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Teaching Physical Science in Junior High School: Instructional Challenges and Learning Experiences in an Integrated Public School at Maluno Integrated School

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Abstract

Teaching Physical Science in Junior High School (JHS) is pivotal for developing scientific literacy, yet it remains challenging in public school contexts where resource constraints, learner diversity, and curricular demands intersect. This study examined (a) the instructional challenges experienced by Physical Science teachers and (b) the learning experiences of JHS students in an integrated public school setting at Maluno Integrated School. Using a qualitative case study design, data were gathered through semi-structured interviews with teachers, focus group discussions with students, and classroom observations. Thematic analysis generated four teacher-challenge themes and four learner-experience themes. Findings show that instruction is shaped by limited laboratory resources, wide variation in learners' prior knowledge and language proficiency, time pressure under curriculum pacing, and assessment demands that compete with inquiry-based learning. Learners reported increased interest during hands-on and contextualized activities, but also described difficulties with mathematical reasoning, abstract concepts, and test-oriented tasks. The study highlights the need for low-cost laboratory alternatives, strengthened scaffolding for conceptual understanding, language-responsive science teaching, and assessment systems aligned with inquiry and conceptual mastery.

Keywords: Physical Science, junior high school, integrated school, instructional challenges, learner experiences, qualitative case study, Philippines

Keywords: reading intervention, struggling readers, literacy instruction, learner engagement, qualitative inquiry, secondary education

Introduction

Physical Science in Junior High School provides learners with a foundational understanding of key concepts such as matter, motion, energy, and forces ideas that underpin not only advanced learning in science, technology, engineering, and mathematics (STEM) fields but also informed decision-making in everyday life. Mastery of these concepts supports learners' ability to interpret natural phenomena, evaluate scientific information, and apply scientific reasoning to practical situations. However, both international and local studies consistently show that science learning outcomes are shaped not only by the prescribed curriculum but also by the realities of classroom implementation. Factors such as teachers' pedagogical content knowledge, availability and quality of instructional resources, and learners' readiness in terms of prior knowledge, language proficiency, and mathematical skills significantly influence how effectively Physical Science is taught and learned (National Research Council, 2000; Osborne & Dillon, 2008).

In public integrated school settings, these challenges are often intensified. Physical Science teachers are tasked with addressing the needs of highly diverse learners who differ in academic achievement levels, linguistic backgrounds, and access to learning materials, while simultaneously adhering to curriculum standards and assessment requirements. Maluno Integrated School reflects these conditions, as it serves learners across multiple grade levels using shared facilities within a context of constrained budgets and large or heterogeneous class groupings. These conditions place additional demands on teachers' instructional decision-making and classroom management. Understanding how teachers navigate instructional barriers and how learners experience Physical Science instruction within this context is therefore essential. Such understanding can inform strategies for improving teaching quality, enhancing learner participation, and ultimately strengthening science learning outcomes in integrated public schools.

Statement of the Problem

This study explored teaching and learning realities in JHS Physical Science at Maluno Integrated School by answering the following questions:

1. What instructional challenges do Physical Science teachers encounter in Junior High School at Maluno Integrated School?
2. What learning experiences do JHS learners report in studying Physical Science?
3. How do these challenges and experiences shape classroom instruction and learning engagement?

2. Review of Related Literature

2.1 Challenges in Science Teaching

Science teaching quality is strongly shaped by access to materials and opportunities for inquiry (National Research Council, 2000). Laboratory limitations can reduce practical experiences and push teachers toward lecture and textbook-centered instruction. Time constraints and curriculum pacing pressures may also narrow inquiry time and reduce conceptual discussion (Osborne & Dillon, 2008).

2.2 Learner Difficulties in Physical Science

Physical Science concepts can be abstract and counterintuitive; students often rely on misconceptions unless instruction explicitly supports conceptual change (Posner et al., 1982). Moreover, scientific literacy requires language skills for reading, explaining, arguing from evidence, and interpreting representations (Lemke, 1990). Mathematics demands such as proportional reasoning, unit analysis, and graph interpretation also influence science learning success (Hestenes, Wells, & Swackhamer, 1992).

2.3 Effective Approaches

Inquiry-oriented instruction and formative assessment support deeper understanding when they are aligned with learning goals and learners' prior knowledge (Black & Wiliam, 1998; National Research Council, 2000). Scaffolding through guided questioning, worked examples, and stepwise reasoning helps novice learners manage cognitive load (Sweller, 1988). Contextualization connects science to real-life experiences, supporting relevance and motivation (Osborne & Dillon, 2008).

3. Methodology

3.1 Research Design

A qualitative case study design was used to provide an in-depth understanding of Physical Science teaching challenges and learner experiences within the specific context of Maluno Integrated School.

3.2 Participants and Locale

Participants consisted of Physical Science teachers handling JHS classes and selected JHS learners enrolled in Physical Science. Teachers were selected purposively based on teaching assignment; learners participated through criterion sampling to represent varied achievement levels and classroom sections.

3.3 Data Collection

Data for this study were gathered using multiple qualitative data sources to ensure depth, richness, and triangulation of findings. Semi-structured interviews with Physical Science teachers were conducted to obtain in-depth insights into their instructional planning processes, day-to-day classroom challenges, availability and use of instructional resources, and assessment practices. The semi-structured format allowed teachers to elaborate on their experiences while ensuring that key areas relevant to the study objectives were consistently explored across participants. This approach enabled the researcher to capture both common patterns and context-specific nuances in instructional decision-making within the integrated public school setting.

In addition, student focus group discussions (FGDs) were employed to explore learners' perspectives on their experiences in studying Physical Science. The FGDs probed students' levels of engagement, perceived difficulties in understanding scientific concepts, and the types of instructional supports that facilitated their learning. Conducting discussions in a group setting encouraged interaction among participants, allowing learners to reflect collectively on shared experiences and articulate views that might not surface in individual interviews. This method provided valuable insights into how instructional practices were received and interpreted by learners.

Finally, classroom observations were carried out to document actual teaching–learning processes as they naturally occurred. Observations focused on instructional strategies used by teachers, patterns of learner participation, utilization of available resources, and assessment-related practices during lessons. These observations served to validate and complement data obtained from interviews and FGDs, offering an objective view of classroom dynamics and instructional implementation. The integration of these three data sources strengthened the credibility of the findings by allowing for cross-verification of teacher-reported practices, learner experiences, and observed classroom realities.

3.4 Data Analysis

Thematic analysis followed iterative coding: familiarization, initial codes, theme generation, theme refinement, and narrative synthesis. Triangulation across interviews, FGDs, and observation notes strengthened credibility. Member checking was used for selected summaries of findings.

3.5 Ethical Considerations

Permissions were obtained from school authorities. Participants provided informed consent/assent. Confidentiality was ensured through anonymized labels (e.g., T1, T2; S1, S2).

4. Results and Discussion

4.1 Instructional Challenges in Teaching Physical Science

Four major themes emerged from teacher interviews and classroom observations.

Theme 1: Limited Laboratory Resources and Practical Constraints

Teachers reported minimal laboratory equipment and improvised materials, limiting experiments and hands-on activities.

Teacher responses:

T1: "Minsan gusto naming magpa-experiment pero kulang ang gamit… kaya demo na lang o video."

T2: "Kahit simple materials, minsan kailangan pang mag-abono para lang may activity."

Limited resources shift instruction toward demonstrations and explanations rather than learner-led inquiry. This aligns with literature that practical work depends heavily on material access and classroom conditions (National Research Council, 2000; Osborne & Dillon, 2008).

Theme 2: Learner Diversity and Gaps in Prior Knowledge
Teachers emphasized wide differences in reading comprehension, numeracy, and science background knowledge.

Teacher responses:
T3: "Hindi pare-pareho ang foundation may mabilis, may hirap magbasa, may hirap sa math."
Diverse readiness levels require differentiated scaffolding. Without structured supports, learners struggle with conceptual understanding and problem-solving. This is consistent with cognitive load principles: novices need carefully sequenced guidance (Sweller, 1988).

Theme 3: Abstract Concepts and Mathematical Demands
Teachers identified topics like motion, force, energy transformations, and particle models as difficult to teach due to abstraction and mathematical representation.

Teacher responses:
T2: "Kapag equations na at graphs, doon talaga sila nahihirapan."
Interpretation: Learners may retain misconceptions unless instruction supports conceptual change and connects multiple representations (Posner et al., 1982). Tools like conceptual questions and formative checks help address misunderstandings (Black & Wiliam, 1998).

Theme 4: Time Pressure, Curriculum Pacing, and Assessment Load
Teachers described limited time for remediation, investigations, and feedback due to pacing guides and frequent assessment demands.

Teacher responses:
T1: "Minsan kailangan habulin ang lessons… nauubos ang oras sa checking at paperwork."
Interpretation: When time is constrained, teachers may prioritize coverage and test preparation over inquiry and conceptual dialogue. This tension is widely documented in science education reform contexts (Osborne & Dillon, 2008).

4.2 Learners' Learning Experiences in Physical Science
Four themes described students' experiences, blending engagement and difficulty.

Theme 5: Engagement Increases with Hands-on and Contextualized Activities
Learner responses:

S1: "Mas naaalala ko kapag may activity yung may ginagawa kami."
S3: "Kapag halimbawa tungkol sa kuryente sa bahay, mas gets."
Interpretation: Contextualization strengthens relevance and motivation, while hands-on activities support meaning-making (National Research Council, 2000; Osborne & Dillon, 2008).

Theme 6: Difficulty with Scientific Language and Explanation Tasks
Learner responses:

S2: "Nahihirapan ako mag-explain… alam ko yung sagot pero di ko maayos sabihin."
Interpretation: Science learning is deeply language-mediated; students need explicit support in scientific discourse, vocabulary, and explanation structures (Lemke, 1990).

Theme 7: Struggles with Computations, Graphs, and Problem-Solving
Learner responses:

S4: "Kapag may formula, nalilito ako kung ano uunahin."
Interpretation: Mathematics integration is a known barrier in Physical Science. Instruction must scaffold unit analysis, proportional reasoning, and representation translation (Hestenes et al., 1992).

Theme 8: Mixed Feelings Toward Assessment Motivation vs Anxiety
Learner responses:

S5: "Okay yung quiz kasi napipilitan mag-aral… pero minsan nakaka-pressure." **Interpretation:** Assessment can motivate study but also increase anxiety when it emphasizes recall over understanding. Formative assessment practices can improve learning while reducing high-stakes pressure by providing feedback loops (Black & Wiliam, 1998).

4.3 Synthesis: How Challenges Shape Learning Experiences

Findings show a clear interaction: resource limitations and time pressure reduce inquiry opportunities, which then affects learners' ability to build conceptual understanding and scientific reasoning. Teachers' adaptive strategies contextual examples, guided questioning, and demonstrations help maintain engagement, but learners still need stronger scaffolding for scientific language and quantitative reasoning. This supports reform-oriented guidance that inquiry, feedback, and conceptual scaffolds must be feasible within real school constraints (National Research Council, 2000; Sweller, 1988).

5.Implications

To address the instructional challenges identified in this study, several context-sensitive strategies may be implemented to enhance the teaching and learning of Physical Science in public integrated schools. First, schools may develop low-cost inquiry packages by using improvised experiment kits composed of readily available household materials, accompanied by structured activity guides. These packages can help expand opportunities for hands-on and inquiry-based learning even in the absence of fully equipped science laboratories, allowing learners to actively engage with scientific concepts through practical exploration.

Second, teachers may strengthen learners' ability to communicate scientific understanding by deliberately scaffolding scientific explanation. This can be achieved through the use of sentence starters, claim - evidence - reasoning (CER) templates, and consistent vocabulary routines that support the development of science language and discourse. As emphasized by Lemke (1990), explicit support for scientific language enables learners to articulate ideas more clearly and engage more deeply in scientific reasoning and discussion.

Third, instruction may place greater emphasis on quantitative reasoning skills by integrating stepwise problem-solving routines, such as identifying known and unknown variables, selecting appropriate formulas, substituting values, and checking units for accuracy. Regular practice in graph reading, interpretation, and proportional reasoning through short drills and targeted mini-lessons can further support learners who struggle with the mathematical demands of Physical Science.

Fourth, assessment practices may be better aligned with conceptual learning goals by shifting part of the evaluation toward performance tasks, conceptual questions, and ongoing formative checks. Such assessment approaches provide timely feedback, promote deeper understanding, and reduce overreliance on recall-based testing, consistent with the principles of formative assessment outlined by Black and Wiliam (1998).

Finally, sustained teacher support is essential for effective instructional improvement. School-based Learning Action Cell (LAC) sessions may be strengthened to focus on practical strategies for implementing inquiry-based instruction under resource constraints, differentiating instruction for diverse learners, and diagnosing and addressing common misconceptions in Physical Science. Through collaborative professional learning, teachers can share effective practices, reflect on classroom challenges, and collectively enhance instructional quality within the integrated school context.

6. Conclusion

Teaching Physical Science in Junior High School at Maluno Integrated School is characterized by a blended instructional approach shaped by real constraints: limited lab resources, learner diversity, abstract concepts with math demands, and time/assessment pressures. Learners experience strong engagement during hands-on and contextualized lessons but report persistent challenges in scientific explanation and quantitative problem-solving. Improving Physical Science learning in integrated public school settings requires feasible, resource-sensitive inquiry designs, language-responsive instruction, strong scaffolding for representations and computations, and assessment practices aligned with deep understanding rather than coverage alone.

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