of the study.

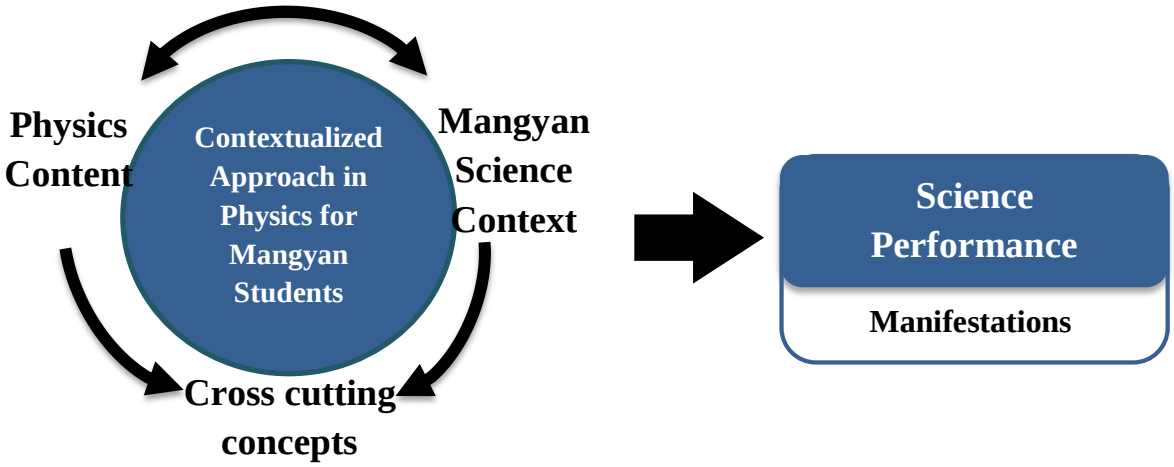


Figure 2 Framework of the Study

From Figure 2, it shows that three domains interact repeatedly. The two-headed arrow between Physics content and Mangyan Science context means that two are interconnected and interrelated with each other. Arrowheads from the two components; Physics content and Mangyan Science context are directly pointing on the cross-cutting concepts means each of the domains contributes to its development. It is a continuous process of advancement on the three domains that will strengthen the grounds of contextualized approach in Physics. The working

model for the approach was adapted from Maastricht Seven Jump Model for PBL Tutorials. After the revision came up with six (6) essential steps namely Problem, Predict, Process, Product, Solutions and Reflections; hence known as 4PSR working model. This model was developed based on the strength of contextualized education considering Mangyans' culture and tradition. The full detail of the working model is articulated in the appendix (Appendix B).

The interaction of the Physics content and the context of Mangyan science added more cross-cutting concepts. An increase in these concepts filled the gap between the mainstream science and the indigenous (minority) education. In the long term, the contextualized approach will be an answer to the "Science for All" program of DepEd.

The contextualized approach was implemented on Mangyan students. Pre-test and post-test in measuring the science performance were conducted on the Mangyan respondents to test the effectiveness of the contextualized approach in Physics. The science performance was labeled using the following descriptors: Outstanding, Very Satisfactory, Fairly Satisfactory and Did Not Meet Expectations. Each of the descriptors has its own equivalent numerical value. As illustrated in the figure, the approach also quantified the motivation towards learning of the Mangyans students in Physics. Manifestations of the learning motivation of the Mangyan students were collected using reflective journals written by the students after each of the learning sessions and semi-structured interview after the exposure to the contextualized approach.

The contextualized approach was considered as a starter in implementing the inclusive education proposed by the United Nations. The approach is anchored and designed based from the daily activities, culture, and tradition of the Tau-Buhid in the western part of Mindoro. As the

curriculum, specifically the science curriculum gets closer to their daily routines there was a greater percentage of appreciation and application of these concepts.

It is aimed that after using the teaching style, there will be great benefits not just the Mangyan students, but the teachers and the community as well. The Mangyan students are expected to understand the science lessons easily in the sense that samples of these concepts are right inside in their houses. Great impact was on the teachers since they can utilize the approach in teaching science and better in teaching other subjects too. The community was also a beneficiary due to the fact that they can use the application of these science concepts in their daily routine. They can be less ignorant and can approach simple and complicated problems by using simple science skills.

Research Problems

The call of UNESCO for a quality basic science education for all and the transformed learners of the Department of Education through the enhanced K-12 curriculum provide the science education community struggles to upturn the performance of students. These students are not only those in the mainstream setting of public education but also for those who are included in the Indigenous People community. One major concern of those in the fringe is the manner on how concepts will be imparted and culture should be taken in great consideration. The main objective of the study is to describe the science performance and motivation towards learning Physics of Mangyan students using the contextualized approach. Specifically, it aims to answer the following questions:

1. What are the features and design of a contextualized instruction approach for Physics appropriate for Mangyan students?
2. Is there a difference between Mangyan students' science performance before and after exposure to the contextualized instruction for Physics approach?
3. Is there a difference in the Mangyan students' motivation towards learning Physics before and after exposure to the contextualized instruction for Physics approach?
4. What are the manifestations of the Mangyan students' motivation towards learning Physics during the experience of the contextualized instruction for Physics approach?

Definition of Terms

Contextualization – It is a process of adapting the curriculum on the prevailing activities in a specific community for better and relevant learning to take place. In the Mangyan education, it is an inclusion process of their routinely activities on classroom discussion for significant learning.

Mangyan – It is an example of a group of indigenous people who are unique in Mindoro. They have their own language, culture and traditions that is different from the lowland populace.

Mangyan Science – It is a term coined by the researcher to describe the culture, tradition and beliefs of Mangyans that are governed by science concepts.

Motivation towards learning science – Motivation is a state that affects behaviors. It is characterized as the individual's willingness to learn science. It can be measured on the number of times a student is actively participating in classroom discussion and activities.

Contextualized Approach – It is a model wherein the concepts are localized in a particular place and uses problem-based method as a manner of lesson delivery.

Science Performance – It is termed as the level of science achievement that corresponds to the pre-test and post-test scores. Possible qualitative equivalent of the scores are as Outstanding, Very Satisfactory, Satisfactory, Fairly Satisfactory and Did Not Meet Expectations.

Chapter 2

Methods

This section discusses the research design that was used in the study. Sampling participants, research instruments and data gathering procedures were explained in details. Moreover, the manner on how data were collected and interpreted were conversed. Ethical considerations and the role of the researcher in the study were also deliberated.

Research Design

The study utilized the Embedded mixed method design specifically Embedded Experimental design. The following figure shows an illustration of the method:

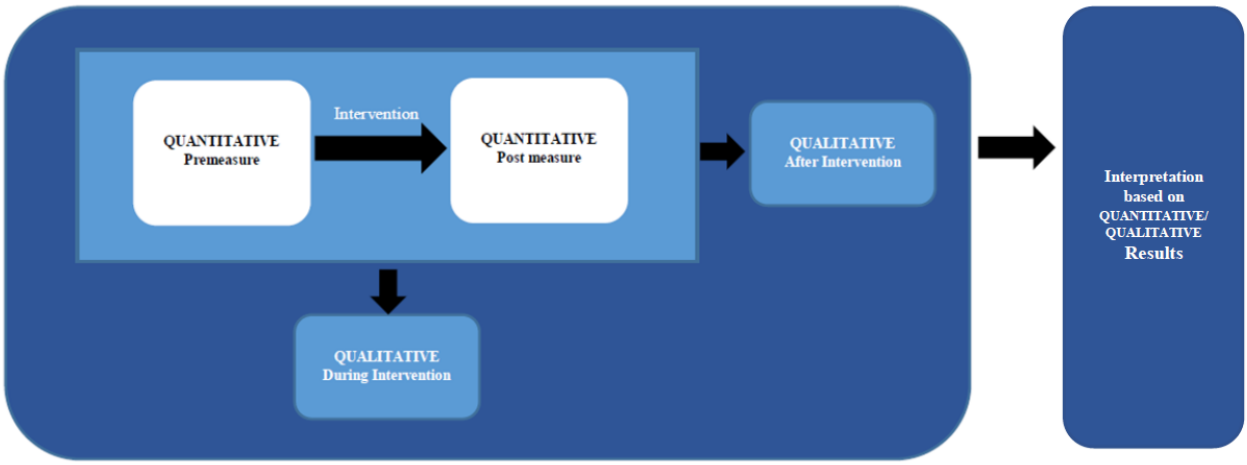


Figure 3. Method: Embedded Experimental Design. Reference: Creswell, J. W. (2012). Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research.

The study addressed the science performance and learning motivation of Mangyan students towards Physics using a contextualized approach. An embedded experimental model

was used; it involved collecting quantitative data before and after the treatment while qualitative data were collected during and after the process. The primary form of data collection is through qualitative research while the qualitative part reinforced and provided additional information to the primary form. It was both sequential and simultaneous since reflective journals were collected at the same course of the quantitative data and semi-structured interview was conducted as follow-up and helped explains the results.

Quantitative Design and Methodology

Quantitative data collection and analysis were done using a pretest/posttest instrument and an embedded ***qualitative*** data collection and analysis through daily reflection journal of the sample population and a semi-structured interview. The researcher utilized the One Group Pretest-Posttest design for quantitative stage in which the sample group took a pretest, exposed to the Contextualized Approach, followed by a posttest to test its effectiveness.

The contextualized approach used the 4PSR working model was conducted to 25 Mangyan students who are currently enrolled in the 7^{th} and 8^{th} grade. Physics topics such as Sound and Heat were the concentration on the 7^{th} grade while Laws and Motion and Work, Power and Energy for the 8^{th} grade. These topics were based on the pre-immersion of the researcher who observed and interviewed community members to extract the prevailing activities of the tribal group. The exposure of the respondents on the teaching approach was 16 hours contact time. Pretest and posttest was provided before and after the mentioned coverage.

Sampling and Participants

Non-probability or purposive sampling technique was employed in this study. The Mangyan tribe is considered as a marginalized sector in the community that is why they lack the capacity to pursue or continue basic education. The sampling method was ideal to use since there is a limited number of participants to be considered in the study.

The participants of the study were 25 Mangyan students under the Junior High School Program: 12 are on the 7^{th} grade and 13 are on the 8^{th} grade. The students were chosen based from their frequent appearances in attending classes in school.

Instruments

Pretest and Posttest

The pretest refers to a 30-item multiple choice developed and validated test that covers the topics of Sound and Light for Grade 7; Laws of Motion and Work, Power and Energy for Grade 8. The same test was used for the post-test.

The pretest and posttest instruments were validated by experts that were limited only to one Head Teacher and two Master Teachers in the field. The Assessment Validation Checklist (See Appendix P) adapted from NEAS, 2015 was used.

The test instruments were also tested for reliability on 348 Grade 8 students. Two hundred eighty of which took the Grade 7 test. The Cronbach- Alpha was used in calculating for the reliability of the instruments.

Contextualization Model Validation Checklist

The checklist contains the six (6) key features of the model. These are the Problem, Predict, Process, Product, Solution, and Reflections. Validators of the model were asked to rate the following features where the contextualization process is highlighted. The scale are as follows (4) Highly Evident, (3) Evident, (2) Slightly Evident, and (1) Not at all Evident.

Learning Plan Validation Checklist

The checklist contains four (4) categories namely, (1) Objectives, (2) Content, (3) Assessment and Evaluation and (4) Learning Context. There the total of fourteen (14) items that were rated by the validators. The learning plan validation checklist is adopted from Nipissing University Schulich School of Education. Validators of the learning plan were provided with 4-point Likert scale assessment checklist: (4) – Highly Evident, (3) – Evident, (2) Slightly Evident and (1) Not at all Evident.

Assessment Validation Checklist

The assessment validation checklist is composed of 10 items that described Validity, Reliability, Flexibility, and Fairness. There are different statements under each category wherein it can be rated from a scale of 1-4, 4 as Highly Evident, 3 as Evident, 2 as Slightly Evident, and 1 as Not at all Evident. It is adopted from NEAS, 2015.

Science Motivation Questionnaire (SMQ)

The science motivation questionnaire is adopted from Glynn and Koballa (2006). It had an overall reliability index of 0.92 for all the 25 items. The Cronbach-Alpha for each of the categories are as follows: career motivation had 0.92, intrinsic motivation had 0.89, self-

determination had a total of 0.88, self-efficacy had a computation of 0.83, and grade motivation had 0.81 (Glynn, Brickman, Armstrong, & Taasobshirazi, 2011). It is a 30-item questionnaire that depicts students' responses on the different categories such as (1) Intrinsically Motivated Learner, (2) Extrinsically Motivated Learner, (3) Relevance (Personal Goals), (4) Responsibility (Self-determination) in learning science, (5) Confidence (Self-efficacy) in learning science, and (6) Test anxiety. The items which describe test anxiety had been removed for the reason that it is not concern of the study. From the original 30-item test, the questionnaire was now composed of 25 items.

The science motivation questionnaire was given as pretest and posttest also.

Classroom Observation Tool

The Classroom Observation Tool was consisted of four situations or teaching episodes. These were the (1) Learning Objectives, (2) Task which was composed of the lesson strategy, activities and delivery, (3) Action which was comprised of the classroom environment, classroom management and generalization, and (4) Result which constituted the end of class assessment and student mastery of the objective. There were a total of 31 items in the tool. Four of which described the learning objectives, 12 items were designated on the task, 10 items for action and 9 items for result. The scoring rubrics used for the classroom observation tool were 3.25 – 4.00 – Outstanding, 2.50 – 3.24 – Very Satisfactory, 1.25 – 2.49 – Satisfactory, and 1.00 – 1.75 – Needs Improvement. The tool was adapted from the Classroom Observation Tool used in the Division of Occidental Mindoro.

Data Gathering Procedure

Table 1
Stages of the Study

Stage 1 – Premeasure – Quantitative Design			
Methods	Participants	Instruments	Analysis
Identification of Research Site Development of Learning Plans Construction of Pretest/Posttest Instruments Adaption of Developed Instruments	NCIP Mangyan Elders School Head Content Validators (Science Educators)	Letters of Consent LP Validation Checklist Assessment Validation Checklist Contextualization Model Validation Checklist Science Motivation Questionnaire (SMQ)	Coding of validation inputs of experts Frequency analysis of the validation results Reliability testing of pretest/posttest instruments
Stage 2 - Premeasure			
Methods	Participants	Instruments	Analysis
Identification of respondents Orientation of Parents/Guardians and Respondents	Grade 7 and 8 subjects Parents/ Guardians	Parental Consent Assent of Children	
Stage 3A – Intervention – Quantitative Data Collection			
Methods	Participants	Instruments	Analysis
Pilot Testing Pretest/Posttest	Grade 7 and 8 subjects	Learning Plans Pretest/Posttest Instruments Science Motivation Questionnaire (SMQ)	t-test (determination of significance of the difference between pretest and posttest)
Stage 3B – Qualitative Data Collection			
Methods	Participants	Instruments	Analysis

Pilot Testing Pretest/Posttest	Grade 7 and 8 subjects	Reflective Journals Semi-Structured Interview	Coding and transcriptions of reflective journal entries and semi-structured interview responses Frequency analysis of reflective journal entries and semi-structured interview responses

Table 1 shows the summary of the data gathering procedure conducted by the researcher. The entire research process was composed of three major stages. Stage 1 constituted the preliminaries like identifying the research site. The researcher coordinated with the National Commission on Indigenous People- Occidental Mindoro Chapter by providing them formal consent letter stating the intention that Mangyans were the respondents of the study. The NCIP channeled the request to the Mangyan elder of the area for permission. The researcher had an immersion with the community to observe the prevailing activities, culture, beliefs and tradition of the Mangyan people. These were reflected on the developed Learning Plans.

The developed learning plans and activity worksheets anchored on the 4PSR Model working model as well as the pretest/posttest were validated by experts limited only to head teachers and master teachers on the field. The contextualized model approach was validated by the experts in terms of the emphasis given on the contextualization process in each of the key features of the model. Experts were given a copy of the key features of the working model (See Appendix B) and a sample learning plan (See Appendix C).

The pretest/posttest was tested on its reliability by conducting it on three-hundred forty eight (348) Grade 8 students. Both the Grade 7 and 8 pretest/posttest was conducted on the 8th grade due the fact that these groups of students already had mastered the competencies of Grade 7 Physics.

The parents or guardians of the Mangyan students were given a parental consent letter to inform about the study and to ask them as well as to allow their child to participate (See Appendix J). The consent letter includes an introduction stating the reason and purpose why their child is invited to participate in the study. It also contains the risk/discomfort and benefits of being in the study. It is reiterated in the consent letter that the identity of their child will be anonymous. The researcher assured the confidentiality of the study among the participants wherein collecting or retaining about the child's identity was not be done. The records of this study were kept private and obscure.

The participants were given an assent to participate in the research study (See Appendix K). The assent contains an explanation of why the researcher is conducting the study, what will the participants do, benefits that they can get and on how the participants and their identity will be protected. If the study will be published, the researcher will only discuss group results and will not use the names of the participants and personal information.

Both the assent and consent were given before the data gathering started. The reply slips for consent was signed by the parents or guardians while the assent's reply slips was signed by the students.

The participants were oriented about the research before the actual data gathering. The researcher conducted a meeting-orientation to inform the participants about the nature of the

study, the process of data gathering, procedures that will be taken like the pre-tests and post-tests, the model approach that will be used, the significance of their science performance and motivation, contents of the assent and consent form, and their important roles in the study.

The respondents were given the pre-test. Grade 7 and 8 Mangyan students exposed to the Contextualized Approach for a period of 16 hours contact time after which the post-test was given. The statistical tool for significant difference was used to test the effectiveness of the mentioned approach.

Data Analysis

In analyzing the data gathered from the study, the following statistical tools were applied: For descriptive statistics, the following tools were used: (1) mean (average) for the measure of central tendency and (2) standard deviation for the measure of variation. Descriptive statistics was employed on the Learning Plan Validation and Assessment Checklist and Science Motivation Questionnaire.

For inferential statistics, (1) Cronbach-alpha was utilized in measuring the reliability of the pretest/posttest, and (2) t-test for paired sample means was employed in testing the significance of the contextualized approach before and after the Mangyan students' exposure to the treatment.

Qualitative Design and Methodology

The case study design was utilized in the study. According to McLeod (2008), case studies are in-depth investigations of a single person, group, event or community. Typically, data

are gathered from various sources and by using several different methods like observations and interviews. In this study, the exposure of the students to the contextualized approach served as the main intent of the changes or improvement in their science performance and learning motivation. Reflective journals and interviews during the conduct of the study were the main source of data.

Sample respondents were exposed to the contextualized approach in Physics Instruction. During the topic discussion, respondents were required to fill in their reflective journals about the learning experiences they have gone through throughout the process. There were a total of nine journal entries for each of the Grade 7 respondents and ten journal entries for each of the Grade 8 respondents. The semi-structured interview was conducted to summarize their thoughts and involvements about it.

Research Site

The setting of the research is grounded on the relationship between culture and Physics education. It is a sitio in a hill, where a group of indigent Mangyan resides. It is a locality where the people are nourished by nature because of simple farming and planting of root crops. The place is dominated by the Tau-Buhid tribe. The main school in the lowland had put up an extension school in the place to cater students that are members of the tribe. Majority of the school's populace are Mangyans. The research is suitable and fitting since there are were no lowland students involved. The results were honest and genuine to the goal of the study in determining the levels of motivation of indigent students in using a specific technique designed with great considerations in their culture.

Selection criteria and Participants

The study was focused on a group of Indigenous People in the western part of Mindoro. Known to the locals as Mangyan, they are the group of people that carry their own identities through their simple way of living. They are peace-loving individuals that give priorities and values to their culture, tradition, and beliefs. They are often discriminated in the society because of their unpleasant appearance due to lack of maintenance of physical hygiene (Calda, 2008). Since they lived in mountains and forested areas, they are ignorant of the new civilizations and technology. Due to long distances from schools, the majority of them lack formal schooling. Even though, the government has efforts to nurture their education by providing schools in their area, only a few pursue higher education. More often than not because of these laid out issues and situations, the majority of them are poor and marginalized. The participants are chosen purposively due to the fact that the researcher wanted to explore how their way of living and activities in their locality can help them understand Physics concepts better. Added to this is the installation of the love of learning for these individuals so that they will continue to educate themselves and pursue higher education to improve their way of life.

From the 25 selected Mangyan students, only six cases were taken into considerations.

Data Collection

The researcher used two types of basic collection procedures: (1) qualitative documents and (2) qualitative interviews. The qualitative documents were classified as private documents since the sample respondents were encouraged to write a reflective journal of their learning experiences while under the treatment of the contextualized approach while teaching Physics.

The documents gave the researcher written evidence and saves time and expense of transcribing. The qualitative interview, on the other hand, is semi-structured. The interview is composed of five questions that measured the motivation of students towards learning Physics. The process of the interview allowed the researcher to control the line of questioning and gets the substantial information and data.

Role of Researcher

The researcher was a combination of an emic and etic in the course of the study. An insider or a full participant in the phenomenon since, the researcher had a direct effect on the delivery of the contextualized approach in the classroom. It partially if not fully affected the responses of students. A semi-structured interview was conducted, that is why there was a greater chance of biased responses from the students. The researcher also had a chance to construct follow-up questions that led to more favorable responses. To avoid the conflict and bias regarding the situation, the researcher invited third party individuals, a teacher from the school and a Mangyan elder as observers.

The researcher played the objective viewer in transcribing the reflective journal of the students. Uncontrolled data was written in the journal since the subjects have the freedom to write what transpires in their learning experience. It was considered private and personal.

Threats to Validity

The following threats played a major role in the qualitative data collection. Ways to address these threats were described in this section.

1. Descriptive validity – There were data which were not recorded during an interview that played a significant role in the result of the study. To ensure the results, the researcher used a video or voice recording so that anything that transpired in the interview may be reviewed again so as not to blunder details.
2. Interpretation validity – The researcher carefully observed students' manifestations towards learning science and being motivated. There were discrepancies on the meaning if the researcher's point of view imposed in the study. To avoid this circumstance, the researcher used open-ended questions which allowed the participant to elaborate on answers. Inquiries should not be confusing or directional in an effort to obtain any response other than the one the respondent would have normally given. The science teacher or the school head were requested to sit and observe during classes to ensure that proper documentation on the manifestations of the students were recorded and witnessed.
3. Reactivity – The researcher was the teacher that utilized the contextualized approach among the Mangyan students. It caused different reactions from the respondents; it was positive or negative that had great effect on the results of the study. Avoiding the condition is not possible, but the researcher was aware of it and the way it influenced what is being observed and stayed mindful of how the presence is influencing the environment and the people being observed, and exactly how this may impact the research outcomes.

Methods of Validation

The following were applied to ensure the validity of the study:

1. Triangulation of data – Two different sources of information were collected to strengthen the coherent theme; (1) the data from the reflective journal and (2) the data from the semi-structured interview.
2. Peer examination – A head teacher and a master teacher served as peer examiner of the reflective journals and the semi-structured interview of the respondents. Two authorities were given copies of the raw data from the reflective journals and recordings from the semi-structured interview. They were asked to code initial and repeating themes based from these sources.
3. Clarification of bias – (p. 41)

Ethical Considerations

The study aimed to test the effectiveness of a contextualized approach in Physics instruction on both science performance and learning motivation. Target respondents of the research were Indigenous People (IP) from the western part of Mindoro Island. These Indigenous People, specifically known as Mangyans for the locality, are composed of eight different tribal groups. Each group has a definite location in the province. Tau-Buhid is most prevalent in the western part. Due to major reasons such as abuses and harassment, it is of great precaution and consideration to choose an ethnic group as sample participants of a study. The researcher chose the area of Sitio Bamban in Brgy Nicolas, Magsaysay, and Occidental Mindoro, known as a Mangyan community in the province for some reason that it is the only community

that has a Junior High School Extension that is dominated by Mangyan students; since Physics is the objective subject of the study.

Consent

Formal letters were constructed addressed to the following: (1) National Commission on Indigenous People (NCIP) – Occidental Mindoro Chapter (See Appendix D) , (2) the Sitio Leader, which was properly channeled to the Mangyan elder (See Appendix E) , and (3) School head and Teacher-in-Charge of the Junior High School (See Appendix F). The process of asking favorable consents and responses from the three important networks were in a consecutive manner. A letter was given to the NCIP, approval from the chapter was a go signal to visit Mangyan communities. From the visitation, a letter was secured in asking permission from the Sitio Leader. The leader itself channeled the request on the Mangyan elder, those members of the tribe were sample participants of the particular study. Approval from the elder gave the way on providing the letter for the School Head for the arrangements and schedules of the conduct of the data gathering.

Parents of the Mangyan participants were asked for their approval if they wanted their children to participate in the course of the study. There were a total of 25 parents/guardians since there were 12 students and 13 students from the 7^{th} and 8^{th} grade respectively. They had the freedom not to allow their children to participate if they were uncomfortable in the course and purpose of the study. Consent forms were provided. The consent has an introduction wherein the parents were informed of why their child is invited to join the study. It also contained the

purpose of the study, description of the study procedures, risk or discomfort of being in the study and benefits that the participants will get.

Protection of Participants

The researcher consciously considered the protection of the participants from physical and mental harm. Activities that require body movements were limited only in running, walking and crawling and did not push the participants to use it in its maximum. Class demonstrations were focused only on the simple pulling and pushing of chairs. (See Appendix D for the Sample Learning Plans). If potentially distressing questions were asked, participants were allowed not to answer these questions and this was made clear to them at the start. During classroom discussions, the researcher sees to it that questions were filtered if necessary to prevent culture biases and offensive meanings. If negative consequences were anticipated to ensue then the researcher had to detect and remove these effects

Debriefing

Participants of the study were briefed on the course and purpose of the research. The orientation was held together with the tribal elders, participants' parents and teachers of the school. The objectives of the research were discussed in details such as subjecting the Mangyan children in a different type of technique in teaching science. It was emphasized that the student-participants will be observed during classes on how they reacted with the strategy, will be asked to write journals and will be interviewed. Quantitative and qualitative sources were laid out such as the pretest and posttest, Science Motivation Questionnaire, reflective journal, and the semi-

structured interview. It was stressed out during the briefing that all data and information that were collected will be kept confidential and with discretion. The researcher informed the participants of what were transcribed in the study.

Confidentiality

Raw scores of the respondents that were generated from the pretest and posttest were kept strictly considering anonymity and confidentiality. Data and results gathered from the quantitative and qualitative method were saved in a data storage only the researcher has access to. Files and documents were kept in private folders with limited accessibility. The identity of the participants were kept in obscurity like giving them labels such as Student A, B or C for peer reviewers. Results of the research were treated with just and fairness. The respondents may or may not request not to publish the results that have been transcribed during the course of the study.

Results of the Study

The results of the research were addressed to the participants and their parents. The researcher conducted a meeting with the parents, respondents, and the Mangyan elders as well to show and explain the outcomes of the study. It was discussed via group results and the identity of the respondents were made confidential. If the parents or respondents wish to know the individual performances via the pretest and posttest results, a private meeting was held exclusive only for the results of that particular participant.

Chapter 3

Results and Discussion

This chapter centers on the presentation of the findings of the study from the validation of the Learning Plans and Activity Worksheets to the testing of the effectiveness of the Contextualized Approach on the science performance and learning motivation of Mangyan students. In this section, data gained from the research instruments will be presented in order to answer the research questions. Firstly, the quantitative data will be shown followed by the qualitative data from journals and interviews.

The Learning Plans

The contextualized model used in the study emerged from the original Maastricht Seven Jump Model for PBL tutorials. The model was used not to stress out the sorts of PBL but adapted in such a way that contextualization's design and features were acknowledged and emphasized. Three experts were asked to validate the contextualized working model. The experts are experienced and seasoned Science educators in the field that have been in the profession for more than fifteen years. There were six questions asked in the questionnaire. The first question was collecting their idea on the revised working model. Two of the experts answered that the contextualized model approach is almost as the same of the original one but further stressed out that the revised model was more concise giving accent to the contextualization process. One expert argued that prediction was different from analyzing the problem and suggested to look for another word or term other than predict. He also proposed to use the word "probe".

The second question was about the advantages of the revised working model from the original one. The three experts agreed that contextualized model was easier to follow due to smaller number of "jumps" involved. One expert also stated that the model did not stop from the objectives alone and wished to come up with a product was a great advantage. The product was a significant part of the contextualization design due to the fact that the students were producing out of their culture and tradition based on the science concepts that they've learned.

The experts had different responses considering the next question on their suggestions about the improvement of the new working model. One expert suggested to include synthesis since it played a significant role in classroom discussion. The other one recommended the inclusion of analysis of the product.

The last question was related to the earlier question asking about the need for the model revision. All experts concluded that the new working model was better than the original one since it involved fewer steps and decisions.

Table 2

Summary of the Means on the Validation of the Features of the Contextualization Model

Indicators	Overall Mean	Description
Problem	2.67	Evident
Predict	2.67	Evident
Process	4.00	Highly Evident
Product	3.00	Evident
Solution	3.33	Evident
Reflections	2.33	Slightly Evident

Note: *3.45– 4.00 – Highly Evident; 2.45 -3.44 – Evident; 2.45 – 1.44 – Slightly Evident; 1.45 – 1.00 – Not at all Evident*

Table 2 shows the summary of the responses of the three expert validators on the different episodes of the teaching-learning process as the key features of the contextualization process. Experts were asked if the contextualization was evident in identifying the problem, the predicting, processing, creating the product, providing the solutions and writing their reflections. It was revealed from the results that experts rated the Process part as the feature of the model where contextualization is Highly Evident with an overall mean of 4.00. On the other hand, the problem identification, the prediction process, the product creation and the provision of solution were described as Evident by the validators with an overall mean of 2.67, 2.67, 3.00, and 3.33 respectively. The reflection part was rated by the experts with 2.33 termed as Slightly Evident. This rating may be brought about by the fact that students were writing their reflections in a journal – a reason why contextualization was not observed. It implied that the features of model showed confirmation that contextualization happens during the teaching-learning process.

Table 3

Summary of the Means on the Validation of the Learning Plan

Indicators	Overall Mean	Description
Objectives	4.00	Highly Evident
Content	3.75	Highly Evident
Learning Context	3.68	Highly Evident
Assessment and Evaluation	3.75	Highly Evident

Note: *3.45– 4.00 – Highly Evident; 2.45 -3.44 – Evident; 2.45 – 1.44 – Slightly Evident; 1.45 – 1.00 – Not at all Evident*

Table 3 shows the summary of the result on the validation of the Learning Plan anchored on the contextualized approach. Four (4) experts were asked to validate the learning plan and activity worksheets using the 4-point Likert scale Learning Plan Validation checklist. Validators were asked to rate the objectives, content, learning context and assessment and evaluation. As stipulated in the table, the Objectives had a mean of 4.00, described as Highly Evident. It means that the objectives of the lesson were clearly reflected in the learning plan. The content that is described by the facts, data, and information, had a mean of 3.75, Highly Evident. It only shows that there was a discussion of the data and information stressed out in the learning plan. The learning context was rated as 3.68 described as Highly Evident. It was an illustration that the learners, learning environment and resources and materials were taken into consideration in the learning plan. Assessment and evaluation were valued by the validator with an overall mean of 3.75, regarded as Highly Evident. It confirms that assessment and evaluation are measurable and aligned with the mentioned objectives and learning competencies.

The contextualized approach is an instructional model designed exclusively for Mangyan students. It is composed of six (6) parts which include (1) Problem, wherein a general question will be given to the students which will they search for the correct answer as the lesson goes on; (2) Predict, it is a part where students list down possible answers or enumerating keywords that are related to the problem that may or may not help them in answering the question; (3) Process, the active part of the lesson where the students are engaged in performing activities that will lead them in answering the problem; (4) Product, is the presentation of their output. It is already the key on what is the answer to the solution; (5) Solution, is the presentation of the answer to the problem and (6) Reflections – the part where the students write their thoughts and insights about

their learning experience. Inclusive to the lesson is the contextualization of the concept for the reason that Mangyan education should have the characteristics of essentiality, which means that the most important things must be taught.

It can be reflected from the results of the validation of the Learning Plan that the contents are aligned on the features of the contextualized approach. It is Highly Evident that the six (6) essential parts of the model had been highlighted.

Science Performance using the Contextualized Model Approach

Table 4

Descriptive Statistics and t-test results for Science Performance

	Pretest		Posttest			95% CI for Mean Difference			
Outcome	M	SD	M	SD	n		p	t	df
Science Performance	12.48	4.09	15.44	4.71	25	-4.40, -1.52	.000*	-4.23*	24

**p < 0.05 = significant*

A paired sample t-test was conducted to compare the results of pretest and posttest before and after the exposure of the Mangyan students on the contextualized approach. There was a significant difference on the pretest (M= 12.48, SD = 4.09) and the posttest (M= 15.44, SD = 4.71) results of the Mangyan students; t (24) = -4.23, $p<0.001$. These suggest that the contextualized model approach has the effect on the Science performance of Mangyan students. Specifically, the contextualized model approach in Physics help the students to understand science better.

The result presented in Table 4 shows that the utilization of the contextualized Model approach is effective in its purpose of increasing the science performance of Mangyan students. It can be concluded from the results of the pretest that prior to the conduct of the study, Mangyan students have low performance in science. After the exposure to the treatment which was consisted of sixteen (16) hours contact time that corresponds to 16 topics and lessons; 9 lessons for Grade 7 and 7 lessons for Grade 8, there was a significant increase on the performance of the students towards the subject. It can then be implied that the utilization of the model approach was a great intervening factor that brought about the increase. Further, it can also be predicted that the usage of contextualized lessons made the students understand the concept even better for the reason that is was useful and meaningful to them (Rathburn, 2017). It was easy for them to analyze since they can relate to the examples that were actually happening in their daily life routines.

The contextualized model approach was successful in its purpose of increasing the science performance of the students. Several factors such as hands-on activities on the context of Mangyans and applications in their daily life undertakings were considered as contributors in the increase. It was mentioned by Musasia, Ocholla, and Sakwa (2016) that hands-on activities where students experience the concepts and discover its explanation provide them with better understanding resulting to an increase performance. Moreover, Bilican, Carkiroglu, and Oztekin (2015) mentioned how contextualized education brought about increase in the academic performance of students. The structures of hands-on activities and the contextualized lessons which were the major features of the contextualized model approach utilized on the Mangyan respondents were positive in its goal of achieving an escalation of science performance.

Science Motivation using the Contextualized Model

Table 5

Mean Comparison of the Science Motivation Questionnaire per Category

Indicator	Overall Mean			
	Pretest	SD	Posttest	SD
Intrinsically Motivated Science Learner	2.95	0.089	3.47	0.349
Extrinsically Motivated Science Learner	3.01	0.039	3.38	0.315
Relevance (Personal Goals)	2.97	0.089	3.65	0.376
Responsibility (Self-determination) in learning Science	2.90	0.074	3.10	0.155
Confidence (Self-efficacy) in learning science	2.94	0.090	3.59	0.494

Table 5 describes the results of Mangyan students' responses in the Science Motivation Questionnaire in each of the categories. Glynn and Koballa (2006) has five categories in the questionnaire, in which four has been adopted by the researcher namely Intrinsically Motivated Science Learner, Extrinsically Motivated Science Learner, Relevance (Personal Goals), Responsibility (Self-determination) in learning science and Confidence (Self-efficacy) in learning science. Based on the table, there is an increase in the overall mean of each of the categories between the pretest and posttest. By comparison, the relevance (personal goals) and confidence (self-efficacy) in learning science categories had the highest gain from the pretest and posttest. In relevance (personal goals) the overall mean is 2.97 in the pretest and 3.65 in the

posttest. The main factor which greatly contributes to the increase is the contextualization of the lessons in Physics. The process of contextualization made the Mangyan students realized the applicability of science in their daily lives. The confidence (self-efficacy) in learning science increases from 2.94 overall means in the pretest to 3.59 overall mean in the posttest. It means that the students gain confidence in learning science since they can relate the concepts in real-life situations.

Table 6

Descriptive Statistics and t-test results for Science Motivation

	Pretest		Posttest			95% CI for Mean Difference			
Outcome	M	SD	M	SD	n		p	t	df
Science Motivation	2.95	0.32	3.38	0.205	25	-0.5595, -0.2949	.000*	-6.66*	24

**p< 0.05= significant*

The results of the Science Motivation Questionnaire responses of the Mangyan students are specified in Table 6. A paired sample t-test was used to determine if there is a significant difference on the learning motivation of Mangyan students before and after they are subjected to the contextualized model approach. There was a significant difference on the pretest (M= 2.95, SD = 0.318) and posttest (M= 3.38, SD= 0.205) responses of Mangyan students in the Science Motivation Questionnaire; t (24) = -6.66, $p<0.001$. These propose that the contextualized PBL model approach raised the learning motivation of students. Specifically, the model approach is a good avenue to motivate Mangyans in learning science.

The contextualized model approach aimed to raise the learning motivation of the students towards the subject. The structures of the working model were created in such a way that it will target not just the performance but also the enthusiasm of the students to learn more. It was equipped with activities designed in the context of Mangyans and further reinforced by concepts application in the community in which the respondents had the accessed to relate into. Learning motivation according to Jou (2013) can be achieved using activities that the students had a significant attachment to it. This feature was employed in the contextualized model approach utilized in the Mangyan community. It can be predicted that the progress before and after the exposure was brought about the contextualized learning activities. Additional, as Darbyshire and Haarms (2015) stated in their study, concepts applications where students can relate particular theories in their daily lives was a great provider of intrinsic motivation. Intrinsic motivation as defined by Glynn and Koballa (2006) is a form of motivation where an individual was driven to learn more because of self-efficacy. This particular feature can be found in the contextualized model approach hence, it was concluded that increase on the learning motivation of the Mangyan students can be brought by this specific factor.

It is the task of every teacher to motivate their students in the class. Increasing the interest of the students in a difficult subject, Physics, for instance, is challenging. Students' motivations come in a variety of types. According to Glynn and Koballa (2006), there are six (6) categories where the students' learning motivation is coming from. These could be intrinsic, extrinsic, responsibility, self-efficacy and relevance to personal goals.

The contextualized model approach does not only target the increase in the science performance but on the learning motivation of Mangyan students as well. It can be anticipated

that one reason why these people are not pursuing higher education or formal schooling is that they are not motivated to learn. The researcher adopted the Glynn and Koballa (2006) Science Motivation Questionnaire to determine unto which category these Mangyan students' learning motivation does are coming through. The results of Table 5 and Table 6 complemented each other; there was an increase in the motivation levels of the students from the pretest and posttest results. Consequently, the category of relevance (personal goals) had the greatest increase among the other categories. It can be explained that the operation of the contextualized model approach had this great impact due to the fact that the model explores the culture, tradition, and routines of their tribal community. They are motivated to learn for the same reason that they are exploring and investigating the richness of their culture through a scientific eye.

Manifestations of Science Motivation using the Contextualized Model Approach

The learning motivation of Mangyan students was observed using a variety of sources. Two major sources came from the qualitative documents; (1) the reflective journal wherein students write their learning experience after each of the lesson conducted and (2) the semi-structured interview conducted by the researcher before, during and after classes. Each of these sources were transcribed and interpreted.

Table 7

Learning Motivation related Themes extracted from the Journal

Sample Transcript	Sub-themes	Themes
It is really fun doing activities in science. *I am so excited on what will happen. My group and I was so amazed when the food*	• Excitement • Demonstration • Activities	Motivation through activities

color in hot water goes up. *The "Show Me" activity is also exciting when we demonstrated the different behaviors of molecules.*		
I was able to report. I like the feeling. *I always raised my hand to answer.*	• Report • Recite	Intrinsic motivation through recitation and participation
I like the lesson because I learned a lot. *I want to listen to the teacher because I know I have so much to learn in science.*	• Like • Learning a lot • Listen • So much to learn	Intrinsic motivation because of the importance of science
It makes me learn more about science because there so many application in our everyday life. *I know that in everything that we do, there is Physics.* *It makes me so excited to learn science more because of these applications.*	• Learn more • Applications • Excitement	Motivation through applications
I am shy to recite but I wanted to raise my hand always when Ma'am is teaching. *I like our teacher, she explained and teach very well that is why I like to listen and recite in class.* *Next time, I will not be shy in answering her questions.*	• Recite • Listen • Teacher	Motivation because of the teacher

Table 7 shows the results of triangulation on students' reflective journal. There are five prevailing themes that described the motivation of the students in class. These motivation were

brought about by the activities, real-life applications, the teacher, and the importance of science. The last theme revealed the students manifestations if they are motivated in the subject which is through recitation and participation in class. Motivation can be described as the increase in the interest of an individual in a particular activity. An increase in the level of interest can brought feelings of happiness and excitement. The table established the fact that the students are excited in learning science. As Student B mentioned, "I am so excited on what will happen". It means that the students quantified their learnings throughout the day. It can also be implied that they have learned a lot because they are listening to the teacher and/or actively participating in class activities. These actuations are connected to the interest of the students, hence their learning motivation. Another repeating statement is, "I like to listen and recite in class". Being attentive and actively participating in class is a direct indicator that the students are motivated in class. Another transcript stated by the students is about their active participation in class be it in group activities and class discussion. It only illustrates that Mangyan students are greatly motivated in learning science during their exposure on the contextualized model approach.

During the interview, the teacher asked the students that were related to their learning motivation in class. When asked about what motivates them in learning science, a majority of the responses was about the manner the teacher teaches the lesson. Four (4) out of six students stated that teacher made them motivated in learning Physics more, "…..The way you teach us is already motivating, so it is really up to me to listen to your discussion" (Grade 8 Student V). One student stated that he became motivated in the subject because of its real-life applications, "…. It keeps me motivated because of the real-life applications" (Grade 7 Student I), and lastly, one

student had a personal response that she was motivated in the subject for her family to be proud of her.

The next question was about examples of strategies used by the teacher that helps you to be motivated on the subject. Students have two major responses; (1) the visual materials used by the teacher such as power point and video presentation and (2) the group activities that had real-life applications. The excerpts are as follows: "…The visual materials that the teacher used to like the picture and illustrations…" (Grade 8, Student V), and "….I like the group activities that we are doing because of its daily life applications…" (Grade 7 Student I).

The researcher also asked the question, "What are the signs or what do you usually do in class when you are motivated in learning the subject?" The students had the same answers to the last question. Manifestations of active participation and high scores in the short quiz were the major themes of their responses. "….I know within myself that I am motivated if I am actively reciting in class because I am confident of my answers" (Grade 8 Student M). "…I am attentively listening to the teacher and I am actively participating in the group activities" (Grade 7 Student B).

Visual materials and the teacher itself are some of the apparent responses of the students when it comes to their learning motivation. Moreover, in terms of their manifestations that they are motivated in class includes active participation in group activities and recitation and high scores in short quizzes.

The results of the semi-structured interview were aligned with Nayir's study in 2017. It was stated there that level of class engagement was related to the learning motivation of the student. The levels of class engagement can be conveyed from group activities and the teacher

itself (Llabao, Sagun, Tamangan, Pattalitan, Dupa, & Bautista, 2016). It was revealed from the results that students were motivated in class because of these factors. The Mangyan respondents had an improvement on their motivation levels due to their engagement in class. This engagement was carried upon by the activities designed by the teacher-researcher itself. Further, the manner of teaching was also a contributing element for this particular increase in the motivation levels.

Table 8

Summary of the Results on the Classroom Observation Tool related to Learners' Motivation

Teaching Episode	First Observation		Second Observation		Third Observation	
	Mean	Description	Mean	Description	Mean	Description
Learners were engaged individually or in groups through appropriate tasks/ differentiated tasks as applicable.	3	Very Satisfactory	3.5	Outstanding	4	Outstanding
Learners recited and participated thus gain confidence.	2.5	Very Satisfactory	4	Outstanding	4	Outstanding
Majority to 100% participated/ recited.	2.5	Very Satisfactory	3	Very Satisfactory	3	Very Satisfactory
Exit slips/ formative assessments/assessments proved that nearly all learners mastered the objectives.	2	Satisfactory	2.5	Very Satisfactory	3	Very Satisfactory

Note: *3.25 – 4.00 – Outstanding; 2.50 – 3.24 – Very Satisfactory; 1.75 – 2.49 – Satisfactory; 1.00 – 1.74 – Needs Improvement*

The table shows the different teaching episodes that describes the motivation of the learners. The science teacher and the school head had observed the researcher utilizing the

contextualized model approach in teaching science. There were three observations. The first was conducted on the first day the students were exposed to the model approach. The second was during the mid-weeks of exposure and the third observation was on the last day of the exposure to the model approach. The classroom observation tool reveals that during the first observation the students had a low of sign of being motivated in class. One reason that can be brought by this phenomenon was that the teacher is foreign to them and their feeling an anxiety towards her. It can be reflected on their journals that they were shy and afraid to talk. On the second observation, the students now were engaged with the activities provided by the teacher, they are also active and participative in class and most of them mastered the objectives of the lesson by getting high scores in the assessment. The third observation is almost the same with the second observation wherein the students are actively engaged in the lesson showing more participation in the discussion through recitation. It is therefore concluded that there is an increase in the learning motivation of the students towards the subject.

The qualitative documents, in terms of reflective journals and semi-structured interviews, answered the question about students' learning motivation towards Physics. Responses from the journal and interview highlighted the important feature of the contextualized model approach which is the real-life applications of the science concepts. Both the journals and interviews revealed the significance of the feature. Due to the contextualization process, students manifest an increase in their performance by actively participating in group activities and reporting of results in class. Their learning motivation can be reflected in the enjoyment and fun that they experience on the discussion of the topics. Evidently, they were suggesting more paired and group activities. Another point, which was stressed on the results, was the fact that students did

not consider Physics as their favorite subject but during the course of the study their interest on the subject has grown. It only means that they become motivated in learning the subject. Results also show that teacher's strategy is considered a factor that affects the performance and motivation of the students. It was clearly stated both from the journal and interview, that they like the method used by the teacher in discussing the lesson. It can be predicted that the method, the students were talking about is the contextualized model approach. Therefore, it can be suggested that there is a significant effect both on the science performance and learning motivation of the Mangyan students which were manifested in their participation, engagement, and behavior in class.

Chapter 4

Summary, Conclusion, and Recommendations

Summary of the Study

Indigenous People (IP) are often times left behind especially in terms of access quality basic education they deserve due to some reasons like their location, culture, and tradition that are needed to be incorporated in the curriculum. Mangyans are indigenous people that are exclusive only in the province of Mindoro. These people, likely experienced discrimination when combined with students in the mainstream. Great attention should be given to them to continue formal schooling and improve the quality of their lives. Science is a subject that is considered essential because of its linkage to technology and industry. UNESCO reiterated that quality basic science education must be delivered to everyone for a reason that it holds the key to sustainability and value of life. Therefore, Mangyans are not an exemption to the rules. Teaching Mangyan students the concepts of science is challenging in a way that it requires the notion of importance and usefulness. To develop the interest of these Mangyan indigents to learn science, concepts must be introduced to them in a manner that they can relate to. Hence, the researcher proposed the idea of contextualized Physics instruction approach to address the concern. The working model called 4PSR (Problem, Predict, Process, Product, Solution, and Reflection) was adopted from the existing Maastricht Seven Jump Model for PBL tutorials. The key features of the working model were determined and integrated with the learning plans and activity worksheets. Selection of topics was based on the usual activities of the Mangyan community. The model's effectiveness was tested on the science performance and learning motivation of

Grade 7 and Grade 8 Mangyan students. There were twenty-five (25) students involved in the study; Thirteen (13) of whom were from the 7th grade and the remaining twelve (12) from the 8th grade.

Further, the researcher utilized the embedded experimental mixed method design in gathering data. Quantitative data were collected from the pretest and posttest and the Science Motivation Questionnaire. Meanwhile, reflective journals and semi-structured interview of selected students under case study were used for the qualitative data. Statistical tools and triangulation of data were used in the analysis of the results.

Summary of Results

Two major sources of data were interpreted and analyzed. Raw scores from the pretest and posttest and the coherent themes that were reflected in the journals and interview of the subjects.

1. The quantitative data shows that there is a significant difference on the results of the pretest and the posttest before and after the exposure of the Mangyan students on the contextualized model approach. The p-value was computed which signifies that the treatment plays a significant effect on the science performance of the target respondents. Moreover, the result of the paired sample t-test on the learning motivation of the students revealed a significant difference also that can be reflected in the scores from the pretest and the posttest. It means that the contextualized model approach is successful in increasing the learning motivation of the Mangyan students in Physics.

2. Qualitative data from the journals were analyzed using triangulation, and peer examination. From the methods, the journals revealed four (4) recurring themes such as (1) subject appreciation, (2) awareness on the importance of the subject, (3) behavior towards the teacher and (4) the significance of real-life applications. It can be implied from the themes the effect on the learning motivation of the students towards the subject because they had developed an appreciation on the subject and they learn the importance of the subject due to the real-life applications of the concepts being discussed to them.
3. The semi-structured interview results showed the increase in both the science performance and the learning motivation of Mangyan students. It was a fact that students do not take Physics as their favorite subject because of the analytical skills it requires. Nevertheless, the strategy of the teacher, the group activities and the visual and video presentations used made them interested in the subject. It was stated by the students that their active participation in class, both in discussion and group activities and high scores on short quizzes were manifestations of their increased performance and motivation.

Limitations of the Study

The contextualized approach utilized the adopted model of Maastricht Seven Jump Model for PBL tutorials. This was known as the 4PSR Model restricted only to six (6) essential steps such as Problem, Predict, Process, Product, Solution, and Reflection. The developed learning plan and activity worksheets were limited only for selected topics in Force, Motion and Energy (Physics) for the 7^{th} and 8^{th} grade of the Junior High School Program; such topics are

Sound, Heat, Laws of Motion and Work, Power and Energy. The bases for the topic selection were the prevailing activities, culture, beliefs, and traditions of the tribal community.

The study was conducted in an annex school that caters the Junior High School Program of the Department of Education. The school is situated in a small barangay where there is a site dominated by Mangyans. The effect of the contextualized model approach was restricted to one Mangyan tribe which is the Tau-Buhid. In addition, the working model was used to measure science performance and learning motivation only.

Conclusion

In this study, a particular model for bringing Science closer to the Mangyans was utilized, the contextualized model approach and was applied in Physics instruction. Mangyans as an ethnic group of Mindoro and considered as one of the indigenous people of the country are considered to be underprivileged members of the nation. The contextualized approach in Physics Instruction opened opportunities for the Mangyans to achieve the quality basic science education they deserve. The process of contextualization provided the Mangyan students an opportunity to improve their science performance and increase their learning motivation towards the subject.

The features of the contextualized model approach highlighted the hands-on activities and real-life applications on the context of Mangyan living. The process of contextualizing selected topics in Physics for Grade 7 and Grade 8 Mangyan respondents was effective in increasing their Science performance. Mangyan students were also motivated when exposed to the contextualized model approach. The upturn of their motivation levels can be brought about by the activities and applications included in the model approach. The reflective journals and

semi-structured interview reinforced the increase in learning motivation of the students toward science. The appreciation and awareness on the importance of the subject were indications of strong motivation level. Evidently, students comprehended the main goal of the study - the contextualization of the concept by appreciating real-life applications of science concepts.

The Contextualized Model was proven effective from the analysis of both quantitative and qualitative data. The quantitative results presented exact numerals which measure the performance and motivation of the Mangyan respondents before and after their exposure to the treatment. The qualitative data presented the same results accordingly. Contextualization of science learning for Mangyan students and other students must therefore be promoted in the classroom as it was proven to be effective from this study. The idea of contextualization in turn must not only be appreciated in the context of the indigenous people but also to other underprivileged members of the education sector such as those belonging to the urban poor and ethnic minorities in a community.

Recommendations

In the light of the findings of the study, the following are hereby recommended:

1. Aside from increasing the science performance and learning motivation of the Mangyan students, future researchers may focus on using the contextualized model approach in determining learning satisfaction and attitudes towards learning science.
2. Future researchers may widen the scope and sequence of the study covering all the topics in Physics for both Grade 7 and Grade 8. Further, learning plans and activity worksheets

for Grade 9 and Grade 10 aligned on the contextualized model approach could also be developed.

3. Since the model approach was exclusively conducted for Mangyan students, other researchers may venture on the effectiveness of the model approach on other indigenous people in the country such as the Manobos of Mindanao and Igorots of Ifugao.
4. The contextualized model approach was focused on the concept of contextualization, future researchers may modify the approach by using Problem-Based Learning (PBL) and other pedagogies to test if the same result will be gained.
5. Future researchers could utilized the contextualized model approach in other areas of science such as Biology, Chemistry, and Earth and Space.
6. The results of the study could be used to strengthen the educational policy considering indigenous people's right to proper and basic education. Similarly, the study could be a mode to promote inclusive and sustainable education for indigenous people in the country.
7. The outcomes of the research could be used as a groundwork in teacher's training development program in contextualizing education for better teaching-learning process.
8. Learning module could be developed by researchers which revolve around the contextualized model approach aside from the learning plans and activity worksheets developed.

References

Abejuela, R. I. (2006). *Indigenous Education in the Philippines: A Case Study of the Sagu-Ilaw School of Indigenous Knowledge and Traditions.* City of Malaybalay: Bukidnon State College.

Aderonmu, T. S., & Obafemi, D. T. (2015). Ordeals of Physics Instruction in Nigerian Secondary Schools: Way Forward for the Attainment of Global Competitiveness. *Journal of Education and Practice*, 87-97.

Amasuomo, J. O. (2014). Academic Perfromance of Students Admitted with Different Entry Certificates to the Nigerian Certificate in Education Programme at the Federal College of Education (Technical), Omoku. *Journal of Technology in Science Education*, 39-47.

Askeland, K., Bull, T., & Mittelmark, M. B. (2010). *Understanding how the poorest can thrive: A case study on the Mangyan women of Mindoro, Philippines.* University of Bergen.

Aydın, S. (2016). An Analysis of the Relationship between High School Students'. *Journal of Education and Training Studies* , 53-59.

Bawagan, A. B. (2010). Towards a Culturally-Relevant Pedagogy: Importance of Culturally-Sensitive Teaching Materials and Methodology. *Asia-Pacific Education Researcher*, 185-197.

Bayar, A., & Kerns, J. H. (2015). Undesired Behaviors Faced in Classroom by Physics Teachers in High Schools. *Eurasian Journal of Physics and Chemistry Education*, 37-45.

Bilican, K., Carkiroglu, J., & Oztekin, C. (2015). How Contextualized Learning Settings Enhance Meaningful Nature of Science Understanding. *Science Education International*, 463-487.

Cabansag, M. G. (2014). Impact Statements on the K-12 Science Program in the Enhanced Basic Education Curriculum in Provincial Schools. *Journal of Arts, Science and Commerce*, 29-39.

Calda, D. S. (2008). *The Status of Mangyan Students' Education in Divine Word College of Calapan: An Analysis.* Calapan City: Divine Word College Calapan .

Campbell, B., & Lubben, F. (2010). Learning science through contexts: helping pupils make sense of everyday situationss. *International Journal of Science Education*, 230-252.

Corben, W. W. (1991). Contextual Constructivism: The Impact of Culture on the Learning and Teaching of Science. *Annual Meeting of the National Association for Research in Science Teaching,* (pp. 1-41). Wisconsin.

Cornelio, J. S., & de Castro, D. F. (2015). The State of Indigenous Education in the Philippines Today. *Indigenous Culture, Education, and Globalization*, 159-179.

Darbyshire, D., & Haarms, R. (2015). Student Motivation in Asian Countries and Its Impact on Academic Success forSecond Language University Students. *Asian Journal of Educational Research*, 17-27.

DepEd. (2012). K to12 Toolkit. Seameo Innotech.

Dela Cruz, M. J. (2017, March 11). *Science Ed and a thinking society.* Retrieved January 18, 2018, from Pressreader: https://www.pressreader.com/philippines/philippine-daily-inquirer/20170311/281754154122594

Dichoso, F. (n.d.). Some Notes on the Hanunoo-Mangyan Culture (Abstract). *Philippine Sociological Review,* 193-195.

Ekici, E. (2016). "Why Do I Slog Through the Physics?' Understanding High School Students' Difficulties in Learning Physics. *Journal of Education and Practice*, 95-107.

Fabella, A. I., & Calda, D. S. (2012). *The Status of Mangyan Education in the Philippines.* Retrieved from Academia.edu: https://www.academia.edu/3753839/Mangyan Education in the Philippines

Ferido, M. B. (2013). *The Spiral Progression Approach in Science.* Quezon City: UP-NISMED.

Garin, R. M., Reyes, R., & Domantay, G. F. (2017). Contextualized and Localized Teaching as a Technique in Teaching Basic Statistics. *Asia Pacific Journal pf Education, Arts and Sciences,* 62-67.

Glynn, S. M., Brickman, P., Armstrong, N., & Taasoobshirazi, G. (2011). Science Motivation Questionnaire II: Validation with Science Majors and Nonscience Majors. *Journal of Research in Science Teaching*, 1159-1176.

Holman, J., & Pilling, G. (2004). Thermodynamics in Context: A Case Study of Contextualized Teaching for Undergraduate. *Journal of Chemical Education,* 373.

Indigenous People in the Philippines vis a vis Asean Community. (2016). Retrieved from Sense Asean: http://blog.aseankore.org/?p=1474

Jalmasco, N. M. (2014, May 28). *Science Education Realities.* Retrieved January 18, 2018, from Manila Times: http://www.manilatimes.net/science-education-realities/100096/

Jou, Y.-T. L. (2013). Integrating Popular Web Applications in Classroom Learning Environments and Its Effect on Teaching, Student Learning Motivation and Performance. *The Turkish Online Journal of Educational Technology*, 157-165.

Korpershoek, H. (2016). Relationships among motivation, commitment, cognitive capacities,. *Frontline Learning Research*, 28-43.

Kotluk, N., & Kocakaya, S. (2016). Researching and Evaluating Digital Storytelling as a Distance Education Tool in Physics Instruction: An Application with Pre-service Physics Teacher. *Turkish Online Journal of Distance Education*, 87-99.

Koul, R. (1997). Contextualized Science for Teaching Science and Technology. *Annual Meeting of the American Educational Research Association*, (pp. 1-35). Chicago, Illonois.

LIabao, N. J., Sagun, J. J., Tamangan, E. A., Agaton P. Pattalitan, J., Dupa, M. E., & Bautista, R. G. (2016). Science Laerning Motivation as Correlate of Students' Academic Performances. *Journal of Technology and Science Education*, 209-218.

Lubben, F., Campbell, B., & Dlamini, B. (2007). Contextualizing science teaching in Swaziland: some student reactions. *International Journal of Science Education*, 311-320.

Mandia, E. H. (2004). The Alangan Mangyan of Mt. Halcon, Oriental Mindoro: Their Ethnobotany. *Philippine Quarterly of Culture and Society*, 96-117.

Mapua. (2016, August 25). *Cardinal Blog.* Retrieved December 13, 2017, from Mapua Website: http://mapua.edu.ph/cardinal_blog.html

Marinas, B. (2002). Philippines., (pp. 51-56).

McDermott, L. C. (2013). Improving the teaching of science through discipline-based education research: An example from physics. *European Journal of Science and Mathematics Education*, 1-11.

McManis, L. D. (2017, November 20). *Inclusive Education: What It Means, Proven Strategies, and a Case Study.* Retrieved from A Blog by Concordia University - Portland:

Montebon, D. R. (2014). K12 Science Program in the Philippines: Students Perceptions in Its Implementation. *International Journal of Education and Research*, 153-164.

Musasia, A. M., Ocholla, A. A., & Sakwa, T. W. (2016). Physics Practical Work and Its Influence on Students' Academic Achievement. *Journal of Education and Practice*, 129-134.

Nayir, F. (2017). The Relationship between Student Motivation and Class Engagement Levels . *Eurasian Journal of Educational Research*, 59-78.

Next Generation Science Standards (NGSS). (2013). *Cross-Cutting Concepts.* NGSS Release.

Orleans, A. V. (2007). The condition of secondary school physics education in the Philippines: Recent developments and remaining challenges for substantive improvements. *The Australian educational researcher*, 33-54.

Ornek, F., Robinson, W. R., & Haugan, M. P. (2008). What makes physics difficult? *International Journal of Environmental & Science Education*, 30-34.

Oroza, A. (2008). *Food and Agriculture Organization of the United Nations.* Retrieved from AGRIS: International Information System for the Agricultural Science and Technology: http://agris.fao.org/agris-search/search.do?recordID=PH2009001514

Ostroff, C. (1992). The relationships between satisfaction, attitude, and performance: An organizational level analysis. *Journal of Applied Psychology*, 963-974.

Pecson, R. (2014, June 1). *Localization and Contextualization in Teaching K-12 Social Studies*. Retrieved December 13, 2017, from Teaching for Living: http://teaching_for_living.htlm

Peoples, E. C. (2002). *Indigenous Peoples Education: From Alienation to Rootedness.* Human Rights Education in Asian Schools.

Perin, D. (2011). Facilitataing Student Learning Through Contextualization. *SAGE journals*.

P., L. B. (2017). Theme: The 21st century adult learner. *Educational Research and Reviews*, 540-548.

Postma, A. (1986). The Concept of Time Among the Mangyans. In *Asian Folklore Studies* (pp. 231-240).

Postma, A. (1989). Formal Education among the Mangyans: suggestions towards improvement and implementation. *Solidarity*, 54-60.

Rathburn, M. K. (2011). Building Connections Through Contextualized Learning in an Undergraduate Course on Scientific and Mathematical Literacy. *International Journal for Scholarship in Teaching and Learning*, 2-18.

Rodriguez, F. (2015, November 10). *Mangyan and Kaingin*. Retrieved from Rappler: https://www.rappler.com/science-nature/environment/105618-hanunuo-mangyan-environment

Salamat, M. (2013, June 15). *All the Mangyans Want Is for Their Children to Learn* . Retrieved from Bulatlat.com: https://www.philippinebasiceducation.us/2013/06/all-mangyans-want-is-for-their-childre.html

SEI-DOST, & UP-NISMED. (2011). *Framework for Philippine Science Teacher Education.* Manila: SEI-DOST & UP-NISMED.

Schick, H., & Phillipson, S. N. (2009). Learning motivation and performance excellence in adolescents with high intellectual potential: what really matters? *High Ability Studies*, 15-37.

Stefan, M., & Ciomos, F. (2010). The 8th and 9th Grades Students' Attitudes towards Teaching and Learning Physics. *ACTA DIDACTA NAPOCENSIA*, 7-14.

Su, K.-D., & Yeh, S.-C. (2014). Effective Assessments of Integrated Animations -- Exploring Dynamic Physics Instruction for College Students' Learning and Attitudes. *The Turkish Online Journal of Educational Technology*, 88-99.

Thacker, E. (2002). *Chapter 2: Learning Motivationa and Performance.* Pearson Education.

UNESCO. (2012). *Education for Sustainable Development: Sourcebook.* Paris: United Nations Educational,Scientific and Cultural Organization.

UNESCO. (2017). *Education for Sustainable Development Goals: Learning Objectives.* Paris: United Nations Educational, Scientific and Cultural Organization.

Virola, M. (2015, June 18). *Education Still Tough Mangyan Goal*. Retrieved from Inquirer.net: http://newsinfo.inquirer.net/699174/education-still-tough-mangyan-goal

Wichadee, S., & Pattanapichet, F. (2015). Enhancement of Performance and Motivation through Application of Digital Games in an English Language Class. *Teaching English with Technology*, 77-92.

Yurdugül, H. M. (2015). Investigation of the Relationship between Learning Process. *Eurasian Journal of Educational Research*, 57-74.

Appendices

Appendix A

SCOPE AND SEQUENCE OF THE STUDY

**based on the K-12 Curriculum Guide in Science Subject (revised January, 2012)*

The Physics subject is described as Force, Motion and Energy in the given curriculum guide. The following are the list of competencies from Grade 7 and 8 Physics.

Grade 7

Content	Content Standard	Performance Standard	Learning Competencies
Sound • Characteristics of sound	The learner demonstrates understanding of the characteristics of sound such as pitch and loudness	The learner recognizes the use of indigenous materials in creating melodious music.	The learner ✓ uses the concepts of wavelength, velocity, and amplitude to describe characteristics of sound such as pitch, loudness and quality. ✓ demonstrates changes in pitch and loudness using real or improvised musical instrument through fair testing. ✓ explains sound production in the human voice box and how pitch, loudness and quality of sound vary from one person to another. ✓ describes how organisms produce, transmit and receive sound of various frequencies (infrasonic, audible and ultrasonic sound). ✓ creates harmonious music using indigenous products.

Heat • Heat transfer	The learner demonstrates understanding of the different modes of heat transfer: conduction, convection, radiation	The learner chooses right materials for a particular purpose for cooking, food storage, and building homes.	The learner ✓ infers the condition necessary for heat transfer to occur. ✓ conducts simple investigations to demonstrate the different modes of heat transfer. ✓ explains different modes of heat transfer in the molecular level. ✓ identifies good and poor conductors of heat and describe their specific uses

Grade 8

Content	Content Standard	Performance Standard	Learning Competencies
Law of Motion • Law of Inertia • Law of Acceleration • Law of Interaction	The learner demonstrates understanding of the Newton's three laws of motion: Law of Inertia, Law of acceleration, and Law of Interaction	The learner observes road safety as a motorist or a pedestrian.	The learner ✓ investigates the relationship of the amount of force applied and the mass of the object to the amount of change in the object's motion ✓ infers that when a body exerts a force on another an equal amount of force is exerted back on it ✓ models passengers body response to changes in motion ✓ develops a written plan and implement a ―Newton's Olympics‖ ✓ observes and predict natural phenomena governed by laws of motion

			✓ designs and implements an experiment that will verify Newton's 3rd law of motion
Work Power and Energy • Layman's definition of work vs. mechanical work • Situations where work is done and where work is not done	The learner demonstrates understanding of work using constant force, power, gravitational potential energy, kinetic energy, and elastic potential energy	The learner maximizes the benefits of energy while minimizing its use of its sources	The learner ✓ differentiates layman's definition of work from mechanical work ✓ determining if work is present in a given activity or not ✓ relates power, work and time ✓ computes for work done by a constant force ✓ differentiates potential and kinetic energy ✓ relates speed and position of object to energy possessed

Appendix B

CONTEXTUALIZATION WORKING MODEL

**based from Maastricht Seven Jump Method*

The Contextualization working model in this study is based from Maastricht Seven Jump Method for PBL tutorials. Originally, the model is comprised of seven steps but the researcher congested it into six learning methods therefore dubbing the model into 4PSR model (Problem, Predict, Process, Product, Solution and Reflection). Below are the key features of the model.

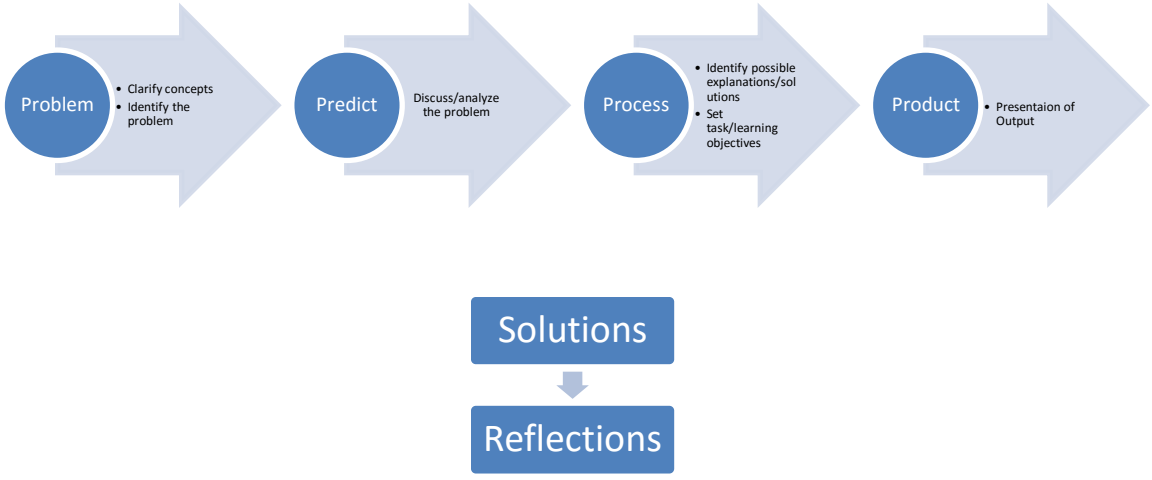


Figure 1 4PSR Model

Key Features:

- ✓ **PROBLEM**
  The Problem is the opening salvo of the discussion. It is the introduction of the topic wherein the teacher will be giving the general topic (e.g. Refraction of Light). It is the essential question that described as the main problem which the topic will revolve. The question will be provided by the teacher and based on the common/usual activity in the community and is unique to the Mangyans.
- ✓ **PREDICT**
  These are the preliminary work of the students. From the question posted by the teacher, students will identify all the questions that are related to the essential

question. They can also pose statements or keywords that will help them solve the problem.

- ✓ **PROCESS**

  The Process part is composed of activities which are still guided by teacher so as not misdirect the learning conceptions of the students. Worksheets and materials available in the community will be provided among the groups. Worksheets will only describe general directions but the construction and design of the activity is up to the students.

- ✓ **PRODUCT**

  The Product can be described by the group's reporting and sharing of their designed activity in class. It also the part of the teacher to add more information about the concept to strengthen what they already know. The highlight of the implementation part is the way it will be presented by the students. They have to think of creative ways for them to impart their learnings in class. *(From here, the Mangyan culture will be reflected or presented).* Say differentiated instruction; each group has different ways of presenting such as in the form of dance, song or role playing.

  This part will also showcase the Mangyan Science that is already present in the community but will be discuss in a more detailed manner following the standards of the Department of Education.

- ✓ **SOLUTION**

  The solution or the conclusion is the final answer to the essential question posed by the teacher. Added to this is the evaluation which is not the traditional pen and paper test. It is situational and oral. Each of the students will be given one situation (in the community's context) that is related to the topic and they will be explaining based on their own understanding.

- ✓ **REFLECTIONS**

  Reflections are journals or diary wherein each student will be writing their learning experience for that particular topic. It will be considered as thinking journal. Free writing will be the modality in writing the journals

Appendix C

SAMPLE LEARNING PLANS

LEARNING PLAN 1.1

I. OBJECTIVES

A. Content Standard.
The learners demonstrate an understanding of the characteristics of sound such as pitch and loudness

B. Performance Standard
The learners recognize the use of indigenous materials in creating melodious music.

C. Learning Competency
The learners use the concepts of wavelength, velocity, and amplitude to describe characteristics of sound such as pitch, loudness, and quality.

D. Learning Purposes
- ✓ Investigate how sounds differ.

II. CONTENT

Sound – Characteristics of Sound

III. LEARNING RESOURCES

A. References
1. Teacher's Guide pp. *not utilized*
2. Learners' Material pp. *not utilized*
3. Textbook pp. *not utilized*
4. Addition Resources from Learning Resources (LR) portal
   Unit 3-Energy in Motion Module 3: Sound
5. Practical Work in High School Physics

B. Other Learning Resources
- Different Mangyan musical instruments such as gitgit, agong, kalutang
- Rope
- Different sound recordings
- Activity 1.1 – Characteristics of Sound
- Group Presentation Scoring Rubric

IV. PROCEDURES

A. Reviewing the previous lesson or presenting the lesson – **(Problem)**
- The students will play a guessing game, entitled "What am I?"
- The teacher will be using three Mangyan musical instruments and let the

students guess the instrument when the teacher played it. (Gitgit, Agong and Kalutang)**. From the game, the teacher will post the question, ***"How can you distinguish the sound of these musical instruments?"***

B. *Presenting examples/instances of the new lesson* – **(Predict)**
   - The teacher will guide the students in searching for the solution to the problem by reviewing concepts on
     - ✓ Amplitude,
     - ✓ wavelength and
     - ✓ Velocity using a rope.
   - From there, students are going to predict or post questions about the relationship of these three quantities to the different musical instruments.

C. *Discussing new concepts and practicing new skills* – **(Process)**
   - The student will be grouped into three, each group are assigned a learning station to work on. **

     Learning Station 1 – Loudness or Intensity of the Sound
     Learning Station 2 – Quality of Sound
     Learning Station 3 – Pitch

D. Developing Mastery – **(Process)**
   - Each group will report the results of their activity by answering the guide questions in each of the learning stations. They will be graded using a scoring rubric.

E. Finding practical application of concepts and skills in daily living – **(Product)**
   - Bato-bato is the common bird in the tribal community. Mangyans are known to catch this bird enable them to sell it in the market. Let the students imitate the sound of the bird to catch them. While students are imitating, the teacher can insert the application of quality and intensity of sound.

F. Making generalizations and abstractions about the lesson – **(Solutions)**
   - The teacher will now seek for the students' answers with regards to the question posted earlier, ***"How can you distinguish the sound of these musical instruments?"***
   - The teacher will be asking additional questions for further understanding of the concept.
   - What material will you use if you want to warn the barrio that there is a big phenomenon to happen? Why will you use that material?

G. *Evaluating learning* – **(Reflection)**

- It is a form of self- evaluation where the students are going to write in their reflective journal.

ACTIVITY # 1.1
CHARACTERISTICS OF SOUND

Purpose:

In this activity, you will investigate how sounds differ.

Procedure:

1. Each group should spend 5 minutes in each learning station
2. Each member of a group is assigned as recorder of observations of one station.

Learning Station 1: Loudness or intensity of Sound

Materials: Gong, gitgit

1. Beat lightly on the drumhead of a gong. Listen to the sound.
2. Beat on it again, but harder this time. Listen carefully.
3. Beat on it much harder for the last time. Listen closely.
4. Pull up slightly a gitgit string. Release, watch it vibrate and listen to the sound produced
5. Pull up the same string but higher this time. Again release, watch it and listen.
6. Pull up the same string but much higher. Release, watch and listen.

Guide Questions:

1. For the gong, (a) in which case was the sound loudest? (b) In which case did you exert the greatest force when beating?
2. For the gitgit string, (a) in which case was the sound loudest? (b) In which case did you exert the greatest force? (c) How do the amplitudes of vibration differ in each case?
3. Relate energy carried by a sound wave, its amplitude, and loudness.

Learning Station 2: Quality of Sound

Materials:

2 sets of recorded sound from 5 sources

(1 – Gitgit, gong, bamboo flute)

(2 – Gong, kalutang, gitgit)

1. Listen to the recorded sound of 4 instruments.
2. Identify the instrument which produced the sound.
3. Characterize the sound produced by each instrument

Guide Questions

1. What is the source of the first sound; the second sound; the third sound; and so on.
2. Differentiate the sound coming from each instrument.
3. What is particular characteristic of sound observed?

Learning Station 3: Pitch and thickness of string

Material: gitgit

1. Examine the diameter of the strings.
2. Pitch is the highness or lowness of a sound. Pull up each string gently from the thickest to the thinnest. Listen closely to the pitch of each string.
3. Pull up each string slowly and listen closely one at a time to hear the difference in pitch. Look closely how each string vibrates.

Guide Questions

1. Which string produces a higher sound, the thick or the thin string?
2. Which vibrates faster?
3. Which has a higher frequency?
4. Which has a higher pitch, the thick or the thin string?
5. How is pitch related to frequency? To the diameter or thickness of the string?

LEARNING PLAN 2.1

I. OBJECTIVES

A. *Content Standard.*
The learners demonstrate an understanding of different modes of heat transfer

B. *Performance Standard*
The learners choose right materials for a particular purpose for cooking, food storage, and building homes.

C. *Learning Competency*
The learners infer the condition necessary for heat transfer to occur.
Learning Purposes
- ✓ Identify the different conditions for heat transfer to occur.

II. CONTENT

Heat – Heat Transfer

III. LEARNING RESOURCES

A. *References*
1. Teacher's Guide pp. *not utilized*
2. Learners' Material pp. *not utilized*
3. Textbook pp. *not utilized*
4. Addition Resources from Learning Resources (LR) portal
Unit 3 – Motion and Energy Module 5: Heat

B. *Other Learning Resources*
Activity # 2.1: Warm me up, Cool me down

IV. PROCEDURES

A. *Reviewing the previous lesson or presenting the lesson* – **(Problem)**
- The teacher will ask the students if there is a time that they are alarmed when they incidentally placed their hand on a very hot object or very cold object. Let the students tell their stories about it.
- Introduce the lesson by asking the students the question, ***"Why is it that you feel hot or cold when you touch a hot or cold object?"***

B. *Presenting examples/instances of the new lesson* – **(Predict)**
- Guide the students to write their predictions about the question by enumerating the different concepts necessary.
  - ✓ Heat
  - ✓ Thermal energy
  - ✓ Thermometer
- The students will also be enumerating three (3) possible answers.

C. *Discussing new concepts and practicing new skills* – **(Process)**

- The students will be conducting a simple experiment.
- Prior to the conduct of the experiment, the teacher will be explaining the procedures of the activity. Each group also will assign a leader, a secretary/recorder and a reporter.

D. Developing Mastery – **(Process)**

- Each group will be presenting their work in class. They will be graded using a scoring rubric.

E. Finding practical application of concepts and skills in daily living – **(Product)**

- Ask the students different situations that the transfer of heat is very evident. Lead them in understanding these applications.
  - ✓ What is the role of the casserole or frying pan when you are cooking?
  - ✓ What is the practice of your mother when are too hot because of flu? Why is this so?
  - ✓ Take note of your banga (clay pot) and tapayan (clay jar). Why do you think that the clay pot is best to use when you are cooking and the clay jar for storing cold water as a source for drinking?

F. Making generalizations and abstractions about the lesson – **(Solutions)**

- The teacher will now look for the students' answer with regards to the question posed, ***"Why is it that you feel hot or cold when you touch a hot or cold object?"***

G. *Evaluating learning* – **(Reflection)**

- It is a form of self- evaluation where the students are going to write in their reflective journal.

ACTIVITY # 2.1
WARM ME UP, COOL ME DOWN

Purpose:

In this activity, you should be able to

- Describe the condition necessary for heat transfer to take place.

Materials Needed:

- 2 small containers (drinking cups or glasses)
- 2 big containers (enough to accommodate the small containers)
- tap water
- hot water
- food coloring
- laboratory thermometers (with reading up to 100^{o}C)

Procedure:

1. Label the small and big containers as shown in Figure 1.
2. Half fill containers 1, 2, and A with tap water. Half fill also container B with hot water. *Be careful when you pour hot water into the container.*
3. Add few drops of food coloring to the larger containers.
4. Measure the *initial temperature* of water in each of the 4 containers, in degree Celsius (°C). Record your measurements in Table 1.

Figure 1

5. Carefully place container 1 inside container A (Figure 2). This will be your *Setup 1*.
6. Place also container 2 inside container B. This will be your *Setup 2*.
7. Measure the temperature of water in all containers 2 minutes after arranging the setups. Record again your measurements in the table (after 2 minutes).
8. Continue to measure and record the temperature of the water after 4, 6, 8, and 10 minutes. Write all your measurements in the table below.

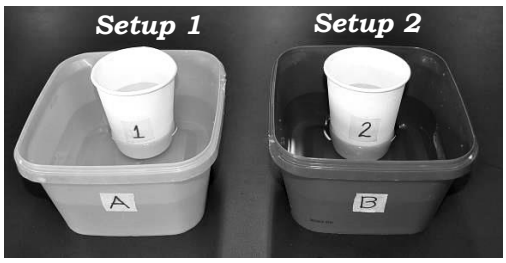


Figure 2

Table 1. Temperature readings for Setup 1 and Setup 2

Container		**Temperature (°C) of Water After**					
		0 min (initial)	**2 mins**	**4 mins**	**6 mins**	**8 mins**	**10 mins**
Setup 1	**1**-*Tap water*						
	A-*Tap water*						
Setup 2	**2**-*Tap water*						
	B-*Hot water*						

Q1. In which setup did you find changes in the temperature of the water inside the containers? In which setup did you NOT find changes in the temperature of the water inside the containers?
Q2. In which setup is heat transfer taking place between the containers?
Q3. What then is the condition necessary for heat transfer to take place between objects?

9. Refer to the changes in the temperature of water in the setup where heat transfer is taking place.

Q4. Which container contains water with higher initial temperature? What happens to its temperature after 2 minutes?
Q5. Which container contains water with lower initial temperature? What happens to its temperature after 2 minutes?
Q6. If heat is related to temperature, what then is the direction of heat that transfers between the containers?
Q7. What happens to the temperature of water in each container after 4, 6, 8, and 10 minutes? What does this tell us about the heat transfer taking place between the containers?
Q8. Until when do you think will heat transfer continue to take place between the containers?

If your teacher allows it, you may continue to measure the temperature of the water in both containers for your basis in answering Q8. And if you plot the temperature vs. time graph of the water in both containers, you will obtain a graph similar to Figure 3.

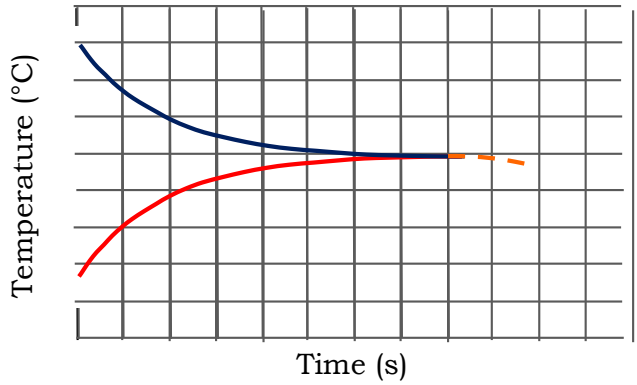


Figure 3

10. Analyze the graph and answer the following questions:

Q9. What does the blue curved line on the graph show? Which container does this represent?
Q10. What does the red curved line on the graph show? Which container does this represent?
Q11. What does the orange broken line in the graph show? Is heat transfer still taking place during this time? If yes, where is heat transfer now taking place?

LEARNING PLAN 3.1

I. OBJECTIVES

A. *Content Standard.*
The learners demonstrate an understanding of Newton's three laws of motion: Law of Inertia, Law of Acceleration, and Law of Interaction.

B. *Performance Standard*
The learners observe road safety as a motorist or pedestrian.

C. *Learning Competency*
The learners model passengers' body response to change in motion.

D. *Learning Purposes*
- ✓ Explain the law of inertia in terms of objects at rest and in motion.

II. CONTENT

Newton's Law of Motion – Law of Inertia

III. LEARNING RESOURCES

A. *References*
1. Teacher's Guide pp. *not utilized*
2. Learners' Material pp. *7-9*
3. Textbook pp. *not utilized*
4. Addition Resources from Learning Resources (LR) portal *Unit 1-Force, Motion, and Energy Module 1: Forces and Motion*
5. Pabellon and Tubal. (2000). Science and Technology for a Better Life. Diwa Scholastic Press. Quezon City. pp. 59-61
6. PASMEP (1992). Teacher Resource Materials. UP NISMED Publishing. Quezon City. pp. 70-75.
7. Wilkinson J. (1990). World of Physics Bk I. McMillan Co. Melbourne pp. 107-109.

B. *Other Learning Resources*
- Piles of wood
- Activity # 3.1: Investigating Inertia

IV. PROCEDURES

A. *Reviewing the previous lesson or presenting the lesson* – **(Problem)**
- The teacher will ask the class if they have experienced pushing a cart in a downhill direction or riding a boat. If the students answer yes, ask the following questions:
  - What did you observed when you push the cart in the downhill direction?
  - What happens to the boat if it is not yet on the river? How about if you are already sailing on the river?

- Collect answers from the students, and try writing them on the board. After which the students are finished sharing their experiences about the questions posted, give them the problem they are going to look for the answer, ***" Why do you think that objects remain at rest (the boat on the riverbanks) and continue moving (the cart moving in a downhill direction) unless there is a someone or something to stop it?***

B. *Presenting examples/instances of the new lesson* – **(Predict)**
   - The students will be grouped into four. Each group should at least come up with three possible answers regarding the problem. The groups are required to write it on the paper provided.
   - The teacher will provide keywords that will help the students in finding an answer to the problem. The words are as follows:
     - ✓ Inertia
     - ✓ Mass
     - ✓ Speed

C. *Discussing new concepts and practicing new skills* – **(Process)**
   - The groups will be assigned to a different learning station to investigate the First Law of Motion which is the Law of Inertia.
   - The teacher will ask each group to assign a leader, a recorder, and a reporter.

D. Developing Mastery – **(Process)**
   - Reporters of the group will present the data and results of their station. Each learning stations has guide questions for them to answer.
   - The group's presentation will be graded using a group presentation scoring rubric.

E. Finding practical application of concepts and skills in daily living – **(Product)**
   - From the results of the activity, the teacher will then ask the students about their understanding of the concept of inertia.

     Concepts:
     - ✓ Inertia is the property of a body which resists changes in a body's condition of rest or of motion with constant velocity.
     - ✓ A measure of the inertia of a body at rest is its mass. A body with more mass has greater inertia. The more inertia a body has, the more difficult it is to start it moving.
     - ✓ The measure of the inertia in motion of a body is its speed. A body with a greater speed has more inertia than the lesser one. It will also be more difficult to stop the body if it is originally in motion.

- ✓ The law of inertia states that a body at rest will remain at rest and a body in motion in a straight line will remain in motion unless acted upon by a net force. This is Newton's first law of motion.

- The teacher will be asking the question, "*Who is difficult to stop Student A, who weighs 45 kg or Student B whose weight is 64kg? Justify your answer."*

F. Making generalizations and abstractions about the lesson – **(Solutions)**

- The teacher will now seek for the students' answers with regards to the question posted earlier, **"*Why do you think that objects remain at rest (the boat on the riverbanks) and continue moving (the cart moving in a downhill direction) unless there is someone or something to stop it?***

G. *Evaluating learning* – **(Reflection)**

- It is a form of self- evaluation where the students are going to write in their reflective journal.

ACTIVITY # 3.1
INVESTIGATING INERTIA

Purpose:

In this activity, you should be able to

- Demonstrate the Law of Inertia

Procedure:

Learning Station 1: The Tale of the Two Eggs

Materials: raw egg, boiled egg

1. Begin by giving each student a raw egg and a boiled egg (make sure your boiled eggs are cold, just like the raw ones).
2. Have them spin their eggs and observe their motion.

Guide Questions:

1. Describe the motion of the raw egg? the boiled egg?
2. Explain why there is a difference in their motion.

Learning Station 2: Table Cloth Investigation

Materials: Table cloth or fabric, Plate – heavier is best, Lit candle (optional)

1. Place the cloth on a table. Make sure it is dry.
2. Prepare the surface of the table by cleaning it and if possible add furniture polish to make it slippery.
3. Place the plate and lit candle (lit candle – optional) on the cloth.
4. Slowly pull the table cloth. Observe what happens.
5. With adult supervision, quickly pull the table cloth out from under the items. Be sure to pull the cloth quickly towards yourself in one swift move. Do not hesitate on the "pull" of the force.

Guide Questions:

1. What happens when you slowly pulled the table cloth? Explain.
2. What happens when you quickly pulled the table cloth? Explain.

Learning Station 3: Pile of Wood

Material: pile of wood

1. Pile the wood as shown in Figure 3.1.2.
2. Slowly pull the wood at the bottom of the pile. Observe what happens.
3. Arrange again the wood from the beginning but this time quickly pull the wood at the bottom pile. Observe what happens.

Figure 3.1.2

Guide Questions

1. Compare what happens on the top pile if the wood at the bottom is pulled slowly and quickly. Explain why that is so.
2. Is it magic or Physics? How do you explain your observation?

Learning Station 4: Ramp and Roll

Materials: ramp (inclined plane), ball

1. Set up a ramp and roll a ball on it. Mark it as Situation A. Observe what happens.
2. Raise the angle of inclination of the ramp and let the ball roll on it again. Mark it as Situation B. Observe what happens to the ball. Take note of the speed of the ball compare to Situation A.
3. Continue to raise the angle of inclination of the ramp. Mark it as Situation C. Observe the speed of the ball and compare it with Situations A and B.

Guide Questions:

1. What did you observe in Situation A? What happened to the ball when it reached the bottom?
2. What happens to the ball in Situation B when it reached the bottom of the ramp? On Situation C?
3. Suppose you will continue to raise the angle of inclination of the ramp, what will happen to the motion of the ball? Will it continue to

LEARNING PLAN 3.2

I. OBJECTIVES

A. Content Standard.
The learners demonstrate an understanding of Newton's three laws of motion: Law of Inertia, Law of Acceleration, and Law of Interaction.

B. Performance Standard
The learners observe road safety as a motorist or a pedestrian.

C. Learning Competency
- ✓ **The learners investigate the relationship of the amount of force applied and the mass of the object to amount of change in the object's motion.**

D. Learning Purpose
- ✓ Describe the relationship between: (a) Mass and acceleration when force is constant and (b) Force and acceleration when mass is constant

II. CONTENT

Newton's Law of Motion – Law of Acceleration

III. LEARNING RESOURCES

A. References
1. Teacher's Guide pp. *not utilized*
2. Learners' Material pp. *9-14*
3. Textbook pp. *not utilized*
4. Addition Resources from Learning Resources (LR) portal *Unit 1-Force, Motion, and Energy Module 1: Forces and Motion*
5. UP NISMED 2002. Sourcebook for Teachers: Practical Work in High School Physics. UP NISMED, Quezon City.

B. Other Learning Resources
- Paper boats
- Large pulley
- Iron stand
- Two (2) identical masses (at least 1 kg each)
- Activity # 3.2: Atwood Machine (The Deep Well Analogy)

IV. PROCEDURES

A. Reviewing the previous lesson or presenting the lesson – **(Problem)**
- The class will be divided into three groups. Each group should have at least 5-6 members. Each member of the group should have one paper boat.
- The students will be playing, "Paper Boat Racing". The mechanics of the game is simple. Each member will be blowing the paper boat into

the end of the room and back to his/her group mates. The second member in line will put his/her paper boat on top of the first member's boat and will do the same procedure. The game will continue until the last member has returned to their original position. The group that is first to finish is the winner.

- From the game, the teacher will be asking the students about their observations in blowing the paper boats.
- Using the students' responses, the teacher will give the problem, ***"Why is it that heavier objects are hard to move?"***

B. *Presenting examples/instances of the new lesson* – **(Predict)**

- The teacher will be collecting ideas from the students about the problem. Each group should at least present one possible answer.
- The teacher will also take note of the words that are important in today's discussion. These are:
  - ✓ Mass
  - ✓ Force
  - ✓ Acceleration

C. *Discussing new concepts and practicing new skills* – **(Process)**

- The teacher will be conducting a demonstration activity. Since there are limited materials, one set up will be prepared. The teacher will be asking the students every now and then to assist her in the demonstration to ascertain that they are participating.
- After the demonstration, groups will be answering the guide questions that will be provided.
- The demonstration activity is about Atwood Machine which is a good analogy of the deep well concept – the major source of water supply in the tribal community.
- Assignments for each group should be noted: (1) a leader, (2) recorder, (3) reporter.

D. *Developing Mastery* – **(Process)**

- Representatives of each group will present their answer in class. They will be graded using a group presentation scoring rubric.

E. *Finding practical application of concepts and skills in daily living* – **(Product)**

- The students will sum up or generalize the concepts learned about the Law of Acceleration by answering the following questions:
  - ✓ How is acceleration related to the net force when the mass is kept constant?
  - ✓ How is acceleration related to the mass if the net force is kept

constant?

- The teacher will be providing the mathematical relationship that describes the Law of Acceleration.

F. *Making generalizations and abstractions about the lesson* – **(Solutions)**
   - The teacher will now seek for the students' answers with regards to the question posted earlier, ***"Why is it that heavier objects are hard to move?"***

G. *Evaluating learning* – **(Reflection)**
   - It is a form of self- evaluation where the students are going to write in their reflective journal.

ACTIVITY # 3.2

ATWOOD MACHINE (THE DEEP WELL ANALOGY)

Purpose:

In this activity, you will:

- Describe the relationship between (a) mass and acceleration when force is constant and (b) force and acceleration when mass is constant.

Materials:

String
Pulley
Iron Stand
Sets of Masses

Procedure:

1. Connect the two objects with equal masses with a string and place them over a pulley. Arrange them at the same level as shown in Figure 8.2.1. Ask the students to predict what will happen once you release the objects. Recorders of the group should label this as Prediction 1.

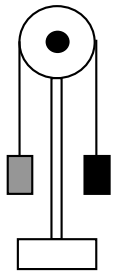


Figure 3.2.1

2. Pull down one object and hold it for a while in its new position. Again, ask the students to predict what will happen when the objects are again released. Let them give their reasons to support their predictions. It should be labeled as Prediction 2.

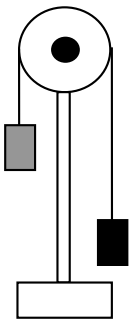


Figure 3.2.2

Note: In case your students won't give their predictions, you may make use of the question below:

- ✓ Which of the following gives the best prediction and supporting reason?
    - A. The block will move down because the gravitational force on the block will be greater at the lower level.
    - B. The block will remain stationary because there will be no net force on the block.
    - C. The block will move up and return to its original position because of conservation of potential energy
    - D. The block will move up and return to its original position because that was its equilibrium position.

3. Change one object with greater mass. Hold them again at the same level. Lastly, ask them to predict what will happen once the objects are released. Labeled this as Prediction 3.

Guide Questions:

1. State your prediction 1, 2 and 3.
2. What is the relationship on the force applied to the masses to its acceleration?
3. What is the relationship of the mass of the object to its acceleration?
4. Relate the concept of Atwood machine when you fetching water in the well.

Appendix D

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

December 14, 2017

SAN JOSE COMMUNITY SERVICE CENTER
RECEIVED
18 DEC 2017
DATE
SIG.
NCIP · WORS

Noel Raul A. Zoleta
Unit Head
National Commission on Indigenous People
San Jose, Occidental Mindoro Chapter

Sir:

Greetings of peace!

I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".* The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in San Jose, Occidental Mindoro.

In line with this, I am requesting your good office to visit our Mangyan communities preferably our Mangyan schools to observe their way of life and conduct interviews.

I am looking forward for your favourable response regarding this matter.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Appendix E

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

December 17, 2017

Artemio Enano
Sitio Leader
Sitio Bamban, Brgy Nicolas
Magsaysay, Occidental Mindoro

Sir:

Greetings of peace!

I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".* The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in Occidental Mindoro.

In line with this, I am requesting your good office to conduct interviews and observation on Mangyans presently residing in your sitio.

I am looking forward for your favorable response regarding this matter.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Approved:

Artemio Enano
Sitio Leader, Bamban

Appendix F

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

December 17, 2017

Wilberto M. Villadares, Ph.D.
Principal III
Magsaysay National High School- Main
Magsaysay, Occidental Mindoro

Thru: **Wilson Madayag**
Teacher –In-Charge
Magsaysay National High School- Bamban Annex

Sir:

Greetings of peace!

I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Mangyan Science through Contextualized PBL Model Approach in Physics Instruction"*. The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in Occidental Mindoro.

In line with this, I am requesting your good office to have the Mangyan students enrolled in your school to be the respondents of my study; included are the conduct of concept tests and lesson integration.

I am looking forward for your favorable response regarding this matter.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Appendix G

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research

Sir/Ma'am:

Greetings!

I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".* The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in Occidental Mindoro.

In line with this, I am requesting your expertise to validate the working model dubbed as the 4PSR (Problem, Predict, Process, Product, Solution and Reflection). The model has been repackaged from the Maastricht Seven Jump Model for PBL tutorials.

I am looking forward for your favorable response regarding this matter.

Attached to this letter is the Model Validation Questionnaire.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Appendix H

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research

Sir/Ma'am:

Greetings!

I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".*The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in Occidental Mindoro.

In line with this, I am requesting your expertise to validate my Learning Plans, Activity Worksheets and Pre-test/Posttest that will be utilized on the conduct of the study.

I am looking forward for your favorable response regarding this matter.

Attached to this letter is the Learning Plan and Assessment Validation Checklist.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Appendix I

Philippine Normal University
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

February 4, 2018

Rodel M. Bahia, Ph.D.
Principal III
San Jose National High School
San Jose, Occidental Mindoro

Thru: **Ferdinand G. Masangcay**
Head Teacher V, Science Department
San Jose National High School

Sir:

Greetings of peace!
I am a graduate student from Philippine Normal University. I am conducting a research entitled, *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience"*.The mentioned research aims to explore the richness of Mangyan culture and tradition for it to be incorporated in a teaching model that will benefit our Mangyan students in Occidental Mindoro.

In line with this, I am asking your permission to allow me to conduct my data gathering procedure at Magsaysay National High School – Bamban Extension every Tuesday afternoon, the whole month of February. My Tuesday afternoon classes will be moved every Friday afternoon in which the students have their vacant period.

I am looking forward for your favorable response regarding this matter.

Respectfully yours,

Maria Fatima L. Jingco
Researcher

Approved:

Ferdinand G. Masangcay
Head Teacher V, Science Department

Rodel M. Bahia, Ph.D.
Principal III, San Jose National High School

Appendix J

PARENTAL CONSENT TO PARTICIPATE IN RESEARCH STUDY

Title of the Study: *"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".*
Researcher: Maria Fatima L. Jingco

Introduction
Your child is being asked to be in a research study of utilizing the contextualized model approach in teaching physics. The model is based from the prevailing activities, culture and tradition of the Mangyan tribe. The researcher believed that a culture-based instruction will help Mangyan students learn the concept of science easily. She/he was selected as a possible participant because he/she is a Grade 7 and Grade 8 students of MNHS-Bamban Extension. I am requesting you to read this form and ask any questions that you have before allowing your child to participate in the study.

Purpose of the Study
The purpose of the study is to first identify the level of science performance and motivation of the students. It will be measured using a pre-test and a Science Motivation Questionnaire (SMQ). Secondly, to test if the method of teaching can increase the level of science performance and motivation of Mangyan students.

Description of Study Procedures
If you decide to allow your child to participate, s/he will be asked to do the following things:

- Take two pre-tests, one for the science performance and the one for the science motivation – s/he will be asked to take the tests to determine the level of her/his science performance and motivation.
- Participate in the implementation of the contextualized model approach in the classroom- I will be using the said approach in teaching Physics. As a student, your child is tasked to do and comply all the requirements and activities that I will ask them to do. Learning activities and assessment will also be provided to the students.
- Take two post-test – After the implementation of the contextualized model approach, your child will take two post-tests, to determine if there is an increase on the level of science performance and motivation.
- Write a journal – At the end of every lessons we discussed, your child will be asked to write a journal of his/her learning experiences during the entire duration of the topic.
- Be interviewed – If your child is part of the upper and lower 5% based on the pre-test result, I will set an interview with him/her. Some questions about the model approach that

I used and his/her experience when studying will be asked. S/He needs to answer the questions honestly. If you give permission, I will record your child's response using a voice recorder. The interview will take about 5-10 minutes.

Risk/Discomfort of Being in this Study

- There are no reasonable foreseeable risks.
- There will be no extra grade or point given to the students for participating in this study. The results of the pre-test and post-test will not affect their science grades this academic year.

Benefits of Being in the Study

The benefits of participation are the following:

- Your child will get to exposed with the contextualized model approach wherein it could help him/her improve his/her understanding in Physics by relating it with Mangyan culture.
- The level of science performance and motivation of your child will be assessed. Through that, you will be able to identify your child's competency.

Confidentiality

This study is anonymous. I will not be collecting or retaining any information about your child's identity. The records of this study will be kept confidential.

Right to Ask Questions and Report Concerns

You have the right to ask question about this research study and to have those questions answered by me before, during and after the research. If you have further questions about the study, at any time feel free to contact me, Maria Fatima L. Jingco, at 09293694849.

CONSENT

Your signature below indicates that you have decided to allow your child to participate as a research subject for this study, and that you have read and understood the information provided above.

Parent/Guardian Name: _____

Parent/GuardianName: _____ Date: _____

Appendix K
ASSENT TO PARTICIPATE IN RESEARCH STUDY

"Contextualizing Physics Instruction for Indigenous People: The Mangyan Experience".

My name is Maria Fatima L. Jingco, a science teacher at San Jose National High School, San Jose, and Occidental Mindoro. At present, I am taking up Masters of Arts in Science Education with specialization in General Science at Philippine Normal University. I am doing a research study as part of my requirement in completing my course. I would like to tell you about this study and ask if you wanted to be a respondent.

What is a research study?
A research study is when people like me collect information about a topic to find more about it.

Why am I doing this study?
As you have read in the title of my research, this undertaking is exclusively for Mangyans of Mindoro only. It has been in my curiosity how students like you perform and get motivated in your studies especially in science or Physics. It is also my concern, why majority in your tribe do not pursue higher education. In this study, I will utilized the contextualized model approach. The model approach is designed based from your activities in the community, culture and tradition. I have high hopes that integrating your daily routines on science concepts will help you improve your science performance, be motivated in studying and better pursue higher education.

Why am I talking to you about this study?
I am inviting you to take part because you are a Mangyan student and this study will benefit you in increasing the level of your science performance and motivation.

What will happen if you participate in this study?
If you agree to participate and your parents give you permission, I will ask you to:

- Take two pre-tests, one for the science performance and the one for the science motivation – You will be asked to take the tests to determine the level of your science performance and motivation.
- Participate in the implementation of the contextualized model approach in the classroom- I will be using the said approach in teaching Physics. As a student, you are tasked to do and comply all the requirements and activities that I will ask you to do. Learning activities and assessment will also be provided.
- Take two post-tests – After the implementation of the contextualized model approach, you will take two post-tests, to determine if there is an increase on the level of science performance and motivation.
- Write a journal – At the end of every lessons we discussed, you will be asked to write a journal of your learning experiences during the entire duration of the topic.
- Be interviewed – If you are part of the upper and lower 5% based on the pre-test result, I will set an interview with you. Some questions about the model approach that I used and your experience

when studying will be asked. You need to answer the questions honestly. If you give permission, I will record your response using a voice recorder. The interview will take about 5-10 minutes.

Total time: Both the pre and posttest will take 1.5 hours. The implementation of the contextualized model approach will be observe for 16 hours. If you have an interview, it will last for 5-10 minutes.

Study Location: Magsaysay National High School- Bamban Extension, Sitio Bamban, Bgry Nicolas, Magsaysay, Occidental Mindoro

Are there benefits to being in the study?

The benefits of your participation are the following:

- You will be exposed with the contextualized model approach wherein it could help you improve your understanding in Physics by relating it with Mangyan culture – your very own culture.
- The level of your science performance and motivation will be assessed. Through that, you will be able to identify your competency.

Who will know about your study participation?

Besides from your parents, the researcher, your principal and your science teacher are the only ones who will know the details of your study participation. If I publish the reports or give talks about this research, I will only discuss group results. I will not use your name or any other personal information that would identify you.

Will you get paid for being in the study?

You will not be paid for being in this study.

Do you have any questions?

If you have further questions about the study, you and your parents can contact me, Maria Fatima L. Jingco, at 09293694849.

ASSENT OF CHILDREN

If you decide to participate, and your parents agree, I will give you a copy of this form to keep for further reference.

_____ _____

Child's Signature Over Printed Name Date

Appendix L

PRETEST/ POST-TEST (GRADE 7)
FORCE, MOTION AND ENERGY

Directions: *Write the letter of your choice on the space provided before the number.*

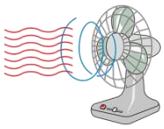
1. The children in the neighborhood are happily playing and are very noisy. Which among the illustration would describe the amplitude of their sound?

A. B. C. D.

2. Each of us has different sounding voice. How do we create sound with our voices?
   A. The vocal folds vibrate interrupting the air flow.
   B. During exhalation, the vocal folds are at rest.
   C. The vocal folds come together stop vibrating.
   D. None of the above
3. What will happen if you submerge your hand in very cold water?
   A. Heat from hand will transfer unto the cold water.
   B. Heat from the cold water will transfer to your hand.
   C. You will cold and then warm afterwards.
   D. You will feel warm at first and then cold afterwards.
4. Nena feels the warmth of the sun on her face when she went of the house to dry her clothes. What method of heat transfer is being described on the situation?
   A. Conduction B. convection C. radiation D. induction
5. Mang Cardo strums the thick string on his gitgit. What characteristics of sound will be produced?
   A. High pitch B. low pitch C. high quality D. low quality
6. Which among the following illustrations BEST describe conduction of heat?

A. B. C. D.

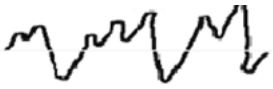
7. There are frequencies of sound that human cannot hear. What is the term for such frequency?
   A. Audible B. infrasonic C. ultrasonic D. supersonic
8. Two materials made of aluminum and stainless namely Material X and Material Y respectively are placed in a hot water. Which among the following will likely to happen?
   A. There will be an increase on temperature of the Material X.
   B. There will be an increase on temperature of the Material Y.
   C. There will be a decrease on temperature of the Material X.
   D. There will be a decrease on temperature of the Material Y.
9. What are the different factors that affect the pitch of sound in a stringed instrument like the gitgit?
   A. The length of the string C. The tautness of the string
   B. The thickness of the string D. All of the above
10. What characteristics of sound can be inferred on the different musical instruments?
   A. Loudness B. quality C. pitch D. intensity
11. Which of the following illustration is described by convection?

   A. B. C. D.

12. Which of the following conditions when heat transfer will likely to occur?
   A. When there are differences in the temperature of the materials involved.
   B. When there are similarities in the temperature of the materials involved.
   C. When there are no changes in temperature on both objects.
   D. None of the above
13. Which among the statements is TRUE about convection current?
   A. Cold air rises and warm air goes down
   B. Warm air rises and cold air goes down
   C. Warm air stays at the bottom and cold air on top.
   D. Cold air stays at the bottom and warm air on top.
14. Which of the following is pleasant sound in the ears?



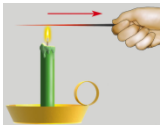


   A. B. C. D.

15. Which among the following is good conductor of heat?

A. Wooden block B. stainless steel C. Plastic spoon D. a piece of clothing

16. What method of heat transfer can be inferred in the figure below?



A. Conduction B. Convection C. Radiation D. Induction

17. How can the pitch of a vibrating string be made higher?

I. Tighten the string
II. Change to a thick string of the same kind
III. Reduce its length.

A. I only B. II only C. I and III D. II and III

18. What method of heat transfer is reflected on the hot coffee?

A. Conduction B. convection C. radiation D. insulation

19. What is the part of the respiratory system that is considered as the power source in the production of the human voice?

A. Air B. vocal tract C. diaphragm D. Vocal folds

20. Which of the following is an example of convection?

A. The sun is drying up the wet clothes.
B. When you are making soup and the water is rising and lowering.
C. When ice changes the temperature of the pitcher of water.
D. When the roasted pig is being cooked using charcoal.

21. What will happen to the sound waves if the amplitude is increased?

A. An increased in pitch C. An increased in frequency
B. An increased in quality D. An increased in loudness

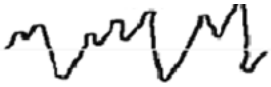
22. What part of the human ear collects the sound from the environment?

A. Pinna B. Ear Canal C. Ear Drum D. Middle Ear

23. What type of heat transfer is demonstrated on the baby chickens which are kept warm from the heat lamps?

A. Conduction B. Convection C. Radiation D. Insulation

24. What type of sound can be described by this wavelength?



A. Pleasant B. loud C. noise D. quiet

25. Which of the following is INCORRECT?

A. More air molecules are being brought together and pushed apart during each cycle
B. Air molecules are being brought together and pushed apart more frequently each second

C. Vocal folds vibrate at multiple frequencies at once
D. All of the above

26. What method of heat transfer is described by ironing of shirt?
A. Condensation B. Conduction C. Convection D. Radiation

27. Which of the following frequencies can be described as inaudible or infrasonic?
A. Lower than 20Hz C. Higher than 20HZ
B. Lower than 20 000 Hz D. Higher than 20 000 Hz

28. Which of the following describes a radiation process?
A. Walking on warm sand barefooted
B. The candle will transfer its heat on the spoon and warms your hand.
C. You are feeling warm near a bonfire.
D. The water boils in a kettle.

29. Which of the following describes a conductor?
A. Conductors are materials that allow transfer of heat.
B. Conductors are materials that do not allow the transfer of heat.
C. Conductors are used only during conduction process.
D. Conductors are used only in radiation process.

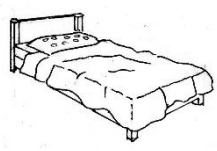
30. The same note is played on a gong and on a kalutang. Which characteristic distinguishes the sound coming from the two instruments?
A. Pitch B. loudness C. quality D. intensity

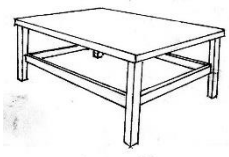
Appendix M

PRE-TEST/ POST-TEST (GRADE 8)
FORCE, MOTION AND ENERGY

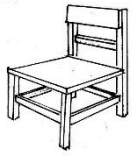
Directions: *Write the letter of your choice on the space provided before the number.*

1. There two containers, namely container A and container B. Container A is heavier than container B. Which among the following will accelerate more if the force exerted on both is equal?
   A. Container A
   B. Container B
   C. The containers will have the same acceleration.
   D. The containers will not accelerate.
2. The students played the game of Tug of War. Which Newton's Laws of Motion BEST describes the game?
   A. Law of Inertia
   B. Law of Acceleration
   C. Law of Interaction
   D. All of the above
3. Mang Juaning placed a "kalso" – a small block of wood on the tire of his jeepney when he rested on an uphill. Which Newton's Laws of Motion did Mang Juaning consider?
   A. Law of Inertia
   B. Law of Acceleration
   C. Law of Interaction
   D. All of the above
4. Which among the statements BEST describes Newton's 3rd Law of Motion?
   A. Acceleration is inversely proportional to the mass of an object.
   B. An object at rest will remain at rest unless acted upon by an external force.
   C. Forces always come in pairs.
   D. An object will move if a force is applied unto it.
5. Arrange the following objects in decreasing acceleration if an equal amount force is exerted to make them move.


I


II


III


IV

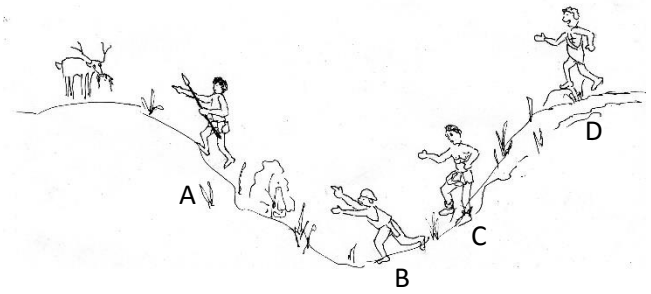
   A. I, II, III, and IV
   B. II, IV, I, and III
   C. III, II, IV, and I
   D. IV, III, II, and I
6. What will happen to an object in motion if there is no external force applied to it?

A. It will continue to move in straight line.
B. It will continue to move depending on the path it wants to take.
C. It will stop for a while and then continue to move.
D. It will stop eventually for some time.

7. What is the reaction force on the following situation: The man is climbing a coconut tree?
   A. The force of the man's foot on the tree.
   B. The force of the man's foot on the wind.
   C. The force of the tree trunk on the man's foot.
   D. The force of the wind on the man's foot.
8. Which among the following situation implies that there is work done?
   A. Nene is pushing against the wall.
   B. Aling Basyang is walking to the park while carrying her baby.
   C. Mang Toto is constructing a pig pen.
   D. Pedro is pushing a sack of rice towards the store.
9. Which among the following sports acquire the GREATEST kinetic energy?
   A. Basketball C. Chess
   B. Running D. Volleyball
10. Aling Moringa is pushing her basket of dirty clothes towards the river. She exerted a 15 J of work in doing this. She reached the river for about 25 minutes (1500s). Calculate the power of Aling Moringa for the mentioned activity.
    A. 0.01 Watts B. 100 Watts C. 22 500 Watts D. 1485 Watts
11. Which among the following situation describes the LEAST potential energy?
    A. A man resting on top of the hill.
    B. A mountain climber reached Mount Apo's peak.
    C. A boy eating mangoes on top of the tree.
    D. A little girl riding on her new bike in the park.
12. Mang Ipe his making a new chair. He exerted force by using a hammer on the nail with the magnitude of 7 N. What would be the magnitude of the force exerted by the nail on the hammer?
    A. 7 N B. 3.5 N C. 0 N D. 10.5 N
13. What is the work done of Boyong on pushing their house when he exerted a 150 N of force?
    A. 150 J B. 75 J C. 0 J D. 225 J
14. Which among the following is NOT a factor affecting power?
    A. Work done C. force exerted
    B. Time elapsed D. mass of the object
15. Two birds are resting on top of the tree with the height of 100m. Bird A has twice as mass of Bird B. Which has greater potential energy?

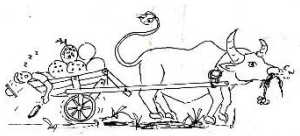
A. Bird A
B. Bird B
C. Both have the same potential energy
D. Both do not have a potential energy

16. Tina is riding on a jeepney. Suddenly the driver steps on the brake and Tina was thrown upward. Which Newton's Laws of Motion BEST describes the situation?
    A. Law of Inertia
    B. Law of Acceleration
    C. Law of Interaction
    D. All of the above
17. In which points in the illustration, the kinetic energy is the LEAST?

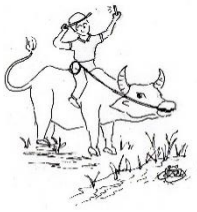


A. Point A B. Point B C. Point C D. Point D

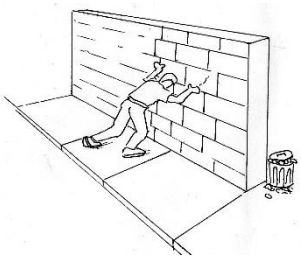
18. Which among the following illustration is the work done GREATEST?



Situation D



Situation E



Situation F

Situation G

A. Situation D B. Situation E C. Situation F D. Situation G

19. Which will have the LEAST acceleration?
    A. The boy pushing 50 kg of bananas.
    B. The boy pushing 1kg of sweet potato.
    C. The boy pushing 10 kg of unripe mangoes.

D. The boy pushing 15 kg of palay.

20. Which of the animals in the illustration has the GREATEST potential energy?

A. The worm B. the cat C. the goat D. the bird

21. In which daily activities below is Newton's 3rd law present?
    A. Washing the clothes in the river.
    B. Carrying a pail of water.
    C. Cooking rice.
    D. Running with friends.
22. Which among the following is NOT a factor that affects the kinetic energy of an object?
    A. Mass B. velocity C. weight D. height
23. Which of the following statement BEST describes inertia?
    A. Inertia is the tendency of an object to resist changes in motion.
    B. Mass is the measure of inertia in motion.
    C. Speed is the measure of inertia at rest.
    D. All of the above.
24. Which is TRUE about action-reaction forces?
    A. They are equal in magnitude
    B. They are opposite in direction
    C. They act on different bodies (they don't cancel each other)
    D. All of the above
25. What is the kinetic energy of a horse with a mass of 50 kg that runs with the speed of 10m/s?
    A. 250 J B. 500 J C. 2500 J D. 5000 J
26. Which among the following does NOT describe a mechanical work?
    A. Joyjoy pulling her toy cart.
    B. Mang Tonyo lifting a sack of rice.
    C. Lino doing hid work in the construction site.
    D. Linda pushing the map on the floor.

27. A girl who was standing on the aisle of a bus was holding a book. The book fell when the bus suddenly moved forward. Where will the book land on the floor with respect to the girl's position?
    A. In front of the girl
    B. At the back of the girl
    C. same position as the girl
    D. not enough information is given
28. A force F is applied to an object resulting to an acceleration a. If force increases 4 times, the acceleration b.
    A. is doubled
    B. reduce to ¼
    C. reduce to ¼
    D. increases 4 times
29. Four friends namely Adoy, Badong, Caloy and Dado wanted to test who among them has the greatest power. Their task is to apply a 10 J of work in lifting a crane. Which among the following statements this four friend acquire the greatest power?
    A. Tonyo lifted the crane in 45 minutes.
    B. Badong lifted the crane in 1 hour.
    C. Caloy lifted the crane in 30 minutes.
    D. Dado lifted the crane in 15 minutes.
30. Cars for racing activities must be made up of light materials. This is explained by the relationship
    A. $a \propto F$
    B. $a \propto M$
    C. $a \propto \frac{1}{m}$
    D. $a \propto \frac{1}{F}$

Appendix N

MODEL VALIDATION QUESTIONNAIRE

Name of Validator: _____

Years of Teaching Experience (Science): _____ Current Position: _____

Institution: _____

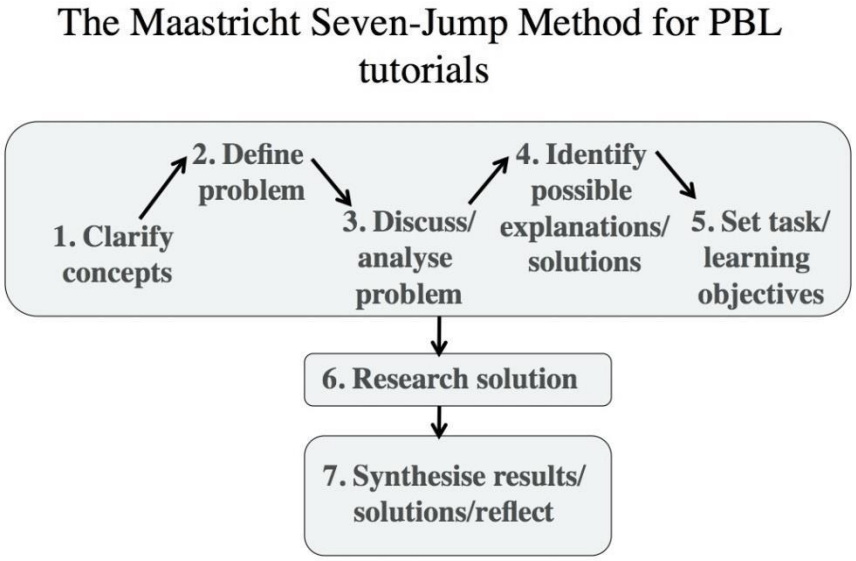


Figure 1 Maastricht Seven-Jump Method for PBL Tutorials (Original model)

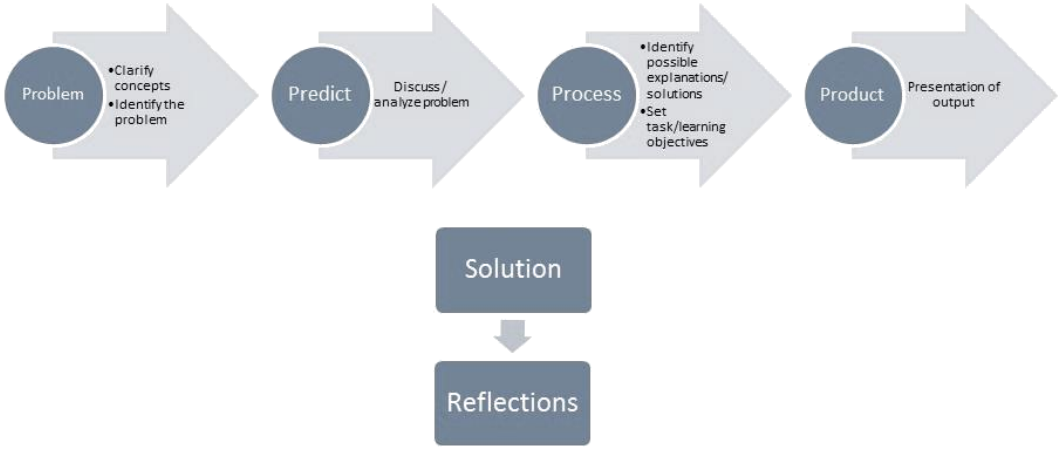


Figure 2 4PSR Working Model (Revised Model)

1. What are your thoughts about the revised working model?

2. What do you think are the advantages of the revised working model to the original one?

3. Are the features of the revised working model aligned with the purpose of contextualized model?

4. Is there anything that you would like to suggest to the new working model for areas of improvement?

5. There is a need to revise the original model because
   _____
   _____
   _____
   _____
   _____
6. The new working model is better than the old one due to the following reason/s
   _____
   _____
   _____
   _____
   _____

Appendix O

CONTEXTUALIZED MODEL VALIDATION CHECKLIST

Please check ( ) the following scale that corresponds to the following indicators.

Indicators	4 Highly Evident	3 Evident	2 Slightly Evident	1 Not at all Evident
A. Problem 1. Contextualization is shown in identifying and clarifying of the problem.				
B. Predict 1. The discussion and analysis of the problems shows indication of contextualization.				
C. Process 1. Setting the tasks and learning objectives demonstrates contextualization. 2. Contextualization is apparent in identifying possible solutions for the problem via group and paired activity.				
D. Product 1. The presentation of the output of the group activity has a strong indication of contextualization.				
E. Solution 1. The presentations of the solution to the given problem have an accent of contextualization.				
F. Reflections 1. This part where the students write their learning experiences illustrates contextualization.				

Appendix P

LEARNING PLAN VALIDATION CHECKLIST

Please check ( ) the following scale that corresponds to the following indicators.

Indicators	4 Highly Evident	3 Evident	2 Slightly Evident	1 Not at all Evident
A. Objectives				
1. The objectives are aligned on the content and performance standards of the curriculum guide.				
2. The number of learning objectives is realistic.				
3. The learning objectives can be reflected on the learning competencies provided.				
B. Content				
1. The content of the lesson is well-addressed.				
2. The content includes facts, data, information, formulas, concepts, skills, knowledge and attitudes.				
3. The content is measurable and observable. It matches the assessment and evaluation.				
C. Learning Context				
C. 1 Learners				
1. Identifies learners' prior knowledge related to the objectives.				
2. Includes differentiated instruction (content, process and product) to ensure inclusion of all learners (must include, where applicable, accommodations and/or modifications to learners identified as exceptional)				
3. Identifies learners who require additional support, including accommodations and/or modifications; describes strategies to be used.				
4. Describes changes in content, process and product to meet needs.				

C.2 Learning Environment 1. Describes the teaching learning space.				
2. Describes adjustment to the teaching – learning space.				
C.3 Resources and Materials 1. List the resources to be used for example: o Text title, author, and page(s) o Films, websites and articles o Exemplars, models, anchor charts o Hand-outs (worksheets, templates, rubrics and checklist) o Supplies (paper, markers, manipulative)				
D. Assessment and Evaluation 1. Identifies the strategy used to assess the learning.				
2. Includes self and peer assessment as appropriate.				
3. Identifies assessment of learning skills or achievement categories.				

(Revised from Nipissing University Schulich School of Education)

Appendix Q

ASSESSMENT VALIDATION CHECKLIST

Please check ( ) the following scale that corresponds to the following indicators.

Indicators	(4) Highly Evident	(3) Evident	(2) Slightly Evident	(1) Not at all Evident
1. Questions are based on suitable social, educational or workplace activities and contexts.				
2. Written text type is authentic in purpose, content and format.				
3. Language (grammar, vocabulary) is consistent with course content to date.				
4. Questions relate directly to learning outcomes being assessed.				
5. Questions assess student's ability to meet learning outcomes being assessed				
6. Assessment method is appropriate for skills being assessed				
7. Instructions to students ensure students are fully aware of assessment requirements.				
8. The language of instructions is consistent with language level of the course.				
9. Reasonable adjustment can be made for students with specific needs or language skill profiles				
10. Questions do not require specialist knowledge beyond course content to date.				

(Adapted from NEAS, 2015)

Appendix R

SCIENCE MOTIVATION QUESTIONNAIRE

Please respond to each of the following statements from your point of view. The following scale is used: (1) Never, (2) Rarely, (3) Sometimes, (4) Usually and (5) Always

Statement	1	2	3	4	5
1. I enjoy learning science					
2. The science I learn relates to my personal goals					
3. I like to do better than other students on science tests.					
4. If I am having trouble learning science, I try to figure out why.					
5. Earning a good science grade is important to me.					
6. I put enough effort into learning science.					
7. I use strategies that ensure I learn science well.					
8. I think about how learning science can help me get a good job.					
9. I think about how the physics I learn will be helpful to me.					
10. I expect to do as well as or better than other students in science quarters.					
11. I think about how my science grade (in a quarter) will affect my overall average					
12. The science I learn is more important to me than the grade I receive.					
13. I think about how learning science can help my career.					
14. I think about how I will use the science I learn.					
15. It is my fault, If I do not understand science.					
16. I am confident I will do well on science activities and projects.					
17. I find learning science interesting.					
18. The science I learn is relevant to my life.					
19. I believe I can master the knowledge and skills in science courses.					
20. The science I learn has practical value for me.					
21. I prepare well for science activities.					
22. I like science that challenges me.					
23. I am confident I will do well on science test.					
24. I believe I can earn a grade of better than “90” in a science subject.					
25. Understanding science gives me a sense of accomplishment.					

Appendix S

CLASSROOM OBSERVATION TOOL

Name: _____ Subject:_____

Time & Date: _____ Lesson: _____

	SITUATION/TEACHING EPISODE	Evaluation Rubrics				Remarks
		4	3	2	1	
A	Learning Objectives					
	The Teacher:					
	1. Reviewed the previous lessons and clarify concepts from the previous lessons that learners had difficulty understanding.					
	2. Introduced the new lesson and connects the previous lessons to the new lesson in a logical manner.					
	3. Established a purpose for the new lesson by presenting clear and precise objectives. It is important to write the objectives on the board,					
	4. The teacher motivated the learners through start-up or warm-up activities or/and encourage learners to ask questions about the new lesson to assess if they had understood the purpose of learning the new lesson.					
	TASK					
B	Lesson Strategies, Activities, and Delivery					
	5. The teacher demonstrated mastery of the content within and/or across curriculum teaching areas.					
	6. The teacher conveyed ideas clearly and unlock difficult words.					
	7. The teacher presented logical order of concepts or present lessons developmentally (simple to complex)					
	8. Teacher applied appropriate instructional strategies and methods to achieve the learning objectives. a. Direct instruction b. Indirect instruction c. Interactive instruction d. Experiential instruction e. Independent Study f. Others					
	9. The teacher used contextualization to deepen understanding and/or differentiated activities					

	appropriate to learners' needs.					
	10. The teacher integrated ICT into any of the different parts of the lesson to promote learning and enhance the abilities and skills of both learners and teachers.					
	11. The teacher promoted literacy and numeracy for each appropriate grade level relevant to aspects of daily living.					
	12. The teacher applied strategy/ies to develop critical and creative thinking as well as other higher order thinking skills (HOTS) through well-planned set of questions or varied examples for higher level understanding.					
	13. The teacher displayed proficient use of Mother Tongue, Filipino, and English to improve teaching and learning and to develop learners' pride of their language, heritage, and culture.					
	14. The teacher used verbal and non-verbal classroom communication strategies to support learners' understanding, participation, engagement, and achievement.					
	15. The teacher created a learning environment that applies positive and non-violent discipline in the management of the learner's behavior.					
	16. The teacher clarified misconceptions immediately.					
	ACTION					
C	Classroom Environment, Classroom Management					
	17. Learners were safe and secured in physical/ classroom environment.					
	18. Learners displayed fairness, respect, discipline, and care while in class.					
	19. Learners showed appropriate behavior of individualism, cooperation, gender-sensitiveness, and healthy competition in classroom activities.					
	20. Learners were engaged individually or in groups through appropriate task/ differentiated task as applicable.					
	21. Learners recited and participated, thus gained confidence.					
	22. Learners worked productively by assuming tasks/ responsibility.					
D	Generalization					
	23. The learners answered recall situations related to the activities that enable them to craft their own ideas regarding the lesson without verbatim repetition.					

	24. Application: The learners applied what they learned in a creative way: role play, dramatization, demonstration, simulation, composition writing, etc.					
	25. Analysis: The learners answered a problem through logical examination of facts through case studies, concept mapping, reaction paper, experiment, etc.					
	26. Valuing: The learners made an assessment/reflections according to given standards.					
	RESULT					
E	End of Class Assessment & Student Mastery of the Objective					
	27. Majority to 100% participated/recited.					
	28. Exit slips/ formative assessment/ summative assessments proved that nearly all learners mastered their objectives.					
	29. Activities done were congruent with the objectives deepening of understanding was evident.					
	30. Rubrics were presented and reviewed with learners before actual performance, such that, rubrics were fair and student friendly.					
	31. The 21st century skills embedded in the learning competencies were evident. a. Learning & Innovation Skills b. Informative, Media, and Technology Skills c. Effective Communication Skills d. Life and Career Skills					

Scoring Rubrics:

3.25 – 4.00	Outstanding
2.50 – 3.24	Very Satisfactory
1.75 – 2.49	Satisfactory
1.00 – 1.74	Needs Improvement

Appendix T

MODEL VALIDATION RESULTS

1. What are your thoughts about the revised working model?

   ***Expert A*: The revised working model is reminiscent of the old model but is definitely more concise.**

   ***Expert B:* Predict: discuss/analyze the problem. Prediction is different from analyzing the problem. Look for other words other than predict. I suggest, "Probe".**

   ***Expert C*: The revised working model aims to shorten the old model so as to focus more on significant learnings inside the classroom.**

2. What do you think are the advantages of the revised working model to the original one?

   ***Expert A:* It is easier to follow due to the smaller number of 'jumps" involved**.

   ***Expert B:* Since you did not stop from the objectives alone, and wishes to come up with a product, that is a great advantage.**

   ***Expert C*: The advantages of the new working model is that it is easy to follow and understand, memorize perhaps since it has a mnemonics. And also it is aligned on the sequence of the lesson presentation proposed by the Department of Education.**

3. Are the features of the revised working model aligned with the purpose of contextualized model?

   ***Expert A*: Yes. They both follow the same basic steps.**

   ***Expert B:* Majority of the concepts are the same except on the concept of the products.**

   ***Expert C*: Yes.**

4. Is there anything that you would like to suggest to the new working model for areas of improvement?

Expert A: **Synthesis should still be included as part of the model.**

Expert B**: Include analysis of the products.**

Expert C**: The improvement of the model lies on the teacher itself. The strengths and weaknesses of the new model will arise only if used in a real classroom setting.**

5. There is a need to revise the original model because

Expert A: **The old model is very taxing as it includes more steps than the new.**

Expert C: **To shorten the content or the steps. As you investigate the old model some steps are redundant or repeating.**

6. The new working model is better than the old one due to the following reason/s

Expert A: **The new working model is better as it involves fewer steps and decisions.**

Expert B**: Fewer steps and involve product production.**

Expert C**: The great advantage of the new model is the contextualization part.**

Appendix U

CONTEXTUALIZED MODEL VALIDATION RESULTS

Table 2 Contextualized Model Validation Summary of Results

Indicators	1	2	3	Mean
A. Problem 1. Contextualization is shown in identifying and clarifying of the problem.	3	3	2	**2.67**
B. Predict 1. The discussion and analysis of the problems shows indication of contextualization.	3	2	3	**2.67**
C. Process 1. Setting the tasks and learning objectives demonstrates contextualization. 2. Contextualization is apparent in identifying possible solutions for the problem via group and paired activity.	4	4	4	**4.00**
D. Product 1. The presentation of the output of the group activity has a strong indication of contextualization.	3	3	3	**3.00**
E. Solution 1. The presentations of the solution to the given problem have an accent of contextualization.	4	3	3	**3.33**
F. Reflections 1. This part where the students write their learning experiences illustrates contextualization.	3	2	2	**2.33**

Appendix V

LEARNING PLAN VALIDATION RESULTS

Table 3 Learning Plan Validation Summary of Results

Indicators	1	2	3	4	Mean
A. Objectives					
1. The objectives are aligned on the content and performance standards of the curriculum guide.	4	4	4	4	**4**
2. The number of learning objectives is realistic.	4	4	4	4	**4**
3. The learning objectives can be reflected on the learning competencies provided.	4	4	4	4	**4**
B. Content					
1. The content of the lesson is well-addressed.					
2. The content includes facts, data, information, formulas, concepts, skills, knowledge and attitudes.	4	4	4	4	**4**
3. The content is measurable and observable. It matches the assessment and evaluation.	3	3	4	3	**3.25**
C. Learning Context					
C. 1 Learners					
1. Identifies learners' prior knowledge related to the objectives.	4	4	4	4	**4**
2. Includes differentiated instruction (content, process and product) to ensure inclusion of all learners (must include, where applicable, accommodations and/or modifications to learners identified as exceptional)	3	3	4	3	**3.25**
3. Identifies learners who require additional support, including accommodations and/or modifications; describes strategies to be used.	4	4	4	4	**4**
4. Describes changes in content, process and product to meet needs.	4	4	3	3	**3.5**
C.2 Learning Environment					
1. Describes the teaching learning space.	4	4	4	4	**4**

2. Describes adjustment to the teaching – learning space.	4	4	4	3	**3.75**
C.3 Resources and Materials					
1. List the resources to be used for example: o Text title, author, and page(s) o Films, websites and articles o Exemplars, models, anchor charts o Hand-outs (worksheets, templates, rubrics and checklist) o Supplies (paper, markers, manipulatives)	3	3	4	3	**3.25**
D. Assessment and Evaluation					
1. Identifies the strategy used to assess the learning.	4	4	4	4	**4**
2. Includes self and peer assessment as appropriate.	3	3	4	3	**3.25**
3. Identifies assessment of learning skills or achievement categories.	4	4	4	4	**4**

Appendix W

PRETEST/POSTTEST VALIDATION RESULTS

Table 4 Pretest/Posttest Validation Summary of Results

Indicators	1	2	3	4	Mean
Validity					
1. Questions are based on suitable social, educational or workplace activities and contexts.	4	4	4	4	**4**
2. Written text type is authentic in purpose, content and format.	3	3	4	3	**3.25**
3. Language (grammar, vocabulary) is consistent with course content to date.	4	4	4	4	**4**
4. Questions relate directly to learning outcomes being assessed.	4	4	4	4	**4**
5. Questions assess student's ability to meet learning outcomes being assessed	4	4	4	4	**4**
6. Assessment method is appropriate for skills being assessed	4	4	4	3	**3.75**
Overall Mean					**3.83**
Reliability					
7. Instructions to students ensure students are fully aware of assessment requirements.	4	4	4	3	**3.75**
8. The language of instructions is consistent with language level of the course.	4	4	4	4	**4**
Overall Mean					**3.88**
Flexibility					
9. Reasonable adjustment can be made for students with specific needs or language skill profiles	3	3	4	3	**3.25**
Fairness					
10. Questions do not require specialist knowledge beyond course content to date.	4	4	4	4	**4**

Appendix X

PRETEST/POSTTEST RELIABILITY STATISTICS RESULTS

Table 4.1 Grade 7 Pretest/Posttest Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha based on Standardized Items	No. of Items
0.750	0.762	30

Table 4.2 Grade 7 Pretest/ Posttest Item Statistics

	Mean	Standard Deviation	N
Qu1	0.9214	0.26955	280
Qu2	0.7964	0.40337	280
Qu3	0.8929	0.30985	280
Qu4	0.9143	0.28044	280
Qu5	0.8714	0.33532	280
Qu6	0.7179	0.45085	280
Qu7	0.8071	0.39525	280
Qu8	0.6893	0.46361	280
Qu9	0.8036	0.39801	280
Qu10	0.6786	0.46786	280
Qu11	0.8000	0.40072	280
Qu12	0.8036	0.39801	280
Qu13	0.6786	0.46786	280
Qu14	0.7357	0.44174	280
Qu15	0.7786	0.41595	280
Qu16	0.7214	0.44910	280
Qu17	0.7143	0.45256	280
Qu18	0.8214	0.43614	280
Qu19	0.7500	0.43379	280
Qu20	0.8214	0.46786	280
Qu21	0.8821	0.41092	280
Qu22	0.8857	0.31873	280
Qu23	0.8393	0.36792	280
Qu24	0.7071	0.45589	280
Qu25	0.7571	0.42958	280
Qu26	0.9036	0.29571	280
Qu27	0.8357	0.37120	280
Qu28	0.9250	0.26386	280
Qu29	0.8250	0.38065	280
Qu30	0.8000	0.40072	280

Table 4.3 Grade 7 Pretest/Posttest Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum/ Minimum	Variance	No. of Items
Item Means	0.803	0.679	0.925	0.246	1.363	0.006	30
Item Variances	0.159	0.070	0.219	0.149	3.144	0.002	30

Table 4.4 Grade 7 Pretest/Posttest Item Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	23.1571	16.205	0.500	-	0.735
Qu2	23.2821	16.261	0.289	-	0.741
Qu3	23.1857	16.173	0.439	-	0.736
Qu4	23.1643	16.747	0.234	-	0.745
Qu5	23.2071	16.659	0.216	-	0.745
Qu6	23.3607	16.568	0.161	-	0.749
Qu7	23.2714	16.779	0.132	-	0.750
Qu8	23.3893	16.748	0.106	-	0.753
Qu9	23.2750	16.759	0.137	-	0.750
Qu10	23.4000	16.649	0.130	-	0.752
Qu11	23.2786	16.919	0.086	-	0.753
Qu12	23.2750	16.996	0.064	-	0.754
Qu13	23.4000	16.427	0.189	-	0.748
Qu14	23.3429	16.714	0.126	-	0.751
Qu15	23.3000	15.938	0.377	-	0.736
Qu16	23.3571	15.714	0.406	-	0.734
Qu17	23.3643	16.053	0.305	-	0.740
Qu18	23.2571	15.797	0.397	-	0.735
Qu19	23.3286	16.745	0.121	-	0.752
Qu20	23.2571	15.812	0.358	-	0.737
Qu21	23.1964	16.309	0.267	-	0.743
Qu22	23.1929	16.529	0.283	-	0.742
Qu23	23.2393	17.179	0.016	-	0.756
Qu24	23.3714	15.546	0.448	-	0.731
Qu25	23.3214	16.011	0.340	-	0.738
Qu26	23.1750	16.288	0.414	-	0.737
Qu27	23.2429	16.220	0.336	-	0.739
Qu28	23.1536	16.976	0.146	-	0.748
Qu29	23.2536	15.946	0.418	-	0.734
Qu30	23.2786	15.277	0.615	-	0.722

Appendix Y

PRETEST/POSTTEST RELIBILITY STATISTICS RESULTS GRADE 8

Table 5.1 Grade 8 Pretest/Posttest Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha based on Standardized Items	No. of Items
0.754	0.762	30

Table 5.2 Grade 8 Pretest/ Posttest Item Statistics

	Mean	Standard Deviation	N
Qu1	0.8534	0.35417	348
Qu2	0.8448	0.36259	348
Qu3	0.8563	0.35127	348
Qu4	0.9282	0.25859	348
Qu5	0.7500	0.43364	348
Qu6	0.7816	0.41375	348
Qu7	0.7443	0.43691	348
Qu8	0.6724	0.47001	348
Qu9	0.8161	0.38797	348
Qu10	0.7586	0.42854	348
Qu11	0.8937	0.30869	348
Qu12	0.7241	0.44759	348
Qu13	0.7730	0.41950	348
Qu14	0.7701	0.42136	348
Qu15	0.7672	0.42320	348
Qu16	0.6609	0.47408	348
Qu17	0.6580	0.47505	348
Qu18	0.7960	0.40357	348
Qu19	0.7989	0.40144	348
Qu20	0.7069	0.45584	348
Qu21	0.8448	0.36259	348
Qu22	0.7701	0.42136	348
Qu23	0.8506	0.35702	348
Qu24	0.6063	0.48927	348
Qu25	0.6925	0.46211	348
Qu26	0.7500	0.43364	348
Qu27	0.7730	0.41950	348
Qu28	0.9253	0.26331	348
Qu29	0.8218	0.38320	348
Qu30	0.7557	0.43026	348

Table 5.3 Grade 8 Pretest/Posttest Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum/ Minimum	Variance	No. of Items
Item Means	0.778	0.606	0.928	0.322	1.531	0.006	30
Item Variances	0.167	0.067	0.239	0.173	3.580	0.002	30

Table 5.4 Grade 8 Pretest/Posttest Item Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Qu1	22.4914	17.352	0.360	-	0.744
Qu2	22.5000	16.677	0.584	-	0.732
Qu3	22.4885	16.908	0.522	-	0.736
Qu4	22.4167	17.829	0.294	-	0.748
Qu5	22.5948	18.922	-0.152	-	0.771
Qu6	22.5632	17.284	0.315	-	0.745
Qu7	22.6006	18.016	0.089	-	0.758
Qu8	22.6724	17.166	0.295	-	0.746
Qu9	22.5287	17.501	0.273	-	0.748
Qu10	22.5862	17.609	0.207	-	0.751
Qu11	22.4511	17.580	0.333	-	0.746
Qu12	22.6207	18.467	-0.034	-	0.766
Qu13	22.5718	16.799	0.455	-	0.737
Qu14	22.5747	17.213	0.328	-	0.744
Qu15	22.5776	17.046	0.376	-	0.742
Qu16	22.6839	17.024	0.330	-	0.744
Qu17	22.6868	18.106	0.051	-	0.762
Qu18	22.5489	16.854	0.459	-	0.737
Qu19	22.5460	17.424	0.284	-	0.747
Qu20	22.6379	17.286	0.275	-	0.748
Qu21	22.5000	17.939	0.152	-	0.754
Qu22	22.5747	18.378	-0.005	-	0.763
Qu23	22.4943	18.631	-0.072	-	0.764
Qu24	22.7385	16.522	0.447	-	0.736
Qu25	22.6523	17.075	0.327	-	0.744
Qu26	22.5948	18.092	0.070	-	0.759
Qu27	22.5718	17.122	0.357	-	0.743
Qu28	22.4195	18.290	0.079	-	0.756
Qu29	22.5230	16.982	0.446	-	0.739
Qu30	22.5891	15.983	0.689	-	0.723

Appendix Z

CLASSROOM OBSERVATIOM RESULTS (excerpt)

Indicators on the Science Performance

C	Classroom Environment, Classroom Management	First Observation		Second Observation		Third Observation	
		A	B	A	B	A	B
	32. Learners were safe and secured in physical/ classroom environment.	3	3	3	3	4	3
	33. Learners displayed fairness, respect, discipline, and care while in class.	3	3	3	3	4	4
	34. Learners showed appropriate behavior of individualism, cooperation, gender-sensitiveness, and healthy competition in classroom activities.	3	3	4	3	4	3
	35. Learners were engaged individually or in groups through appropriate task/ differentiated task as applicable.	3	3	4	3	4	4
	36. Learners recited and participated, thus gained confidence.	3	2	4	4	4	4
	37. Learners worked productively by assuming tasks/ responsibility.	3	2	3	3	4	3
	Mean	3	2.67	3.5	3.17	4	3.5
	Overall Mean	**2.84**		**3.34**		**3.75**	

Indicators on the Science Motivation

C	Classroom Environment, Classroom Management	First Observation		Second Observation		Third Observation	
		A	B	A	B	A	B
	20. Learners were engaged individually or in groups through appropriate task/ differentiated task as applicable.	3	3	4	3	4	4
	21. Learners recited and participated, thus gained confidence.	3	2	4	4	4	4
	27. Majority to 100% participated/recited.	3	2	3	3	4	3
	28. Exit slips/ formative assessment/ summative assessments proved that nearly all learners mastered their objectives.	2	2	3	2	3	3
	Mean	2.75	2.25	3.5	3.00	3.75	3.5
	Overall Mean	**2.38**		**3.25**		**3.63**	

Appendix AA

PRETEST POSTTEST RESULTS

Table 6.1 Pretest Posttest Results

Student	Pretest Score	Posttest Score
1	12	24
2	17	22
3	10	13
4	9	12
5	12	11
6	7	10
7	18	19
8	6	10
9	10	16
10	12	14
11	10	9
12	17	14
13	16	16
14	15	17
15	8	14
16	7	17
17	10	12
18	11	11
19	11	13
20	17	17
21	22	28
22	16	15
23	15	19
24	15	21
25	9	12

Table 6.2 Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre-test	12.4800	25	4.09390	.81878
	posttest	15.4400	25	4.70886	.94177

Table 6.3 Paired Sample t-test

		Paired Differences				
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
					Lower	Upper
Pair 1	pre-test - posttest	-2.96000	3.48186	.69637	-4.39724	-1.52276

		t	df	Sig. (2-tailed)
Pair 1	pre-test - posttest	-4.251	24	.000

Appendix AB

SCIENCE MOTIVATION QUESTIONNAIRE RESULTS

Table 7.1 Pretest Posttest Results

Student	Pretest Score	Posttest Score
1	2.76	3.28
2	2.84	3.44
3	2.64	3.36
4	3.08	3.4
5	2.52	3.16
6	3	3.4
7	2.52	3.24
8	3.36	3.72
9	3.16	3.32
10	2.88	3.48
11	3	3.32
12	2.36	3.08
13	3.12	3.48
14	3	3.4
15	2.76	3.36
16	2.96	3.32
17	3.16	3.68
18	2.72	3.68
19	2.96	3.24
20	3.24	3.36
21	3.92	3.4
22	3	3.92
23	2.68	3.16
24	3.2	3
25	3	3.32

Table 7.2 Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	2.9536	25	0.31826	0.6365
	Posttest	3.3808	25	0.20498	0.04100

Table 7.3 Paired Sample t-test

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower
Pair 1	Pretest - Posttest	-0.42720	0.32057	0.06411	-0.55952

		Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tailed)
Pair 1	Pretest - Posttest	-0.29488	-6.663	24	.000

Appendix AC

SAMPLE REFLECTIVE JOURNAL TRANSCRIPTIONS

Grade 7 Student B Journal Entries

Lesson: Characteristics of Sound

I am so happy learning science today because of the different activities. I come to like the guessing game that we've done. I learned that the reason why objects and musical instruments have different sound is that different materials have the unique quality of sound.

Lesson: Modes of Heat Transfer

The activity today is about the three modes of heat transfer. Ma'am always give us question at the start of the lesson and through our activity, we must find answer to that question. I enjoyed the activity today. There are three groups in our class. The activity assigned to us is about convection. We put hot and cold water on separate bottles, then we put food color (jobus) inside the bottles and flip it. I am so excited on what will happen. My group and I was so amazed when the food color in hot water goes up.

Grade 7 Student F Journal Entries

Lesson: Pitch and Loudness of Sound through Guitar Construction

The activity today is about constructing our own guitar. I enjoyed it and I participated in my group to make the guitar because we wanted to win as the most beautiful guitar. Our guitar is different from the other groups because we used different thickness of rubber bands. Our teacher

explained to us that different thickness of rubber bands produced different sounds. My brother has a guitar, now I understand why the strings in the guitar has different thickness also.

Lesson: Good and Poor Conductors

We discussed today was about good and poor conductors. I learned about the objects that become hot easily like the spoon. I liked the lesson because I learned a lot. Our class is always happy.

Grade 7 Student H Journal Entries

Lesson: Human Voice and Sound Production

There is a video today from the laptop of our teacher. It is about how human produces our voice. It was explained in the video why we have different types of voices. I did not fully understand it because it is fast and in English but Ma'am paused it and explain it in Tagalog. I like our teacher, she explained and teach very well that is why I like to listen and recite in her class.

Lesson: Heat Transfer Conditions

Our teacher had different materials brought today. I am so excited because this is another activity. I like science and enjoy listening with our teacher if there is an activity. She is kind. She let us used the materials and is not angry with us even we are noisy and running around. I like to answer her questions during discussion because I wanted her to know that I am listening very well.

Grade 7 Student I Journal Entries

Lesson: Frequencies of Sound

I am assigned us the leader of our group today. All the leaders have a meeting to discuss the different parts and function of the ear. After our meeting, we discussed it with our group mates and draw the ear and label its parts. During the reporting, I am expecting that Ma'am will call me to present our group's work but she did not call me and instead she called one of my classmates that was not listening and noisy.

Lesson: Modes of Heat Transfer (Molecular level)

I did not fully enjoy our activity today, because just watched a video and our teacher gave us an activity worksheet. I don't what will I write in the activity because I did not understand the video at all. Maybe because the narrator is speaking fast. But our teacher tried to explain to us the lesson.

Grade 8 Student M Journal Entries

Lesson: Law of Inertia

I enjoyed the activity today about the Law of Inertia. I am challenged about the stacks of coins on how will I removed the last coin without making the other coins on top not to move. Our teacher explained that the concept behind the activity is about inertia. I've learned a lot about this lesson because it has an application that I experienced personally. It was when I rode the jeepney with my mother and then suddenly the jeepney driver steps on the break and I was thrown forward. I never forgot that experience because it is one of my embarrassing moment.

Lesson: Power

I enjoyed the activity that we had today. I was so curious when our teacher asked us if we want to know our super powers. I thought at first we will be doing magic but instead we walked up the stairs and computed for our power. It is a good thing that I was grouped in C*** - ****'s group because she is intelligent and know how to compute for power. But Ma'am still helps us and monitor our work every now and then. I am not shy anymore because I think she is nice.

Grade 8 Student V Journal Entries

Lesson: Law of Acceleration

I am excited every Tuesday that we have our new science teacher. She is good in teaching science. I learned a lot from her today by discussing the concept of Law of Acceleration. I really like it when she provides examples that are close to our activities in the community. Now, I know the reason why my father will add more bananas to the floater when the water in the river is flowing fast so that it will not move fast and my father will be safe in delivering the bananas.

Lesson: Newton's Olympics

I like the science subject if we are doing different activities. I hope that every day we will do group activities in science like the one that we did we Newton Olympics. I know now that in everything that we do, there is Physics.

Appendix AD

SAMPLE SEMI-STRUCTURED INTERVIEW TRANSCRIPTIONS

The semi-structured interview is informally done before, during and after class discussions. The interview is composed of five questions. The respondents were chosen based on their raw scores in the Pretest of the Science Motivation Questionnaire. Three students from the top and bottom of the list were chosen.

Grade 7 Student B

Teacher: First question, is Physics your favorite subject? Why or why not?

Student: Ahhmm..Ma'am. No. It is not my favorite subject because (pause) I had difficulty in analyzing problems, formula derivations like that.

Teacher: What should be done so that Physics will be your favorite subject?

Student: Ahmmmm…Maybe Ma'am I need to develop my skills in problem analysis so that if I encountered the problems it will not be hard for me.

Grade 7 Student F

Teacher: Ah, ok. Can you give examples of the strategies that we used that you think helped you to be motivated in the subject?

Student: (long pause)

Teacher: What are the strategies we used in class that makes you interested?

Student: About the topics I like Ma'am like the heat; because it is my favorite.

Teacher: What are the signs or your activities in class for us to know that you are motivated?

Student: I am listening well Ma'am and then I am reciting.

Grade 7 Student H

Teacher: Ok, so because you find difficulty in the subject, what are the possible activities that we must do to increase your interest in learning Physics?

Student: Make the problem solving easier.

Teacher: What activities should be done in the classroom to make you interested in the subject?

Student: (long pause) it will be easier if I am group with intelligent classmates.

Teacher: So, it means that the group activities are effective?

Student: Yes, Ma'am.

Teacher: What makes you motivated to study Physics more?

Student: (pause)

Teacher: repeated the question

Student: I am group with intelligent classmates.

Grade 7 Student I

Teacher: Ok, so can you give strategies used in class that helped you to be motivated in class?

Student: hmm… In using power point Ma'am.

Teacher: so you like presentations?

Student: Yes, Ma'am.

Teacher: Why?

Student: Because I learned better Ma'am when there are visual aids or presentations.

Teacher: Ah ok. So what are the manifestations in yourself that you are interested in our lesson in Physics?

Student: Maybe Ma'am when I am listening very well and I will be active in class.

Grade 8 Student M

Teacher: What activities we should do in the classroom for you to be interested?

Student: Perhaps Ma'am the paired activity, so that when there are things that you don't know you can ask them.

Teacher: Ok. So what are the things that will motivate you to study Physics more?

Student: Maybe Ma'am (pause) the way the teacher discusses on how s/he will catch the attention of the students.

Teacher: Can you give examples that we already used in the classroom that in a way helped you to be motivated in the subject?

Student: The one that we used?

Teacher: Yes, the one that I used that made you interested in the subject?

Student: (chuckles) Perhaps Ma'am, the group activities.

Grade 8 Student V

Teacher: First question, is science your favorite subject? Why or why not?

*Studen*t: No. (Small laughs)

Teacher: Why?

Student: Because Ma'am the lessons are very complicated.

Teacher: How did you say that it is complicated?

Student: Because it is more on solving and analysis. I am not good analysis.

Appendix AE

SAMPLE LESSON TRANSCRIPTION

Lesson: Characteristics of Sound
Date: February 13, 2018
Time Started: 1:07 PM
Time Ended: 2:19 PM

[Beginning of File]

Good afternoon, class. May I request everybody to please stand. Who wants to lead the prayer?

Ma'am, it will be Chen-chen.

I don't like. I am shy.

Okay, Chen-chen, can you please lead the prayer.

The student prays.

Good afternoon again, class.

Good afternoon, Ma'am.

I did not hear you, good afternoon class.

Good afternoon, Ma'am.

Are you excited in our lesson for today?

Yes, Ma'am.

Alright, so before anything else in the whole world. Let us play a guessing game. Can anyone tell me what a guessing game is?

Ma'am, we are going to guess something?

There are clues given and we are going to guess what it is.

There are pictures, from the pictures you will be asking questions.

Yes, some of your answers are partly correct. But this time, our guessing game is about different sounds from different musical instruments. Are you familiar with the different musical instruments? Can you give me some examples?

Gong, Ma'am.

Yes, correct. Very good. Another?

Ma'am, drums!

Yes, very good. Still another example?

Ahmmm, guitar Ma'am.

Oh yes, very good. Now let us see if you are familiar with the sounds of the musical instruments that you've mentioned in our Guessing Game. Are you now, ready?

Yes, Ma'am.

Ok, let us start.

Teacher played the recorded sound of the gitgit (the version of the guitar in Mangyans).

Ok, what do you think is that sound?

I think, it's a guitar.

Almost there, what do you think is the musical instrument?

Ma'am, I know. I know. It's the gitgit. We still have one in our house.

That is correct. Very good.

Ok, so let us proceed with the second musical instrument.

Teacher played the recorded sound of the agong (the version of the gong or big drums in Mangyans). Students are listening intently.

So what do you think is the musical instrument class?

It's the agong Ma'am.

Very good. Can you please describe what's the agong like?

It's like a gong Ma'am. Just like the one they used in Showtime. (laughs)

Alright, that is correct. Now let us proceed to last musical instrument.

Teacher played the recorded sound of the kalutang (the version of the xylophone in Mangyans).

What is the musical instrument class?

I don't know Ma'am. It's like the sound of bottles.

That is not the sound of bottles. Anyone, who can guess?

Silence.

What are you thinking? You want me to tell the instrument?

Not yet, ma'am. Wait, can you please replay the sound Ma'am?

Okay, your request is my command.

Teacher replayed the recorded sound of the kalutang.

Okay, can you guess now, what sound is it?

I am familiar with the sound Ma'am. But I can't remember the instrument.

So, I think I better reveal what musical instrument it is. It's the kalutang.

Ahhhh…

You know class, it is one of your traditional musical instruments. As Mangyans you should be familiar with it. Well, maybe because you haven't seen a real one since you're the younger generation of your tribe. But I want you to ask your parents about it. Maybe they themselves have seen a kalutang or even played one. Alright, so are we good?

Yes, Ma'am.

So from the game that we had. I would like to ask the question, “How can you distinguish the sound of one musical instrument from another?” Say, how can you say that it is the sound of the gitgit, and the other one is the sound of the gong?

Students are silent.

Teacher repeated the question in Tagalog.

Ma’am maybe because they have different types of sound produced.

Yes, that could be. Any other idea?

Class is silent once again.

So, why do you think are these musical instruments have different sound produced?

Because that’s the way it is, Ma’am.

The class laughs.

Ok, so to answer that particular question we will be having an activity. But before that. I would like you to take note of the following important terms that will guide you in answering our question. The terms are amplitude, wavelength, and velocity. Are you familiar with these terms?

No, Ma’am.

Alright, so you better listen carefully as we discussed these concepts. I want you to take note while we are discussing for you not to miss the important points.

The teacher showed a rope in class. Are you familiar with this?

Yes, ma’am. That’s a rope.

Ok, very good. When and where are you using this material?

That is use to strap the goat so that they will not be at large in the neighborhood.

Okay, very good. So more likely ropes are used for the goats in your community?

Yes, Ma'am.

If ropes are for the goats, this time we will be using it to describe the different characteristics of sound. Ok, so let me tie this rope in this area. *Teacher tied the rope in a stationary chair.*

Now, I want you to observe, what happens to the rope when I swing the rope like this. *Teacher demonstrate a standing wave.*

So, what did you observe? Okay, before answering that question, you wants to try to swing the rope.

Ma'am.

Ma'am.

Ma'am.

Ma'am, me.

Ma'am.

Ok, handsome. What's his name class?

Jigger, ma'am.

Alright, Jigger. Please swing the rope, just like what I did.

The student swing the rope.

So what did you observe class? What happens to the rope? What did you see?

Yes, Chen-chen?

The rope is like a wave Ma'am. It is like a snake.

Oh, yes. That is correct. What else? Other observation?

Yes, mark?

The rope formed like a letter, "s".

Yes, that is also correct. Now let me draw that particular observation on the board. Now this is the wave-like pattern of the rope when we swing it. *Teacher drew it on the board*. This part of the wave is what we called the amplitude. Based, from my beautiful drawing (giggles), what do you think does the amplitude describes?

Class is silent.

Now, let me draw another wave again. Teacher drew another wave but this time higher or bigger than the first drawing. So, what do you think is the difference between these two waves that I drew?

The one is big and other one is small, Ma'am.

Very good.

So, if this the amplitude. Teacher marked the amplitude on the smaller and bigger wave. Again, what do you think does the amplitude describes?

The height of the wave?

Yes pardon, I did not hear your answer. And can you please stand so that your classmates will recognize your answer.

I think, the amplitude is the height of the wave Ma'am.

That is absolutely correct! And because of that let's give him an applause.

The fireworks clap, Ma'am.

What's the fireworks clap?

The student demonstrated the fireworks clap.

Ok, so let's give him a fireworks clap.

Very good. The amplitude is actually the height of the wave. So what do you think is the relationship of this amplitude to the loudness of the sound? Let us go back to our drawing, in this particular illustration which has the louder sound, the one with the lower amplitude or higher amplitude?

Ma'am!

Ma'am!

Ma'am!

Oh, yes? (pointing to the student)

The one with the higher amplitude, Ma'am.

Yes, that is correct. So meaning, the higher the height of the wave or the greater is the amplitude, the louder is the sound.

So let's go back to our musical instruments earlier. Which do you think among these three, the gitgit, agong, and kalutang has the greater amplitude?

The agong, Ma'am!

Very good, class.

Ok, let us go back to our wave. We now have the first characteristic which is the amplitude. Next is the wavelength. So, this is the wavelength. *Teacher pointing on the board, the wavelength*. What do you think does the wavelength describe?

It is the distance between the two mountains.

The class laughs.

This is not a mountain (pointing on the higher part of the wave). Remember class we are talking about the wave. This highest part is what we called the crest. So what do you call the highest part of the wave?

Crest.

Very good, but if you want to keep this as mountains. It's okay, as long as you understand the concept. Now if you have highest point, the wave has also, its lowest point and it is called the trough.

Again, what is the lowest point of the wave?

The trough.

How about the highest point?

The crest, Ma'am.

Very good. Now, let's go back to the wavelength. What do you think does the wavelength describes? From the term itself, you can already come up with the answer.

Class was silent.

Teacher repeated the question in Tagalog.

It is the distance between the two crests, ma'am.

Yes, that is correct. It is not only defined by the distance between two crests but also with the distance between the two lowest points or the troughs.

How about the velocity of the wave? What is velocity in Tagalog?

Class is quiet.

Velocity is "bilis" in Tagalog. So anyone who can describe the velocity of the wave?

It is the speed of the wave Ma'am.

Yes, that's more like it. But technically, it is how the wave travels in a certain medium. Now, I think you are ready for our activity.

The class started some noise.

Ok, ok, settle down now. We will not be starting the activity if you are not silent enough and not on your proper seats.

The class managed their noises.

Now I will be grouping you into three groups. Each group will be assigning a leader, a secretary or recorder, and a reporter. You will be working on different activities. Each activity has a specific materials to work on and guide questions to answer. Okay, please count off students.

The students started to count off. Teacher guided them in counting.

All ones in front. Twos would be over there, and threes at the back. Okay at the count of ten, you should be on your group. 1-2-3-4-5-6-7-8-9-10! Everybody in their respective groups?

Yes, Ma'am.

Now, choose leader and get your materials in front. Group 1 will be working on Learning Station 1 and your materials are the agong and the gitgit. Since we have only one gitgit, you have to share that with Group Three afterwards. Group 2 on the other hand will be working on Learning Station 2. Your material is the recorder. There were already five sets of sounds there. And of course Group 3, you are assigned on Learning Station 3 and your material is the gitgit. Okay, leaders please get your materials and guide questions here. You only have 20 minutes to work on this particular activity. And remember that I only borrowed that materials so please be careful in handling them.

Students were busy doing their activity. *Teacher roamed around to check if they are following the procedure.*

Group 1, you know what you are going to do?

Yes, ma'am.

So, what are you going to do with the drum? How about the gitgit?

We are going to beat the drum lightly at first then harder the second time around.

Very good. How about the gitgit?

We don't know, Ma'am.

You read the instruction very carefully. It says here, pull the string lightly and listen to the sound. And then what's next?

Pull it harder next time, Ma'am and observe again.

Okay, that's it. Don't forget to answer the guide questions.

Okay class, remember that as you are doing the activity you must find the answer to the question that we had last time about distinguishing sounds from different sources.

Okay, group 2. What do we have here?

We are just going to listen to the different sounds Ma'am and guess what instrument it is.

Yes.

Just like our Guessing game activity, Ma'am.

Ok, very good. Don't forget to answer the questions. Choose a good reporter.

Yes, Ma'am.

The class became noisy because of the activity. Students were excited in what they are doing.

How about you, Group 3. So what is your activity?

We are going to pull the strings of the gitgit, Ma'am.

And then?

We will listen to the different sound the strings produced based from its thickness.

Okay, good. Answer the questions carefully.

Yes, ma'am.

So, time is up. So can we hear now the reporters from each of the group?

Ma'am, wait!

Okay, three minutes more to go.

Are you now ready?

Yes, Ma'am!

Okay, let us start the reporting from Group 1.

Number 1 question, for the gong, (a) in which case was the sound loudest? (b) in which case did you exert the greatest force when beating? Our answer is the sound was the loudest when we beat the drum harder.

Ok, good. Next question, please.

Number 2, For the gitgit string, (a) in which case was the sound loudest? (b) in which case did you exert the greatest force? (c) how do the amplitudes of vibration differ in each case? Our answer is the sound was the loudest when we pulled the string of the gitgit harder. We exerted the greatest force, when we pulled the string the hardest.

Okay, right. Meaning class, the harder that you beat the drum and pulled the string of the gitgit, the louder is the…..

Sound!

Very good. How about for question number 3?

Number 3, relate energy carried by a sound wave, its amplitude, and loudness. If the sound is loud, the amplitude is high. Just like Ma'am said earlier.

Ok, that is right. And what about the energy?

The reporter is quiet.

Anyone from the group or from the class? What about the energy? Where the energy does came from?

Class is silent.

Say, when you beat the drum or pull the string of the gitgit, where does the energy come from?

From us?

Yes! That's it! From the force that you apply or exerted on the instrument. When you beat the drum lightly, what can you say about the energy?

Low?

Yes, low. How about beating the drum hard, how much is the energy you exerted?

High!

Very good, great or large energy. So it means, the greater the energy is, the sound is …….

Louder!

Very good again class. I am going to write it on the board. Loud sound means high amplitude and greater energy. Okay, very good group 1, let's give them a clap. Let's proceed now to the second group.

Number 1, what is the source of the first sound? The second sound? The third sound? And so on? Our answer is, the first sound is a gitgit or guitar, the second sound is an agong or drum, the third sound is from a bird (laughs) we don't know Ma'am.

It's just okay. Continue.

The fourth sound is the sound of the river, and the last sound is the sound of the rain.

Okay very good. Number 2 question, please.

Number 2, differentiate the sound coming from each instrument. The sound coming from the different instrument are different from each other. The gong produces a loud sound while the gitgit has a soft sound.

Okay, good. Number three question.

Number 3, what is particular characteristic of sound you observed? I think Ma'am it's the quality of sound because it is written in the title of our activity.

(Laughs) Okay, that is correct. What can you say about the quality of sound?

The quality of sound is different from different materials.

Yes, very good. So let's give another clap to group 2. Let's now have the last group. They investigated about the strings of the gitgit. No need to read the questions, just state your answer.

Okay Ma'am. The string that produces the higher sound is the thin string while the thick string produces a low sound.

Okay, that is correct.

Number 2, the thin string vibrates faster than the thick string. For number 3, the thick string has higher frequency. The thin string has a higher pitch. We don't have answer to number 5 Ma'am.

Okay, that is so honest of you. So let us discuss, the results of group 3. So I have here the gitgit, I want you to observe very carefully as I pull the thin and the thick string. So you have to observe, which vibrates faster and which has a higher sound. Let us try to pull the thin string. *Teacher pulled the thin string.* Look at the string and listen very carefully.

Yes, Ma'am.

Let's do it one more time, the thin string. *Teacher pulled again the thin string.*

Okay, now let's have the thick string. Look and listen. Okay, I'll repeat the thick string one more time. What did you observe?

Ma'am!

Ma'am!

Ma'am!

Okay, let's try Chen-chen.

The thin string vibrates faster and also has a higher sound than the thick string.

Very good.

You know class the vibration of the string can be described by the frequency, and the sound that you hear is what we called the pitch. So what again is the vibration?

Frequency, ma'am.

Very good, how about the highness and lowness of sound?

Pitch Ma'am!

Alright! So my question now, what can you say about the frequency and pitch produced by the thin string?

Ma'am!

Yes, Mark.

The thin string has a high frequency and high pitch.

That's it! How about the thick string?

Ma'am!

Yes, Ms. Beautiful. You are?

Rosalinda, ma'am.

Ok, Rosalinda. What about the thick string?

The thick string has a low frequency and low pitch.

Very good. So it means that the thinner the string, the higher is the frequency and pitch.

Okay now, everyone of you is familiar with the Bato-bato.

Yes, Ma'am.

Who among this class, had already catch a Bato-bato?

Ma'am! Almost all the boys are raising their hands.

Yes Jigger, can you please tell us how do you catch a bato-bato? Do you use a slingshot or you use a stone to catch it?

No, Ma'am.

So what did you do?

I just imitate the sound of the bird Ma'am. From there, one of my companion will catch the bird from the tree, using a net.

Ah (nods) okay. Why not use the slingshot, I think it is better to shot the bird like this? Teacher demonstrate a slingshot move. Students laughs.

No, Ma'am. Because the bird might die. Our purpose is to catch the bird alive because we are going to sell it.

Ah, okay. So how much the bird cost?

If the bird is still small, it costs 5-10 pesos. If the bird is small, it cost 15-20 pesos Ma'am.

That's so cheap. How many birds do you catch?

Sometimes 3 or 5 Ma'am.

Ah okay. So in catching the Bato-bato, you have to imitate the sound of the bird. What do you think is the characteristic of sound is present there?

I think it's the quality of sound Ma'am because the bird has a different sound from other birds.

Very good. Who wants to imitate the sound of the Bato-bato?

Ma'am!

Students imitating the sound of Bato-bato.

Very good. So let us go back now to our question earlier. How can you distinguish the sound of the different musical instruments?

Ma'am, we can now tell the different sound of the musical instruments because they have different quality of sound.

Okay, very good. Now I want you to get ½ sheet crosswise of paper and write your feelings about the lesson that we discussed. Write also what have you learned.

Students wrote their reflective journal. Teacher collected the paper.

Goodbye class.

Goodbye, Ma'am. [End of file]

CURRICULUM VITAE

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EDUCATION

2008 - Present	Philippine Normal University Masters in Science Education – General Science (42 units)
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September 2015 - May 2016	**Teacher I**, **Junior High School** Sta Teresa National High School Division of Occidental Mindoro
November 2011 - August 2015	**Teacher I, Junior High School** Western Bicutan National High School Division of Taguig City and Pateros
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HONORS AND AWARDS

2018 **Best Demonstration Teacher**

Awarded by DepEd-Division of Occidental Mindoro during the Division Science Festival 2018

2017 **Gawad Lilok**
Awarded by DepED- Division of Occidental Mindoro as Best Researcher for an action research entitled, "Localized Learning Materials: Tool in Enhancing the Academic Performance of Grade 11 Students in Earth Science"

2017 **Best Research Paper**
Awarded by Department of Education - MIMAROPA Region for an action research entitled, "Localized Learning Materials: Tool in Enhancing the Academic Performance of Grade 11 Students in Earth Science" during the 1st Regional Summit

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ATOMS (Association of Teachers in Occidental Mindoro in Science)
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PUBLICATIONS

Jingco, M. F. (2017). On Mountains, Ricefields and Rough Roads. *The Noblest Profession*. DepEd - MIMAROPA Region.

CONFERENCE PRESENTATIONS

TALKS

Jingco M.F. (2017). Getting Ready for Higher Education, Middle Level Skills Development, Employment and Entrepreneurship. Talk presented at the *San Jose National High School* Career Guidance Week, San Jose, and Occidental Mindoro.