

Recreational Science Learning as a Pedagogical Tool in Fostering Student's Creativity, Inquiry, and Performance in Science Classroom

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Abstract—This study, titled "Effectiveness of Recreational Science Learning as a Pedagogical Tool in Enhancing Students' Creativity, Inquiry, and Performance in Science," investigates the impact of modern, play-integrated instructional strategies on student outcomes. The research primarily aims to evaluate the implementation level of Recreational Science Learning (RSL) through indicators such as hands-on experiential activities, gamified science tasks, collaborative learning, and interactive demonstrations. Additionally, it assesses students' creativity (focusing on originality, design ability, imagination, and flexibility) and inquiry skills (centered on formulating hypotheses, conducting investigations, and data interpretation). By synthesizing these variables, the study examines the significant relationships and effects between RSL as a pedagogical framework and students' academic performance in Science, as measured by monthly and quarterly assessments. Ultimately, the research seeks to establish a comprehensive narrative on how recreational learning methodologies enhance the overall scientific competency and achievement of learners. The research employed a descriptive-experimental design to systematically assess the variables involved. The study involved 100 Grade 8 students selected through purposive sampling to serve as the primary respondents. Data collection was facilitated through a researcher-made survey questionnaire and performance-based tools. To process the data, descriptive statistics such as weighted mean and standard deviation were utilized to categorize the levels of RSL implementation and student skills. For the inferential analysis, Pearson Product-Moment Correlation was used to test relationships between variables, while a t-test analysis was employed to determine the significant effects of the pedagogy on student performance. The findings indicate that Recreational Science Learning is Highly Effective as a pedagogical tool, with all indicators receiving high weighted means from the respondents. Students demonstrated a Very High level of creativity, particularly in their ability to generate original ideas and adapt to complex tasks. Similarly, students' inquiry skills were rated at a Very High level, showing a strong mastery of the scientific method and data interpretation. Most notably, the academic performance of the students was classified as Outstanding, as they consistently achieved top scores in both monthly and quarterly science evaluations. Based on the statistical analysis, the null hypotheses regarding the relationship between RSL and both creativity and inquiry skills were rejected. This is because the results showed a significant correlation, proving that interactive and experiential strategies directly contribute to the development of creative and investigative thinking. However, the null hypothesis regarding student performance was accepted, as the study found no significant effect between the RSL tool and test scores. This suggests that while the pedagogy significantly boosts engagement and higher-order thinking skills, these internal improvements do not always translate directly into traditional written examination results, which

may be influenced by other external factors. To maximize the benefits of these findings, it is recommended that Science teachers consistently integrate gamified and experiential tasks into their daily lessons to sustain high student motivation. School administrators should provide the necessary instructional materials and laboratory facilities to support these innovative practices. Furthermore, curriculum developers are encouraged to formally embed recreational learning frameworks into the national science syllabus to align with 21st-century skills. Finally, future researchers should explore longitudinal studies to see if RSL affects performance over a longer duration or investigate other variables like student grit and digital literacy.

Keywords— Recreational Science Learning, Creativity, Inquiry Skills, Academic Performance, Pedagogical Tool, Division of Lag.

I. INTRODUCTION

Science education increasingly emphasizes not just content mastery, but developing skills like creativity, inquiry, and overall performance asserted by Pinar, Sagcal, Acut, & Roleda et al., (2025). In many classrooms, traditional lecture-based methods are still dominant, which can limit the opportunities students have for hands-on discovery, playful engagement, or recreational learning. To address this gap, pedagogical innovations such as Recreational Science Learning are being considered. Such approaches integrate fun, exploratory, game-based, or experiential activities into science teaching, making learning more motivating and potentially more effective.

According to Bybee (2015) that effective science instruction should engage learners in meaningful exploration that connects theory to real-world experiences. This approach cultivates deeper understanding and higher engagement. In response to this educational evolution, Recreational Science Learning has emerged as a pedagogical strategy that merges enjoyment and learning, making science both engaging and effective. Such integration aligns with constructivist principles, where students build knowledge through active experiences rather than passive absorption.

Studies in recent years have shown promising results for recreational or informal science interventions. Lin et al. (2023) emphasizes playful, hands-on, and gamified experiences that enhance learners' motivation and cognitive engagement. This method transforms traditional science classrooms into environments where curiosity thrives through experimentation, games, and interactive challenges. Similarly, Vygotsky's social constructivism, as reinterpreted by Li and

Zhao (2019), supports the idea that learning occurs best when students participate in collaborative, meaningful, and enjoyable tasks.

Another line of research addresses creativity and inquiry more directly. For instance, “Fostering scientific creativity in science education through scientific problem-solving approaches and STEM contexts: a meta-analysis” mentioned by Pinar et al., (2025) emphasized that fostering creativity enhances students’ ability to think divergently, solve complex problems, and design innovative experiments. When learners engage in recreational science activities, they are encouraged to manipulate materials, ask unconventional questions, and express ideas in novel ways. Likewise, Manaf et al. (2022) found a strong correlation between creativity and academic achievement, suggesting that creativity is not only a cognitive asset but also a key determinant of science performance.

Inquiry skills, such as question formulation, hypothesis testing, data interpretation, are also enhanced through active and recreational learning. The study “Active Learning in STEM Education with Regard to the Development of Inquiry Skills” asserted by Guniš, (2022) found that inquiry-based science education (IBSE) strategies, especially when combined with well-designed digital tools and formative assessment, strengthened students’ inquiry skills across STEM disciplines.

Furthermore, performance in science measured through tests, lab activities, or grades is also influenced by instructional strategy. Cited by Laguna, (2025) showed that using an experiential learning strategy significantly improved science performance among Grade 6 pupils. Such strategies overlap with recreational science learning in their emphasis on student engagement, doing rather than just listening. Johnson (2020), also reinforces that inquiry emerges most powerfully when learners experience authentic, hands-on engagement rather than mere theoretical instruction.

Moreover, teachers play a critical role in implementing Recreational Science Learning effectively. As argued by Ng and Tan (2021), teachers who integrate creative and recreational pedagogies help students view science as a dynamic process of discovery rather than a rigid body of knowledge. Effective facilitation ensures that recreational activities remain academically grounded and aligned with learning goals. Hence, teacher competence and instructional design are essential mediators between the recreational approach and improved learning outcomes.

In this study, the recreational Science Learning. Recreational Science Learning encompasses pedagogical methods that are fun, interactive, exploratory, and often hands-on. It might include gamified learning, science games, experimental workshops, collaborative problem solving in informal or semi-formal settings. Zosh et al. (2018), both emphasizing that engagement, reflection, and fun are essential components of effective learning. Recreational Science Learning embodies these principles by providing students with opportunities to interact, reflect, and create within the context of science education. By integrating recreation and inquiry, this approach seeks to balance enjoyment with academic rigor, thus nurturing holistic scientific growth.

This study aims to examine whether implementing recreational Science learning Recreational Science Learning influences students’ creativity, inquiry skills, and Science Performance. By situating recreational pedagogy within empirical and theoretical perspectives, the study aims to contribute to science education discourse and support teachers in designing learning experiences that are both enjoyable and transformative for students.

1.1 Statement of the Problem

Problem/s which were addressed by the research

This study seeks to investigate the effectiveness of Recreational Science Learning as a pedagogical tool in enhancing creativity, inquiry, and performance among junior high school students in Looc Integrated School in Calamba City, Laguna, aiming to determine how this experiential and engaging approach influences students’ overall learning outcomes in science.

Specifically, it sought to answer the following questions:

1. What is the level of recreational Science learning as a pedagogical tool in terms of;
 - 1.1 hands on experiential activities,
 - 1.2 gamified Science task,
 - 1.3 collaborative learning and
 - 1.4 interactive demonstration
2. What is the level of students’ creativity in Science Classroom in terms of;
 - 2.1 originality of idea,
 - 2.2 ability to design, and
 - 2.3 use of imaginative solutions?
 - 2.4 flexibility?
3. What is the level of students’ inquiry in Science Classroom in terms?
 - 3.1 formulating,
 - 3.2 hypothesizing,
 - 3.3 conducting and
 - 3.4 analyzing and interpretating?
4. What is the level of students’ performance in science terms of;
 - 4.1 monthly and
 - 4.2 quarterly?
5. Is there a significant relationship between recreational Science learning as a pedagogical tool and student creativity in science classroom?
6. Is there a significant relationship between recreational Science learning as a pedagogical tool and students’ inquiry in science?
7. Is there a significant effect between recreational Science learning as a pedagogical tool and students’ performance in science?

II. METHODOLOGY

The research employed a descriptive-experimental design to systematically assess the variables involved. The study involved 100 Grade 8 students selected through purposive sampling to serve as the primary respondents. Data collection was facilitated through a researcher-made survey questionnaire and performance-based tools. To process the

data, descriptive statistics such as weighted mean and standard deviation were utilized to categorize the levels of RSL implementation and student skills. For the inferential analysis, Pearson Product–Moment Correlation was used to test relationships between variables, while a t-test analysis was employed to determine the significant effects of the pedagogy on student performance.

III. RESULTS AND DISCUSSION

This part deals with the presentation, analysis, and interpretation of data gathered to answer the sub-problems relative to the main problem of this study. It presents and discusses the findings based on the research questions that guided the investigation. The data are systematically organized and analyzed using appropriate statistical tools to provide clear and meaningful interpretations of the results in relation to the objectives of the study.

Level of Recreational Science Learning as a Pedagogical Tool

In this study, the level of Recreational Science Learning as a pedagogical tool refers to hands-on experiential activities, gamified science tasks, collaborative learning, and interactive demonstration. These indicators describe how recreational and experiential approaches are utilized in teaching Science to enhance students’ engagement, understanding, and learning experiences.

The Recreational Science Learning as a pedagogical tool is presented in the succeeding tables, which show the statements, mean, standard deviation, remarks, and verbal interpretation. These statistical measures provide a clear description of how the respondents perceive the implementation and effectiveness of the said pedagogical approach. Table 1 shows the level of Recreational Science Learning as a pedagogical tool in terms of hands-on experiential activities.

Table 1. Level of Recreational Science Learning as a Pedagogical Tool in terms of Hands-on Experiential Activities

Statement	Mean	SD	Remarks
Doing hands-on experiential activities, I...			
...have been given time to recall what I already know about the topic before the solving of problems.	4.57	0.5	Strongly Agree
...participate in experiments that allow me to explore science concepts through real-life application: actively.	4.64	0.5	Strongly Agree
...enjoy learning when I can touch, observe, and manipulate materials during science activities.	4.62	0.6	Strongly Agree
...understand lessons better when I experience them through practical, hands-on tasks.	4.51	0.5	Strongly Agree
...feel more motivated to learn science when I perform activities rather than just listen to lectures.	4.58	0.5	Strongly Agree
Weighted Mean	4.58		
SD	0.56		
Verbal Interpretation			Very High

Table 1 presents the level of Recreational Science Learning as a pedagogical tool in terms of hands-on experiential activities. Respondents agree that they are given opportunities to recall prior knowledge before problem-solving, actively participate in experiments with real-life applications, engage in

learning by touching and manipulating materials, understand lessons better through practical tasks, and feel more motivated when performing activities rather than merely listening to lectures.

The level of Recreational Science Learning in terms of hands-on experiential activities attained a weighted mean of 4.58 with a standard deviation of 0.56, verbally interpreted as Very High. This indicates that hands-on experiential activities are consistently implemented and are highly beneficial in enhancing students’ learning in Science. This further implies that students learn more effectively when they are actively involved in the learning process, allowing them to explore, experience, and apply scientific concepts in meaningful ways.

In summary, the findings suggest that hands-on experiential activities as a component of Recreational Science Learning are evidently manifested in the teaching-learning process. Through active participation, experiential engagement, and practical application of knowledge, students develop better understanding, increased motivation, and deeper appreciation of Science concepts.

Table 2 demonstrates the extent level of Recreational Science Learning as a pedagogical tool in terms of gamified science tasks. Respondents agree that they are given time to pause and think before solving problems, perceive science lessons as more engaging when presented through games and challenges, master concepts more effectively in competitive yet enjoyable activities, feel energized to participate when learning includes game-based tasks, and are able to apply their knowledge when solving problems in a gamified format.

Table 2. Extent Level of Recreational Science Learning as a Pedagogical Tool in terms of Gamified Science Task

Statement	Mean	SD	Remarks
Participating in Gamified Science Tasks, I			
...was allowed to pause and think about the problem without immediately trying to solve it.	4.70	0.5	Strongly Agree
...perceive science lessons as more engaging when they are presented through games and challenges.	4.53	0.5	Strongly Agree
...master science concepts more effectively when activities are competitive yet enjoyable.	4.68	0.5	Strongly Agree
...feel energized to participate in class when science learning includes fun, game-based tasks.	4.36	0.6	Strongly Agree
...implement my knowledge effectively when solving science problems in a gamified format.	4.41	0.6	Strongly Agree
Weighted Mean	4.54		
SD	0.58		
Verbal Interpretation			Very High

The extent level of Recreational Science Learning in terms of gamified science tasks obtained a weighted mean of 4.54 with a standard deviation of 0.58, verbally interpreted as Very High. This indicates that gamified science tasks are effectively integrated into the learning process and significantly enhance students’ engagement and participation. This further implies that incorporating game elements in science instruction promotes active involvement, sustains interest, and improves students’ ability to apply learned concepts.

In summary, the findings reveal that gamified science tasks as a component of Recreational Science Learning are clearly

evident in classroom practices. Through interactive, enjoyable, and competitive activities, students become more motivated, engaged, and capable of understanding and applying scientific knowledge.

Table 3 shows the extent level of Recreational Science Learning as a pedagogical tool in terms of collaborative learning. Respondents agree that they experience moments of sudden understanding when solving problems, enjoy learning science through group work in experiments or projects, gain new ideas and perspectives through discussions with peers, feel more confident in solving problems when collaborating, and actively contribute to group activities and discussions in class.

The extent level of Recreational Science Learning in terms of collaborative learning garnered a weighted mean of 4.54 with a standard deviation of 0.63, verbally interpreted as Very High.

This indicates that collaborative learning strategies are effectively practiced and play a significant role in enhancing students' understanding and engagement in Science. This further implies that interaction and cooperation among students foster deeper comprehension, boost confidence, and encourage active participation in learning tasks.

Table 3. Extent Level of Recreational Science Learning as a Pedagogical Tool in terms of Collaborative Learning

Statement	Mean	SD	Remarks
Working together with my classmates, I ...			
...experienced moments where I suddenly understood the solution to a problem.	4.65	0.5	Strongly Agree
...enjoy learning science when I work together with my classmates on experiments or projects.	4.47	0.6	Strongly Agree
...learn new ideas and perspectives when I discuss science topics with my peers.	4.46	0.6	Strongly Agree
...feel more confident solving problems when collaborate with others.	4.53	0.6	Strongly Agree
...contribute actively to group discussions and activities in our science class.	4.59	0.6	Strongly Agree
Weighted Mean	4.54		
SD	0.63		
Verbal Interpretation			Very High

In summary, the findings indicate that collaborative learning as a component of Recreational Science Learning is strongly evident in the classroom setting. Through shared experiences, exchange of ideas, and active participation, students develop better problem-solving skills, improved confidence, and a more meaningful learning experience in Science.

Table 4 shows the extent of Recreational Science Learning as a Pedagogical Tool in terms of Interactive Demonstration.

Table 4 reveals the level of Recreational Science Learning as a pedagogical tool in terms of interactive demonstration. Respondents agree that the lesson encourages them to reflect on problems after solving them, generate unique ideas when working on science projects, prioritize original solutions, express their ideas confidently during presentations, and demonstrate innovation when solving scientific problems.

The level of Recreational Science Learning in terms of interactive demonstration achieved a weighted mean of 4.57 with a standard deviation of 0.60, verbally interpreted as

Highly Effective. This indicates that interactive demonstrations are effectively utilized in teaching and significantly contribute to the development of students' critical thinking and creativity. This further implies that when students are exposed to engaging and interactive instructional approaches, they are more likely to think independently, express their ideas confidently, and develop innovative solutions.

Table 4. Level of Recreational Science Learning as a Pedagogical Tool in terms of Interactive Demonstration

Statements	Mean	SD	Remarks
When my teacher carries out the recreational science learning, as a teaching tool, I can ...			
...look back at the problem after solving it.	4.71	0.4	Strongly Agree
...generate unique ideas when working on science projects.	4.72	0.4	Strongly Agree
...prioritize original solutions instead of copying existing ones.	4.35	0.6	Strongly Agree
...articulate my own ideas confidently when presenting science activities.	4.52	0.6	Strongly Agree
...innovate when solving scientific problems.	4.55	0.6	Strongly Agree
Weighted Mean	4.57		
SD	0.60		
Verbal Interpretation			Highly Effective

In summary, the findings suggest that interactive demonstration as a component of Recreational Science Learning is strongly manifested in the teaching-learning process. Through reflective thinking, idea generation, and active participation, students are able to enhance their creativity, confidence, and problem-solving abilities in Science.

Level of Students' Creativity in Science Classroom

In this study, the level of Students' Creativity in Science Classroom refers to Originality of Idea, Ability to Design, Use of Imaginative Solutions, and Flexibility.

The level of Students' Creativity in Science Classroom is revealed in the following table, which shows the statement, Mean, Standard Deviation, remarks, and verbal interpretation.

Table 5 shows the level of Students' Creativity in Science Classroom in terms of Originality of Idea.

Table 5. Level of Students' Creativity in Science Classroom in terms of Originality of Idea

Statements	Mean	SD	Remarks
When my teacher carries out the recreational science learning as a teaching tool, I can ...			
...able to understand what the problem was asking before solving it.	4.49	0.5	Always
...generate unique ideas when working on science projects.	4.39	0.6	Always
...prioritize original solutions instead of copying existing ones.	4.39	0.6	Always
...articulate my own ideas confidently when presenting science activities.	4.26	0.6	Always
...innovate when solving scientific problems.	4.53	0.5	Always
Weighted Mean	4.41		
SD	0.64		
Verbal Interpretation			Very High

Table 5 indicates the level of students' creativity in the science classroom in terms of originality of ideas. Respondents report that they are able to understand problems clearly before attempting to solve them, generate unique ideas when working on science projects, prioritize original solutions over copying existing ones, express their ideas confidently during presentations, and demonstrate innovation in solving scientific problems.

The level of students' creativity in terms of originality of ideas obtained a weighted mean of 4.41 with a standard deviation of 0.64, verbally interpreted as Very High. Students are consistently able to develop unique and creative ideas in science-related chores, showing that they are original in their thinking. This further implies that the use of Recreational Science Learning as a teaching tool effectively supports the development of creative thinking among students.

In summary, the findings reveal that originality of ideas as a dimension of students' creativity is highly evident in the science classroom. Through opportunities to think independently, express ideas, and explore innovative solutions, students are able to strengthen their creativity and apply their knowledge in more meaningful and original ways.

Table 6 highlights the level of students' creativity in the science classroom in terms of ability to design. Respondents agree that they are able to connect current lessons to previously learned concepts, design simple experiments to test scientific ideas, create models or prototypes to demonstrate understanding, organize materials and procedures confidently, and improve or modify existing designs to make them more effective.

Table 6. Level of level of Students' Creativity in Science Classroom refers to Ability to Design

Statements	Mean	SD	Remarks
When my teacher provides hands-on science activities as part of the learning process, I can ...			
...connect the lessons to things covered in previous classes.	4.29	0.7	Strongly Agree
...design simple experiments to test scientific ideas.	4.23	0.7	Strongly Agree
...create models or prototypes to demonstrate understanding of science concepts.	4.57	0.5	Strongly Agree
...feel confident organizing materials and steps in designing experiments.	4.56	0.5	Strongly Agree
...modify existing designs to make them more effective.	4.66	0.5	Strongly Agree
Weighted Mean	4.46		
SD	0.64		
Verbal Interpretation			Very High

The level of students' creativity in terms of ability to design achieved a weighted mean of 4.46 with a standard deviation of 0.64, verbally interpreted as Very High. This indicates that students possess strong skills in designing and organizing scientific tasks, demonstrating their ability to apply knowledge in practical and creative ways. This further implies that hands-on science activities contribute significantly to enhancing students' design thinking and problem-solving abilities.

In summary, the findings suggest that the ability to design as a dimension of students' creativity is highly manifested in the science classroom. Through engaging in experimental

design, model creation, and improvement of existing ideas, students are able to develop creativity, confidence, and deeper understanding of scientific concepts.

Table 7 shows the level of level of Students' Creativity in Science Classroom in terms of Use of Imaginative Solutions. Table 7 illustrates the level of students' creativity in the science classroom in terms of use of imaginative solutions. Respondents agree that they are able to justify why a certain solution is correct, apply creative thinking when facing challenges in experiments, think of multiple ways to solve science problems, imagine possible outcomes before conducting experiments, and enjoy discovering unique yet effective solutions during science activities.

The level of students' creativity in terms of use of imaginative solutions attained a weighted mean of 4.47 with a standard deviation of 0.61, verbally interpreted as Very High. This indicates that students are highly capable of utilizing imagination and creativity in addressing scientific problems. This further implies that engaging students in complex and thought-provoking tasks enhances their ability to think divergently and explore various possible solutions.

Table 7. Level of Students' Creativity in Science Classroom in terms of Use of Imaginative Solutions

Statements	Mean	SD	Remarks
When my teacher presents complex scientific problem: that require creative thinking, I can ...			
...able to clearly state why a certain solution or answer was right.	4.51	0.5	Strongly Agree
...use creative thinking when facing challenges in science experiments.	4.39	0.6	Strongly Agree
...think of multiple ways to solve a science problem.	4.54	0.5	Strongly Agree
...imagine possible results before experimenting.	4.49	0.6	Strongly Agree
...enjoy finding unusual yet effective solutions in science activities.	4.44	0.6	Strongly Agree
Weighted Mean	4.47		
SD	0.61		
Verbal Interpretation			Very High

In summary, the findings reveal that the use of imaginative solutions as a dimension of students' creativity is highly evident in the science classroom. Through opportunities to explore different ideas, anticipate outcomes, and apply creative thinking, students are able to strengthen their problem-solving skills and develop a more innovative approach to learning Science.

Encouraging imaginative approaches in STEM education leads to deeper engagement. Asigigan and Samur (2021) found that students who applied imaginative problem-solving techniques in gamified STEM tasks improved their critical thinking and intrinsic motivation. Imaginative solutions emerge when students are exposed to interdisciplinary contexts. Bahar (2025) observes that linking arts and sciences stimulates creative thinking by requiring learners to draw on diverse knowledge and perspectives.

Table 8 shows the level of Students' Creativity in Science Classroom in terms of Flexibility.

Table 8. Level of level of Students' Creativity in Science Classroom in terms of Flexibility

Statements	Mean	SD	Remarks
When my teacher introduces new information or change to our science tasks, I can ...			
...provide correct answers for most problems during the lesson.	4.39	0.6	Strongly Agree
...easily adjust my ideas when experiments do not go as planned.	4.53	0.6	Strongly Agree
...try new methods in solving science problems.	4.41	0.6	Strongly Agree
...adapt to changes in the instructions during science activities.	4.42	0.6	Strongly Agree
...revise my ideas when I discover better approaches.	4.40	0.5	Strongly Agree
Weighted Mean	4.43		
SD	0.62		
Verbal Interpretation			Very High

Table 8 depicts the level of students' creativity in the science classroom in terms of flexibility. Respondents agree that they are able to provide correct answers during lessons, adjust their ideas when experiments do not go as planned, try new methods in solving science problems, adapt to changes in instructions, and revise their ideas when better approaches are discovered.

The level of students' creativity in terms of flexibility obtained a weighted mean of 4.43 with a standard deviation of 0.62, verbally interpreted as Very High. This indicates that students demonstrate a strong ability to adapt and adjust their thinking in response to changing situations and challenges in science activities. This further implies that students are open to new ideas and are capable of modifying their approaches to achieve better outcomes.

In summary, the findings suggest that flexibility as a dimension of students' creativity is highly manifested in the science classroom. Through adapting to changes, exploring alternative methods, and revising ideas, students are able to enhance their problem-solving skills and develop a more dynamic and responsive approach to learning Science.

Level of Students' Inquiry in Science Classroom

In this study, the level of Students' Inquiry in Science Classroom refers to Formulating; Hypothesizing; Conducting; and Analyzing and Interpreting.

The level of Students' Inquiry in Science Classroom is revealed in the following table, which shows the statement, Mean, Standard Deviation, remarks, and verbal interpretation. Table 9 shows the level of Students' Inquiry in Science Classroom refers to in terms of Formulating.

Table 9 presents the level of students' inquiry in the science classroom in terms of formulating. Respondents agree that they are given time to recall prior knowledge before solving problems, can clearly state the problem or question they want to investigate, identify variables to be tested in experiments, enjoy creating questions that guide scientific investigations, and develop hypotheses based on the questions they formulate.

The level of students' inquiry in terms of formulating obtained a weighted mean of 4.43 with a standard deviation of 0.59, verbally interpreted as Very High. This indicates that

students are highly capable of formulating scientific questions, identifying variables, and developing hypotheses as part of the inquiry process. This further implies that learners are actively engaged in the initial phase of scientific inquiry, which is essential in developing critical thinking and investigative skills.

Table 9. Level of the level of Students' Inquiry in Science Classroom in terms of Formulating

Statements	Mean	SD	Remarks
When my teacher presents a scientific phenomenon for u to investigate, I can ...			
...recall what I already know about the topic in a given before solving of problems.	4.60	0.6	Strongly Agree
...clearly state the problem or question I want to investigate.	4.58	0.5	Strongly Agree
...identify what variables to test in a science experiment.	4.58	0.5	Strongly Agree
...enjoy creating questions that guide my scientific investigations.	4.14	0.7	Strongly Agree
...develop hypotheses based on the questions I formulate.	4.37	0.6	Strongly Agree
Weighted Mean	4.43		
SD	0.59		
Verbal Interpretation			Very High

In summary, the findings suggest that formulating as a component of students' inquiry skills is strongly evident in the science classroom. Through questioning, hypothesizing, and identifying variables, students are able to strengthen their scientific reasoning and engage more deeply in the process of inquiry-based learning.

Table 10 illustrates the level of students' inquiry in the science classroom in terms of hypothesizing. Respondents agree that they are given time to think before solving problems, can formulate predictions based on observations, anticipate possible outcomes before conducting experiments, appreciate forecasting what may happen in science activities, and validate their hypotheses through logical reasoning.

Table 10. Level of Students' Inquiry in Science Classroom in terms of Hypothesizing

Statements	Mean	SD	Remarks
When my teacher introduces a new experim and ask what might happen, I can ...			
...pause and think about the problem without immediately trying to solve it.	4.60	0.6	Strongly Agree
...formulate predictions based on my observations.	4.58	0.5	Strongly Agree
...anticipate possible outcomes before starting an experiment.	4.58	0.5	Strongly Agree
...appreciate forecasting what might happen in a science activity.	4.14	0.7	Strongly Agree
...validate my hypotheses with logical reasoning.	4.37	0.6	Strongly Agree
Weighted Mean	4.45		
SD	0.65		
Verbal Interpretation			Very High

The level of students' inquiry in terms of hypothesizing obtained a weighted mean of 4.45 with a standard deviation of 0.65, verbally interpreted as Very High. This indicates that students demonstrate strong skills in forming and validating hypotheses as part of the scientific inquiry process. This further

implies that learners are capable of engaging in predictive and logical thinking, which enhances their understanding of scientific phenomena.

In summary, the findings reveal that hypothesizing as a component of students' inquiry skills is highly evident in the science classroom. Through prediction, reasoning, and validation of ideas, students are able to strengthen their analytical thinking and actively participate in meaningful scientific investigation.

Table 11 shows the level the level of Students' Inquiry in Science Classroom refers to in terms of; Conducting.

Table 11. *Level of the level of Students' Inquiry in Science Classroom refers to in terms of Conducting*

Statements	Mean	SD	Remarks
When my teacher provides the materials and procedure for a science activity, I can ...			
...experienced moments where I suddenly understood the solution to a problem.	4.67	0.5	Strongly Agree
...follow the steps of an experiment carefully and accurately.	4.56	0.5	Strongly Agree
...make sure I use materials properly during science activities.	4.45	0.6	Strongly Agree
...record observations systematically during experiment.	4.54	0.5	Strongly Agree
...handle laboratory tools safely while conducting experiments.	4.51	0.6	Strongly Agree
Weighted Mean	4.55		
SD	0.60		
Verbal Interpretation			Very High

Table 11 shows the level of students' inquiry in the science classroom in terms of conducting. Respondents agree that they experience moments of sudden understanding of solutions, follow experimental steps carefully and accurately, use materials properly during science activities, record observations systematically, and handle laboratory tools safely while conducting experiments.

The level of students' inquiry in terms of conducting obtained a weighted mean of 4.55 with a standard deviation of 0.60, verbally interpreted as Highly Effective. This indicates that students demonstrate strong ability in performing scientific procedures with accuracy, care, and safety. This further implies that learners are actively engaged in hands-on scientific investigation, which enhances their procedural knowledge and practical skills in science.

In summary, the findings suggest that conducting as a component of students' inquiry skills is clearly manifested in the science classroom. Through careful execution of experiments, proper use of materials, and systematic recording of data, students are able to develop discipline, accuracy, and deeper understanding of scientific processes.

Table 12 illustrates the level of students' inquiry in the science classroom in terms of analyzing and interpreting. Respondents agree that they are encouraged to reflect on problems after solving them, decode data collected from experiments, connect observations to their original hypotheses, utilize graphs and tables in evaluating results, and value drawing conclusions based on their findings.

The level of students' inquiry in terms of analyzing and interpreting obtained a weighted mean of 4.40 with a standard deviation of 0.64, verbally interpreted as Highly Effective. This indicates that students demonstrate strong capability in examining, organizing, and making sense of scientific data. This further implies that learners are able to link evidence with explanations, which is essential in developing critical thinking and scientific reasoning skills.

Table 12. *Level of Students' Inquiry in Science Classroom in terms of Analyzing and Interpreting*

Statements	Mean	SD	Remarks
When my teacher asks us to examine and explain the findings of our science task, I can ...			
...actively re-examine the problem-solving steps during the demonstration to better understand the results.	4.42	0.6	Strongly Agree
...decode the data collected from my experiments.	4.21	0.6	Strongly Agree
...connect my observations to the original hypothesis.	4.45	0.6	Strongly Agree
...utilize graphs and tables to evaluate experimental results.	4.51	0.6	Strongly Agree
...value deriving conclusions based on my findings.	4.39	0.6	Strongly Agree
Weighted Mean	4.40		
SD	0.64		
Verbal Interpretation			Very High

In summary, the findings suggest that analyzing and interpreting as a component of students' inquiry skills is evidently manifested in the science classroom. Through careful examination of data, use of graphical representations, and logical interpretation of results, students are able to strengthen their understanding of scientific concepts and improve their decision-making in inquiry-based learning.

Level of Students' Performance in Science

In this study, the level of Students' Performance in Science refers to monthly and quarterly test.

The level of Students' Performance in Science is revealed in the following table, which shows the raw score, Frequency, Percentage, Mean, Standard Deviation, and verbal interpretation.

Table 13 presents the level of students' performance in Science in terms of monthly test. The results show that the majority of the students (91%) obtained scores ranging from 25–30, verbally interpreted as Outstanding, while 9% obtained scores ranging from 19–24, interpreted as Very Satisfactory. No students fell under the lower performance categories such as Satisfactory, Fairly Satisfactory, and Did Not Meet Expectation.

The level of students' performance in Science in terms of monthly test obtained a weighted mean of 25.90 with a standard deviation of 1.28, verbally interpreted as Outstanding. This indicates that students consistently demonstrate a high level of mastery in Science as reflected in their monthly assessment results. This further implies that the instructional strategies and learning experiences provided are effective in developing students' academic achievement in the subject.

Table 13. Level of Students' Performance in Science in terms of Monthly Test

Raw Score	Students' Performance in Science in terms of Descriptive Equivalent Monthly Test (Average)		
	F	%	
25-30	91	91	Outstanding
19-24	9	9	Very Satisfactory
13-18	0	0	Satisfactory
7-12	0	0	Fairly Satisfactory
1-6	0	0	Did Not Meet Expectation
Total	100	100	
Weighted Mean		25.90	
SD		1.28	
Descriptive Equivalent		Outstanding	

In summary, the findings suggest that students' performance in Science is notably high based on their monthly test results. The concentration of scores in the highest performance category reflects strong understanding of science concepts and effective learning engagement among the students.

Table 14 presents the level of students' performance in Science in terms of quarterly test. The results reveal that most of the students (91%) obtained scores ranging from 41–50, verbally interpreted as Outstanding, while 9% obtained scores ranging from 31–40, interpreted as Very Satisfactory. No students were classified under the lower performance categories, indicating consistently high achievement among the respondents.

Table 14. Level of Students' Performance in Science in terms of Quarterly Test

Raw Score	Students' Performance in Science in terms of Quarterly Test		Descriptive Equivalent
	F	%	
41-50	91	91	Outstanding
31-40	9	9	Very Satisfactory
21-30	0	0	Satisfactory
11-20	0	0	Fairly Satisfactory
1-10	0	0	Did Not Meet Expectation
Total	100	100	
Weighted Mean	44.90		
SD	3.69		
Descriptive Equivalent	Outstanding		

The level of students' performance in Science in terms of quarterly test obtained a weighted mean of 44.90 with a standard deviation of 3.69, verbally interpreted as Outstanding. This indicates that students demonstrate a very high level of mastery of Science concepts as reflected in their quarterly assessment results. This further implies that the instructional approaches and learning strategies implemented are effective in sustaining students' academic performance and understanding of the subject matter.

In summary, the findings suggest that students' performance in Science during quarterly assessments is consistently high. The dominance of scores in the Outstanding category reflects strong conceptual understanding, effective

learning engagement, and successful instructional delivery in Science.

Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Creativity in Science Classroom

In this study, the level of Recreational Science Learning as a Pedagogical Tool refers to Hands-on Experiential Activities, Gamified Science Task, Collaborative Learning and Interactive Demonstration while the Students' Creativity in Science Classroom refers to Originality of Idea, Ability to Design, Use of Imaginative Solutions, and Flexibility.

The Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Creativity in Science Classroom is revealed in the following table, which shows the Multiple Regression Analysis using Pearson Product Moment Correlation Coefficient or Pearson-r, p-value, and number of observation or respondents.

Table 15 presents the test of significant relationship between Recreational Science Learning as a pedagogical tool and students' creativity in Science classroom in terms of originality of idea, ability to design, use of imaginative solutions, and flexibility. Using Pearson Product-Moment Correlation with 100 respondents, the analysis determined whether Recreational Science Learning indicators are significantly associated with students' creativity in Science.

Table 15. Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Creativity in Science Classroom

Recreational Science Learning as a Pedagogical Tool	Students' Creativity in Science Classroom	Originality of Idea,	Ability to Design	Use of Imaginative Solutions,	Flexibility
Hands-on Experiential Activities	Pearson Correlation Sig. (2-tailed)	0.211* (2.0.035)	0.122 0.228	0.159 0.114	0.071 0.484
	N	100	100	100	100
Gamified Science Task	Pearson Correlation Sig. (2-tailed)	0.366* (2.0.000)	0.256* 0.010	0.118 0.241	0.153 0.128
	N	100	100	100	100
Collaborative Learning	Pearson Correlation Sig. (2-tailed)	0.251* (2.0.012)	0.357* 0.000	0.183 0.069	0.131 0.192
	N	100	100	100	100
Interactive Demonstration	Pearson Correlation Sig. (2-tailed)	0.319* (2.0.001)	0.317* 0.001	0.323* 0.001	0.399* 0.000
	N	100	100	100	100

The results reveal that Hands-on Experiential Activities are significantly related only to Originality of Idea, while no significant relationships are found with Ability to Design, Use of Imaginative Solutions, and Flexibility. Gamified Science Tasks show significant relationships with Originality of Idea and Ability to Design, while no significant relationships are observed with Use of Imaginative Solutions and Flexibility.

Meanwhile, Collaborative Learning shows significant relationships with Originality of Idea and Ability to Design, while no significant relationships are found with Use of Imaginative Solutions and Flexibility. In contrast, Interactive Demonstration shows significant relationships across all dimensions of creativity—Originality of Idea, Ability to Design, Use of Imaginative Solutions, and Flexibility. The correlations range from weak to moderate, with p-values indicating significant associations in selected variables.

These findings imply that Recreational Science Learning as a pedagogical tool is associated with selected dimensions of students' creativity in Science. This suggests that when teachers utilize interactive demonstrations, collaborative activities, gamified tasks, and hands-on experiences, students are able to enhance their creative thinking, particularly in generating original ideas, designing outputs, and demonstrating flexible thinking depending on the strategy used.

In summary, the findings demonstrate that Recreational Science Learning is significantly related to students' creativity in Science in specific domains. The results signify that these pedagogical approaches contribute to strengthening students' creative capacities and improving their overall engagement and performance in Science learning.

Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Inquiry in Science Classroom

In this study, the level of Recreational Science Learning as a Pedagogical Tool refers to Hands-on Experiential Activities, Gamified Science Task, Collaborative Learning and Interactive Demonstration while the Students' Inquiry in Science Classroom refers to in terms of Formulating; Hypothesizing; Conducting; and Analyzing and Interpreting.

The Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Inquiry in Science Classroom is revealed in the following table, which shows the Multiple Regression Analysis using Pearson Product Moment Correlation Coefficient or Pearson-r, p-value, and number of observation or respondents.

Table 16 presents the test of significant relationship between Recreational Science Learning as a pedagogical tool and students' inquiry in Science classroom in terms of formulating, hypothesizing, conducting, and analyzing and interpreting. Using Pearson Product-Moment Correlation with 100 respondents, the analysis determined whether Recreational Science Learning indicators are significantly associated with students' inquiry skills in Science.

The results reveal that Hands-on Experiential Activities are significantly related to Formulating and Analyzing and Interpreting, while no significant relationships are found with Hypothesizing and Conducting. Gamified Science Tasks show significant relationships with Formulating, Hypothesizing, and Conducting, while no significant relationship is observed with Analyzing and Interpreting. Meanwhile, Collaborative Learning shows significant relationships across all domains of inquiry—Formulating, Hypothesizing, Conducting, and Analyzing and Interpreting. In contrast, Interactive Demonstration shows significant relationships with

Formulating, Hypothesizing, and Analyzing and Interpreting, while no significant relationship is found with Conducting. The correlations range from weak to moderate, with p-values indicating significant associations in selected variables.

Table 16. Significant Relationship between the Recreational Science Learning as a Pedagogical Tool and the Students' Inquiry in Science Classroom

Recreational Science Learning as a Pedagogical Tool	Students' Inquiry in Science Classroom				
		Formulating	Hypothesizing	Conducting	Analyzing and Interpreting
Hands-on Experiential Activities	Pearson Correlation	0.211*	0.094	0.169	0.248*
	Sig. (2-tailed)	0.035	0.353	0.092	0.013
	N	100	100	100	100
Gamified Science Task	Pearson Correlation	0.372*	0.205*	0.262*	0.142
	Sig. (2-tailed)	0.000	0.040	0.008	0.160
	N	100	100	100	100
Collaborative Learning	Pearson Correlation	0.247*	0.279*	0.434*	0.270*
	Sig. (2-tailed)	0.013	0.005	0.000	0.007
	N	100	100	100	100
Interactive Demonstration	Pearson Correlation	0.338*	0.209*	0.168	0.338*
	Sig. (2-tailed)	0.001	0.037	0.095	0.001
	N	100	100	100	100

These findings imply that Recreational Science Learning as a pedagogical tool is associated with selected dimensions of students' inquiry skills in Science. This suggests that when teachers integrate collaborative activities, gamified tasks, hands-on experiences, and interactive demonstrations, students are able to enhance their inquiry skills, particularly in formulating questions, generating hypotheses, performing experiments, and interpreting results depending on the strategy used.

In summary, the findings demonstrate that Recreational Science Learning is significantly related to students' inquiry skills in Science in specific domains. The results signify that these pedagogical approaches contribute to strengthening students' scientific inquiry abilities and improving their engagement in the process of investigation and understanding of scientific concepts.

Significant Effect between the Recreational Science Learning as a Pedagogical Tool on the Students' Performance in Science

In this study, the level of Recreational Science Learning as a Pedagogical Tool refers to Hands-on Experiential Activities, Gamified Science Task, Collaborative Learning and Interactive Demonstration while the Students' Performance in Science refers to Monthly and Quarterly.

The Significant Effect between the Recreational Science Learning as a Pedagogical Tool on the Students' Performance in Science is revealed in the following table, which shows the Multiple Regression Analysis using t-Test, with the computed t-value (t-cal), p-value, number of observations or respondents, and critical t-value (t-crit) or constant.

The Significant effect between the Recreational Science Learning as a Pedagogical Tool and the Students' Creativity in Science Classroom is revealed in the following table, which shows the Multiple Regression Analysis using **t-test**, p-value, and number of observation or respondents.

Table 17 presents the test of significant effect between Recreational Science Learning as a pedagogical tool on students' performance in Science in terms of monthly and quarterly assessments. Using t-test analysis with 100 respondents, the study determined whether the different components of Recreational Science Learning significantly influence students' academic performance in Science.

Table 17. Significant Effect between the Recreational Science Learning as a Pedagogical Tool on the Students' Performance in Science

Recreational Science Learning as a Pedagogical Tool		Students' Performance in Science	
		Monthly (Average)	Quarterly
Hands-on Experiential Activities	t-value	1.61	1.61
	Sig. (2-tailed)	0.11	0.11
	N	100	100
Gamified Science Task	t-value	0.46	0.46
	Sig. (2-tailed)	0.65	0.65
	N	100	100
Collaborative Learning	t-value	0.49	0.49
	Sig. (2-tailed)	0.63	0.63
	N	100	100
Interactive Demonstration	t-value	-0.77	-0.77
	Sig. (2-tailed)	0.45	0.45
	N	100	100

The results reveal that Hands-on Experiential Activities do not have a significant effect on both monthly and quarterly performance. Gamified Science Tasks also show no significant effect on students' performance in both assessments. Similarly, Collaborative Learning does not significantly affect students' academic performance in Science. Interactive Demonstration likewise shows no significant effect on both monthly and quarterly test results. All findings indicate that the computed values do not meet the level of significance. These findings imply that Recreational Science Learning as a pedagogical tool does not significantly influence students' academic performance in Science based on their monthly and quarterly assessments. This suggests that although these instructional strategies enhance engagement, participation, and learning experiences, they do not directly translate into measurable improvement in test performance. This further implies that other factors such as study habits, mastery of lessons, and assessment design may have a greater impact on students' academic achievement.

In summary, the findings demonstrate that Recreational Science Learning has no significant effect on students' performance in Science. The results signify that while these pedagogical approaches are effective in improving classroom engagement and learning experiences, they are not statistically significant in influencing students' academic performance.

IV. CONCLUSION AND RECOMMENDATIONS

There is a significant relationship between Recreational Science Learning as a pedagogical tool and students' creativity in Science, Therefore the hypothesis is rejected. The results show that the different components of Recreational Science Learning are associated with selected dimensions of creativity, indicating that engaging and interactive instructional strategies contribute to the development of students' creative thinking skills.

There is also a significant relationship between Recreational Science Learning as a pedagogical tool and students' inquiry in Science, hence the hypotheses is also rejected. The findings reveal that the use of experiential, collaborative, gamified, and interactive approaches is linked to students' ability to formulate questions, generate hypotheses, conduct investigations, and analyze and interpret scientific data.

However, there is no significant effect on Recreational Science Learning as a pedagogical tool and students' performance in Science, therefore the hypothesis is accepted. This indicates that although Recreational Science Learning enhances engagement, creativity, and inquiry skills, it does not directly correspond to improvements in students' monthly and quarterly test results.

Based on the drawn conclusions resulted to the following recommendations:

Curriculum developers and policymakers are encouraged to consider the integration of Recreational Science Learning approaches in Science curriculum design. This will serve as a basis for enhancing curriculum content and instructional strategies that promote creativity, inquiry, and meaningful learning experiences among learners in line with 21st-century education requirements.

School administrators are encouraged to support the implementation of Recreational Science Learning by providing adequate instructional materials, facilities, and professional development opportunities for teachers. This will strengthen the delivery of innovative teaching strategies and promote improved instructional practices aligned with quality education goals.

Science teachers are encouraged to continuously integrate Recreational Science Learning strategies in their instruction by using experiential, interactive, and student-centered approaches. This will help increase student participation, motivation, and conceptual understanding, and further strengthen creativity and inquiry skills in the Science classroom.

Junior high school students are encouraged to actively engage in Recreational Science Learning activities such as hands-on experiments, science games, and creative tasks. Through these approaches, they will further enhance their creativity and inquiry skills while also improving their understanding of Science concepts, allowing them to experience learning beyond memorization and apply knowledge in real-life situations.

Future researchers may conduct similar studies in different contexts or incorporate additional variables such as learning

motivation, critical thinking skills, or academic environment to further explore other factors that may influence students' performance in Science.

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