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Investigating the Effect of Indigenous Game-based Activities on Student's Performance and Learning Views in Physics

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ABSTRACT

The use of indigenous game-based activities in teaching Physics concepts can eradicate the continuous perception of students that Physics is a boring and difficult subject. This study focused on the development and validation of indigenous game-based activities (IGBA) that can be used as a springboard to teach Physics concepts and enhance the performance of students. It used the Research and Development methodology that includes the validation of the indigenous game-based activities and try-out wherein the researcher used one-group pretest-posttest design to 42 purposively-selected students in a public secondary school in eastern Ilocos Norte, Philippines. Using a researcher-made and item-analyzed pretest and posttest, an adapted students' views checklist, interview guide and adapted validation tool, the study found out that Ilocos Norte has a lot of indigenous games rich with Physics concepts, using games familiar to students encourages better participation among learners and solicits greater interest towards the subject, thus making the teaching-learning process more appealing to students. The purposively selected teachers strongly agreed that the IGBA is a valid instructional material for teaching Physics concepts. Tryout results show that the material effectively improves students' performance in Physics. It was supported by students' views that when the activities are used in teaching, Physics becomes interesting, motivating, challenging, enjoyable and full of fun, not difficult to learn and understand because they are applicable and relevant, not time consuming because they ease students' burden in problem-solving, elicit maximum participation among learners, and ensure greater retention of the concepts they learn.

INTRODUCTION

One way of making high school Physics relevant and meaningful to students is by using real-life experiences in which Physics concepts are manifested. Any community, however poor, possesses several folk toys and implements. Ingenuity and resourcefulness can turn them into appropriate teaching/learning materials. Activities in the backyard, rich with Physics concepts can also be utilized as springboard in teaching the concepts. Thus, learning with profound meaning enables learners to apply the knowledge they are learning in the classroom to real-world situations. By concentrating on students' learning, meaningful learning can be accomplished. In other words, meaningful learning can be produced if students take the lead in the learning process. Students can enhance their problem-solving skills by engaging in relevant learning. Furthermore, pupils' critical and creative thinking abilities can be enhanced by relevant learning. Students can develop greater awareness of and concern for all life events.

One of the attempts made by instructors and students in learning Physics to accomplish meaningful learning is by integrating it with real-world phenomena, such as through indigenous games (Putranta, Kuswanto, Hajaroh, Dwiningrum, & Rukiyati, 2021). In addition, using indigenous games in teaching has become an increasingly popular approach in recent years, particularly in indigenous communities where traditional games are still played. Indigenous games can provide a unique and engaging way of teaching that incorporates cultural knowledge and values into the learning process.

In this study, indigenous games refer to the traditional games Filipino children play that make use of indigenous ways (manner/methods) and means (materials). Games are transmitters of culture, they make an individual entirely at ease and free to be himself and provide a player a greater possibility for a successful social relation because they break down formality, introduce strangers, start a conversation, and induce laughter. Hence, games often reflect the values, beliefs, and traditions of the culture from which they originate. They can preserve and transmit cultural knowledge and practices from generation to generation. Morales (2014) stated that linking culture with learning Physics improves learner's concept attainment since they see physics in enhancing the knowledge of their roots, which consequentially increases their motivation to learn. Indigenous games commonly played by children demonstrate many physics concepts. As such, explaining the scientific aspect of the games promotes inquiry and develops students' critical and creative thinking.

Indigenous Game-Based Technique is a method of teaching that utilizes indigenous games to facilitate learning. As such, the students acquire physics knowledge (learn) and appreciate their cultural heritage while they play (fun). Experimentation and playing are two exploratory forms of learning that are considered valuable. When learners play, they exercise mental exploration wherein

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they test their creativity, do a lot of reflection, critical thinking, test out their ideas and get concrete feedback on their accuracy.

he reasons above inspired the researchers to develop indigenous game-based activities (IGBA) utilizing the steps of Research and Development (R & D) methodology then test the effectiveness of these activities in teaching high school Physics. Results of the research could: (1) stimulate the students' appreciation to Filipino culture, afford the students' social development and educational values, and improve their physics achievement and attitudes towards the subject; (2) help teachers in achieving a desirable teaching-learning process for it will encourage them not only to use indigenous games in teaching physics but also to design games/activities that apply concepts and principles of the subject with the goal to improve and enrich Physics instruction; (3) provide school administrators and curriculum planners with a clearer view of the role of indigenous games in learning, hence, proper procurement and utilization of necessary facilities, instructional materials and equipment, as well as provision of students' activities will be strengthened; (4) give textbook writers this research as one of their references in publishing specific types of instructional materials that suit learners' and teachers' needs; and (5) be an eye opener to the society to provide more activities like sports fest (showcasing traditional /indigenous games) that involves or integrates a wide array of explanations on physics concepts to students. Science is vital because of its links to technology and industry, which have high development priorities. Science systematically develops students' scientific inquiry skills, values, and attitudes such as objectivity, curiosity, and honesty, as well as mental habits such as critical thinking. All of these benefit individual student's personal development, future career, and life in general. These abilities, values, attitudes, and personalities are also beneficial to the community to which a student belongs, and the country in which he lives.

Specifically, the study sought to: 1) find out what indigenous games exist in Ilocos Norte, Philippines that can be used to teach Physics concepts and enhance the Physics performance of students; 2) what game-based Physics activities can be made from these indigenous games; 3) test how valid is the IGBA in terms of objectives, content, instructional characteristics, and evaluation categories; 4) find out how effective is the IGBA in teaching Physics concepts; and determine the students' views when IGBA is used in teaching Physics.

LITERATURE REVIEW

The primary goal of Science education in the Philippines is to develop students' scientific literacy, which includes understanding the principles and concepts of Science, the scientific method, and its applications. The Department of Education in the Philippines has identified three main goals of Science Education: To develop scientific literacy among students, including understanding the nature of Science and its role in society. To prepare students for higher education and careers in Science and technology, by providing them with a strong foundation in the sciences and related fields. To promote scientific inquiry and critical thinking skills, which can be applied to various academic and real-world contexts. In addition to these goals, Science education in the Philippines also emphasizes the importance of developing ethical values and social responsibility among students, in order to encourage them to use scientific knowledge for the benefit of society and the environment.

With the adoption of the new curriculum, the same old problems in the education sector were not addressed. Still, there is inadequacy on the number of classrooms, textbooks, seats, and toilets in public schools (Navarro, 2022). The excessive teaching loads of teachers (Esguera, 2018), the difficulty in following the spiral progression approach in teaching (Dunton & Co, 2019), the scarcity of instructional materials (Soriano & Vargas, 2021), the presence of big class sizes (Esguera, 2018), and the inadequate training for teachers (David, Albert & Vizmanos, 2019), are still there.

Many educators and graduate student researchers have identified several factors that contribute to Filipino students' poor performance in Physics. These include teacher quality, the teaching-learning process, the school curriculum, instructional materials, and administrative support.

There are abstract concepts and principles in Physics which students could hardly understand. This makes students consider Physics as a difficult subject because it needs a lot of mental and physical exploration and extra effort to comprehend its nature, principles, and laws. Besides, students do lots of handwriting, and after a while the theory seems like a fantasy.

This study is anchored on Theory of Constructivism, Gaming Theory, Slavin's and Jonhson's Cooperative Learning Theory and Gardner's Theory of Multiple Intelligences. Constructivism and cooperative learning theories show that play and experimentation are powerful forces in the development of the individual mind. Playing a game is an example of an activity where students work cooperatively because here, an individual feels entirely at ease and free to be himself and improve his social relation. It is also a form of mental exploration in which children create, reflect on, and work out their understanding together. And since each learner is gifted with unique intelligences, he contributes to the betterment of the group output. He sees his peers in a new light, not as competitors, but as sources of ideas (Lecaroz, 2000).

Students learn easier if they are exposed to hands-on experiments using useful instructional materials. A Science teacher therefore should equip himself with adequate and suitable materials such as (a) Science tool and equipment, (b) visual aids, (c) audio-visual aids, (d) textbook and teacher's manual, and (e) Most Essential Learning Competencies (MELCs).

Indigenous games, also known as traditional games, are

symbols of the Filipinos' national identity and pride. They are part and parcel of every Filipino's childhood and of the many fiestas the child experienced in the city and the countryside. Such competitive games which are a product of his forefathers' ingenuity and creativity are simple, enjoyable, easy to play, and with rules easy to follow.

Indigenous Game-Based Technique is a method of teaching that utilizes indigenous games to facilitate learning. As such, the students acquire Physics knowledge (learn) and appreciate their cultural heritage while they play (fun). An appropriate teaching strategy arouses and sustains the interest of the students to learn easily. Game modeling in the form of competition requires maximum participation among students. With corresponding incentives, it will motivate the students to learn and understand the lesson at a faster rate. Game modeling as a teaching strategy bridges study and fun. Students' eager attention and urge to require knowledge are enhanced (Santos, 2002).

Teaching should then attempt to make learning experience pleasant and gratifying so that learners continue learning. To maintain the interest and to motivate students, it is worthwhile to use games in the classroom. They serve as interesting springboard in starting the lesson for the day.

According to Dagnew (2017), as cited by Moro and Billote (2023), attitudes are the best predictor to estimate students' success and achievement. Moreover, attitudes have shown to affect how students learn and what they want to learn; thus, helping students attain favorable attitudes, which can foster their understanding of a subject (Sahin, 2009). Moreover, according to Osborne *et al.* (2003), attitude toward science/physics consists of different sub-constructs which eventually give rise to a person's interest and belief in learning the subject matter, as Chu *et al.* (2008) agreed to the aforesaid statement that with attitudes toward learning physics, it is a huge factor that influences their study habits, which is related to their conceptual development.

The review of literature cited above guided and gave highlights to this study. As found out, the indigenous game-based activities show relevance of Physics to real life because they are community-based; learner-centered because they involved cooperative learning; and environmentally/socially oriented since the activities are done in an outdoor environment that helps the students improve their social relations. Moreover, they provide the students an avenue to experience and see the importance of what they learn.

These mentioned characteristics of the indigenous game-based activities give an answer to the teachers' search of appropriate and effective teaching materials that can translate the curriculum into concrete experiences and can cause learning and draw positive feedbacks towards Physics from the students.

MATERIALS AND METHODS

This study focused on the development and validation of IGBA in Physics. It was undertaken following the Research and Development (R & D) methodology with three stages: Planning stage, Development stage and Validation stage.

Stage 1 or the Planning stage has two phases: Preliminary Preparation; and Bibliographical Research. Phase 1. Preliminary Preparation. Through self-reflection of childhood memories, informal interviews, observations and extensive reading, the survey of indigenous games in Ilocos Norte was done. The researchers were able to identify the different names, material used, and ways/manners of playing the indigenous games. Hand in hand with gathering materials and searching for the indigenous games was the selection of games that can demonstrate Physics concepts. After that, the identified indigenous games' list of Physics concepts can demonstrate was done. The list was shown and discussed with some of the researchers' friends in the graduate school and several Physics teachers for enrichment and clarification purposes. Phase 2. Bibliographical Research. The researchers reviewed literature and extensive reading about the indigenous games chosen for the study. The history and other details about the games were discussed extensively.

Stage 2 or the Development Stage has three phases, which are as follows. During Phase 3 or Writing the indigenous game-based activities, the researchers made indigenous game-based activities for the following topics: Work, Kinetic Energy, Potential Energy, Power, Law of Conservation of Mechanical Energy, Energy Transformation, Heat Transfer and Thermal Energy. These topics were chosen because students are observed to have some misconceptions about their nature. In Phase 4 or the Preliminary evaluation of the indigenous game-based activities (IGBA), the developed material was shown to research and Physics experts for their comments and suggestions. These was also shown to some Physics teachers for refinement purposes. Next, in Phase 5 or the Preliminary revision of the indigenous game-based activities, the researchers revised the indigenous game-based activities based on the suggestions given by the experts in phase 4.

Stage 3 or Validation Stage has two phases. During Phase 6 or Validation of the indigenous game-based activities by Physics teachers, the IGBA was validated by the Physics experts to establish internal validity. Suggestions and comments of these experts were incorporated for the improvement of the material. Physics teachers who were involved in the preliminary evaluation did not participate in the final evaluation of the game-based activities to avoid bias. In Phase 7 or the Try out, the developed and validated IGBA was tried out to the 42 high school students of a public secondary school in eastern Ilocos Norte, Philippines. The tryout was done to further establish the validity of the material as evaluated by the Physics teachers in phase 6. The try out followed a one-group pretest-posttest design. It started with the administration of the pretest and teaching making use of the IGBA followed, wherein two

Physics teachers in the school were asked to observe. It ended with the administration of the posttest and student views checklist. Modified triangulation method of gathering data was used to look into the views (feedbacks or reactions) of students toward the subject as an effect of the IGBA used. The effectiveness of the indigenous game-based activities was based on the teacher observers' comments and suggestions, significance of the difference between the pretest and posttest mean scores of students and their views.

The researchers made use of the following data gathering instruments: A Validation checklist for Physics experts, which was used to validate IGBA and was patterned to the one used by Ubiña (2002). Physics teachers from DepEd Ilocos Norte, Ilocos Norte College of Arts and Trades and Mariano Marcos State University selected through purposive sampling validated the IGBA; 2) Pre-/ Post- Achievement Test.

This researcher-made test items were constructed based on a table of specifications designed for this study and it consisted of 40 multiple choice items on concepts included in each indigenous game-based activity. Physics teachers internally validated the test and was pilot tested to the Physics students at another campus of the same public secondary school where the study was conducted. Kuder-Richardson Formula 20 coefficient was 0.59 with standard deviation of 0.40, which means that the achievement test was reliable; 3) Students' Views Checklist.

A survey questionnaire consisting of 20 attitudinal validated statements and was used to secure information about the respondents' views (reactions or feedbacks) towards Physics after the IGBA was employed.

It was patterned after the Physics Attitude Test by Baraoidan (1990) and the Science Attitude Inventory Test by Celerino Calag as cited by Pacis (1995). It was also shown to research experts for refinement purposes. Ten statements were stated negatively and ten positively; 4) Interview Guide. This consists of questions patterned from the student feedback checklist and asked informally during and after the try-out by the researcher to the samples on the spot; and 5) Observation Checklist. A checklist modeled from student views checklist used by two (2) Physics teacher observers while the try-out was going on.

Descriptive statistics particularly mean and standard deviation were used to analyze the ratings of the physics teachers regarding the validity of the indigenous game-based activities. The same statistical tools were used in analyzing the views (feedback) of the students towards the subject as a result of the implementation of the indigenous game-based activities. The t-test of difference of two independent samples was utilized in finding whether there was a significant difference between the students'pretest and posttest mean scores. All data were analyzed using SSPS for Windows.

RESULTS AND DISCUSSION

Survey of Indigenous Games in Ilocos Norte

The researcher acquainted herself with the different names, materials used, and ways/manners of playing many existing indigenous games in Ilocos Norte through reflections of my childhood experiences, informal interviews, observations, and extensive reading.

After the search, selection of the games that can demonstrate Physics concepts and listing of Physics concepts that the identified indigenous games can demonstrate was done. The list was shown and discussed with several Physics teachers for enrichment and clarification purposes. Table 1 presents a summary of my survey. It shows that Ilocos Norte is rich in indigenous games that show Physics concepts.

Table 1: Indigenous games in Ilocos Norte and the Physics concepts they can demonstrate

Indigenous Game	Physics Concepts
1. *Sipa*	(For games # 1-11) Force, motion, speed, velocity, acceleration, free fall-projectile, gravity, mass, weight, impulse, momentum, laws of motion, work, power, energy (kinetic energy, potential energy, law of conservation of mechanical energy, heat, energy transformation, friction, pressure
2. *Codici* (Bati Cobra, striking/throwing sticks or spippers game)	
3. *Pinnalsuot* (small-diameter bamboo blowgun game)	
4. *Binnaldaan* (coconut leaf-made ball game)	
5. *Bandying* (slipper touch game)	
6. *Pinnuyot* or *Pinnitikan ti Lastiko* (blowing and pushing rubber bands with index finger)	
7. *Kinnugtaran ti Lastiko* (kicking rubber bands)	
8. *Siatung* (running while shouting game)	
9. *Sikki* (stone game)	
10. Jackstone (making use of small stones)	
11. Sack race	
12. *Pinnalsiit* (slingshot game)	Same concepts with sipa plus elasticity (stress, strain, Hooke's Law, elastic potential energy)

13. *Lipay* (Ilocano Bowling game)	(For games #13-19) Force, motion, speed, velocity, acceleration, gravity, impulse, momentum, laws of motion, work, power, energy (kinetic energy, potential energy, law of conservation of energy, energy transformation, heat, friction, pressure)
14. *Tumbang Preso* (striking an empty milk can with a taw)	
15. *Tatsing* (bottle caps or coin in a square)	
16. *Patintero* (Entrados or Intra)	
17. *Bawang Base* (catching and detaining game)	
18. *Dinuron* (localized tug-of-war game using a bamboo)	
19. *Kumbato* (Piko)	
20. *Bolintec* (holen or marble rolling game)	(For games # 20-22) Same concepts with tumbang preso plus circular and rotational motions and lens
21. *Kinnuti* (Tops ot Trumpo game)	
22. *Intra Paridusdos* (circular patintero)	
23. *Torsi* (Finger wrestling)	(For games # 23 & 24) Force, motion like energy transformation, heat and thermal energy, friction
24. *Sanggol* (hand wrestling)	
25. Chinese Garter	(For 25 & 26) Force, motion, speed, velocity, acceleration, gravity, impulse, momentum, laws of motion, work, power, energy (kinetic energy, potential energy, laws of conservation of energy, energy transformation, heat, friction, pressure, wave motion, ffrequency, period, amplitude
26. Jumping rope	
27. San Pedro (blindfolding game)	(For game # 27 & 28) Motion (3rd Law), energy (heat and thermal energy), friction, sound, light
28. *Kinnutitan* (Hide and Seek)	
29. *Yoyo*	Same concepts with sipa, tension force, rotational dynamics, circular motion
30. *Pinnatayaban ti Ullaw* (Kite-flying)	Same concepts with sipa plus tension force, light reflection, wind spped/currents
31. *Sungca*	Force, motion, gravity, laws of motion, energy (kinetic energy, potential energy, energy transformation, heat), friction, pressure, sound, concave lens

The Indigenous Game-Based Activities (IGBA)

These are the researcher-made activities that utilize indigenous games to facilitate learning in Physics and used as instructional materials in the try-out stage of the study. The games included in the activities with the topic(s) they demonstrate were *tumbang preso* (work), *patintero* (power), *sipa* (gravitational potential energy, power and law of conservation of mechanical energy), *codici* and *pinnalsuot* (kinetic energy), *yoyo* (law of conservation of mechanical energy), *pinnalsiitan* and *tatsing* (energy transformation), and *bawang base* (heat transfer and thermal energy).

Each of the activities made have the following parts: Preliminaries, Purpose, Concepts, Materials, Procedure, and Applications. These parts are patterned to that of a usual teaching resource material.

The Preliminaries consist the title of activity, Physics topic, indigenous game employed and time allotment as specified in the curriculum. The Purpose part specifies the objectives or targets for the lesson. The Concepts part specifies the different Physics concepts that can be tackled in the lesson. The Materials part indicates what things are needed for the activity. In the Procedure, a discussion of an indigenous game as well as how to play it are specified. This is followed by activity-based questions that students need to answer. The last part is the Applications. In here, students are given situational problems to answer or solve so that they can see the relevance of what they learned in real-life experiences.

Validation of the IGBA by Physics Experts

In all twenty-seven (27) weighted means, 23 (85%) filled the Strongly Agree scale (4.21-5.00) and only 4 (15%) under the Agree scale (3.14–4.20). This shows that majority of the mean ratings of the evaluators fall under the scale with the descriptive rating of Strongly Agree. When the computed composite means were taken for all categories namely, A (4.56), B (4.40), C (4.50) and D (4.34), a descriptive rating of Strongly Agree was arrived at. As a result, the overall mean (4.45) obtained a descriptive Strongly Agree rating.. The overall standard deviation of 0.5 reveals that there was a very minimum variation in the respondents' ratings. It can be inferred therefore that the physics teachers highly approved the material and strongly agreed that the indigenous game-based activities are valid instructional materials for physics teaching.

Table 2: Results of the evaluation made by Physics teachers (n=27)

Statements	Mean	DI
A. Objectives		
The objectives of the indigenous game-based activities are		
1. specific	4.6	SA
2. measurable	4.33	SA
3. attainable	4.4	SA
4. teachable	4.8	SA
5. observable	4.67	SA
Composite Mean	**4.56**	**SA**
B. Content		
The objectives of the indigenous game-based activities		
1. develop the mathematical and analytical skills required by the subject area at the intended year level.	4.20	A
2. present real life situations.	4.73	SA
3. give information that are appropriate and relevant for the development of science concepts.	4.27	SA
4. have exercises appropriate for the content.	4.33	SA
5. promote active participation and response among the students.	4.53	SA
6. focus on specific skills and concepts.	4.33	SA
Composite Mean	**4.40**	**SA**
C. Instructional Characteristics		
The objectives of the indigenous game-based activities		
1. arouse the interests and sustain the attention of the students.	4.67	SA
2. develop creative and critical thinking.	4.10	A
3. entertain and educate the students.	4.67	SA
4. present variation in the presentation of activities/exercises.	4.40	SA
5. promote interactive grouping and cooperative learning.	4.60	SA
6. introduce ideas/concepts/skills through a logical learning sequence.	4.20	A
7. are meaningful and interesting to its target audience.	4.40	SA
8. keep majority of the students involve in the learning tasks most of the times because they are learner-centered.	4.80	SA
9. integrate values development in the learning activities/exercises.	4.47	SA
10. provide practical application because they are environmentally/socially/culturally oriented.	4.73	SA
Composite Mean	**4.50**	**SA**
D. Evaluation		
The objectives in the indigenous games		
1. test the students' understanding of the lesson.	4.27	SA
2. measure analytical and mathematical ability of the students.	4.10	A
3. provide activities or exercises that will help the students retain information about the lesson.	4.47	SA
4. provide an environment for the students to apply the basic principles of the lesson.	4.60	SA
5. develop problem solving skills like analysis and computation.	4.27	SA
6. help the teacher assess students' mastery of the lessons covered.	4.33	SA
Composite Mean	**4.34**	**SA**
Overall Mean	**4.45**	**SA**

Legend	*Range of Mean*	*Descriptive Interpretation*
	4.21-5.00	*Strongly Agree (SA)*
	3.41-4.20	*Agree (A)*
	2.61-3.40	*Undecided (U)*
	1.81-2.60	*Disagree (D)*

Effectiveness of the Indigenous Game-Based Activities (IGBA)

The results of the pretest and posttest scores of the students in Table 3 interestingly picture out significant information about the increase in physics achievement of the students after IGBA was used in teaching the subject.

Table 3: Distribution of the pretest and posttest scores of the students on the Physics achievement test (n=42)

Score Scale	**Pretest**		**Posttest**	
	f	**%**	**f**	**%**
31 - 40	-	-	4	9.5
21 - 31	-	-	20	47.5
11 - 20	32	76.2	18	42.9
1 - 10	10	23.8	-	-
Total	**42**	**100**	**42**	**100**

Moreover, the result presented in Table 4 implies that the IGBA are capable of improving the students' performance in physics. It also shows that IGBA are effective tools in teaching physics concepts. This coincides with findings of Morales (2016) and Moro and Billote (2023), that the use of indigenous game-based activities in the teaching and learning process provided the conditions and conceptual ecology for learners to undergo conceptual change and achieve conceptual understanding.

Table 4: The t-test of difference between the pretest and posttest mean scores of the students (n=42)

	Physics Achievement Test		
	Pretest		**Posttest**
Mean	13.21		21.05
Standard Deviation	4.05		6.11
Mean Difference		7.84	
t-value (two-tailed)		7.00*	

**p < 0.05*

It is evident then that the IGBA enhanced the students' learning performance in Physics and this claim is supported by the following students' feedbacks during the on-the-spot interviews.

Mayat ken nakatulong a talaga ti panagusar ti inidigenous games idiay activities mi ata ma-experience mo no kasano nga mapasamak isu nga mas maawatam. [The use of Indigenous games is good and helpful in our activities because we experienced [it] and so it is more understandable.] – Noli

When using indigenous games in the activity, nalawlawag la bassit ti pannakaawatmi ata sigud nga mai-applayen daydiay concepts nga diniscuss. [Using indigenous games in the activity makes our understanding of the lesson clearer because the concepts discussed are immediately applied.] – Lyn

Wen, isuda nukua ti agpar-participate idiay games ti activity, daguitay di-unay active iti group discussions. No ana ti na-observe da idiay ay-ayam ket isu met ti isungbatda kadaguitay activity questions para idiay write-up. [Yes, those who are not so active in group discussions are the ones who participated in the games of the activity. What they observed in the game they played are their answers to the activity questions for the write-up.] – Cherry

Students' views on Physics with the Use of IGBA

Table 5 generally shows that since majority of the responses of the students in terms of the positive statements are Strongly Agree (SA) and the overall response for the negative statements is Strongly Disagree (SD), it can be said that the students have positive feedbacks towards Physics because of the use of IGBA as instructional material.

According to students, when the IGBA is used in teaching, Physics becomes interesting, motivating, challenging, enjoyable and full of fun, not difficult to learn and understand because they are applicable and relevant, not time consuming because they ease students' burden in problem solving, elicit maximum participation among learners, and ensure greater retention of the concepts they learn. The findings imply that the use of indigenous games in teaching Physics can trigger positive reactions/feelings based on students idealized memories which consequentially affects their motivation and attitudes toward learning the subject, eventually affecting the learners' understanding of the subject. Furthermore, these results support Bringula *et al* (2015) and Moro and Billote (2023) studies where they found out that emotions such as being very happy, excitement, and delight dominate other forms of emotions when playing games. This also supports the studies of Hartt, Hosseini, and Mostafapour (2020) and Calzada and Antonio (2023) that interactive

approach such as game-based learning has emerged as a novel method of increasing student motivation, emotional involvement, and enjoyment. Moreover, Suguitan and Natividad (2022) reiterated that key concepts and skills could be enriched by supplementing instruction with appropriate, contextualized, and relevant curriculum support materials.

Table 5: Means and descriptive ratings of the students' views on the use of indigenous game-based activities

Statement	**Mean**	**DI**
1. Indigenous games motivate me to learn physics.	4.71	SA
2. I see no value on the use of indigenous games in teaching physics concepts.	4.76	SD
3. Indigenous games are important sources of scientific information.	4.69	SA
4. Physics is one of the least useful subjects that I have taken even with the use of indigenous games.	4.62	SD
5. Using indigenous games in physics makes me experience thrills in science.	4.61	SA
6. I find indigenous game-based activities difficult to perform.	4.19	D
7. Indigenous game-based activities in physics challenge me to study more about the subject.	4.57	SA
8. I don't want to skip my physics class especially when my teacher introduces indigenous games.	4.30	SA
9. Using indigenous game-based activities makes me see the relevance of physics in our lives.	4.92	SA
10. Indigenous game-based activities make physics dry and boring.	4.76	SD
11. Having fun and learning at the same time make physics an enjoyable subject.	4.78	SA
12. Indigenous games in physics can ease my burden in solving physics problems.	4.54	SA
13. Game-based activities help me appreciate my cultural heritage.	4.38	SA
14. Indigenous games lessen my knowledge on the mathematical formulation of physics concepts.	4.19	D
15. Indigenous games make physics concepts difficult for me to learn.	4.21	SD
16. Indigenous games make me uncomfortable in my physics class because I work on my own pace.	4.26	SD
17. I am distracted in learning physics concepts if we play.	4.60	SD
18. Play and experimentation are valuable forms of learning physics concepts.	4.52	SA
19. I am not comfortable in playing and learning at the same time.	4.24	SD
20. Learning physics through games is time consuming	3.83	D
Overall Mean	**4.48**	**SA**

Legend	*Positively stated*		*Negatively stated*
	Strongly Agree (SA)	*4.21 – 5.00*	*Strongly Disagree (SD)*
	Agree (A)	*3.41 – 4.20*	*Disagree (D)*
	Undecided (U)	*2.61 – 3.40*	*Undecided (U)*
	Disagree (D)	*1.81 – 2.60*	*Agree (A)*
	Strongly Disagree (SD)	*1.00 – 1.80*	*Strongly Agree (SA)*

CONCLUSION AND RECOMMENDATIONS

The indigenous game-based activities are valid and effective instructional materials in teaching Physics and could enhance the performance of the students. Furthermore, the Physics performance of the students can be intensified when they work cooperatively as they play and learn. That is, they see themselves not as competitors but as sources of ideas. when the activities are used in teaching, Physics becomes interesting, motivating, challenging, enjoyable and full of fun, not difficult to learn and understand because they are applicable and relevant, not time consuming because they ease students' burden in problem-solving, elicit maximum participation among learners, and ensure greater retention of the concepts they learn.

In light of the findings of this research, the following recommendations are hereby presented: Teachers should be encouraged to use and design more indigenous game-based activities as springboards for explaining physics concepts. There should be in-service seminars and training for teachers and writers using indigenous games to teach science concepts. Questions in the achievement test should use terms from the toys and games in the activities to make the test more relevant and valid.

Introducing indigenous game-based activities in physics classes is one way of orienting students to an aspect of their cultural heritage and to the relevance of physics in their lives. Therefore, the government should support the DepEd thrust of promoting science culture through community-based learning resources by allocating national and local funds to public schools to produce activity materials. More research must be done to test the effectiveness of the indigenous game-based activities in teaching other topics in physics or other science subjects A wider try-out on the effectiveness of the indigenous game-based activities should be done to verify further their validity as instructional materials.

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