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Game-Based Learning: The Effect of Traditional Filipino Games on Motivation, Engagement, and Conceptual Understanding of Grade 7 Learners in San Pascual National High School, San Pascual, Masbate, Philippines

Niño R. Nazareno

Teacher IV, Department of Education, San Pascual National High School

Abstract

This study examined the effect of integrating Traditional Filipino Games as a game-based learning strategy on the motivation, engagement, and conceptual understanding of Grade 7 learners in Science at San Pascual National High School during the first quarter of School Year 2025–2026. Anchored on Game-Based Learning Theory, Constructivist Learning Theory, Self-Determination Theory, and Experiential Learning Theory, the study employed an explanatory sequential mixed-methods design. The quantitative phase used a one-group pretest–posttest quasi-experimental design with one intact Grade 7 class selected through purposive sampling. Research instruments included a researcher-made 30-item pre-test and post-test to measure conceptual understanding and an adapted survey questionnaire to assess students' motivation and engagement. The instruments underwent expert validation and pilot testing, yielding acceptable reliability coefficients as assessed by Cronbach's alpha. Quantitative data were analyzed using a weighted mean and a paired-samples t-test in IBM SPSS Statistics Version 31.

The qualitative phase involved Focus Group Discussions (FGDs) with purposively selected students based on post-test performance to explain and triangulate the quantitative findings. Qualitative data were transcribed, coded, categorized, and analyzed using Braun and Clarke's thematic analysis to identify recurring themes related to learners' experiences during the intervention.

Findings revealed that students' motivation and engagement significantly improved after the integration of Traditional Filipino Games. Results of the paired-samples t-test showed statistically significant differences in motivation, engagement, and conceptual understanding before and after the intervention. Qualitative findings supported these results, as learners described the activities as enjoyable, interactive, collaborative, and culturally meaningful, helping them better understand and retain scientific concepts.

The study concludes that integrating Traditional Filipino Games into Science instruction is an effective, culturally responsive instructional strategy that enhances learners' motivation, engagement, and conceptual understanding. Based on the findings, a Culture-Based Game-Based Learning Instructional Guide for Grade 7 Science was proposed.

Keywords: Game-Based Learning, Traditional Filipino Games, Student Motivation, Student Engagement, Conceptual Understanding

Chapter 1
THE PROBLEM AND ITS BACKGROUND

Introduction

Now more than ever, energizing students to capture their interest and sustain it through motivation to achieve science academic goals will be crucial to learning. This is true for highly abstract learning, such as energy transformation, materials science, and force and motion. These concepts require some level of analysis and translation into active learning far above simple mechanical repetition.

Based on the School Improvement Plan (SIP) data for the academic year 2022-2023, San Pascual National High School reports that grade 7 learners registered a mean percentage score of 80.24% in Science, with the Pomelo section posting the lowest score at 78%. Interpreting this performance will be linked to the absence of active conceptual and critical thinking and to low motivation to learn—a chasm that underscores gaps in performance resulting from learned helplessness under the traditional instruction approach adopted at the school.

This curiosity drives exploration as adolescents are keen on cognitive and emotional development. These ideas are strongly supported by Piaget and Erikson, as well as the need to do and have fun while learning. The problem arises when classroom instruction is designed for these levels, which is seldom the case, leaving students disengaged.

Today's learners, and especially today's youngsters, will increasingly prefer to learn in interactive and multisensory environments. To accommodate this requirement, educational approaches need to change and include strategies that stimulate psychomotor and thinking skills. One such strategy is Game-Based Learning (GBL), where elements of a game, such as challenges, feedback, and teamwork, are used to encourage engagement and foster motivation.

This GBL study aims to situate it in the context of the Philippines by using *Laro ng Lahi* Games for Science Teaching. Not only do games like patintero, luksong tinik, and tumbang preso engage children physically, but they also serve as tools for scientific thinking in a culturally meaningful way. For instance, patintero can be used to teach motion, and bask skips can be used to teach about force and energy transfer. By engaging with these games, students will learn scientific concepts while preserving cultural ones that are quickly being lost.

This aligns with the K to 12 Basic Education Curriculum of the Department of Education, which promotes collaboration, critical thinking, contextualized learning, and cultural literacy in classroom instruction. Students from San Pascual North District, particularly those in rural communities where traditional Filipino games are still commonly practiced, may benefit from this approach, as it enables them to connect scientific concepts to real-life experiences and cultural practices.

Several studies have already established the effectiveness of Game-Based Learning (GBL) in improving learners' motivation, engagement, and academic performance in Science and STEM education (Sharmin et al., 2023). However, most of these studies focused on digital games, online gamified platforms, or Western-designed instructional models. Similarly, studies on Traditional Filipino Games or Laro ng Lahi have largely emphasized their role in physical education, social development, and cultural preservation rather than their application in Science instruction (Torillo et al., 2024).

Although Capinding and Salazar (2023) explored the integration of traditional Filipino games in Grade 7 Science instruction, there remains limited local research examining how these culturally grounded games influence learners' motivation, engagement, and conceptual understanding using an explanatory sequential mixed-methods design. Moreover, few studies have focused specifically on Grade 7 learners

in rural public secondary schools where traditional games remain culturally relevant and familiar to students. Hence, there is still a gap in the literature regarding the use of modified Traditional Filipino Games as a culturally responsive game-based learning strategy in Science education. This study seeks to address this gap by examining the effects of integrating Traditional Filipino Games on the motivation, engagement, and conceptual understanding of Grade 7 learners in Science.

Most of the literature affirms GBL theory's effectiveness in motivation, engagement, and academic performance; however, most studies focus on digital and Western models. There will be a clear absence of local studies on the use of indigenous games in formal science teaching methods, especially at the junior high school level.

To fill this void, the current research will employ an explanatory sequential mixed-methods design. The quantitative component, comprising motivation and engagement surveys, pre- and post-tests, and qualitative data from focus group discussions, will form a comprehensive dataset. This approach will provide rich context alongside clear measurement boundaries and outcomes.

The study will be conducted during the first quarter of the 2025-2026 academic year. It will determine the effects on learners' motivation, engagement, and conceptual understanding when Traditional Filipino Games are integrated into Grade 7 Science instruction. Plus, it will assess the potential of the approach toward curriculum and instructional design relevance to Filipino learners.

In the end, this study aims to develop inclusive, locally tailored educational outlines for teachers, curriculum creators, and policymakers, and to contribute to a broader discussion of inclusively localized education. It will transform the science classroom into a place that nurtures a love for the country through culture, identity, and enhanced learning.

Theoretical Framework

This study was anchored on the Game-Based Learning (GBL) Theory, which focused on the application of gaming elements such as points, levels, rewards, feedback, cooperation, and competition to enhance motivation and academic achievement. Plass, Homer, and Kinzer (2015) stated that learners engaged with content more readily when information was presented in an organized and playful manner, where tasks were meaningful, and feedback was instantaneous. In this case, culturally relevant games such as patintero or tumbang preso were used as activities that fostered Filipino identity.

Instruction that incorporates students' cultural contexts promotes retention along with emotional and behavioral engagement. The integration of traditional Filipino games into science instruction clearly enhances learners' motivation, performance, and overall engagement, as noted by Capinding and Salazar (2023). These findings help reinforce GBL and its culture's adaptation to local contexts.

The GBL was also examined through the lenses of Constructivist Learning Theory, particularly through the works of Jean Piaget and Jerome Bruner. In this case, Piaget's concept of active learning, together with Bruner's scaffolding through discovery, was applied. Learners were expected to build understanding through participation in traditional games that demonstrated various scientific concepts, such as the particulate nature of matter, solutions, and phase changes. For instance, in patintero, movement served as a model for the various states of matter, allowing learners to experience learning by doing rather than merely engaging with abstract chemistry concepts.

The work of Deci and Ryan on Self-Determination Theory (SDT) will further strengthen the framework. SDT claims motivation differentiates and gets stronger when there is autonomy, competence, and relatedness. These criteria will easily be met through traditional Filipino games. Students will be given choices while working with others (autonomy), will be able to enhance skills during the activity

(competence), and interact with peers in a cooperative manner (relatedness). In tumbang preso, students are motivated to engage in strategized group play within a culturally familiar context.

Moreover, this strategic approach will be enhanced by Kolb's Experiential Learning Theory, which cycles through concrete experience, reflective observation, abstract conceptualization, and active experimentation. Filipino traditional games will serve as the primary platform for these learning stages, designed to reinforce physical engagement, reflection, conceptualization, classroom introspection during discussions, active experimentation through follow-up science activities post-discussions, and enhanced understanding of concepts.

All of these combine to assist learners in understanding science through the perspective of traditional Filipino games using the four theoretical lenses — GBL, Constructivism, SDT, and Experiential Learning — supporting the overall objective of integrating the games to enrich student learning in science. These frameworks will inform both the implementation and analysis of the intervention to examine motivation and engagement alongside understanding, ensuring that these facets are not treated in isolation. Changes in academic outcomes will be evaluated using quantitative data from pre- and post-tests and surveys, while qualitative data from FGDs will depict learners' experiences of autonomy, competence, social connection, and reflective learning.

By employing these interrelated theories, this study intends to develop a culturally responsive, game-based instructional strategy that designs pedagogical content frameworks for consideration through Filipino learners' lenses and assists in reforming science education toward inclusivity and effective practice.

Conceptual Framework

This study observed the Gamified Lesson Plan for systematically incorporating Traditional Filipino Games into Science classes, using the 7E's instructional model, specifically designed to increase students' motivation, participation, and understanding of concepts. It stemmed from the context of culturally based games such as patintero, luksong tinik, and tumbang preso, which were used as teaching tools for the Grade 7 Science classes during the first quarter, particularly for the lessons on the particulate nature of matter, phase changes, and the properties of solutions, collectively referred to as the "master" unit.

Traditional games will be incorporated as independent variables, while motivation, engagement, and students' scientific conceptual understanding will be considered dependent variables. Other variables, such as prior knowledge, teaching method, and classroom setup, will be considered intervening variables, although they will not be directly managed.

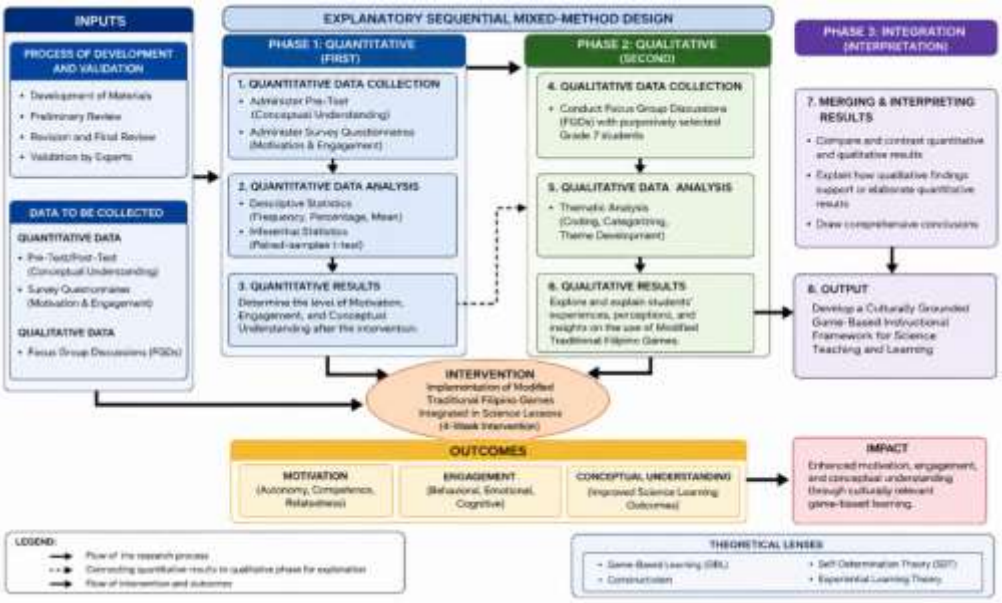
For this framework, the subject teacher, together with Science educators and content specialists, will create and validate instructional materials and assessment tools. After validation, these materials will be implemented in a 4-week intervention with one intact Grade 7 class at San Pascual National High School, which will be purposively sampled. This class will receive science instruction that integrates Traditional Filipino Games, with lessons designed according to the 7E's instructional model and guided by culturally relevant lesson logs.

The quantitative data will include results from pre- and post-tests to evaluate shifts in conceptual understanding, as well as Likert-scale surveys to gauge students' motivation and engagement. Concurrently, qualitative data will focus only on group interviews with the Top 5 and Bottom 5 students from the post-test results. This combination of methods will provide insights into the measurable outcomes alongside the classroom experiences.

The design framework will be based on four major theories: Game-Based Learning (GBL), which is focused on learning by doing through play; Constructivist Learning Theory, which holds that learners build knowledge through purposeful participation; Self-Determination Theory (SDT), which accounts for motivation in terms of the autonomy, competence, and relatedness of the learner; and Experiential Learning Theory, which explains learning as a cyclical process of doing, reflecting, conceptualizing, and applying.

These lenses collectively will assist the framework in demonstrating the relationship between culturally responsive pedagogy and improved science learning. The research will focus on measuring learning outcomes while advancing curriculum development, fostering inclusive and contextually relevant teaching approaches, and enhancing education policy frameworks. This study, aligned with the Republic Act No. 10066, the National Cultural Heritage Act of 2009, will argue, through the lens of this framework, for the guarding and educational value of Traditional Filipino Games for teaching and cultural appreciation.

Figure 1. Conceptual Framework of the Study



Statement of the Problem

This study aimed to examine the effect of integrating Traditional Filipino Games in a Science class using a game-based learning approach, particularly on students' motivation, engagement, and conceptual understanding. Specifically, it sought to answer the following questions:

1. What is the level of motivation of students in a Science class before and after the intervention with respect to:

1.1. Autonomy;
1.2. Competence; and,
1.3. Relatedness?

2. What is the level of engagement of students in a Science class before and after the intervention with respect to:

2.1. Behavioral engagement;

2.2. Emotional engagement; and,
2.3. Cognitive engagement?
3. Is there a significant difference between the motivation of students before and after the intervention?
4. Is there a significant difference between the engagement of students before and after the intervention?
5. What are the students' mean pre-test and post-test scores before and after the intervention?
6. Is there a significant difference in the pre-test and post-test mean scores of students?
7. How do the participants perceive the effectiveness of the integration of Traditional Filipino Games in Science education in enhancing engagement, motivation, and conceptual understanding?
8. Based on the findings of the study, what output may be proposed?

Hypothesis

This study is guided by the following null hypotheses:

1. There is no significant difference in the level of motivation of students in a Science class before and after the integration of Traditional Filipino Games.
2. There is no significant difference in the level of engagement of students in a Science class before and after the integration of Traditional Filipino Games.
3. There is no significant difference in the pre-test and post-test mean scores of students' conceptual understanding of Science before and after the intervention using Traditional Filipino Games.

Assumptions of the Study

This study is grounded on the following assumptions, particularly in its qualitative phase, which involves focus group discussions and classroom observations:

Students can articulate their learning experiences.

It is assumed that Grade 7 learners are capable of expressing their thoughts, feelings, and perceptions regarding the integration of Traditional Filipino Games into their Science classes when guided by appropriate questioning during focus group discussions.

Lived experiences can reflect the effectiveness of instructional strategies.

The study assumes that students' narratives, reflections, and classroom behaviors provide valid and valuable insights into how the game-based, culturally-rooted instructional approach influenced their motivation, engagement, and understanding of science concepts.

Participants will respond truthfully and thoughtfully.

It is assumed that all respondents, particularly those chosen for focus group discussions, will share genuine opinions and experiences without fear or pressure, especially as ethical protocols such as informed consent, anonymity, and voluntary participation are observed.

The classroom environment allowed authentic student experiences.

It is assumed that the classroom climate during the four-week intervention enabled the learners to meaningfully engage with the integrated traditional games, thus offering authentic responses during qualitative data collection.

Scope and Delimitation of the Study

This investigation aims to determine how the use of Traditional Filipino Games affects learners' engagement, motivation, and understanding of concepts during Grade 7 Science instruction. The research will take place in the first quarter of School Year 2025–2026 and will last 4 weeks at San Pascual National High School, a public high school in San Pascual North District.

This study will focus on one intact Grade 7 class, typically comprising 30 to 40 students. This section

will serve as the experimental group for the study and will be taught Science using selected Traditional Filipino Games, including patintero, luksong tinik, and tumbang preso. There is no control group for the implementation. The instructions will cover only the first quarter's least-learned competencies in Grade 7 Science: the particulate nature of matter, phase changes, and solutions.

The methods of data collection will include administering pre- and post-tests to evaluate understanding and survey questionnaires to assess student motivation and engagement. Selected student participants will be invited to participate in focus group discussions (FGDs) to gain a deeper qualitative understanding of learning processes during the intervention. The study sample will consist solely of students, thus excluding teachers as data collection participants.

The scope of the study is restricted to the identified subject competencies: it does not intend to investigate other subjects, other grades, or Traditional Filipino Games other than those purposively selected to align with the identified specific science competencies. While the study may be constrained by external factors such as prior academic performance, preferred learning styles, or the way teachers deliver lessons, these factors will not be controlled in the study's design. As such, the study's findings, although aimed at providing culturally relevant, game-enhanced strategies for teaching Science at the junior high school level in the Philippines, are bounded by the study's scope and do not claim applicability across other educational settings

Chapter 2
RELATED LITERATURE AND STUDIES

This chapter presents a review of relevant literature that supports the investigation of integrating Traditional Filipino Games into Science instruction. It explores key themes, including game-based learning in Science education, student engagement and motivation through games, and the educational integration of culturally rooted traditional Filipino games.

Game-Based Learning in Science Education

Traditional Filipino games, as part of Capinding and Salazar's (2023) study, were integrated into Grade 7 Science instruction and found to significantly increase learners' motivation, interest, and academic performance. In a one-group pretest-posttest quasi-experimental design, students' engagement was measured alongside their test scores, which indicated improvement after a six-week intervention that included Tatsing, Piko, and Harang Taga. Additionally, the authors underscored the unique relevance of these games in motion and velocity physics as propellers of curiosity and excitement. Their findings support integrating culturally responsive pedagogy through Filipino traditional games, as these learners experienced science that was relevant to their lives.

The perception of science lectures as monotonous or arduous has become widespread. Yet the GBL, or Game-Based Learning, strategy addresses this challenge by combining elements of a game, including goals, directives, rewards, feedback, and optional participation in learning. This encourages interactivity and the development of powerful lessons. Today's tech-savvy learners adapt best through immersion in stimulating, fluid technological elements, which is achieved through game-based learning.

WBL is beneficial for science education, as evidenced by numerous empirical studies. In one such study, Wang et al. (2022) conducted a meta-analysis of K-12 STEM education and concluded that GBL significantly enhanced students' ability to master concepts and problem-solving skills. Moreover, Lopez-Fernandez et al. (2024) noted that GBL-facilitated environments, whether online or physical, fostered

improved motivation and performance, stressing that interaction quality, not the medium, enhanced learning effectiveness.

Additional studies affirm the advantages of GBL and neuroscience. Sharmin et al. (2023) used fNIRS to examine the impact of STEM learning and found that playing games during learning activities heightened students' emotional involvement and cognitive engagement, thereby significantly improving attention and retention.

The literature analysis showed that the instructional design elements of narrative and experience are fundamental. Souza et al. (2024) demonstrated the teaching of Newtonian physics with an RPG, while Priya et al. (2021) designed "ML-Quest" for basic concepts of machine learning, both emphasizing that students were better able to understand the material through structured gameplay design, which provided them agency, challenge, and scaffolding.

To summarize, the various approaches to scientific topics, combined with sound pedagogy, have proven effective in developing motivational and critical thinking skills while nurturing an understanding of STEM subjects—an essential for comprehending complex scientific concepts.

Student Engagement and Motivation through Game-Based Learning in Science Education

The modern science classroom is still struggling with student engagement and motivation because the subject is abstract and conceptually difficult. A teacher-centered approach relegates learners to passive recipients of information, hindering their ability to appreciate and retain the scientific concepts presented. To address this issue, Game-Based Learning (GBL) has evolved as an effective instructional strategy that integrates game features such as goals, feedback, rewards, and optional participation, thereby offering students active emotional, behavioral, and cognitive involvement.

There is evidence to support GBL's effectiveness across various domains of learning. Kuo et al. (2023) applied "Self-designed Board Games" (SdBG) strategies in citizenship education, in which students worked in groups to design and play their own games. This approach dramatically enhanced students' creativity and essential civic competencies, illustrating GBL's ability to foster learner engagement and development through active, collaborative group work.

In one review, Al-Azawi et al. (2020) reported that game-based approaches motivate students through rewards, progress indicators, and feedback, which were absent in traditional teaching. Their findings highlighted the GBL advantage in sustaining motivation for participating in school activities. Supporting this, Wang et al. (2022) reported, through a meta-analysis, that applying GBL in digital formats in STEM courses enhanced retention of learned concepts, motivation, and self-directed learning.

We learned this from López-Fernández et al. (2024): interest and participation are effectively cultivated among students in GBL settings, both in person and online. This echoes what Anastasiadis et al. (2021) reported regarding the increase of both intrinsic and extrinsic motivation: learners are motivated when appropriately challenged and given opportunities for social interaction and feedback.

Using fNIRS, Sharmin et al. (2023) found that educational games—especially those that incorporate decision-making and problem-solving tasks—activate reasoning, attention, and other higher-order cognitive functions.

Narrative-based GBL has demonstrated tremendous promise. Souza et al. (2024) designed a role-playing game in which students learned Newton's physics by taking the roles of historical physicists. Storytelling not only improved engagement but also made learners emotionally connected to the content. Priya et al. (2021) used a quest-based approach to ML-Quest, a gamified platform for teaching machine learning, and reported that students persisted longer on complex topics while completing quests.

"Transformational play" is how Barab et al. (2020) defined students taking on significant roles and actively engaging in a constructed game world as learners. They become active players who assume identities as scientists or problem-solvers. The notion was also supported by Squire (2021), who argued that GBL fosters learning cultures in which students are more active meaning-makers rather than passive content recipients.

Gee (2020) viewed this approach through the prism of situated learning and argued that GBL puts learners in authentic problem-solving contexts that promote independence, inquisitiveness, and self-efficacy. All of these factors sustain motivation toward academics over an extended period.

To conclude, the literature consistently supports the use of GBL in Science teaching. Be it on digital platforms, through narrative-based game quests, or in traditional games rooted in culture, game-based approaches positively impact motivation, active engagement, and interaction with scientific concepts. Exploration, collaboration, and sustained focus are essential to GBL, which addresses many of the motivational deficiencies left by traditional teaching methods.

Integration of Traditional Filipino Games in Education

The integration of Laro ng Lahi into the MATATAG curriculum is viewed as an exercise in cultural responsiveness and sensitivity. The new DepEd curriculum, implemented last school year 2024-2025, mandates the use of culture-based learning in instruction. In the General Shaping Paper for the MATATAG Curriculum (2023), the Department of Education reiterates Section 5. E of RA 10533 (Enhanced Basic Education Act of 2023) and DepEd Order No. 21, s. Two thousand nineteen as its legal basis, and mandated that every teacher utilize "culture-based instruction positively," alongside inquiry-based teaching, reflective teaching, project-based learning, and a constructivist teaching approach. This is to facilitate the effective development of 21st-century skills among the learners, grounded in their cultural background.

Other games such as patintero, luksong tinik, tumbang preso, and agawan base are not merely sources of entertainment but are deep-seated expressions of Filipino values, identity, and community-based artisanship. When brought into the classroom, these games serve two purposes: they enhance learning instruction while fortifying the students' cultural identity.

Ruin, Tamban, and Bandoy (2024) analyzed the lived experiences of junior secondary school students who participated in Laro ng Lahi and noticed that the games enhanced social interaction and collaboration as well as active emotional involvement. Their proposed phenomenological study confirmed that such games positively influence feelings of acceptance and, in turn, motivation, thereby fostering development from many perspectives. Likewise, Belano and Perez (2024) noted that these Laro ng Lahi games help improve students' participation and performance, thereby encouraging teachers to apply them in other disciplines, such as Physical Education and Science.

The students' engagement with traditional Filipino games enhances their coordination, problem-solving skills, and strategic thinking ability, as noted by Torillo et al. (2024). These results confirm the possibility of Laro ng Lahi in cultivating and facilitating higher-order thinking skills when strategically incorporated with academic learning goals. Almonte and Andal (2023) further validated this claim with their research on the use of indigenous games as part of interactive lessons, which enhanced class participation and understanding of the lesson among grade 10 students.

The cultural relevance of such games is also emphasized in the work of Ferolino and Marasigan (2022), which analyzed how incorporating Laro ng Lahi into the school curriculum safeguards Filipino culture amid the growing popularity and influence of digital and Western games. Their findings align with the

NCCA's (Makasining & NCCA, 2023) efforts to revive traditional games and foster among the youth a love for one's country, Filipino identity, and culture. This is also supported by the ASEAN secretariat (2024), which urges member countries, including the Philippines, to protect traditional games as intangible cultural heritage and systematically incorporate them into national educational frameworks.

Traditional games were examined by Dizer, Logan, and Raval (2024), who examined the broad benefits of Indigenous play among people born in the 1980s. Their findings indicate that engagement with such games in childhood fostered emotional self-regulation, social skills, and physical well-being—traits that remain relevant to today's educational objectives. Similarly, Avila (2023) studied the Laro ng Lahi and analyzed the implementation of indigenous games within the context of formal education. While the enthusiasm and cooperation among students are enhanced, other challenges, such as inadequate space and insufficient teacher orientation, can restrict full engagement.

Asuncion (2019) reported a study on the appreciation of traditional Filipino games among learners of Generation Z and noted a dip in recognition and participation due to greater accessibility to electronic games and devices. This emphasizes the need for instructional strategies that foster interest in and engagement with these games, especially in subjects that encourage movement and teamwork, such as Science, Physical Education, and Araling Panlipunan.

In unison, these studies illustrate that Laro ng Lahi offers more than just culture; it has the potential to revolutionize a classroom, transforming it into a vibrant and purposeful learning environment. When integrated into the curriculum, traditional games can increase student participation and classroom activity and strengthen the connection between what students learn academically and how it is applied in real life. By using Laro ng Lahi in Science instruction, the teacher enhances students' understanding while safeguarding intangible cultural heritage. This is taught through the lens of inclusive pedagogy and multicultural education.

Conceptual Understanding and Meaningful Learning in Science Education

Key conceptual understanding drives science education by enabling students to describe phenomena, draw cross-conceptual relationships, and relate scientific thinking to everyday life. The construction of meaningful relationships among scientific concepts is the foundation for deeper, stronger knowledge structures and an alternative to rote memorization. The relationships among scientific concepts become meaningful when prior knowledge is related to new information. This involves the act of making that relation.

In the science classroom, the development of conceptual understanding through meaningful learning and the promotion of conceptual change are critical components of the teaching-learning process and have garnered much attention in recent times. In the meta-analysis of Pacaci and Turkmen (2023) on the role of conceptual change in science teaching and learning, it was noted that students' conceptual understanding improved remarkably. Conceptual change in learning and teaching was found to be extremely valuable in science education, where children arrive at school with alternative conceptual understandings.

Meaningful learning and conceptual understanding are supported through inquiry-based learning. In the research of Strat et al. (2024), the inquiry-based approach to science teaching and learning facilitates the exploration of phenomena, the formulation of explanations, the use of evidence, and meaningful, deep learning of scientific concepts. Retention and transfer of learning are further supported by students' active engagement in the knowledge-construction process during inquiry-based learning.

Similarly, Daniel et al. (2025) studied the use of modified guided discovery learning in physics laborato

ries. Their study showed that guided discovery learning in laboratories improved students' procedural and conceptual knowledge. The authors of this study argued that exploring scientific ideas through guided activities enables students to participate in the process and enhances their ability to understand deeper, more complex scientific ideas. Their study argues that genuine learning results from the user's discovery and reflection on the content.

The use of technology-integrated learning environments has also been shown to help users formulate concepts. Meronda et al. (2025), in their systematic review of the use of virtual laboratories in the science classroom, observed that virtual experiments helped to improve students' scientific literacy and understanding of science concepts. This study also noted that when learners can see and manipulate abstract scientific ideas, meaningful learning occurs and understanding of complex concepts is enhanced.

In addition, interdisciplinary instruction has been shown to enhance understanding of science concepts. The work of Corrigan et al. (2025) examined STEAM instruction and found that integrating science, instructional technology, engineering, the arts, and mathematics enhanced learners' understanding of concepts. Students' scientific reasoning and decision-making skills improved, as learners were able to link concepts and apply them to real-life situations.

Wandi's (2023) systematic review focused on developing deeper conceptual understandings. The review focused on the frameworks used in the review articles. Wandi concluded that constructivist frameworks led to much more meaningful learning than traditional teacher-directed instruction. The conclusion of the review was that when learners engage more with the learning process and activities, the meaning and conceptualization of what they learn deepen.

The effects of constructivism and the inquiry approach were also highlighted by Suryati et al. (2024). They indicated that the inquiry approach affects learners' conceptual understanding, particularly in chemistry. Suryati et al. showed that learners engaged in inquiry activities were able to construct conceptual frameworks and significantly improved their ability to interrelate scientific concepts across a variety of contexts. These pieces of evidence further support the idea that when learners become actively involved in the learning process, science learning becomes more meaningful.

Pratiwi (2025) reviewed studies concerning conceptual understanding in physics and noted that active learning strategies were more effective than traditional ones. The review found that learners' conceptual understanding is stronger when they are allowed to collaboratively explore, challenge, and discuss scientific concepts.

Research has shown that conceptual understanding is a strong predictor of success in academic science. Addido (2025) showed that learners with a higher degree of conceptual understanding performed better in science. The study said that learners who understand the core scientific concepts can more easily solve related and even novel problems.

In the Philippines, Purigay (2025) studied how using structured drawing tasks improved students' understanding of Newton's Laws of Motion. The study found that learners who draw and engage in other active learning tasks have a better conceptual understanding of the laws than learners who have only experienced traditional teaching. The study also found that learners who can apply scientific concepts through various activities are more likely to achieve meaningful learning than those who are not engaged.

The reviewed studies indicate that learner-centered strategies (i.e., inquiry-based, guided discovery, and other constructivist, active, experiential approaches) yield improvements in both meaningful learning and conceptual understanding. The present study is supported by these findings, which imply that, in

science, learner-centered strategies (i.e., active methodologies) improve conceptual understanding. Given that Traditional Filipino Games promote participation, collaboration, and reflection within a contextualized learning framework, these games may be a useful means of developing meaningful learning and conceptual understanding of science among Grade 7 learners.

Synthesis

The research and reviews examined show that Game-Based Learning (GBL) improves students' motivation, interest, and understanding in science. Wang et al. (2022); López-Fernández et al. (2024); Sharmin et al. (2023); Souza et al. (2024); Priya et al. (2021) described game-based learning as a technique that results in students' active participation, sustained attention, effective problem-solving, and better performance. The authors noted that their studies, using different games (e.g., digital, role-play, and gamified learning), showed positive effects on students' cognitive and affective outcomes. This means that Game-Based Learning (GBL) is effective not just in the gaming apparatus, but also in the active, cooperative, and experiential learning it fosters.

The motivation and engagement literature on learners is also consistent with previous literature, which shows that game-based teaching strategies stimulate learners' behavioral, emotional, and cognitive engagement. Kuo et al. (2023); Anastasiadis et al. (2021); Barab et al. (2020); Squire (2021) found that game-based learning results in active and meaningful participation, especially when learners are given the freedom to make decisions and learn collaboratively and cooperatively with their peers. These findings align with Self-Determination Theory, which states that the freedom to make choices, a sense of achievement, and social connectivity all enhance intrinsic motivation to learn. Despite the different teaching and learning contexts across the studies, the results consistently showed that participatory, interactive, learner-centered processes are more engaging than traditional teacher-centered processes.

The literature further indicates that conceptual understanding improves via constructivist, inquiry-based, experiential, and active learning. Pacaci and Turkmen (2023), Strat et al. (2024), Daniel et al. (2025), Suryati et al. (2024), and Pratiwi (2025) argue that learners build a deeper understanding by actively engaging with scientific phenomena and integrating new knowledge and experiences. Similarly, Corrigan et al. (2025), Meronda et al. (2025), and Purigay (2025) argue that meaningful learning results from authentic experiences that allow students to see, do, and think about the science involved. This positively impacts Constructivist Learning Theory and Experiential Learning Theory, as both Learning Theories emphasize involvement in the actual process as a critical aspect of conceptual development.

Furthermore, research on Traditional Filipino Games shows that they can be used as educational resources in addition to being cultural artifacts. Constructed research by Capinding and Salazar (2023), Ruin et al. (2024), Torillo et al. (2024), and Almonte and Andal (2023) found that traditional games enhance academic performance and cultural awareness as well as boost participation, teamwork, and motivation. These studies argue that using culturally based instructional methods can provide learners with an opportunity to integrate learning content with previously learned experiences. This, in turn, can increase the relevance and meaning of learning.

In game-based learning (GBL), learner engagement, and culturally sensitive education, while there is ample supporting literature, gaps are also identified by multiple researchers. First, most GBL studies focus on the digital, gamified, or technological realms, and there are few studies of non-digital, culturally sensitive games. Second, while there are many studies of the Traditional Filipino Games (TFG) in the context of cultural preservation, social development, and physical education, there is a lack of studies of the Traditional Filipino Games as a game-based instructional approach in Science. Third, there are also

very few studies on the effects of Traditional Filipino Games on motivation, engagement, and conceptual understanding within the same research scope. Finally, a few studies use an explanatory sequential mixed-methods design to explore how learners, particularly Grade 7 learners, experience and perceive the use of Traditional Filipino Games in the teaching of Science in rural public secondary schools.

Chapter 3
METHODOLOGY

This chapter outlines the research design, methods, and procedures used to investigate the effectiveness of integrating Traditional Filipino Games into Science instruction among Grade 7 students. It details the study's research approach, participants, instruments, data-gathering process, and analysis techniques.

Research Design

This study adopted an explanatory sequential mixed-methods design, which starts with the quantitative phase and the collection of quantitative data, followed by qualitative data collection to provide explanation and triangulation. The design seeks to assess the impact of integrating Traditional Filipino Games into Instructional Strategy in Science for Grade 7 on students' motivation, engagement, and conceptual understanding.

The quantitative part of the study consists of administering researcher-developed pre-tests and post-tests to evaluate the learners' conceptual understanding of the selected science topics. Furthermore, the motivation and engagement levels of the student respondents were assessed using validated survey questionnaires administered before and after the intervention. This phase aims to validate the effectiveness of the instructional approach in the integrated science lessons.

During the qualitative analysis of the results, focus group discussions (FGDs) were conducted with purposively sampled Grade 7 students who participated in the intervention. The FGDs are intended to capture students' experiences, perceptions, reflections, and feelings regarding the incorporation of Traditional Filipino Games into their Science classes.

The combination of quantitative and qualitative outcomes comprehensively assesses the impact of culture, game-based approaches, strategies, and technological integration on students' learning outcomes in Science.

Respondents of the Study

The respondents of this study were Grade 7 students from San Pascual National High School, a public secondary school in the San Pascual North District, San Pascual, Masbate, Philippines. The school was selected because of its diverse student population, accessibility to the researcher, administrative support for instructional innovation, and alignment of the Grade 7 Science curriculum with the objectives of the study.

Research Instrument

This study utilized both quantitative and qualitative research instruments to examine the effects of integrating Traditional Filipino Games (Laro ng Lahi) on the motivation, engagement, and conceptual understanding of Grade 7 learners in Science.

For the quantitative phase, a researcher-made 30-item multiple-choice pre-test and post-test were developed to measure students' conceptual understanding of the least learned competencies in Grade 7 Science during the first quarter, specifically on the particulate nature of matter, phase changes, and solutions: such as describe the Particle Model of Matter as "All matter is made up of tiny particles with each pure substance having its own kind of particles, describe the particles are constantly in motion, having

spaces between them, attracting each other, and moving faster as the temperature increases (or with the addition of heat), use diagrams and illustrations to describe the arrangement, spacing, and relative motion of the particles in each of the states (phases) of matter, explain the changes of state in terms of the particle arrangement and energy changes when: solid → liquid → vapor, and vapor → liquid → solid, identify the role of the solute and the solvent in a solution, and demonstrate how different factors affect the solubility of a solute in a given solvent, such as temperature and pressure. The test items were based on the Department of Education's MATATAG Curriculum Guide and Table of Specifications (TOS). To establish content validity, the instruments were evaluated by Science educators, a research adviser, and subject-matter specialists. Revisions were incorporated based on their comments and recommendations.

A pilot test was conducted among Grade 7 students who were not included in the study's actual respondents to determine the reliability and clarity of the test items. The pre-test and post-test were analyzed using Cronbach's alpha, which yielded a coefficient of 0.82, indicating high reliability. Item analysis was likewise conducted to determine the test items' difficulty and discrimination indices before the final administration.

Students' motivation and engagement levels were measured using an adapted version of Martin's Student Motivation and Engagement Scale (SMES). The adapted questionnaire assessed constructs related to autonomy, competence, relatedness, behavioral engagement, emotional engagement, and cognitive engagement using a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). To assess the level of motivation and engagement of the grade 7 learners in science before and after the intervention involving the integration of Traditional Filipino Games in Science instruction, the study utilized a Likert scale to rate different factors, such as autonomy, competence, relatedness, behavioral engagement, emotional engagement, and cognitive engagement. Table 1 presents the different Verbal Interpretations to the corresponding categorical response from the 5-point Likert scale for evaluation and scoring, or the learner's response.

Table 1. Likert Scale for Evaluation and Scoring

Likert Scale	Scoring Range	Categorical Response	Verbal Interpretation
5	4.21 – 5.00	Strongly Agree	Very High
4	3.41 – 4.20	Agree	High
3	2.61 – 3.40	Neutral	Moderate
2	1.81 – 2.60	Disagree	Low
1	1.00 – 1.80	Strongly Disagree	Very Low

The instrument underwent expert validation to ensure contextual appropriateness for Grade 7 Filipino learners. A pilot test was also conducted to establish internal consistency reliability, which obtained a Cronbach's alpha coefficient of 0.89, indicating very high reliability.

For the qualitative phase, data were gathered through Focus Group Discussions (FGDs) involving purposively selected students from the experimental class, specifically the Top 5 and Bottom 5 performers based on post-test results. A semi-structured interview guide was developed to elicit students' experiences, perceptions, and reflections regarding the integration of Traditional Filipino Games in Science instruction. The interview guide was reviewed by qualitative research experts to ensure clarity, alignment, and appropriateness of the questions.

The instruments were administered sequentially following the explanatory sequential mixed-methods design of the study. Quantitative data collection through pre-tests, post-tests, and survey questionnaires was conducted first, followed by the qualitative phase through FGDs to further explain and validate the quantitative findings. The gathered data were triangulated to provide a comprehensive understanding of the effectiveness of culturally responsive game-based learning in Grade 7 Science instruction.

Data Gathering Procedure

The data-gathering process of this study followed an explanatory sequential design, with quantitative data collected first, followed by the qualitative phase. The implementation lasted four weeks during the first quarter of the School Year 2025–2026 at San Pascual National High School, San Pascual, Masbate, Philippines, with one selected Grade 7 class serving as participants.

Phase 1: Quantitative Data Collection

At the onset of the intervention, the researcher administered a researcher-made pre-test to assess the students' initial understanding of selected Grade 7 Science competencies. Simultaneously, two validated Likert-scale survey questionnaires were distributed—one measuring student engagement and the other measuring motivation. These instruments established baseline data prior to the instructional intervention. After the pre-assessment, the class undergoes Science instruction incorporating Traditional Filipino Games (Laro ng Lahi) such as patintero, luksong tinik, and tumbang preso. The intervention was integrated into regular classroom sessions over a four-week period. Upon conclusion, a post-test identical in structure to the pre-test was administered to evaluate learning gains. Students were also asked to respond to the same motivation and engagement surveys to identify any significant shifts in affective responses after the intervention.

Phase 2: Qualitative Data Collection

Following the quantitative phase, the researcher conducted focus group discussions (FGDs) with a criterion-sampled subset of students from the same class. These discussions aimed to gather deeper insights into the students' perceptions, experiences, and reflections regarding the integration of traditional games into Science lessons. The FGD guide was semi-structured and aligned with the study's objectives.

Phase 3: Triangulation

After data collection, the researcher integrated findings from the pre- and post-tests, the survey, and the FGD. This triangulation process ensures validity, deepens the analysis, and offers a holistic understanding of the effects of game-based instruction. The themes emerging from qualitative data were compared and cross-referenced with quantitative trends to provide a comprehensive interpretation of the results.

Before data collection began, the researcher obtained approval from relevant school authorities and secured informed consent from the students and their guardians. Ethical standards, including voluntary participation, anonymity, and confidentiality, were strictly upheld throughout the study.

Data Analysis

Upon the researcher's completion of the data-gathering process, the data were arranged, tallied, and statistically analyzed to address the study's research questions, employing both descriptive and inferential statistics.

Quantitative

1. **Weighted Mean (*WM*)**. This was used to describe the (1) level of motivation of students in a science class before and after the intervention in terms of autonomy, competence, and relatedness, and the (2) level of engagement of students in a science class before and after the intervention in terms of behavioral engagement, emotional engagement, and cognitive engagement.

2. **Paired samples *t*-test**. This was used to determine the (1) difference between the motivation— Autonomy, Competence, and Relatedness—of students before and after the intervention; (2) difference between the engagement— Behavioral Engagement, Emotional Engagement, and Cognitive Engagement—of students before and after the intervention; and the (3) difference in the pre-test and post-test mean scores of students. This test was appropriate to use, since the study used a one-group pretest–posttest design in which the same set of participants was measured twice on the same continuous outcomes. The paired-samples t-test is recommended when comparing the mean scores of a single group measured at two different time points to test whether the mean difference is statistically different from zero (Talikan et al., 2024; Lin, 2024). The paired-samples t-test was conducted using IBM SPSS Statistics Version 31, a software program used by researchers across disciplines for the quantitative analysis of complex data.

Qualitative

The results from the FGDs were examined as per Braun and Clarke's (2006) Thematic Analysis. This was used to better explain the participants' experiences and perceptions regarding the inclusion of Traditional Filipino Games in Science teaching, and how these relate to the quantitative results.

There are six phases to this analysis. The first was that the researcher became familiar with the interviews by repeatedly reading them. The second was that the researcher wrote codes based on significant responses and statements regarding the students' motivation and engagement. The third required the researcher to identify possible themes from the provided responses and organize related responses into those themes. The fourth was the review of possible themes to ensure each was clear and related to the study's aims. The fifth was the identification and naming of themes based on supporting evidence, and the last was the integration of the themes with the quantitative results to describe the impact that Traditional Filipino Games have on students' motivation and engagement, as well as their conceptual understanding.

To achieve a higher level of assurance in the qualitative findings, the author cited participants' responses within the identified themes. Equal consideration was then given to the qualitative and quantitative results through triangulation. This provided greater confidence in the interpretation of the findings.

Chapter 4
RESULTS AND DISCUSSIONS

This chapter presents the study's results and provides a systematic discussion of the findings in light of the Statement of the Problem. The data obtained from the pre-test and post-test, survey questionnaires, and statistical analyses are organized, analyzed, and interpreted to determine the effect of integrating Traditional Filipino Games on the motivation, engagement, and conceptual understanding of Grade 7 learners in Science.

1. What is the level of motivation of students in a Science class before and after the intervention with respect to Autonomy, Competence, and Relatedness?

This section presents the results on the level of motivation of Grade 7 students in a Science class before and after the implementation of the intervention involving Traditional Filipino Games. Motivation was examined using the components of autonomy, competence, and relatedness, which are key constructs of Self-Determination Theory. Descriptive statistics, specifically weighted mean scores and their corresponding interpretations, were used to compare students' motivational levels before and after the inter-

vention. The succeeding subsections discuss the results for each motivational component in detail, highlighting changes attributed to the integration of game-based and culturally responsive learning activities.

1.1 Autonomy

Table 2 presents students' motivation levels regarding autonomy before and after the intervention through the integration of Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations across five autonomy-related indicators, highlighting changes in students' perceived freedom, choice, and self-expression in learning (see Table 2).

Table 2. Level of Motivation of Students in Terms of Autonomy Before and After the Intervention

Indicators	Before the Intervention	Interpretation	After the Intervention	Interpretation
I feel free to express my own ideas during Science lessons.	2.83	Moderate	4.65	Very High
I enjoy working on Science activities especially during games where I make decisions.	2.65	Moderate	4.70	Very High
I like doing Science tasks where I can be creative.	2.70	Moderate	4.73	Very High
I can choose how I learn Science best.	2.68	Moderate	4.73	Very High
I am more interested in Science when I choose how to do tasks.	2.65	Moderate	4.68	Very High
Composite *WM*	2.70	Moderate	4.70	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low).

Results showed that students demonstrated moderate autonomy motivation, with a composite weighted mean of 2.70. As for the systems, the item "I feel free to express my own ideas during Science lessons" had the highest weighted mean (WM = 2.83), demonstrating that students had a sufficient level of self-expression within the confines of a predictable, traditional classroom pattern. On the other hand, items concerning autonomy with respect to decision-making and choice in learning tasks, such as enjoyment of science activities during game tasks that involve decision-making and being more interested in tasks when the manner of doing it is left to the learner, produced comparatively lower weighted means (WM = 2.65). This distribution is consistent with the literature, indicating that before the intervention, students had little learner autonomy in their instruction, which is consistent with the literature indicating that teacher-centered instruction limits students' control and choice of their learning (Plass et al., 2015; Piaget, 1972).

Following the intervention, there is a broad-based, visible enhancement across all aspects of autonomy, as indicated by a weighted mean of 4.70, which qualifies all responses as "very high." Out of all autonomy indicators, 'creativity' and 'choice,' intricately laced in the statements "I like doing Science tasks where I can be creative" and "I can choose how I learn Science best," scored the highest weighted mean of 4.73. The remarkable progression identifies the educational atmosphere, through the inclusion of Traditional Filipino Games, as the most accessible learning environment in which students can exercise choice, creativity, and self-directed learning. The observations reflect Self-Determination Theory, which

identifies autonomy as an important source of intrinsic motivation when learners are offered choices and control over their learning (Deci & Ryan, 2017).

The results align with the principles of Game-Based Learning and constructivist theory – learners become more motivated when they participate in meaningful, experiential activities rather than receiving information passively (Plass et al., 2015; Bruner, 1966). The culturally familiar games, namely, patintero and tumbang preso, appear to have deepened students' ownership of their learning, enabling them to make decisions, articulate, and playfully create within a motivated social context. Capinding and Salazar (2023) reported the same result, wherein the incorporation of traditional Filipino games sustained learners' motivation and active participation, as the educational activities were culturally responsive and the learning environment was interactive.

The results in Table 2, on the other hand, indicate that incorporating Traditional Filipino Games positively affected students' autonomy-related motivation in Science. The students' psychological needs related to autonomy were sufficiently addressed, as the intervention provided opportunities to choose, create, and self-express. The result was an educational setting that was more responsive, energizing, and motivating, aligned with the theoretical constructs and previous studies in this work.

1.2 Competence

Table 3 presents students' motivation levels regarding competence before and after the intervention that integrated Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations of five competence-related indicators, reflecting students' perceived confidence, understanding, and sense of achievement in Science, as presented in Table 3.

Table 3. Level of Motivation of Students in Terms of Competence Before and After the Intervention

Indicators	Before the Intervention	Interpretation	After the Intervention	Interpretation
I feel confident in answering Science questions.	2.63	Moderate	4.63	Very High
I believe I can understand Science well.	2.38	Low	4.63	Very High
I understand what is taught in our science class.	2.73	Moderate	4.83	Very High
I do well in Science when I try hard.	2.65	Moderate	4.80	Very High
I feel proud when I succeed in Science activities.	2.70	Moderate	4.90	Very High
Composite *WM*	2.62	Moderate	4.76	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Prior to the intervention, the data suggest that students had a moderate level of motivational orientation toward competence, with a mean of 2.62. Of the indicators, "I understand what is taught in our science class" had the highest mean (WM = 2.73), showing that students had a moderate perception of their understanding of science lessons. In contrast, the indicator "I believe I can understand Science well" had a low mean (WM = 2.38), indicating that many students had little confidence in their overall ability to understand science concepts. This shows that a number of difficulties accompany the teaching of science

concepts in both lesson-based and 'traditional' approaches. This can result in students being taught in ways that limit their opportunities to actively demonstrate their understanding (Piaget, 1972; Bruner, 1966).

In all competence indicators concerning the intervention, there was a significant increase, with all indicators being very highly weighted, yielding a composite weighted average of 4.76. Most notably, the indicator "I feel proud when I succeed in Science activities" (WM = 4.90) was the weighted mean indicator; similarly, indicators concerning understanding lesson content and academic performance were also above average. Thus, these data reveal that the use of Traditional Filipino Games strongly enhanced students' competence by providing sufficient opportunities to build and master a concept, receive feedback, and succeed. Such was also found to be consistent with Self-Determination Theory was most applicable because of the perceived competence in the students due to mastery and success that they were able to accomplish with the given activities (Deci & Ryan, 2017).

The positive change in closely related motivational attributes reinforces the value of Game-Based Learning and experiential learning, suggesting that confidence and content mastery increase in learning environments that promote active engagement and problem-solving (Plass et al., 2015; Kolb, 2015). Students engaged both physically and cognitively with scientific concepts through culturally significant games, making abstract concepts more tangible and understandable. Using traditional Filipino games, Capinding and Salazar (2023) reported similar results, showing that students' confidence, understanding, and academic performance in Science improved significantly.

Students' motivation to use traditional Filipino games was most positively affected in the competence domain. Initiative enhancements improved competence, and with that, understanding and confidence come a sense of success, which fulfills the increased motivation in Science learning and the psychological need to be competent.

1.3 Relatedness

Table 4 presents students' motivation levels relatedness before and after the intervention through the integration of Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations across five indicators that describe students' sense of belonging, peer Support, and social interaction during Science learning activities, as presented in Table 4.

Table 4. Level of Motivation of Students in Terms of Relatedness Before and After the Intervention

Indicators	Before the Intervention	Interpretation	Before the Intervention	Interpretation
I feel connected with my classmates during Science group work.	2.60	Low	4.80	Very High
I enjoy sharing ideas with my classmates during Science games.	2.65	Moderate	4.85	Very High
I feel good working with my classmates in Science.	2.68	Moderate	4.75	Very High
I feel confident sharing ideas with my classmates during game-based lesson in Science.	2.80	Moderate	4.68	Very High

I feel supported by my classmates during Science activities.	2.73	Moderate	4.73	Very High
Composite *WM*	2.69	Moderate	4.76	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Prior to the intervention, the data showed that the students had an average level of motivation relatedness, as indicated by a composite weighted mean of 2.69. Among the indicators, "I feel connected with my classmates during Science group work" had the lowest weighted mean (WM = 2.60), which was classified as low, suggesting students had little social connection to one another during collaborative Science activities. Other indicators of enjoying sharing ideas and feeling supportive of classmates were classified as moderate, suggesting that peer interaction was not a prevalent focus in the traditional classroom. Such findings Support constructivist orientations that argue that learning settings devoid of intentional collaborative arrangements may curtail opportunities for genuine social interaction and collaborative knowledge building (Piaget, 1972; Bruner, 1966).

As shown in the results, the indicators improved after the intervention, as demonstrated by the weighted means in the very high range. Moreover, the composite weighted mean is equal to 4.76. The participant had the most positive response in the indicator "I enjoy sharing ideas with my classmates during Science games, (WM = 4.85). The participant followed this measure with feeling connected during group work and feeling supported by classmates. Based on these results, it is concluded that the Traditional Filipino Games Integration was effective in improving students' feelings of connectedness and belonging. The relational aspect, according to Self-Determination Theory, is satisfied when students experience a sense of connectedness, social Support, and companionship with peers, which enhances intrinsic motivation and is sustained over long periods of time (Deci & Ryan, 2017).

The results received further Support for the principles of Game-Based Learning and experiential learning, which stress that there are benefits in the collaboration, teamwork, and common problem-solving activity in an effective learning environment (Plass et al., 2015; Kolb, 2015). The use of Traditional Filipino Games in the study enhanced positive peer interactions in an environment that students are familiar with and comfortable in, as the games require teamwork, communication, and strategic planning. Similar results were also reported by Capinding and Salazar (2023), who stated that during Science lessons, the use of traditional Filipino games improved learners' socialization, collaboration, and motivation.

Overall, Table 4 shows that integrating Traditional Filipino Games positively affected students' motivation regarding connectedness. The intervention supported learners' psychological need for connectedness by fostering collaboration, peer Support, and social engagement, resulting in a more inclusive, engaging, and motivating environment for learning Science.

2. What is the level of engagement of students in a Science class before and after the intervention with respect to: Behavioral Engagement, Emotional Engagement, and Cognitive engagement?

This section presents results on student engagement in a Science class before and after the implementation of the intervention involving Traditional Filipino Games. Student engagement was examined across three dimensions—behavioral, emotional, and cognitive engagement—which collectively describe learners' observable participation, emotional involvement, and depth of cognitive processing during Science instruction. Descriptive statistics, particularly weighted mean scores and their corresponding interpretations, were used to compare engagement levels before and after the intervention. The succeeding

subsections discuss each dimension of engagement in detail to illustrate the changes attributed to the game-based, culturally responsive instructional approach.

2.1 Behavioral Engagement

Table 5 presents students' behavioral engagement levels before and after the intervention, which integrated Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations for five indicators describing students' observable participation, effort, attention, and task completion during Science learning activities, as presented in Table 5.

Table 5. Level of Behavioral Engagement of Students in Terms Before and After the Intervention

Indicators	Before the Intervention	Interpretation	After the Intervention	Interpretation
I actively participate during our Science class activities.	2.98	Moderate	4.50	Very High
I complete the tasks and activities assigned by my Science teacher on time.	2.75	Moderate	4.60	Very High
I pay attention and listen carefully during class discussions, especially during game-based lessons.	2.83	Moderate	4.75	Very High
I follow instructions properly during game-based Science lessons.	2.90	Moderate	4.65	Very High
I try my best to learn more even when Science lessons are hard.	2.85	Moderate	4.63	Very High
Composite *WM*	2.86	Moderate	4.63	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low).

Pre-intervention, the students' modicum of behavioral engagement had a composite weighted mean of 2.86. Within these indicators, the statement "I actively partake in the exercises during our Science class" had the highest weighted mean of 2.98. This indicates that, prior to the intervention, students had some level of participation in Science class activities. However, some indicators encompassing task completion and sustained effort, such as adherence to activity due dates and a valiant effort even with lesson difficulty, remained in the moderate mean range. These findings indicate that although students were mostly compliant and attentive, engagement was lackluster, characteristic of the traditional classroom setup, with its teacher-centered instruction and students playing a passive role in the entire learning process.

Following the intervention, all of the engagement behaviors have shown a significant increase, with all the means at a very high level of a composite weighted mean, WM, of 4.63. The highest weighted mean came from the statement, 'I pay attention and listen carefully during class discussions, most especially during the lessons with games (WM 4.75),' indicating that learners were more attentive during lessons that used games. The positive increase in scores for participation, instruction compliance, and persistence in learning indicated that the Traditional Filipino Games were effective in sustaining students' participation. This is consistent with the Game-Based Learning Theory, which states that structured activi-

ties with instant feedback and relevant tasks are the reasons students are actively engaged and demonstrate on-task behaviors (Plass and others, 2015).

Kolb's (2015) theories of experiential learning state that behavioral engagement increases when learners participate in hands-on, action-oriented activities. The increased levels of participation and effort after the intervention could be attributed to the fact that Traditional Filipino Games require movement and attention. Capiding and Salazar (2023) reported similar results when they used Traditional Filipino Games to teach science, noting the improvement of active participation and engagement in behavior during the lessons.

Table 5 reports the Extent to which integrating Traditional Filipino Games into the study's science lessons increased students' behavioral engagement. The results demonstrate that the intervention provided new learning opportunities and increased engagement in learning that had previously been passive and limited to the information-receiving stage, allowing for the delivery of science instruction in a more active and meaningful way.

2.2 Emotional Engagement

Table 6 presents students' levels of emotional engagement before and after the intervention through the integration of Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations across five indicators that describe students' interest, enjoyment, excitement, and emotional connection to Science learning activities, as presented in Table 6.

Table 6. Level of Emotional Engagement of Students Before and After the Intervention

Indicators	Before the Intervention	Interpretation	After the Intervention	Interpretation
I enjoy learning Science, especially when games are part of the lesson.	2.80	Moderate	4.75	Very High
I feel excited to attend Science class.	2.93	Moderate	4.68	Very High
I look forward to activities involving Traditional Filipino Games in Science.	2.90	Moderate	4.68	Very High
I feel happy when I learn science better through games.	2.85	Moderate	4.78	Very High
I feel more connected to my classmates during interactive Science activities.	2.73	Moderate	4.60	Very High
Composite *WM*	2.84	Moderate	4.70	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

The prior results indicated that students were moderately emotionally engaged, with a composite weighted mean of 2.84. Excitement about attending Science class, which was the most compartmentally weighted, with a mean of 2.93, indicates moderate anticipation of Science classes before the intervention. However, the moderate connection between enjoyment of Science lessons and gaming, feeling more connected in interactive activities, and the enjoyment of Science lessons remains. Completing this engagement indicates a moderate absence of negative engagement towards overall Science lessons, reflecting the framework that traditional structures have a deficit in augmenting positive engagement in Science through enthusiasm and overall enjoyment of lessons. This relies heavily on the fact that previ-

ous issues persist because Science instruction remains primarily focused on a limited scope of information, and, as a result, restrictive engagement persists across overall teaching within the Science framework.

After the intervention, there was a significant increase in all indicators of emotional engagement, with all weighted means in the very high category, and a composite weighted mean of 4.70. The greatest weighted mean was noted on the item 'I feel happy when I learn science better through games' (WM = 4.78). This shows that students had positive feelings associated with learning when engaging in game-based activities. The consistently high post-test scores also indicate that the students appreciated the incorporation of Traditional Filipino Games into Science lessons. They found the lessons enjoyable, refreshing, and emotionally engaging. This aligns with the Game-Based Learning theory, which states that positive feelings, such as enjoyment and excitement, increase learners' willingness and commitment to participate in learning activities (Plass et al., 2015).

These positive emotional responses from students, attributed to the culturally familiar nature of Traditional Filipino games, helped improve emotional engagement, as supported by experiential learning and constructivist perspectives. These theories hold that learning becomes more profound when emotions are involved in concrete, interactive stimuli (Kolb, 2015; Bruner, 1966). This aligns with the results of Capinding and Salazar (2023), who noted that traditional Filipino games can increase learners' enjoyment, interest, and emotional engagement in Science lessons.

In general, the results in Table 6 show that incorporating Traditional Filipino Games increased students' emotional involvement in Science. By cultivating enjoyment and excitement and fostering positive emotional ties to learning, the intervention enhanced students' motivational and emotional comfort in the classroom, thereby creating the desired atmosphere for deep involvement and learning.

2.3 Cognitive engagement

Table 7 presents students' cognitive engagement levels before and after the intervention through the integration of Traditional Filipino Games into Science instruction. The table compares the weighted mean scores and corresponding interpretations across five indicators that describe students' use of learning strategies, depth of thinking, focus, and active contribution during Science learning activities, as presented in Table 7.

Table 7. Level of Cognitive Engagement of Students Before and After the Intervention

Indicators	Before the Intervention	Interpretation	After the Intervention	Interpretation
I ask questions to understand difficult Science topics.	2.78	Moderate	4.60	Very High
I think deeply about how Science lessons apply to real life.	2.93	Moderate	4.65	Very High
I try different ways like drawing, rereading, or asking questions to understand new Science topics.	2.78	Moderate	4.55	Very High
I stay focused on solving problems during Science activities.	2.90	Moderate	4.70	Very High
I contribute ideas or answers when asked in Science class.	2.90	Moderate	4.68	Very High

Composite *WM*	2.86	Moderate	4.64	Very High

Note. Scoring Range: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderate); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Before the intervention, the composite weighted mean score review data shown is 2.86, indicating that students' cognitive engagement is at an average level. One of the statements, "I think deeply about how Science lessons apply to real life," has a weighted mean of 2.93, the highest among the statements, indicating that the students engaged in moderately reflective thinking; however, the indicators that pertained to the use of questioning, strategies, and sustained attention are also at moderate levels. This shows that higher-order thinking, including inquiry, metacognitive strategies, and problem-solving, is not strongly emphasized in the traditional instructional approach. This result aligns with the constructivist stance that, in traditional passive learning environments, students are not afforded opportunities to actively construct and use knowledge (Piaget, 1972; Bruner, 1966).

There is clear evidence and substantial improvement surrounding all cognitive engagement indicators from the intervention, all of which have weighted means in the very high range, averaging a composite weighted mean of 4.64. The mean of 4.70 was the highest for the statement "I stay focused on solving problems during Science activities." It was then closely followed by the contribution of ideas and the application of concepts to real-world situations. Overall, the results indicate that the inclusion of Traditional Filipino Games helped learners engage in higher-order thinking, use varied strategies, and sustain cognitive concentration during Science activities. Meaningful challenges and problem-solving tasks that come with immediate feedback are said to enhance deeper cognitive processing and engagement (Plass et al., 2015), which is the premise of Game-Based Learning theory.

The rise in cognitive engagement also affirms experiential learning theory, which asserts that learners gain deeper insights through their involvement in problem-solving and application, as well as through reflective processes in which they apply concepts to real-life situations (Kolb, 2015). The authentic contexts that Traditional Filipino Games offered called for reflective, strategic thinking and decision-making, which enhanced engagement at higher-order thinking levels. This aligns with what Capinding and Salazar (2023) found, namely that traditional Filipino games enhanced students' critical thinking, conceptual understanding, and cognitive engagement in Science lessons.

The results in Table 7 show that Traditional Filipino Games integrated into the curriculum helped students experience greater cognitive engagement in Science. The integration deepened students' cognitive engagement, enabling them to learn Science more effectively and more lasting.

3. Is there a significant difference between the motivation of students before and after the intervention?

This section presents the results of the inferential statistical analysis conducted to determine whether there was a significant difference in students' motivation in a Science class before and after the implementation of the intervention involving Traditional Filipino Games. A paired-samples t-test was employed to compare pre-intervention and post-intervention motivation scores across the components of autonomy, competence, and relatedness. The results of this analysis provide empirical evidence on the effectiveness of the intervention in enhancing students' motivational outcomes.

Table 8 presents the results of the paired-samples t-test conducted to determine whether there is a significant difference in students' motivation in a Science class before and after the intervention involving the

integration of Traditional Filipino Games. The table summarizes the mean differences, standard deviations, t-values, degrees of freedom, p-values, and decisions for the three motivation components—autonomy, competence, and relatedness—thereby presenting the statistical comparison of pre-intervention and post-intervention motivation levels, as shown in Table 8.

Table 8. Difference in the Motivation of Students in a Science Class Before and After the Intervention

Paired Variable	Differences		*t*	df	*p*-value	Decision	Interpretation
	Mean	SD					
(Pre-) Autonomy – (Post-) Autonomy	-1.995	.535	-23.588	39	< .001	Reject H_0	Significant
Pre-) Competence – (Post-) Competence	-2.140	.618	-21.900	39	< .001	Reject H_0	Significant
Pre-) Relatedness – (Post-) Relatedness	-2.070	.602	-21.755	39	< .001	Reject H_0	Significant

Note. Difference is significant at $p < .05$.

The findings indicate a statistically significant difference in students' autonomy pre- and post-intervention, with a mean difference of −1.995 $t(39) = -23.588$, $p < .001$). The negative mean difference indicates that students' autonomy levels increased after the intervention, surpassing pre-intervention levels. Thus, it can be posited that the Traditional Filipino Games were successful in improving the students' autonomy in terms of choice, self-expression, and control over the learning process. This result aligns with Self-Determination Theory, which holds that learning situations that afford meaningful choices and self-direction promote intrinsic motivation (Deci & Ryan, 2017). The result also aligns with the tenets of constructivism, which view the learner as an active participant in knowledge acquisition when autonomy-supportive learning conditions are present (Bruner, 1966; Piaget, 1972).

The difference in the students' competence also indicated a statistically significant difference. Most likely due to the increase in competence after the intervention and the greater confidence students developed in their ability to understand and perform Science tasks. Competence, as defined by Deci and Ryan (2017), strengthens when the learner views themselves as able to succeed. This ability to succeed is a hallmark of the Game-Based Learning environments defined by Plass et al. (2015.

There was indeed a meaningful difference in students' relatedness, with a mean difference of −2.070 ($t(39) = -21.755$, $p < .001$). After the intervention, students reported greater social connection, Support, and engagement with their classmates. Traditional Filipino Games require a fair amount of social interaction as they necessitate cooperation, communication, teamwork, and collective peer Support. This connection aligns with the relatedness component of Self-Determination Theory, where a rise in learners' motivation results from feeling a sense of community and, thus, creating positive social ties in the working environment (Deci & Ryan, 2017). Capinding and Salazar (2023) also reported the same social bond and collaborative learning effect promoted by traditional games among students.

The findings in Table 8 showed that incorporating Traditional Filipino Games in the classroom has a meaningful positive effect on students' motivation on all three components. This confirmed the rejection of the null hypotheses, consistent with the provided motivational components. The findings on the null hypotheses certainly illuminate the positive impact the intervention has had on student motivation in

Science, thereby confirming the theoretical underpinning and the related research previously presented in the current work.

4. Is there a significant difference between the engagement of students before and after the intervention?

This section presents the results of the inferential analysis conducted to determine whether there was a significant difference in students' engagement in a Science class before and after the implementation of the intervention involving Traditional Filipino Games. A paired-samples t-test was employed to compare pre- and post-intervention engagement levels across the behavioral, emotional, and cognitive dimensions. The results provide statistical evidence of the intervention's effectiveness in enhancing students' overall engagement in Science instruction.

Table 9 presents the results of the paired-samples t-test conducted to determine whether there is a significant difference in students' engagement in a Science class before and after the intervention through the integration of Traditional Filipino Games. The table summarizes the mean differences, standard deviations, t-values, degrees of freedom, p-values, and statistical decisions for behavioral, emotional, and cognitive engagement, thereby providing a comparative analysis of students' engagement levels before and after the intervention, as shown in Table 9.

Table 9. Difference in the Motivation of Students in a Science Class Before and After the Intervention

Paired Variable	Differences		*t*	df	*p*-value	Decision	Interpretation
	Mean	SD					
(Pre-) Behavioral Engagement – (Post-) Behavioral Engagement	-1.739	.423	-25.641	38	< .001	Reject H_0	Significant
Pre-) Emotional Engagement – (Post-) Emotional Engagement	-1.821	.352	-32.315	38	< .001	Reject H_0	Significant
Pre-) Cognitive Engagement – (Post-) Cognitive Engagement	-1.759	.403	-27.251	38	< .001	Reject H_0	Significant

Note. Difference is significant at $p < .05$.

The study's findings show big statistical differences in student behavioral engagement before and after the intervention, with a mean difference of −1.739 $t(38) = -25.641$, $p < .001$). With a negative mean difference, it can be said with statistical confidence that the students' behavioral engagement increased after the intervention. This indicates that the participants were able to integrate Traditional Filipino Games in a way that fostered engagement and increased behavioral indicators of engagement, including participation, attention, and task perseverance in Science activities. This finding also complements the Game-Based Learning theory, which states that learners are more likely to be engaged in learning tasks when activities are interactive and have a specific end goal. This also aligned with the principles of experiential learning, which state that learning is more effective when students are mentally and physically active in the experience provided (Kolb, 2015).

In the same way, the difference between emotional engagement also showed a positive change, with a mean difference of −1.821, $t(38) = -32.315$, $p < .001$. The result suggests that the students had a greater sense of enjoyment, excitement, and positive feelings towards Science classes after the intervention. These findings also indicate a higher level of emotional engagement due to Traditional Filipino Games.

More satisfactory results and sustained student focus and participation are expected in Learning through the Games methods, especially given the positive feelings of enjoyment and excitement (Plass et al., 2015). The positive emotions engagement also supports the findings of these theories on the depth of emotional and meaningful experiences in the process of learning (Bruner, 1966; Piaget, 1972).

This research showed that students' cognitive engagement showed a mean difference of -1.759 t(38) = -27.251, p < .001). The students used more diverse learning strategies when planning activities than in science classes. The extra focus and thought put into the learning activities used were greater than in science classes. This is due to the increased cognitive demands and the nature of traditional Filipino games, which met those demands. The increased focus on Cuban games in science classes resulted in their use within the framework of Kolb's theory of experiential learning. Capinding and Salazar (2023) found the same results in their research, in which cognitive engagement and critical thinking (in science instruction) were enhanced by traditional Filipino games.

As evident from Table 9, incorporating Traditional Filipino games provided a pathway to increase students' engagement across all behavioral, emotional, and cognitive levels. The null hypothesis was not accepted in all three engagement cases, strongly indicating that Traditional Filipino games affect students' pedagogical and science educational engagement. The results of this research were further consolidated by other theories and studies on educational engagement.

5. What are the students' mean pre-test and post-test scores before and after the intervention?

This section presents the descriptive analysis of students' academic performance in Science before and after the implementation of the intervention involving Traditional Filipino Games. Students' pre-test and post-test scores were analyzed to determine changes in mean performance and score distribution following the game-based learning approach. Descriptive statistics, including mean scores, minimum and maximum values, and standard deviations, were used to provide an overview of students' conceptual understanding prior to and after the intervention.

Table 10 presents the descriptive statistics of students' pre-test and post-test scores before and after the intervention, which integrated Traditional Filipino Games into Science instruction. The table summarizes the number of participants, minimum and maximum scores, mean scores, and standard deviations, providing an overview of students' academic performance before and after the game-based learning intervention (see Table 10).

Table 10. Pre-test and Post-test Scores of the Students Before and After the Intervention

Variable	*N*	Min	Max	Mean	Std Dev.
Pre-test Score	40	5	18	11.300	2.564
Post-test Score	40	13	29	24.550	3.273

Before using this intervention, the learners' pre-test average score was 11.30, with scores ranging from 5 to 18, indicating limited understanding of the Science lesson content before the Traditional Filipino Games exposure. The standard deviation of 2.564 indicates that some learners lacked knowledge of the Science lessons' content, while others had varying knowledge and understanding, resulting in a moderate spread of scores. This result shows that the learners entered the class with different prior knowledge and understanding, which guided them along different pathways when acquiring new knowledge, and this aligned with constructivist theory (Piaget, 1972; Bruner, 1966). This theory indicates that the learners

arrive in class with some knowledge and understanding, and this was the case with the learners. The average test score indicates that learners' knowledge and understanding of science were very low, suggesting that a traditional teaching approach is ineffective.

Analysis of the post-test results indicated that the intervention resulted in a mean score of 24.55, with a range of 13-29. The standard deviation was 3.273, reflecting the potential dispersion in the post-test results. Students' engagement with the game activities and the level of benefit from the game/activities consists of the detainee moves game. The mean value of students' scores suggests that the level of games and activities provides students with concepts that Support the rich integration of movement. The results Support the game-based learning theory, which emphasizes activity engagement and movement. (Plass, 2015)

The intervention had a positive overall impact on students' science performance; Table 10 shows their post-intervention performance. The mean positive post-test score aligns with the scientific premise of experiential learning, which supports active engagement in learning through real-life situations, and the reflection provides evidence that the game and activities used were beneficial for instructing students' science learning.

6. Is there a significant difference in the pre-test and post-test mean scores of students?

This section presents the results of the inferential statistical analysis conducted to determine whether there was a significant difference between students' pre-test and post-test mean scores in Science following the implementation of the intervention involving Traditional Filipino Games. A paired-samples t-test was employed to compare students' academic performance before and after the intervention. The results provide statistical evidence on the effectiveness of the game-based, culturally responsive instructional approach in improving students' conceptual understanding in Science.

Table 11 presents the results of the paired-samples t-test conducted to determine whether there is a significant difference in students' test scores before and after the intervention integrating Traditional Filipino Games into Science instruction. The table summarizes the mean difference, standard deviation, t-value, degrees of freedom, p-value, and statistical decision, thereby presenting the comparison of students' academic performance before and after the intervention, as shown in Table 11.

Table 11. Difference in the Test Score of Students Before and After the Intervention

Paired Variable	Differences		*t*	df	*p*-value	Decision	Interpretation
	Mean	SD					
Pre-test Score – Post-test Score	-13.250	3.760	-22.285	39	< .001	Reject H_0	Significant

Note. Difference is significant at $p < .05$.

The results demonstrate a practical and statistically significant difference between the first and last assessments of the learners (mean gap = −13.250, $t(39) = -22.285$, $p < .001$). Since the mean difference is negative, it indicates that the students' scores after the intervention were considerably higher than before. The difference indicates that the inclusion of Traditional Filipino Games had a positive impact on students' understanding of the Science lessons. This supports the constructivist theory's idea that learners can gain a better understanding of the material if they actively engage with it through a constructiv

ist, contextual approach, rather than passively receiving it (Piaget, 1972; Bruner, 1966).

The principles of Game-Based Learning and experiential learning, which postulate that outcomes of learning are enhanced if students are actively involved in problem-solving and are able to interact and apply the ideas in real-life situations (Plass et al., 2015; Kolb, 2015), are demonstrated in the enhancement of the students' learning outcomes. Traditional Filipino Games actively involved learners in hands-on experiences applying some scientific ideas, keeping them cognitively and emotionally engaged. This was also observed by Capinding and Salazar (2023), who reported improved performance and understanding of science concepts following the introduction of Traditional Filipino Games to learners.

It is clear from Table 11 that integrating Traditional Filipino Games has, in fact, improved students' scores. Rejection of the null hypothesis indicates that students' academic scores improved, demonstrating that the intervention is not only effective but that game-based learning and culturally relevant pedagogy are impactful. This is particularly true in the area of teaching and learning in Science.

7. How do the participants perceive the effectiveness of the integration of Traditional Filipino Games in Science education in enhancing engagement, motivation, and conceptual understanding?

To complement the study's quantitative findings, a Focus Group Discussion (FGD) was conducted with selected learners to capture their lived experiences during the implementation of game-based learning using Traditional Filipino Games. The participants consisted of the top five and bottom five performers based on the post-assessment results. The FGD aimed to provide deeper insights into how Traditional Filipino Games influenced learners' motivation, engagement, and conceptual understanding in Science.

Audio-recorded responses were transcribed verbatim and analyzed thematically. The analysis yielded three major themes aligned with the study's variables: Motivation, Engagement, and Conceptual Understanding.

Theme 1: Learners' Motivation in Game-Based Science Learning

Integrating Traditional Filipino Games into Science instruction positively affected learners' motivation to participate and engage in lessons. Focus Group Discussion showed that learners perceived their experiences with lessons incorporating games as enjoyable and energizing, rather than their common perception of these lessons as oppressive and academically challenging. Some of them were of the view that Science lessons were boring, tiring, and extremely difficult, especially traditional ones. However, the positivity of their accounts shifted when instructions were incorporated into the games, indicating that the games made it easier to endure the lessons.

Discussions motivated learners to participate, especially through integration. They felt the urge to participate and complete activities in the lessons, as noted by the learner who described the activities with words: "mas ginaganahan po kami mag-aral at makinig." Overall, the testimonies indicate that integrating games transformed the Science lessons, making them activities that students looked forward to rather than shunned.

All learners also gained positive reinforcement from the confidence-building that the gaming activities provided. Participants expressed pride in answering questions correctly, supporting their team, and helping their group members during the game. Participants claimed that the game activities instilled confidence in learners by helping them better understand the concepts, thereby increasing their willingness to participate. Statements such as "I feel confident" and "nakakapagparticipate po ako doon sa laro pati sa science activities" indicate that the activities during the game provided positive reinforcement to learners, leading to increased confidence in the subject.

Another factor that greatly contributed to learners' motivation was interaction with their peers. The game activities prompted teamwork, cooperative task accomplishment, and collaboration. This collaboration and communication made the activities more enjoyable and less threatening. The game activities made the tasks fun and less intimidating. Participants reported that the activities reduced their pressure and made them feel comfortable, along with the happiness that came from being together for the learning. This was mentioned by a student participant, who said that group activities were enjoyable because "ma-saya po gumawa ng activity" and that they felt more collaboration with peers.

The Filipino Traditional Games were forms of Cultural Familiarity that also served as motivation for the learners, as these were games they were already familiar with in the culture of the games, and activities they had already experienced growing up. The activities in the games elicited nostalgic emotions. The learners said they felt like they had gone back to their childhood. This created a conducive learning environment. Nostalgia reduced their anxiety, and participation was then encouraged, as the learners felt confident enough to take part in the activities. The activities were already known to the learners.

Participants in the Focus Group were motivated to learn Science through Traditional Filipino Games. A unique combination of fun, confidence, peer interaction, and culturally relevant games created an environment where learners could collaborate, engage, and be interested and motivated in comprehending Science content. The motivation for learning Science was the culturally relevant games. The Focus Group Discussion made the improvement in educational engagement and learning outcomes visible in the study's results.

Theme 2: Learners' Engagement in Science Learning through Traditional Filipino Games

The Focus Group Discussion findings show that incorporating Traditional Filipino Games into Science teaching improved learners' engagement in the learning process. Learners reported greater involvement, attention, and participation when lessons incorporated games than when lessons were taught in the traditional way. The games motivated learners to become active participants in the learning process rather than passive learners.

Learners were more focused on the lesson when they reported that the activities demanded their full participation, both bodily and mentally. Many participants explained that their willingness to actively listen to instructions, adhere to the rules, and participate in group activities increased because the games required them to work as a team. One learner mentioned that the activities motivated them to become more involved because of the statement, "mas ginaganahan po kami mag-aral at makinig," indicating that engagement in the lesson extended beyond gameplay to the lesson discussion and the activities that followed to process the game.

Many learners' accounts showcase how emotions such as happiness, excitement, and enjoyment revealed emotional involvement on multiple levels. Participants described the games they won, the points they scored, and the tasks they completed as happy and enjoyable. They were also excited and challenged by the games. The learners reported feeling enthusiastic after completing the games. Learners kept describing the excitement and enjoyment as the motivators that kept them engaged, especially as they faced challenges during some games. Phrases such as "super happy po kapag nananalo sa games", "excited po", and "enjoy po" exemplify the positive emotions that kept the learners engaged in the lesson.

Even nervousness and challenges posed by the games were not deemed as hindrances by the learners. The challenges were considered part of the learning, and they were engaged with the games. The learners described how they were encouraged to keep trying and prompted to develop new strategies, espe-

cially when the games became more difficult. The learners described the challenge as something that made them feel "na-cha-challenge," which kept them focused on the lesson and thinking about the objectives.

The participants said engagement increased through collaborative experiences with one another. Most learners said the games required communication, sharing ideas, and teamwork. Since all the learners were engaged in the same activities, they found it easy to participate and share their ideas. Also, they felt that participation was more meaningful and everyone was included when they helped each other learn the mechanics of the game and the science concepts. One of the learners said that the group was engaged in work when they were “sharing ng thoughts kung paano mas mapapabilis at makaka-gain ng maraming points” before they said the game and work were completed.

The focus group discussions identified that learners were more engaged in the game's reflection activities and Q&A sessions when they were completed. A number of learners stated that they were more confident in responding to the questions, which they attributed to the games. They said that because they could easily recall their experiences from the game. It motivated them to stay engaged with the lesson when they were able to answer questions. One of the learners said they felt proud to answer the questions because it was something they learned from the game linked to the lesson, and they were very proud of it.

In total, the data from the Focus Group Discussion narrating accounts suggest that Traditional Filipino Games have established a highly engaging and fun learning environment in which the respondents actively participated. Additionally, the respondents felt a positive emotional connection to the Science lessons and had a high level of interest in Science. Certainly, positive emotional connection and interest in Science lessons, and high, sustained interest in Science. The positive correlation between focus and course completion is evident in a diversified learning environment, especially in a meaningful, focused learning experience. These findings were used to substantiate the level of engagement in learning within the study and to support the use of game-based learning.

Theme 3: Learners’ Conceptual Understanding of Science through Traditional Filipino Games

Focus Group Discussion (FGD) findings show that integrating Traditional Filipino Games into the Grade 7 first-quarter Science lessons helped learners better understand the subject, particularly abstract and microscopic concepts. Learners articulated that the games helped them visualize and experience scientific concepts that were previously difficult to understand using traditional instruction. The movement, interaction, and structured gameplay transformed abstract concepts into concrete learning experiences that enabled learners to gain clarity and understand meaningfully.

Participants described the activities as modeling different scientific processes, including particle motion, state-of-matter changes, and changes in kinetic energy. Other concepts that learners found easy to understand included solids, liquids, gases, phase changes, solute and solvent, mixtures and pure substances, and particle movement. One learner noted that understanding particle movement did not involve imagining a microscope, as physical activities during the game illustrated the processes. This shows that embodied and experiential learning helped learners better understand the abstract ideas in Science.

Using the games, learners provided detailed examples that demonstrated their understanding of the science concepts. For example, explain how Luksong Tinik increased kinetic energy and energy transfer through the jumping and also the gameplay actions. Learners noted differences in movement and spacing, leading them to use Patintero to explain the arrangement and movement of particles and the differ-

ent states of matter. These were noted with learners' roles. These explanations demonstrate active meaning-making aligned with constructivist learning principles.

Furthermore, learners said that using games helped them connect the lessons to their experiences, which, in turn, helped them remember and recall science concepts more easily. Many learners noted the lessons were more memorable because they were associated with \"happy moments\" which shows the effect of emotions on learning. Also, learners transferred their learning to real-life situations. They described the concepts of science as they heated and observed the water, they froze and melted, and also identified mixtures and pure substances in their environment.

Confidence in articulating and responding to Science-related questions grew after the intervention. During the post-game debrief and in class discussions, learners pointed to particular game moments to justify their explanations. Anecdotes like "nalaman ko po 'yun sa laro na konektado po sa lesson" show how game experiences created cognitive scaffolding to bolster understanding and confidence.

These observations strongly correlate with the study's quantitative findings. Prior to the intervention, students' average pre-test score (see Table 10) was 11.30, indicating a low level of understanding. After incorporating Traditional Filipino Games, this figure improved remarkably, with a mean post-test score of 24.55. In addition, the results of the paired-samples t-test in Table 10 showed a notable difference between pre- and post-test scores, $t(39) = -22.285$, $p < .001$, indicating that students' understanding of the concept improved. The qualitative data, in relation to the quantitative results, show that Traditional Filipino Games helped Grade 7 learners better understand, retain, apply, and gain confidence in Science concepts.

Table 12. Joint Display Table: Integration of Quantitative and Qualitative Findings on Conceptual Understanding

Quantitative Findings	Qualitative Findings (Verbatim)	Theme	Meta-Inference
Post-test scores were significantly higher than pre-test scores, indicating improved conceptual understanding after the intervention.	"Mas naiintindihan ko po yung lesson kasi nagagawa namin siya habang naglalaro."	Improved Conceptual Understanding Through Experiential Learning	Learners developed a deeper understanding of science concepts because they experienced them through gameplay rather than passive instruction.
Students demonstrated higher mastery of concepts related to matter, phase changes, and solutions in the post-test.	"Dati nahihirapan akong intindihin yung particles, pero dahil sa laro mas naging malinaw."	Concept Clarity Through Visualization	Traditional Filipino Games helped learners visualize abstract scientific concepts, making them easier to understand.
The increase in post-test performance suggests improved retention of scientific concepts.	"Mas natatandaan ko po yung lesson kapag connected sa laro."	Retention of Learning	Meaningful and contextualized learning experiences enhanced students' ability to remember scientific concepts.
Significant gains in conceptual understanding	"Mas active po kami gumalaw at mag-isip	Higher Cognitive Engagement	Active participation during game-based activities en-

were observed after the intervention.	habang may activity."		couraged deeper cognitive processing of science concepts.
Improved post-test scores indicate greater confidence in understanding and applying scientific knowledge.	"Nagkaroon ako ng confidence sumagot pagkatapos ng activity."	Increased Learner Confidence	Enhanced confidence encouraged learners to participate more actively and demonstrate their understanding.
Students exhibited higher levels of engagement and motivation during the intervention period.	"Mas gusto kong sumali sa class kasi mas masaya at hindi nakaka-bore."	Enhanced Student Engagement	Increased engagement contributed to a more positive learning environment that supported conceptual learning.

The integrated analysis of quantitative and qualitative findings confirms that incorporating Traditional Filipino Games had a significant and positive effect on learners' conceptual understanding of Science. The substantial increase in post-test scores and the statistically significant difference between pre-test and post-test results are supported by learners' accounts of improved visualization, meaningful learning, increased confidence, retention, and the real-life application of concepts. The convergence of findings demonstrates that culture-based, game-based learning is an effective pedagogical approach for teaching abstract Science concepts to Grade 7 learners.

8. Based on the findings of the study, what output may be proposed?

Taking into account the remarkable positive changes in students' motivation (autonomy, competence, and relatedness), engagement (behavioral, emotional, and cognitive), and conceptual understanding following the incorporation of Traditional Filipino Games, the research recommends a Gamified Science Instructional Guide (Lesson Log/Plan) utilizing Traditional Filipino Games for Grade 7 Science.

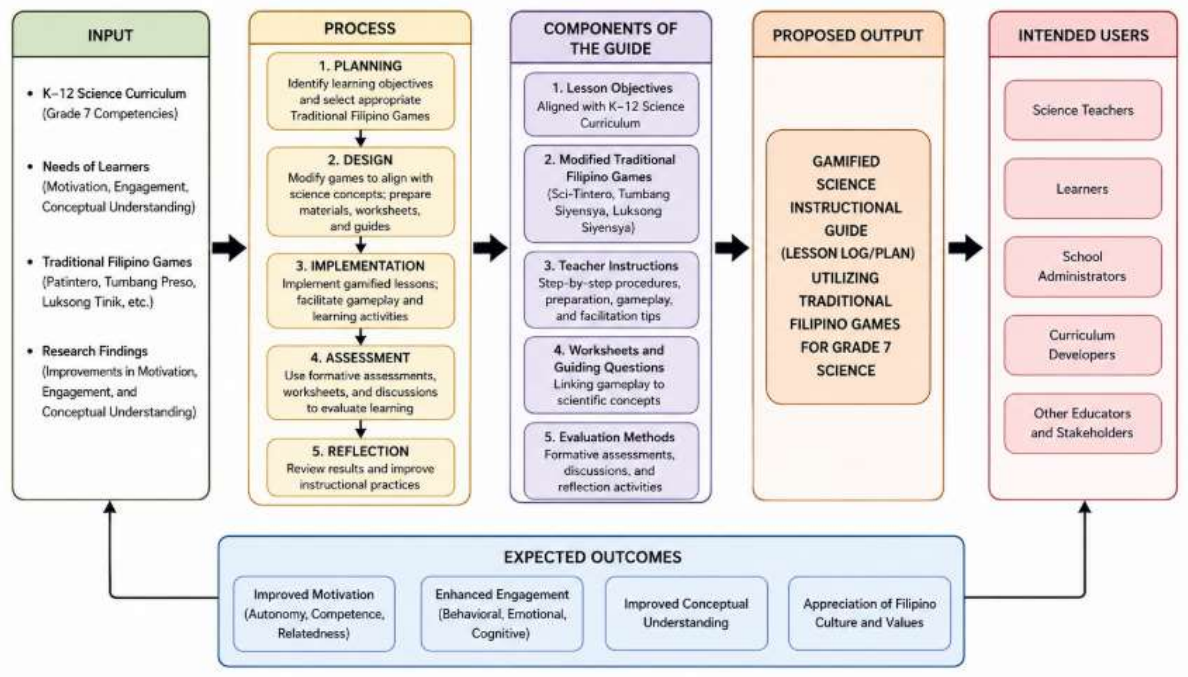
The proposed outcome is an instructional material developed by the researcher that aims to assist Science teachers, step by step, in integrating Traditional Filipino Games into their teaching practice. The instructional guide comprises detailed lesson logs/plans, worksheets, modified game rules, and evaluation methods that align with the Grade 7 Science curriculum's competencies, specifically those related to the particulate nature of matter, phases of matter, and solutions.

The instructional guide (Gamified Lesson Log/Plan) is constructed with the following components:

1. Lesson Objectives that are consistent with the K–12 Science curriculum competencies and goals.
2. Adaptations of Traditional Filipino Games like Sci-tintero, Tumbang Siyensya, and Luksong Siyensya, which are modified forms of Patintero, Tumbang Preso, and Luksong Tinik that aim to target and reinforce Science concepts.
3. Detailed procedural instructions for teachers on how to implement the games in their teaching practice, including preparation, gameplay mechanisms, and facilitation tips.
4. Game worksheets and guiding questions that support students in linking their gameplay experience with scientific concepts.
5. Evaluation techniques that include discussions and formative assessments of concepts and student engagement.

6. The purpose of the instructional guide (Gamified Lesson Log/Plan) is to provide a hands-on and culturally relevant teaching resource that facilitates active participation, collaboration, and higher-order thinking in Science. The resources integrate culturally familiar games to motivate, engage, and instill appreciation for the Filipino culture.

Figure 2. Proposed Culture-Based Gamified Science Instructional Guide



Chapter 5
SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Chapter 5 presents the summary of findings, conclusions, and recommendations drawn from the study on the effect of integrating Traditional Filipino Games into Science instruction. This chapter synthesizes the key findings, formulates conclusions in line with the research objectives, and provides practical recommendations for teachers, school administrators, and future researchers.

Summary

1. Students' motivation level in Science before the intervention was moderate across autonomy, competence, and relatedness. After integrating Traditional Filipino Games, motivation increased to a very high level.
2. Students' engagement level before the intervention was moderate across behavioral, emotional, and cognitive domains. After the intervention, engagement improved to a very high level.
3. There was a statistically significant difference in students' motivation before and after the intervention, indicating that the integration of Traditional Filipino Games positively influenced students' motivation in Science.
4. There was a statistically significant difference in the students' engagement level before and after the intervention, indicating that the use of Traditional Filipino Games enhanced students' participation and involvement in Science lessons.
5. The students' post-test mean scores were higher than their pre-test mean scores, indicating improvement in conceptual understanding after the intervention.

6. There was a statistically significant difference between the pre-test and post-test scores of the students, suggesting that the intervention improved academic performance in Science.
7. Based on the Focus Group Discussion (FGD), students perceived the integration of Traditional Filipino Games as enjoyable, interactive, culturally relevant, and helpful in improving their understanding and retention of Science concepts.
8. Based on the study's findings, a culturally responsive game-based instructional guide (Lesson Log/Plan) integrating Traditional Filipino Games was proposed to enhance motivation, engagement, and conceptual understanding in Grade 7 Science instruction.

Conclusion

1. The integration of Traditional Filipino Games increased Grade 7 students' motivation in Science in terms of autonomy, competence, and relatedness.
2. The use of Traditional Filipino Games enhanced students' behavioral, emotional, and cognitive engagement during Science instruction.
3. Traditional Filipino Games significantly influenced students' motivation, making learners more interested, confident, and willing to participate in Science activities.
4. The intervention significantly improved student engagement by promoting active participation, collaboration, sustained attention, and positive classroom interaction.
5. Students demonstrated higher post-test scores after the intervention, indicating improved conceptual understanding of Grade 7 Science concepts.
6. The significant difference between the pre-test and post-test scores confirms that Traditional Filipino Games contributed positively to students' academic performance in Science.
7. Students perceived the integration of Traditional Filipino Games as enjoyable, interactive, culturally relevant, and effective in helping them understand and retain Science concepts.
8. Study shows that the proposed Culture-Based Game-Based Learning Instructional Guide (Gamified Lesson Log/Plan) is a relevant and effective instructional resource that may support teachers in implementing culturally responsive and engaging Science instruction for Grade 7 learners.

Recommendation

1. Science teachers may integrate Traditional Filipino Games into Science instruction as a culturally responsive and experiential learning strategy to enhance students' motivation, engagement, and conceptual understanding. Game-based activities should include clear instructions, collaborative tasks, meaningful physical movement, and reflective discussions to ensure alignment between gameplay and learning objectives.
2. School administrators may support the implementation of culture-based, game-based learning through professional development programs, the provision of instructional resources, and the establishment of safe and conducive learning environments that encourage innovative, learner-centered teaching practices.
3. Curriculum developers may incorporate Traditional Filipino Games into Science curriculum guides, lesson exemplars, and instructional materials to strengthen contextualized and culture-based instruction aligned with the MATATAG curriculum framework.
4. The Department of Education and educational policymakers may strengthen policies and programs that support learner-centered, experiential, and culturally responsive instructional approaches by in

tegrating indigenous and traditional Filipino practices into classroom instruction.

5. Future researchers may conduct similar studies across different grade levels, subject areas, and educational settings to further examine the effectiveness of Traditional Filipino Games in improving academic performance, motivation, engagement, retention, and social development among learners.
6. Instructional material developers may further enhance, validate, and contextualize the proposed Culture-Based Game-Based Learning Instructional Guide (Gamified Lesson Log/Plan) to improve its adaptability, usability, and effectiveness in various Science learning environments.

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