

Navigating Conceptual Struggles in Physics Teaching: Narratives of Junior High School Science Teachers

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ABSTRACT

This study explored the lived experiences of secondary science teachers in teaching Physics, focusing on their conceptual struggles, coping strategies, and professional identity development. Using a qualitative narrative inquiry design, data were gathered through in-depth interviews with 15 Junior High School science teachers assigned to teach Physics in selected public secondary schools in Samar, Philippines. The narratives were analyzed using thematic narrative analysis guided by Clandinin and Connelly's three-dimensional narrative inquiry framework of temporality, sociality, and place. Findings revealed that teachers' conceptual struggles were multidimensional and shaped by disciplinary misalignment, mathematical demands, difficulties in representing abstract Physics concepts, and structural constraints, including limited instructional resources and inadequate laboratory facilities. The findings also showed that these challenges generated emotional tension and professional vulnerability among teachers. Despite these difficulties, participants demonstrated resilience and professional agency through adaptive strategies, including independent preparation, pedagogical simplification, contextualized instruction, simulations and demonstrations, and collegial and digital support systems. Moreover, the narratives revealed that teachers' struggles contributed to the development of growth-oriented professional identities characterized by reflective practice, continuous learning, and commitment to student understanding. The study concludes that conceptual struggles in Physics teaching are not merely indicators of individual inadequacy but reflections of broader instructional and systemic challenges that also contribute to teachers' professional growth, resilience, and reflective practice. The findings highlight the need for aligned teaching assignments, strengthened content-focused professional development, improved instructional support, and sustained institutional assistance for teachers teaching Physics in resource-constrained contexts.

Keywords: Conceptual Struggles, Narrative Inquiry, Pedagogical Adaptation, Physics Education, Professional Identity, Resilience, Secondary Science Teachers

INTRODUCTION

Physics is widely recognized as one of the most cognitively demanding disciplines in secondary science education due to its reliance on abstract concepts, symbolic representations, and mathematical formulations. These characteristics often create difficulties not only for students but also for teachers, particularly those assigned to teach physics without specialized academic preparation. In this context, conceptual struggle refers to the difficulty teachers experience in understanding, interpreting, and effectively explaining complex physics concepts within the teaching-learning process. Such struggles are closely associated with teachers' content knowledge and pedagogical competence, which are considered essential components of effective science instruction (Navos et al, 2024). Studies further emphasize that integrating content knowledge and pedagogy significantly influences the effectiveness of science teaching and student learning outcomes (Kind & Chan, 2019; Guerriero, 2017).

In the Philippine context, persistent concerns regarding science education continue to be reflected in large-scale international assessments. The Programme for International Student Assessment (PISA) 2018 reported that the

Philippines ranked among the lowest-performing countries in science (OECD, 2019), while the Trends in International Mathematics and Science Study (TIMSS) 2019 revealed that Filipino learners obtained very low performance in both science and mathematics (Mullis et al., 2020). These findings suggest systemic instructional challenges, particularly in areas requiring higher-order thinking and conceptual understanding. Physics topics such as motion, force, electricity, and mathematical problem-solving are often identified as difficult due to their abstract and quantitative nature. Although these assessments provide important indicators of student performance, they offer limited insight into the classroom realities teachers experience when facilitating physics instruction. Existing literature suggests that teachers' mastery of subject matter and their ability to transform complex concepts into meaningful learning experiences are critical determinants of student achievement in science (Gess-Newsome, 2015).

These instructional challenges become more pronounced in geographically isolated and resource-constrained educational settings. In many rural schools, teachers are often assigned to teach subjects outside their field of specialization, a condition commonly referred to as out-of-field teaching. Research has shown that such teaching assignments may negatively affect teachers' confidence and instructional effectiveness, particularly in science-related disciplines (Ingersoll, 2018; Hobbs & Törner, 2019). Teachers in remote schools also frequently encounter limitations in instructional materials, laboratory resources, technological support, and opportunities for professional development, all of which may hinder effective Physics instruction (Pacadaljen, 2024).

Despite these challenges, teachers continue to demonstrate resilience and adaptability in supporting student learning. However, much of the existing literature in science education remains primarily focused on student achievement and conceptual difficulties, with comparatively limited attention to teachers' lived experiences in teaching Physics. There remains a lack of context-sensitive understanding of how secondary science teachers experience, interpret, and respond to their own conceptual struggles, particularly in rural and resource-constrained contexts. This gap highlights the need to examine the human and professional dimensions of Physics instruction, focusing on how teachers negotiate instructional difficulties within their specific teaching environments.

To address this gap, the present study employed a narrative inquiry approach to explore the lived experiences of Junior High School science teachers in one district of the Schools Division of Samar, Philippines. By foregrounding teachers' narratives, the study moves beyond statistical descriptions to capture the complexity of their professional experiences, including the challenges they encounter, the coping strategies they employ, and the ways these experiences shape their professional identities. Through narrative inquiry, the study provides a deeper, more contextually grounded understanding of conceptual struggles in Physics teaching, particularly in remote educational settings. The study likewise contributes to ongoing discussions on improving Physics instruction, teacher support systems, and professional development in science education.

METHODS

Research Design

This study employed a qualitative research design using narrative inquiry to explore the lived experiences of secondary science teachers in teaching Physics. Narrative inquiry was utilized to foreground teachers' personal stories and capture their conceptual struggles, coping strategies, and professional reflections within their actual teaching contexts. The study was anchored in the framework of Clandinin and Connelly (2020), which examined teachers' experiences through the three-dimensional narrative inquiry space of temporality, sociality, and place. Temporality focused on how past experiences, present practices, and future aspirations influenced teachers' conceptual struggles. Sociality examined personal beliefs, emotions, self-efficacy, and social interactions that shaped teaching experiences. At the same time, the place emphasized the contextual realities of teaching Physics within one of the districts of the Schools Division of Samar.

Research Locale and Participants

The study was conducted in selected public secondary schools within a rural setting in the Schools Division of Samar, Philippines. The research environment was characterized by limited instructional resources, inadequate

laboratory equipment, technological constraints, and large classes with diverse learner abilities. These contextual conditions influenced teachers' instructional practices and experiences in teaching Physics.

The participants were 15 Junior High School science teachers, purposively selected using criterion-based inclusion. Only full-time science teachers with at least three years of teaching experience and who had handled Physics concepts in Grades 7 to 10 were included in the study. The participants represented diverse professional backgrounds, including Physics majors and teachers from related fields such as Biology and Chemistry, who were assigned to teach Physics under the integrated science curriculum. Participation was voluntary, and informed consent was secured before data collection.

Research Instrument

The primary research instrument used in the study was a researcher-developed semi-structured interview guide designed to elicit in-depth narratives regarding teachers' conceptual struggles, instructional practices, coping strategies, and professional reflections in teaching Physics. The interview guide consisted of four major sections: background information; lived experiences and challenges; coping strategies and pedagogical adjustments; and reflection and professional growth. Probing questions were used throughout the interviews to encourage participants to elaborate on their experiences and provide deeper explanations.

To establish content validity, the interview guide was reviewed by specialists in science education and qualitative research. A pilot interview was likewise conducted with a teacher who met the inclusion criteria but was not included among the actual participants. Feedback from the validators and pilot participant informed revisions in the wording, sequencing, and clarity of the interview questions.

Data Gathering Procedure

Before data collection, approval was secured from the Schools Division of Samar and the participating school heads. Participants were informed about the purpose and significance of the study, and informed consent was obtained before the interviews were conducted.

Data were collected through in-depth semi-structured interviews conducted either face-to-face or through virtual platforms, depending on participants' availability and convenience. Each interview lasted approximately 45 to 60 minutes and was audio-recorded with participants' permission. Field notes were also maintained to document contextual details, non-verbal cues, and initial reflections relevant to data interpretation. Following data collection, interview recordings were transcribed verbatim, and participants were provided with summaries of their responses for member checking to ensure accuracy and credibility of the narratives.

Data Analysis

Data analysis was guided by narrative inquiry and thematic narrative analysis following the framework of Clandinin and Connelly (2000). Audio-recorded interviews were transcribed verbatim, anonymized, and repeatedly reviewed alongside field notes to gain a comprehensive understanding of participants' experiences. Reflexive memos were likewise maintained to document emerging insights and analytic decisions.

Coding was conducted using both deductive and inductive approaches. Deductive coding focused on areas aligned with the study objectives, such as conceptual struggles, instructional challenges, coping strategies, emotional responses, and professional identity. Inductive coding allowed additional meanings and themes to emerge from participants' narratives. Analysis initially proceeded through within-case examination of individual narratives, followed by cross-case comparison to identify recurring patterns and themes across participants. Representative excerpts and narrative vignettes were utilized to preserve participants' voices and contextual meanings.

Measures of Trustworthiness

To ensure the trustworthiness of the study, the criteria of credibility, transferability, dependability, and confirmability of Team (2003) were observed throughout the research process. Credibility was established

through prolonged engagement with participants, careful transcription of interviews, member checking, and peer debriefing. Participants were provided with summaries of their narratives and emerging themes to validate the accuracy of interpretations. Peer debriefing with a colleague in science education further strengthened the credibility of the findings by minimizing potential researcher bias.

Transferability was supported through a thick description of the research context, participating schools, and participants' teaching backgrounds, allowing readers to determine the applicability of the findings to similar educational settings. Dependability was ensured through the maintenance of an audit trail that documented all stages of the research process, including interview guides, transcripts, coding records, analytic memos, and decision logs. Confirmability was established through reflexive journaling and the triangulation of interview data, field notes, and relevant documents, to ensure that interpretations were grounded in participants' narratives rather than in the researcher's assumptions.

Ethical Considerations

Ethical standards were strictly observed throughout the study. Ethical approval was secured from the Samar State University Institutional Human Research Ethics Committee (*Ethics Code: 2025-0083-G*). Permission to conduct the study was also obtained from the Schools Division of Samar and the participating school heads.

Participation in the study was voluntary, and informed consent was secured from all participants before data collection. Participants were informed of the study's purpose, the procedures involved, and their right to withdraw at any time without penalty. Confidentiality and anonymity were maintained through the use of pseudonyms and secure storage of interview recordings and transcripts. All data collected was used solely for research purposes. Participants were also treated with respect throughout the interview process to ensure their comfort and well-being.

RESULTS AND DISCUSSION

The findings revealed that interconnected cognitive, emotional, and contextual challenges shaped secondary science teachers' experiences in teaching Physics. Through narrative inquiry, ten interrelated themes emerged from the participants' narratives, reflecting both their lived experiences and the coping strategies they employed in teaching Physics. These themes collectively illustrate how teachers negotiated instructional difficulties, adapted their pedagogical practices, and developed resilience within resource-constrained educational settings.

Lived Experiences and Challenges of Teachers in Teaching Physics

Theme 1. Conceptual Struggles Rooted in Disciplinary Misalignment

A recurring theme across the narratives was teachers' experience of teaching Physics despite having academic preparation in other disciplines, such as Biology, Chemistry, or non-science fields. Participants described this transition as a major instructional adjustment that required continuous relearning and preparation. One teacher shared, "*Physics is not my major, so I need to study more before teaching*" (P1), while another participant explained, "*I always woke up early to study my lessons*" (P3).

The findings indicate that conceptual struggles in Physics were influenced not only by the subject's inherent complexity but also by teachers' disciplinary backgrounds. The mismatch between teachers' specialization and teaching assignments created gaps in content knowledge, requiring sustained self-directed learning and additional preparation. These findings support studies on out-of-field teaching, which suggest that teachers assigned outside their area of specialization often experience reduced confidence and increased instructional difficulty, particularly in science-related subjects (Mizzi, 2013).

The findings also suggest that institutional and curricular conditions contributed to these struggles. The spiral curriculum required teachers to teach across multiple science domains regardless of specialization, often without sufficient training or support. Research on teacher development indicates that mismatches between teacher

preparation and teaching assignments may negatively affect instructional quality and teacher confidence (Darling-Hammond et al., 2017).

Despite these challenges, the participants' narratives reflected professional resilience and active engagement. Teachers did not portray themselves as passive recipients of difficulty but as reflective practitioners committed to improving their understanding and instructional practices. In this context, conceptual struggle became a site of professional growth, where continuous preparation and adaptation contributed to the reconstruction of teachers' professional identity in teaching Physics.

Theme 2. Conceptual Struggles Intensified by Mathematical Demands

Another layer of difficulty that emerged from the narratives involved the mathematical nature of Physics. Beyond disciplinary misalignment, participants consistently described how the quantitative demands of the subject intensified their conceptual struggles. Teaching Physics required not only explaining scientific concepts but also guiding students through mathematical processes that many found difficult to understand. One participant explained, *"Teaching physics is challenging, especially when the lesson involves computations"* (P7). At the same time, another shared, *"Since physics involves mathematical computations, it becomes more difficult for learners who are weak in math. I am not very confident in mathematics either"* (P11).

The findings suggest that conceptual struggles in Physics were closely linked to mathematical reasoning and procedural understanding. Teachers found it difficult to facilitate lessons on equations, formulas, and symbolic representations, especially when students lacked foundational mathematical skills. These findings indicate that both teachers and learners encountered shared instructional challenges in understanding and applying mathematical concepts within Physics. From a narrative perspective, the findings reveal that understanding in Physics was negotiated collectively within the classroom. Teachers were not positioned as unquestioned authorities but as participants navigating the same conceptual difficulties as their students. This shared struggle required greater adaptability, persistence, and instructional sensitivity in addressing learners' difficulties.

Research in Physics education emphasizes that mathematical expressions are not merely computational tools but representations of physical relationships. When formulas are approached procedurally without conceptual understanding, learning becomes superficial. Bolanio and Mendaño (2025) likewise reported that students often struggle to connect mathematical reasoning with conceptual understanding in Physics.

The narratives also revealed emotional tension associated with mathematical instruction. Participants described feeling pressure during lessons involving extensive computations, particularly when anticipating students' difficulties. These experiences influenced instructional decisions, including slowing the pace of instruction, simplifying explanations, and reducing emphasis on complex derivations. Such responses reflected teachers' efforts to maintain classroom engagement while balancing instructional demands and personal confidence.

Despite these challenges, the participants demonstrated commitment to addressing mathematical difficulties rather than avoiding them. Their narratives suggest that conceptual struggles in Physics extend beyond scientific understanding to the interpretation and application of mathematical language. Within this context, mathematics served both as a tool for learning and as a barrier that teachers continually sought to manage through adaptive instructional approaches.

Theme 3. Conceptual Struggles in Representing Abstract Physics Concepts

As the narratives unfolded, teachers consistently identified another dimension of difficulty that extended beyond disciplinary background and mathematical demands: the challenge of representing abstract Physics concepts in ways that were meaningful and accessible to learners. While some Physics topics involve observable phenomena, many core concepts, such as force, energy, motion, electricity, and fields, require learners to understand relationships and processes that cannot be directly seen or experienced. For teachers, this created an additional layer of instructional complexity in which understanding the concept itself was only part of the task; equally important was the ability to translate these abstract ideas into forms that students could meaningfully comprehend.

One participant described this challenge by explaining, *“Teaching physics is quite difficult because many topics, such as energy, are abstract and not concrete for students at their level of understanding”* (P8). Another teacher emphasized the combined difficulty of abstraction and computation, stating, *“Teaching physics is challenging, especially when the lesson involves computations with abstract examples”* (P7). These accounts suggest that abstraction was not an isolated instructional issue but one that intersected with mathematical reasoning and conceptual interpretation, making it more difficult for both teachers and learners to construct meaningful understanding.

From the teachers’ perspectives, the struggle largely involved bridging the gap between theoretical ideas and students’ everyday experiences. Physics concepts are often communicated through symbols, equations, graphs, diagrams, and models, all of which require learners to interpret representations that stand in place of real-world phenomena. When students were unable to connect these representations to concrete experiences, conceptual understanding became fragmented, leaving teachers to search for alternative ways to explain the same idea. This experience may be understood through the lens of representational competence, which emphasizes the ability to interpret and connect multiple forms of representation in learning. According to Docktor and Mestre (2014), students commonly struggle to relate verbal explanations, mathematical equations, graphs, and physical interpretations into a coherent understanding of Physics concepts. This difficulty becomes more pronounced when abstract ideas are taught without sufficient visual or experiential support.

Within the narratives, teachers described moments of uncertainty when attempting to explain abstract concepts without adequate instructional materials, laboratory equipment, or visual aids. In resource-limited classrooms, teachers often relied heavily on verbal explanations and textbook descriptions, which were not always sufficient to support deeper conceptual understanding. As a result, teachers experienced additional pressure to become creative and resourceful despite the limitations of their instructional environment. These experiences reflected an ongoing effort to make the invisible visible. Teachers continually sought to translate complex, non-observable phenomena into understandable forms through analogies, contextual examples, simplified explanations, improvised visual aids, and relatable classroom demonstrations. This process required not only strong content knowledge but also pedagogical flexibility, as teachers continually adjusted their explanations to address students’ misconceptions, confusion, and learning needs.

Despite these challenges, the teachers’ narratives demonstrated a strong commitment to improving their instructional approaches. Rather than accepting abstraction as an unavoidable barrier, participants continually explored ways to make concepts more relatable and understandable. These efforts included connecting lessons to familiar experiences, activating prior knowledge, contextualizing scientific ideas, and experimenting with varied explanatory strategies to support student learning.

The results suggest that conceptual struggles in Physics were deeply rooted in the challenge of representation. Teaching Physics required more than mastery of scientific content; it demanded the ability to transform abstract and often invisible phenomena into meaningful learning experiences for students. When this transformation became difficult, conceptual understanding also became fragile, requiring both teachers and learners to negotiate meaning in the classroom collaboratively. In this sense, abstraction emerged not merely as a characteristic of the subject itself, but as a central instructional challenge that significantly shaped the lived experience of teaching Physics.

Theme 4. Conceptual Struggles Shaped by Structural Constraints

The narratives further revealed that teachers’ conceptual struggles in Physics were influenced by structural and contextual limitations within the school environment. Participants described how limited laboratory equipment, inadequate instructional materials, insufficient time, and large class sizes affected the quality of Physics instruction. One teacher shared, *“One of the main challenges is the limited opportunity for actual experimentation due to lack of materials and equipment”* (P12). At the same time, another explained, *“Students find it hard to understand certain concepts when they cannot see actual examples or perform experiments”* (P13).

The findings indicate that structural constraints limited experiential and hands-on learning opportunities, forcing teachers to rely heavily on verbal explanations, textbook illustrations, and simplified analogies. Although these

strategies supported basic understanding, they were often insufficient for developing deeper conceptual learning, particularly in abstract Physics topics.

Teachers also identified limited instructional time and large class sizes as major challenges. The need to cover multiple competencies within restricted class periods reduced opportunities for experimentation, discussion, and remediation. These classroom realities made it difficult to address individual learning needs and provide immediate feedback to students.

These findings suggest that conceptual struggles in Physics are not solely cognitive issues but are also shaped by institutional and contextual conditions. The findings support studies emphasizing that resource availability, classroom conditions, and institutional support significantly influence science teaching effectiveness and student learning outcomes (OECD, 2019; Darling-Hammond et al., 2017). Similarly, King (2016) emphasized that limited practical experience reduces students' conceptual engagement and their ability to connect scientific concepts to real-world applications.

Despite these limitations, participants demonstrated adaptability and resourcefulness by using improvised materials, alternative explanations, and available resources to support learning. These narratives reflect teachers' resilience and commitment to sustaining meaningful instruction despite challenging educational conditions.

Theme 5. Emotional Tension and Vulnerability

The narratives also revealed that conceptual struggles in Physics were accompanied by emotional tension and vulnerability. Participants expressed feelings of satisfaction, frustration, self-doubt, and discouragement, particularly when students struggled to understand lessons. One teacher shared, *"It is rewarding when students can easily solve problems, but it is discouraging when they cannot understand activities, especially in electricity and magnetism"* (P9). Another participant admitted, *"I sometimes feel embarrassed and think that I may not be effective enough"* (P12).

The findings indicate that teachers' emotional experiences were closely connected to students' performance and learning outcomes. When students struggled with abstract concepts and mathematical computations, teachers often questioned their own effectiveness and instructional competence. These experiences suggest that teaching physics involves not only cognitive and instructional demands but also emotional investment and professional responsibility. Studies have shown that teachers' emotional experiences significantly affect instructional decisions, classroom interactions, and professional well-being (Zee & Koomen, 2016).

Despite these emotional challenges, the participants demonstrated resilience and commitment to teaching. Rather than withdrawing from their responsibilities, teachers continued to reflect on their practices and adapt their instructional approaches to support student learning. These narratives highlight that emotional tension and vulnerability are important dimensions of teaching Physics and may serve as catalysts for reflection, growth, and continuous professional improvement.

Theme 6. Growth-Oriented Professional Identity

Despite the conceptual and emotional challenges encountered in teaching Physics, participants demonstrated a growth-oriented professional identity characterized by resilience, reflection, and continuous learning. Teachers consistently viewed their struggles not as signs of inadequacy but as opportunities for professional growth. One participant stated, *"I may not be the best physics teacher, but I am trying my best to teach and help students learn"* (P8), while another shared, *"I see myself as a facilitator, guide, and motivator"* (P9).

The narratives further revealed that teachers perceived professional development as an ongoing process. One participant explained, *"I see myself as someone who is still developing and learning in teaching physics"* (P12), while another reflected that *"Teaching physics is challenging but meaningful. Continuous learning, patience, and collaboration are important in helping both teachers and students grow"* (P15).

These findings indicate that teachers reconstructed their professional identities through reflection, adaptation, and sustained engagement with instructional challenges. Rather than defining themselves solely as content

experts, participants increasingly viewed themselves as reflective practitioners, co-learners, and facilitators of student understanding.

The findings support studies on teacher professional identity, which emphasize that identity develops through experience, reflection, and contextual interaction. Li (2025) highlighted that reflective practice enables teachers to reinterpret challenges as opportunities for growth and professional development. The findings also align with studies on teacher self-efficacy and resilience, which suggest that teachers who maintain confidence in their ability to improve are more likely to persist and adapt in challenging instructional contexts (Parsons et al, 2018)

Overall, the narratives suggest that teaching Physics became a transformative professional experience for the participants. Through continuous reflection, persistence, and adaptation, teachers developed stronger professional commitment and a deeper sense of purpose in their roles as educators.

Coping Strategies and Pedagogical Adjustments in Teaching Physics

Theme 1: Professional Self-Strengthening Through Independent Preparation

Teachers responded to instructional challenges through continuous self-directed preparation and independent learning. Participants described studying lessons in advance, reviewing difficult concepts, and consulting online resources and supplementary materials to strengthen their understanding of Physics. One teacher shared, *“I study the lesson more and prepare in advance before teaching it to my students”* (P1), while another explained, *“I always woke up early to study my lessons so I could explain them better”* (P3).

The findings indicate that independent preparation became a significant coping strategy for addressing content gaps and improving instructional readiness. Teachers demonstrated professional agency by engaging in sustained preparation beyond regular teaching responsibilities, particularly when handling topics outside their field of specialization. This process reflects teachers’ commitment to ensuring accurate instruction and meaningful learning experiences for students despite existing instructional challenges.

Participants also described using online videos, digital resources, and supplementary references to deepen their conceptual understanding and identify more effective ways of presenting complex Physics concepts. These practices suggest that self-directed learning served not only as a coping mechanism but also as ongoing professional development. The findings support studies emphasizing the role of self-regulated professional learning and adaptive expertise in strengthening instructional competence (Darling-Hammond et al., 2017; OECD, 2019). Although participants acknowledged limitations in content knowledge, they remained committed to continuous learning and reflective improvement, demonstrating resilience and professional responsibility in teaching Physics.

Theme 2. Pedagogical Simplification to Manage Mathematical and Cognitive Load

Participants also adjusted their instructional approaches by simplifying lessons, slowing the pace of instruction, and providing step-by-step explanations to support student understanding. One teacher stated, *“I slow down the lesson and make sure that students understand each step before moving to the next”* (P7), while another shared, *“I simplify the lesson and sometimes repeat it the next day so that they can understand better”* (P15).

The findings suggest that pedagogical simplification was intentionally used to reduce students' cognitive burden when learning mathematically intensive, conceptually complex Physics topics. Teachers recognized that learners often struggled to process conceptual explanations and numerical procedures simultaneously. As a result, participants adjusted instructional pacing, segmented lessons into smaller parts, and used guided explanations to make concepts more accessible.

These instructional adjustments reflect teachers’ responsiveness to students’ learning needs and their efforts to maintain conceptual clarity while minimizing confusion. The findings support Cognitive Load Theory, which emphasizes that learning becomes more effective when instruction reduces unnecessary cognitive demands and allows learners to focus on essential information (Sweller, 2020). Similarly, van Merriënboer et al. (2024)

emphasized that structured and segmented instruction improves learners' understanding of complex scientific concepts.

Theme 3. Representational and Experiential Enhancement

Teachers also utilized demonstrations, visual aids, simulations, and hands-on activities to make Physics concepts more meaningful and understandable. One participant explained, *"I use demonstrations, simulations, and hands-on activities to help students understand the lesson"* (P9). *Contextualizing my lesson through real-life examples helps my students understand abstract concepts. Sometimes, I use diagrams, illustrations, or models for my discussion"* (P11) added.

The findings indicate that participants intentionally employed multiple representations and experiential strategies to bridge the gap between abstract scientific concepts and students' real-life experiences. Teachers described using diagrams, models, contextualized examples, improvised materials, and digital simulations to improve conceptual understanding and student engagement. These approaches enabled students to visualize relationships, observe scientific phenomena, and connect theoretical concepts to observable experiences.

The findings support studies on representational competence, which emphasize the importance of integrating verbal explanations, mathematical representations, visual models, and physical demonstrations in science learning (Ainsworth, 2018; Rau, 2017). The findings also align with research highlighting the effectiveness of experiential and inquiry-based learning approaches in improving conceptual understanding and engagement in Physics and science education (Aprillya et al., 2025).

Theme 4. Resourcefulness and Collegial Support Within Structural Constraints

Participants further emphasized the importance of collegial collaboration and external resources in addressing instructional challenges. One teacher shared, *"I seek assistance from master teachers when I do not fully understand the lesson"* (P4). At the same time, another explained, *"With the help of online resources and research, I try to improve my understanding of the lessons"* (P13).

The findings suggest that collegial support, mentoring, and resourcefulness played important roles in sustaining effective Physics instruction despite structural and contextual limitations. Teachers relied on peer collaboration, professional consultation, online learning platforms, and improvised instructional materials to strengthen both content understanding and instructional delivery. These practices reflect a collaborative and adaptive professional culture in which teachers actively sought support to address immediate instructional needs.

The findings support social learning perspectives, which emphasize that professional knowledge develops through interaction, collaboration, and shared experiences. Research likewise indicates that mentoring, collegial support, and professional learning communities contribute to improved instructional competence, teacher confidence, and classroom effectiveness (Vangrieken et al., 2015; Boller & Mendaño, 2024). Furthermore, the use of improvised and alternative resources demonstrates teachers' adaptability and innovation within resource-constrained educational environments.

Overall, the findings indicate that teachers actively responded to the challenges of teaching Physics through reflective, adaptive, and collaborative practices. Despite disciplinary misalignment, mathematical complexity, abstraction, and structural constraints, participants demonstrated resilience and professional agency by continuously strengthening their instructional approaches and seeking meaningful ways to support student learning. Teaching Physics, therefore, emerged as a dynamic process of continuous learning, adaptation, and professional growth.

CONCLUSION AND RECOMMENDATIONS

Teaching Physics emerged as a complex and transformative professional experience shaped by instructional demands, contextual realities, and continuous adaptation. The study highlights that conceptual struggles among secondary science teachers are not merely indicators of insufficient content knowledge but also reflections of

broader curricular, institutional, and resource-related conditions that influence classroom practice. Despite these challenges, teachers demonstrated resilience, reflective practice, and professional commitment through adaptive instructional strategies and continuous learning.

The findings underscore the importance of strengthening institutional support systems for teachers of Physics, particularly through aligned teaching assignments, content-focused professional development, mentoring opportunities, and improved access to instructional resources. The study likewise emphasizes the value of contextualized, inquiry-based, and experiential instructional approaches in supporting meaningful Physics learning. Future studies may further explore teachers' experiences across different science disciplines and educational contexts to deepen understanding of instructional challenges and professional adaptation in science education.

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