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Elementary Teachers' Experiences with Challenges in Teaching Science

Helen G. Garcia
Foundation University, Dumaguete City, Negros Oriental, Philippines

*Corresponding Author Email: helen.garcia007@deped.gov.ph

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Abstract. Science lessons in elementary schools are often hard to teach because classroom realities do not always match what the curriculum expects. Although science is essential for helping young students think critically and ask questions, there is little research that looks closely at what teachers experience when teaching it. This study aimed to address that gap by exploring how elementary teachers handle science instruction in their daily practice. Using Colaizzi's method and purposive sampling, the researcher interviewed six teachers from public schools in a district in Negros Oriental. The results showed that teachers faced many challenges. These included making complex science ideas easier to understand, meeting the needs of different learners, and working with limited teaching materials. Still, the study found that professional development helped teachers feel more confident and improved their teaching methods. Six emergent themes described their experiences: (1) Chained Potential showed the lack of materials; (2) The Rift of Comprehension explained how hard it was to make science clear to students; (3) Blindfolded Mentors revealed the lack of guidance and support; (4) The Alchemy of Teaching highlighted the creative ways teachers kept students engaged; (5) The Evolving Educator showed how teachers learned to adjust their methods; and (6) Beyond the Curriculum emphasized learning through real-life experiences. This study helped explain the difficulties teachers face in teaching science. It also recommended specific actions, such as giving teachers training that matches their real needs, providing enough teaching materials, and encouraging learning through hands-on activities. These measures can help enhance the way science is taught in elementary schools.

Keywords: Elementary teacher; Lived experiences; Phenomenological approach; Science education.

1.0 Introduction

Primary school teachers play a key role in building a strong foundation for learning and improving science literacy (Utami et al., 2024). Despite their strengths, many face challenges like a lack of confidence and limited subject knowledge (Davis et al., 2022). Professional development programs have been implemented globally to address these issues. In Ireland, a program designed to enhance teachers' confidence in teaching sustainability yielded positive outcomes, including increased self-confidence and the adoption of inquiry-based teaching approaches (Murphy et al., 2020). Similarly, Davidson et al. (2020) found that U.S. teachers involved in scientific research developed a stronger emotional connection to science, improving their teaching. In contrast, science education in Bangladesh remains largely teacher-centered, with limited student involvement (Rahman Talukder et al., 2021).

In the Philippines, research has also examined the efficacy of science teaching among educators. Walag et al. (2020) investigated personal science teaching efficacy and subject-specific confidence among primary and high school science teachers in Cagayan de Oro City. Their findings showed that while teachers exhibited satisfactory overall self-efficacy, their confidence varied across subjects, with physics being the most challenging due to its complexity and limited teaching experience. The country's K-12 science curriculum follows a spiral approach, in which students revisit topics at increasingly complex levels (Tirol, 2022). Antipolo et al. (2021) found that preservice teachers (PSTs) encountered minimal difficulties teaching K-12 science. They reported little struggle with subject knowledge, teaching methods, classroom management, lesson planning, assessment, community engagement, or professional development.

Despite these studies, a gap remains in research focusing on the real-life experiences of elementary teachers as they navigate the intricacies of science instruction. While Walag et al. (2020) examined science teaching confidence and subject-specific efficacy, their study did not fully explore the day-to-day challenges faced by elementary teachers. Similarly, Antipolo et al. (2021) focused on preservice teachers rather than in-service educators. This study seeks to fill that gap by qualitatively exploring elementary teachers' lived experiences in teaching science. By understanding their struggles, successes, and perspectives, the research aims to offer valuable insights that can inform teacher training, curriculum development, and policy improvements in elementary science education.

As a science coordinator and teacher, the researcher has observed firsthand the unique challenges elementary teachers face in delivering science lessons. These challenges include simplifying complex concepts, engaging diverse learners, and adapting to resource limitations. Through personal experience, the researcher has witnessed how teachers develop innovative strategies to overcome these difficulties. Similarly, Davidson et al. (2020) found that when teachers actively participated in scientific research, they created a deeper understanding of epistemic affect, which enhanced their ability to support student learning and engagement. However, the everyday insights and experiences of elementary teachers remain underrepresented in academic discussions. This study aimed to amplify their voices and contribute to a deeper understanding of science education at the elementary level. This study supports the United Nations Sustainable Development Goal (SDG) 4, specifically Target 4.1, which promotes access to quality primary and secondary education. Improving science teaching through teacher development directly enhances student achievement by fostering a more profound understanding, critical thinking, and engagement. By addressing instructional challenges, the study helps equip teachers to deliver more effective science education, contributing to the broader goal of quality education for all.

2.0 Methodology

2.1 Research Design

This study employed descriptive phenomenology, a qualitative research approach that gained prominence primarily through the work of Edmund Husserl (Drummond, 2022). Phenomenology aims to explore and understand individuals' lived experiences in their everyday contexts. As this research focused on the lived experiences of elementary teachers regarding the complexities of teaching science, a phenomenological approach was deemed most appropriate. For data analysis, Colaizzi's (1978) seven-step method was utilized to generate a comprehensive and accurate description of the phenomenon, grounded in participants' experiences and validated by their feedback (Gumarang Jr., 2021; Morrow & Rodriguez, 2015).

2.2 Research Locale

The study was conducted in selected schools within the Siaton 1 District, chosen for their significant role in providing foundational education in the region. These schools are among the largest in the district, with faculty sizes ranging from 16 to 18 teachers, and serve as key educational hubs. The decision to focus on these schools was based on their strategic importance in the district's educational system, their diverse teaching environments, and their ability to offer insights into the collaborative dynamics among educators. While they are easily accessible by motorized vehicles, the primary reason for selecting these schools lies in their capacity to provide a representative sample of the district's broader educational framework, supporting a dynamic and professional teaching environment.

2.3 Research Participants

The participants for this study were deliberately chosen based on specific eligibility criteria and the nature of the phenomenon being examined. In phenomenological research, smaller sample sizes are commonly used to facilitate an in-depth analysis of individuals' lived experiences (Alam, 2020). The number of participants included in this study was determined by data saturation. Data saturation is achieved when no new themes or insights emerge, and responses become repetitive (Lincoln & Guba, as cited in Hossain, 2024). The researcher utilized purposive sampling to select the sample, a technique where participants are chosen based on their expertise or extensive familiarity with the subject matter. This approach ensures that the collected data aligns closely with research objectives, thereby enhancing the validity and reliability of findings (Thomas, 2022).

For this study, the participants were elementary school teachers currently teaching science at Ramon Ponce de Leon Elementary School, Lindy Pajunar Memorial School, and Inalad Elementary School in the Siaton 1 District. Eligible participants needed at least three consecutive years of teaching experience within the Department of Education, be 25 years old, and hold Civil Service Commission-approved Teacher I to III positions. Additionally, they were required to be bilingual in English and Cebuano. A total of six participants were interviewed until data saturation was reached, meaning no new categories, themes, or explanations emerged, and responses became redundant (Chitac, 2022).

2.4 Research Instrument
The primary method of data collection was a semi-structured interview. The interview questions, composed in English, were open-ended and designed to elicit meaningful insights from the participants regarding the research topic. These questions were developed based on a thorough review of relevant literature and expert input to ensure they were both appropriate and comprehensive. Additionally, the questions were pre-tested with a small group to validate their clarity and effectiveness. The interviews were recorded automatically using a mobile device, and access to the audio recordings was strictly limited to the researcher.

2.5 Data Gathering Procedure
Data collection took place between January and February 2025. Before conducting face-to-face, in-depth interviews, the researcher first sought formal authorization by addressing a letter to the dean of the Graduate School. After obtaining approval, a request was made to the Supervisor of Siaton 1 District for permission to identify suitable participants. With the Supervisor's endorsement, the request was then sent to the Principals of Ramon Ponce De Leon Elementary School, Lindy Pajunar Elementary School, and Inalad Elementary School, who helped identify potential participants. Before participation, individuals received a thorough explanation of the study's objectives and its strict confidentiality measures. They were assured that all information would remain confidential and were required to sign an informed consent form.

Additionally, participants were told that interviews would be recorded using a mobile phone for audio documentation. Each interview lasted between 20 and 30 minutes, depending on the participants' willingness to elaborate on their experiences. Clarifying questions were used when necessary to encourage participants to expand their responses, allowing for more detailed narratives (Creswell, 2007). Throughout the interviews, the researcher's primary role was to listen actively while only interrupting to seek clarification. The researcher also guided participants toward emerging themes, ensuring that questions remained open-ended and non-leading (Marable, 2011). To minimize potential bias, participants' verbal and non-verbal cues were documented. These observations, along with demographic details such as age and gender, were recorded in a journal. Finally, all recorded and transcribed interviews were carefully cross-checked to ensure the accuracy of the data.

2.6 Data Analysis Procedure
This study employed Colaizzi's phenomenological analysis method to examine the interview transcripts (refer to Serafica & Operiano, 2024, and Awal & Asaduzzaman, 2024, for recent discussions on phenomenological research). The researcher began by recording all interviews using a mobile phone and transcribing them verbatim. Key statements relevant to the research questions were then identified and highlighted. Significant excerpts were selected based on their relevance to the study topic and reworded from a third-person perspective to interpret their meaning. Next, themes were developed by organizing the interpreted meanings into thematic clusters. These were refined through multiple rounds of validation and cross-referencing with the original transcripts to ensure accuracy. Finally, the findings were synthesized into a comprehensive narrative, capturing the teachers' experiences with the complexities of science. To ensure the accuracy of the findings, the final description was presented to participants for validation. Their feedback was incorporated into the analysis, refining it to reflect their lived experiences better.

2.7 Ethical Considerations

Examining the lived experiences of elementary teachers concerning the complexities of science required careful attention to ethical considerations to protect participants' rights, well-being, and dignity. The Graduate School of Foundation University approved the study, with the endorsement of the Supervisor of Siaton District 1. Once approval was granted, the researcher sought permission from the principals of the three elementary schools involved in the study to identify potential participants. Detailed study protocols were thoroughly discussed with the school officials to ensure clarity and alignment in the research process. To uphold their rights and autonomy, participants' consent was secured. They received a clear explanation of the study's purpose, procedures, potential advantages, and any possible risks. This ensured they could make an informed choice about their participation.

Additionally, they were free to withdraw from the study at any point without providing a reason or facing any consequences. The privacy of participants was safeguarded throughout the study. Personal information and responses were carefully managed to ensure anonymity by removing identifying details. Data were securely stored, with access limited solely to the researcher, preserving confidentiality and upholding participants' trust. Most importantly, all data was thoroughly and permanently deleted in the presence of the researcher's adviser, who served as an official witness to ensure the integrity of the process. This deletion was executed using secure methods to guarantee that no retrievable remnants remained, thus upholding the highest standards of confidentiality and ethical research practices. Anonymity was maintained throughout the study to prevent any connection between participants and their responses. Personal identifiers were omitted, enabling participants to share their experiences freely and without concern for disclosure.

The study was carefully structured to prevent any harm or discomfort to participants. Efforts were made to respect their time and emotional well-being, with support available to address any concerns. This ensured a positive and considerate experience for all participants. The study aimed to support participants by exploring their experiences with the complexities of science. It aimed to generate insights that could enhance teaching methods and contribute to academic achievement. Participants' autonomy was honored by allowing them to choose whether to participate in the study. They also retained the right to withdraw without repercussions, ensuring their decisions were fully respected. The study upheld fairness by providing all science elementary teachers with equal participation opportunities. Participants were treated impartially, and risks and benefits were distributed equitably among them.

2.8 Trustworthiness

The research ensured credibility and value by emphasizing essential elements that reinforced the study's integrity and validity, prioritizing: (a) ***Credibility***. Carefully selected methods were employed to accurately capture participants' experiences. These approaches were designed to collect rich, meaningful data that reflected their perspectives and emotions. The research utilized techniques well-matched to its objectives, ensuring the findings were grounded in authentic and comprehensive insights. Additionally, these methods were tailored to fit the study's specific context, enabling a deeper exploration of participants' lived experiences; (b) ***Transferability***. Thorough and precise descriptions were provided to enhance the applicability of the findings in similar contexts. Detailed explanations of the methods, participants' experiences, and study outcomes allowed others to grasp the key factors shaping the results. This transparency ensured that the insights gained could be adapted or utilized in comparable settings, increasing their relevance and usefulness for future research or related studies; (c) ***Dependability.*** The study was meticulously documented and executed, ensuring each step was thoroughly recorded and consistently followed. Comprehensive records were maintained on the methods, procedures, and decisions made throughout the research, promoting transparency and providing a clear evidence trail. Data collection, analysis, and interpretation were conducted uniformly across all participants and situations, maintaining consistency in approach; (d) ***Confirmability***. The findings were derived directly from participants' input, ensuring they remained unbiased and accurately represented their experiences, perspectives, and feedback without external influence or distortion. Steps were taken to capture participants' voices with minimal interference from the researcher. This was achieved by employing open-ended questions, fostering a neutral response environment, and avoiding leading or suggestive prompts. Data analysis was conducted without favoring specific outcomes or preconceived ideas, ensuring that conclusions genuinely reflected participants' lived experiences.

3.0 Results and Discussion

After a thorough analysis of the transcripts and coding, 6 six emergent themes have emerged, capturing the lived experiences of elementary teachers regarding intricacies in science education.

3.1 Emergent Theme 1: Chained Potential

The first theme emphasizes the challenge of limited teaching materials and the creative ways educators adapt to ensure meaningful learning. Participants described how they navigated shortages of textbooks, science equipment, and technology by using alternatives like videos, adjusting lesson plans, and incorporating locally available resources. Despite these limitations, they remained committed to helping students grasp important concepts, often taking extra steps to fill in the gaps. This initial theme unfolds into two key aspects: Gravity of Limitations and Silent Countdown.

Theme 1: Gravity of Limitations

This theme highlights the challenges participants face due to their schools' lack of adequate teaching resources. They express disappointment with the shortage of textbooks, the incomplete state of science equipment, and the limited number of modules, which hinder their ability to deliver lessons effectively. While some participants hoped for more comprehensive teaching materials, such as video lessons and activities incorporating local resources, they struggled to find suitable materials for locally available experiments.

All these statements from the participants highlighted the challenges teachers encounter in delivering hands-on learning experiences due to limited resources:

For me, the time allotted for science is 50 minutes. It's very... well... insufficient. I think 1 hour, and 30 minutes could be the best thing, for most—uhh... for me. Primarily because if it's Science, again, as I've said, the language barrier, so it would take time for them to understand the concepts and then, you know, doing the experiments, preparing the materials. And then, when you experiment, it's not just a 5-minute thing. You know, sometimes it takes like... uhh... 15-20 minutes to finish such experiments, and then, there's observation. And then, you also must analyze what you observed. Then, you conclude what you've observed. So, for me, uhm... I think 1 hour and 30 minutes would be better. (P1)

The thing, Ma'am, I have one challenge is that... in one setting, especially during activities, hands-on— there are experiments, you really can't finish them in 45 minutes. There are times when my concept, instead of following the planned competency, is not quite like Week 1; this is it. I really can't follow it, Ma'am, because... the 45 minutes is not enough, Ma'am, if... we're being honest. (P3)

Finding appropriate materials for experiments is often difficult, and teachers frequently need to provide the necessary tools, especially when students forget to bring their own. Furthermore, integrating ICT and laboratory equipment into teaching is emphasized, as hands-on experience with scientific tools is essential for practical instruction and student understanding. This aligns with the study by Garcia et al. (2022), which stated that laboratory activities are necessary for science education as they offer students the opportunity to engage in hands-on experiments, enhancing their understanding of the material. Without these practical experiences, students often struggle to fully comprehend and appreciate the significance of science. Hadji Abas et al. (2020) observed that two public junior high schools in Lanao del Sur lacked sufficient laboratory resources, hindering teachers from effectively delivering lessons. As a result, students had limited chances for hands-on scientific learning, affecting the quality of their education.

Theme 2: Silent Countdown

The theme reflects teachers' challenges with limited class time and external disruptions. Participants expressed concerns that the time allotted for science lessons is insufficient to cover all necessary competencies, leading to rushed lessons and missed activities. External events, such as extracurriculars, often cause delays, making it difficult to ensure a thorough understanding.

These statements from the participants imply that the current time allotment for science lessons is inadequate for effectively delivering hands-on, experiential learning:

For me, the time allotted for science is 50 minutes. It's very... well... insufficient. I think 1 hour, and 30 minutes could be the best thing, for most—uhh... for me. Mostly because if it's Science, again, as I've said, the language barrier, so it would *take time for them to understand the concepts, and then, you know, doing the experiments, preparing the materials. And then, when you experiment, it's not just a 5-minute thing. You know, sometimes it takes like... uhh... 15-20 minutes to finish such experiments, and then, there's observation. And then, you also must analyze what you observed. Then, you conclude what you've observed. So, for me, uhm... I think 1 hour, and 30 minutes would be better.* (P1)

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The limited class time and factors like the language barrier prevent students from fully engaging with the material and completing tasks such as experiments, analysis, and observations. As a result, teachers may struggle to cover all the necessary competencies, leading to rushed lessons or the need to extend lessons beyond the scheduled time. This highlights the need for more time to ensure thorough understanding and meaningful learning experiences. This finding aligns with those of Peniero et al. (2020), who discovered that science education in Japan and the Philippines differs in terms of lesson planning, class duration, and teaching conditions. Japanese teachers have the advantage of adaptable lesson planning and more frequent but shorter science classes. Meanwhile, Filipino teachers contend with limited class time, larger student populations, and extra duties, reducing opportunities for hands-on learning and active student participation. Similarly, Cervantes (2024) reported that a House leader had urged the Department of Education (DepEd) to review the revised time allocations under the "Matatag" curriculum, highlighting the increased workload and stress for teachers. The leader also emphasized the need to reconsider the daily subject-teaching requirement and ensure that teachers' working hours stay within the legal limit, especially in cases of double-shifting.

3.2 Emergent Theme 2: The Rift of Comprehension

This theme explores the challenges faced by science teachers due to language barriers, students' difficulty in understanding concepts, and diverse learning abilities. Using English as the medium of instruction makes it harder for students to grasp scientific terms, leading teachers to incorporate translations and bilingual explanations. Despite efforts to simplify lessons, some concepts remain complex, requiring teachers to conduct additional research and integrate interactive strategies. Students' varying learning styles and intellectual capacities add to the difficulty, prompting teachers to use differentiated instruction and remedial sessions to ensure effective learning for all. Under this, two themes also emerged, namely: Words in Void and Diverse Minds in Motion.

Theme 3: Words in the Void

This theme highlights how the language barrier affects Science education, making it difficult for students to understand and express ideas in English. Teachers address this challenge using translations, bilingual explanations, and localized strategies to improve comprehension. While some students are fluent, many require additional support, which demands more time and effort. Limited parental support at home further complicates learning, emphasizing the need for adaptive teaching approaches.

These statements from the participants highlighted the impact of language barriers in education, showing how teachers adapt their methods to help students understand content better:

We will have video lessons, then I will pause. I will pause the video lesson and then try to explain what's happening in the video so that they won't be left hanging. The video, of course, is in English, so we will switch to Binisaya. (P1)

I find it not difficult, but you must take the time to explain it to them. They will-they will, in turn, ask you to explain in... in, uh... vernacular. But I intend to speak it in English because I also want them to learn, not just Bisaya. I also want them to learn to communicate in English. (P4)

Language barrier, since our learning resources were written in English and then … we, teachers, try to localize what is present in their community so that they can connect with the lessons that we are talking about or the day's lesson—to enrich the day's lesson. And difficult uhh.. yes, the …language barriers and you must try to be strategic as a teacher, most importantly, because our learners there in Salingkubong, since their parents don't have enough opportunity to have in education, so they don't have a foundation, the highest foundation, in scaffolding their learners about the daily activity task *given by the teachers.* (P6)

Teachers frequently pause lessons or translate material into the local language to aid comprehension, especially when resources are in English. Despite the extra time it takes, teachers' efforts to maintain English in the classroom reflect the growing challenge of language differences and their strategic attempts to bridge the gap in student learning. This aligns with the views of Means et al. (2021), who emphasized the need for a central scientific language but acknowledged the limitations of using just one language in science, proposing translation and technology as solutions. Furthermore, De Los Reyes (2022) supported this by showing that using a mix of languages or translanguaging enhances understanding in multilingual classrooms, offering a practical approach to overcoming language barriers in science education.

Theme 4: Diverse Minds in Motion

This theme emphasizes the importance of addressing students' diverse learning styles and abilities. It reflects teachers' efforts to adjust their teaching strategies to accommodate students' different needs, recognizing that not all learners process information the same way. Teachers utilize various methods, including remedial classes, differentiated instruction, and eclectic approaches, to ensure that fast learners and those with average abilities can grasp the material.

These testimonies from the participants illustrate the challenges teachers face when adapting to the diverse learning abilities of their students:

I used to do a remedial class. I will reteach uhh.. same topic, but in a different way. Let's say uhh… different- you know, teaching strategies or learning styles. (P1)

I don't believe that one size fits all because not all pupils have the same intellectual capacity. So, in teaching, we must differentiate between those who are fast and those who belong to the average category. (P4)

For example, Ma'am, uh... the problem in the department or in... the problem today, Ma'am, uh... the pupils, the reading ability of the students. So, it's a mix of students, Ma'am. We have many students, Ma'am, 40 plus, that's why... we still have a high... problem... uh... It's a big challenge in teaching, Ma'am, because it's a mix. (P5)

They highlighted the importance of differentiated teaching strategies, such as using varied teaching methods and adjusting instruction to accommodate students with different learning speeds and needs. This aligns with the observation of El-Sabagh (2021), who explored the impact of adaptive e-learning tailored to students' learning styles, showing its advantage over traditional methods in boosting engagement. In line with this thought, Hassan et al. (2019) developed a framework that adapts gamification to individual learning styles, resulting in a 25% increase in motivation and a 26% reduction in dropout rates.

3.3 Emergent Theme 3: Blindfolded Mentors

This theme illustrates educators' difficulties in effectively teaching Science, particularly in the context of a lack of specialized training and the struggle to implement effective teaching strategies. Teachers emphasize the importance of continuous learning and specialized training to address knowledge gaps and stay updated with evolving Scientific trends. However, even with training, many teachers find it challenging to apply new strategies in the classroom, mainly when seminars focus more on lesson planning than practical teaching. This theme includes two sub-themes: Unsharpened Minds and The Struggle to Ignite.

Theme 5: Unsharpened Minds

This theme highlights the participants' awareness of the importance of ongoing professional development in science education. Teachers express varying preferences for ongoing training, with some emphasizing the importance of staying updated on new trends, teaching methods, and technologies. They highlight the need for more focused seminars to enhance their skills, particularly for complex topics and higher grade levels.

These testimonies from the participants highlighted the critical role of continuous professional development for science teachers, emphasizing its significance in improving teaching effectiveness:

In training... uhh, training is essential, Ma'am, especially for me, I'm an elementary teacher. We don't have a major. It's not like *my teaching Science is... It's been a few years; it's still relatively new. Therefore, training is particularly necessary, especially in higher grades, as certain concepts or facts require periodic review.* (P3)

Nothing much. I'm happy because, as they learn, I'm also learning. I'm happier with science, but I'm not confident with math. In my opinion, we need to have training in science. It could be annual. Just annual. At least, the teacher will experience it because there are innovations. At the same time, the teacher's learning will also be continuous. (P4)

So, I need to upskill more in teaching, such as through trainings and seminars. It's important because it has a positive impact according to research, one that I have read in research, teaching Science, it is essential—the seminars, as part of (inaudible) profile in teaching Science as a teacher because if you have less engagement or less opportunity to be exposed to workshops and trainings, of course, you also have less competency in teaching—competent in teaching Science. But if you... If you're involved in training seminars regarding teaching Science, I assure you that, as a generalist, I can teach effectively and efficiently in Science. (P6)

Particularly for those with limited experience or lacking specialization in the subject, the participants stressed the importance of ongoing training to keep teachers updated on innovations and teaching strategies. This approach ensures that teachers remain competent and adaptable in their roles. This aligns with the findings of Suchyadi et al. (2020), who argue that improving the quality of education hinges on continuous professional development through structured training and growth efforts. Similarly, Rochette (2022) advocates for more practical, on-the-job training, suggesting that schools must find more effective ways to support teachers' professional growth. Maeng et al. (2020) further support this by demonstrating that professional development programs significantly enhance elementary science teachers' understanding and confidence, particularly when they involve modeling, feedback, and coaching. These insights underscore the importance of regular learning opportunities to enable teachers to stay ahead and promote high-quality education.

Theme 6: The Struggle to Ignite

This theme focuses on the challenges teachers face when using effective Science teaching methods. It highlights the need for practical training, diverse teaching methods, and a focus on students' needs to help them learn more effectively and stay up to date with the curriculum.

These statements from the participants emphasized the need for improvements in science education by emphasizing the importance of more practical training for teachers, ensuring that seminars went beyond just lesson planning and provided hands-on experience:

For learning strategies in Science, I partly… I can say that… It's not that, you know, effective as… as in practical teaching because during our seminars, it's mostly on, uhm… lesson planning, more on lesson planning. However, when it comes to practical matters, since seminars are time-constrained, the time is very limited. I know that science can really offer a lot, but due to time constraints, it's somewhat lacking. Though, … though, it's helpful, but it's not that effective because the time is… was limited and the… the ideas and information were also limited though there were such… uhm… examples or like learning competencies being targeted, but it's not really that comprehensive because Science is a bit broad. (P1)

There are those competencies that I think would be difficult for them, and there are also competencies where it's not – it can no longer… It's no longer in the MELCs, but during those times when it wasn't yet the pandemic, it was there. Then, some were removed, and there are MELCs left that I found out that… right now, we're using MELC, there is this competency about rocks, I think, that is no longer in K to 12, because I believe that competency belongs to Grade 4 already. After all, it's no longer in our books. (P4.

Yes, teachers should be innovative and creative, and always expose learners to real-life situations. Be a learner-centered approach in teaching … science. Learner-centered approach when less of the teacher. It is more on scaffolding, not spoon-feeding. Because scaffolding is that teacher's role, they are just there to facilitate and help learners throughout the learning process. However, when the whole task is learner-centered, learners are the ones who do the task. Less of the teacher, more on the pupils or students. (P6)

It also highlighted the need for teaching resources, such as textbooks, to be updated to reflect curriculum changes, including the reassignment of topics to different grade levels. This aligns with the views of Suchyadi et al. (2020), who stated that enhancing the quality of education necessitates ongoing professional development through structured training and sustained growth efforts. Similarly, Boateng et al. (2023) suggested that university faculties responsible for teacher training should have supported future educators in balancing practical experience with theoretical learning throughout their programs.

3.4 Emergent theme 4: The Alchemy of Teaching

This theme focuses on utilizing technology and active learning strategies to enhance science education. Participants highlighted how digital tools, such as YouTube videos and interactive simulations, help overcome resource limitations and to improve student engagement. They also emphasized the importance of hands-on activities, questioning techniques, and cross-disciplinary connections to make learning more meaningful. However, challenges such as students' struggles with complex concepts and the need for continuous teacher adaptation were acknowledged, underscoring the importance of innovative and flexible teaching approaches. Under this theme, two sub-themes emerged: EdTech in Action and Igniting Curiosity.

Theme 7: EdTech in Action

This theme illustrates how Science teachers overcome resource limitations using technology and creative methods. Participants use YouTube and ICT tools to demonstrate experiments, making lessons engaging and accessible. Interactive strategies, like group work and cross-subject integration, enhance understanding. By combining digital tools with traditional materials, teachers ensure a well-rounded learning experience.

These statements from the participants illustrate how Science teachers adapt to challenges by integrating technology to enhance student learning:

So, with that, as a teacher, with all those uhh … lack of materials and resources, I used to uhh… download videos from YouTube, okay, because there- uhh . There were videos about experiments that we would observe, so that, at least by watching the video, we could see how the experiments are conducted and what they entail. Although we may not be able to personally conduct the experiment, at least we have an idea of the things involved in experimenting. (P1)

Another thing is, one of the benefits for the teacher… we know Science is teaching the concept, it is about facts, so the students—I also saw that with the use or help of ICT, they become more engaged, especially if what you use is interactive, like there is a slideshow and there are questions where they get to choose, then the correct answer appears—it is interactive, Ma'am, where they can correct and see, "Ah, so that's how it is." As a result, the class becomes more interactive, and students remember the concept better. (P3)

With limited resources, participants use YouTube videos and interactive simulations to help students visualize experiments and grasp concepts without direct hands-on experience. They also observe that ICT tools, such as slideshows and quizzes, make lessons more engaging, interactive, and memorable. By incorporating digital tools, teachers address material shortages and improve student participation and comprehension, making Science more accessible and practical. This echoes the results of Depone et al. (2024), who emphasized that technology plays a crucial role in modern education, making integration essential for effective learning. To maintain high-quality instruction, teachers must actively adopt digital tools in their teaching methods. However, as Jannah et al. (2020) noted, the effectiveness of digital learning depends not only on technology but also on teachers' competencies and creativity. While digital tools enhance motivation, engagement, and critical thinking, their impact is significantly influenced by how well teachers implement them. Schools with strong infrastructure see better results, reinforcing that successful digital learning requires access to technology and skilled educators who can maximize its potential.

Theme 8: Igniting Curiosity

This theme highlights the importance of active learning in science. Participants emphasize hands-on activities, questioning techniques, and real-life connections to enhance understanding. They value student engagement, concrete demonstrations, and the integration of technology, creating a supportive environment for exploring scientific concepts.

These statements from the participants highlight different approaches to making science education more engaging and effective:

You develop the art of questioning. You throw them the questions, and they can share their ideas, based on real objects and *manipulated materials, so they can verify the facts we present to them.* (P1)

So, I give them instructions and then they follow. They do the mixing of the ingredients by stirring, and everyone will observe. (P2)

And when it comes to my teacher relationship with my parents and students, particularly the students themselves, because we are talking here about science, they have difficulty understanding science, and that is one of the most challenging parts as a teacher in teaching science. … It's tough for them to understand the concept, but when I try to elevate my teaching strategy and technique with the uhh… integrating the technology. I try to incorporate interactive simulations so that the students can gain an in-depth understanding of the concept. (P6)

Encouraging students to ask questions fosters critical thinking and allows them to explore ideas using hands-on materials to confirm scientific facts. Providing structured guidance in experiments helps students follow step-by-step procedures, reinforcing learning through direct participation and observation. Research supports these approaches, with Canuto (2024) demonstrating how science comics improve engagement and simplify complex topics, while Safitri et al. (2023) found that Problem-Based Learning (PBL) boosts motivation and academic performance. Similarly, Picardal et al. (2022) demonstrated that contextualized instruction yields more significant student achievement than traditional methods. These findings underscore the need for dynamic, student-centered teaching to enhance the effectiveness of science education.

3.5 Emergent theme 5: The Evolving Educator

This theme highlights the importance of professional development in enhancing Science teaching. Participants recognize that continuous learning through training, seminars, and collaborative sessions strengthens their teaching skills and effectiveness. They acknowledge the evolving nature of education, emphasizing the need to adapt to students' exposure to technology and social media. Engaging in research, refining questioning techniques, and sharing strategies with colleagues contribute to personal and professional growth. This theme includes one sub-theme: Catalysts of Progress.

Theme 9: Catalysts of Progress

This theme highlights the importance of professional growth in science teaching, as emphasized by the participants. They recognize that training, seminars, and collaborative sessions enhance their skills and qualifications, making them more effective educators. Continuous learning helps them stay ahead in a rapidly evolving digital landscape, refine questioning techniques, and foster student curiosity. By actively seeking professional development, teachers improve their teaching strategies and adapt to the changing needs of education.

These statements illustrate the participants' recognition of professional development as a key factor in enhancing their teaching effectiveness:

Through the trainings, so INSET helped us a lot as teachers. INSET and the LAC sessions, the feedback during the monitoring, and it has developed us more effectively in our profession, particularly in teaching kids. (P1)

For me, Ma'am, in my case, it seems like… but trainings will… just by attending trainings, Ma'am, you can cope with the needed… needed – what is this – needed requirement or qualifications to be a science teacher. (P3)

We have given the time and, at the same time, provided seminars and trainings to capacitate learners in teaching science. And about concepts, we have our LAC sessions, as well as district-wide school LAC sessions, where we aim to capacitate our colleagues, our teachers so that we can make the best endeavor. (P6)

They emphasize the value of training programs, collaborative learning sessions, and feedback mechanisms in strengthening their skills and qualifications as science educators. By participating in INSET, LAC sessions, and various seminars, teachers improve their instructional strategies and stay updated with new methodologies, ensuring they can meet the evolving demands of science education. This is aligned with the notion of Davidson et al. (2020), who discovered that actively engaging in scientific research allowed teachers to gain a firmer grasp of epistemic affect, enhancing their ability to foster student learning and engagement in science. Similarly, Rahman Talukder et al. (2021) highlighted the importance of improving teacher training, continuous professional growth, and integrating inquiry-based approaches to strengthen science education.

3.6 Emergent Theme 6: Beyond the Curriculum

This theme highlights how participants integrate reflective and values-driven teaching into their practice to enhance student learning and personal growth. They emphasize ensuring student mastery of competencies, making lessons relevant to real life, and fostering curiosity and critical thinking. Their reflections reveal the challenges and rewards of teaching Science, demonstrating their commitment to continuous improvement. This theme encompasses two sub-themes: Guiding Stars of Tomorrow and Waves of Reflection.

Theme 10: Guiding Stars of Tomorrow

This theme highlights participants' dedication to student-centered learning, ensuring students achieve competencies through engaging and meaningful instruction. They emphasize hands-on experiences, contextualized examples, and inquiry-based approaches to deepen understanding. Participants also recognize the importance of assessments, feedback, and parental involvement in fostering student success.

These statements from the participants illustrate the importance of going beyond basic instruction to ensure students fully grasp lessons, using strategic questioning to develop critical thinking, and maintaining regular communication with parents to support student progress:

So, uhh, with those uhh you know … problems … as a teacher, we need to go an extra mile so that we could be able to deliver our lessons to our learners with uhm … whole learning experience and at the same time, they could be able to … to get our learning competencies. (P1)

But for me, Ma'am, it's really about the level of questioning for students nowadays, when you ask "what," they can still answer. But when you get to "why," that's when they go silent. So I told myself… but you can do something about it, Ma'am. You can rephrase the question—I rephrase my questions or give them an example. If they still don't get it, I'll let them give their example. If they can't say it, they know it, Ma'am, because especially kids, they're naturally curious. (P3.

So, what I did, and again, I provided feedback to the parents. Uhh… communication is essential. Providing feedback regarding their learners or children, perhaps. And about that action, I see that it is effective because communication and feedback are essential. That you must communicate with their parents, uh, based on their performance, time to time, so that their parents should be aware of… while they are inside the classroom, because at the end, it's about our learners, so teaching science to them … time to time … I must say that there is development. (P6)

Emphasizing extra effort in teaching, adapting questioning techniques, and involving parents all contribute to a student-centered approach that fosters deeper learning and engagement. This supports the conclusions of Macias et al. (2021), who examined how future teachers worked with elementary students to create fair learning opportunities in science. Their study demonstrated that this teamwork enabled teachers to understand the challenges in underprivileged areas, develop solutions in collaboration with students, and advance in their profession.

Theme 11: Waves of Reflection

This theme captures participants' reflections on their experiences as science teachers, highlighting both the challenges and rewards of the profession. They express frustration over student struggles yet find joy in discovery, engagement, and curiosity-driven learning. Participants also emphasized the importance of values education, real-life applications, and continuous professional growth in shaping their teaching approaches.

These statements from the participants highlight different perspectives on teaching Science, showing both the challenges and rewards of the profession:

I am challenged, and it's exciting. It's fun teaching Science. (P2)

So, as a Science teacher for four years—almost four years, uhm… I can say that, as a science teacher, it is challenging, yet also exciting and enjoyable. (P3).

My experience as an Elementary Science teacher is quite uhh … exploring since I … came here uhh … 2010? I have been *teaching this subject for 8 years and... I also find this subject very interesting because, while the pupils learn, I, as a teacher, am learning too. Uhh, like those different uhh .. methods, strategies, that's why I find this subject interesting.* (P4)

Some teachers find it demanding yet fulfilling, appreciating the excitement and enjoyment of engaging students in scientific exploration. Others see teaching as a continuous learning process, where they impart knowledge and discover new methods and strategies alongside their students. This aligns with McLaren's (2023) view of education as both a means of control and liberation, where strengthening teachers' instructional skills allows them to challenge traditional ideas, foster critical thinking, and guide students toward personal growth. Both perspectives underscore the transformative nature of education, where teachers play a crucial role in shaping their development and that of their students. Similarly, Menon (2020) shows that hands-on teaching experiences help aspiring educators build confidence and shape their professional identities. Both perspectives emphasize the importance of teaching as a process of imparting knowledge and evolving as an educator through experience and reflection.

4.0 Conclusions

This study explored the challenges and rewards of teaching Science, focusing on the strategies educators used to overcome obstacles and foster meaningful learning. Its main contribution was highlighting the resilience, creativity, and adaptability teachers demonstrated in navigating the complexities of science education. Participants cited challenges such as limited resources, time constraints, and language barriers; however, they addressed these issues using available materials, technology, hands-on activities, and translanguaging —an approach supported by De Los Reyes (2022) for enhancing comprehension in multilingual classrooms. Despite these difficulties, participants found teaching Science deeply rewarding, especially in cultivating curiosity, critical thinking, and a love for discovery. They also emphasized the importance of continuous professional development, reflecting McLaren's (2023) view of education as a means of both control and empowerment. Reflective teaching was another key strategy, allowing educators to adapt lessons to diverse student needs, an approach consistent with Macias et al. (2021), who documented professional growth through collaboration in underserved areas. While challenges persist, the study highlighted how adaptable, reflective, and professionally supported teaching practices can lead to meaningful science learning. These findings offer practical guidance for improving science instruction and teacher training programs, particularly in resource-limited and multilingual settings. Future research could further explore strategies for addressing resource gaps and the broader impact of translanguaging in science education.

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The author affirms sole contribution to all aspects of this work and has reviewed and approved the final version.

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7.0 Conflict of Interests

The author declares no conflicts of interest.

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