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DIFFICULTIES OF TEACHERS IN TEACHING SCIENCE

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Abstract

This study investigated the difficulties teachers face in teaching science, during the School Year 2024–2025 in a large-sized division in Central Visayas, Philippines. Using a descriptive research design, the study involved forty-five (45) science teachers who served as respondents. Data were gathered through a researcher-made survey questionnaire, which was validated using the criteria of Carter V. Good and Douglas E. Scates and tested for reliability through Cronbach's Alpha with thirty (30) teachers from District 1 who were not included in the actual study. Descriptive and comparative statistical tools, including frequency, percentage, mean, and the Mann–Whitney U test, were employed in data analysis. Results revealed that teachers experienced significant difficulty in teaching science, particularly in pedagogical content knowledge, physical infrastructure, and access to training. These difficulties were consistent across age groups, educational attainment, and years of service. However, a significant difference was found in training-related difficulties when teachers were grouped according to length of service, indicating that novice teachers lacked access and confidence in pursuing specialized training. In contrast, more experienced teachers struggled to keep pace with emerging trends and innovations in science education. The findings underscore the need for targeted, differentiated professional development programs, improved science facilities, and a mentoring system to support novice and experienced teachers alike. Based on the results, an action plan was proposed to enhance teachers' competence and effectiveness in science instruction, ultimately improving student learning outcomes.

Keywords: *Teaching difficulties, science education, pedagogical content knowledge, professional development, science teachers, action plan*

Bio-notes:

Icon Mae M. Callojellas is an elementary school teacher at Danao Elementary School under the Schools Division of the Negros Island Region, Department of Education, with ten years of teaching experience. She holds a Bachelor of Elementary Education degree from Negros Oriental State University–Bayawan–Sta. Catalina Campus. She began her teaching career as a Kinder Volunteer Teacher at Santa Catalina Central Elementary School from 2013 to 2015 and has been serving as a Grade III teacher at Danao Elementary School since 2015. Passionate about teaching, she is skilled in effective classroom instruction and in fostering a positive and engaging learning environment. Her professional strengths include strong communication skills, computer literacy, adaptability, and teamwork and collaboration.

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Introduction

Rationale

Science teachers continue to experience significant difficulties in delivering effective instruction due to the complex and abstract nature of scientific concepts and the demand for strong pedagogical content knowledge (PCK). Effective science teaching requires the integration of content mastery and appropriate instructional strategies; when this integration is weak, students' conceptual understanding and engagement are adversely affected (Gess-Newsome, 2015). Furthermore, limited access to well-equipped laboratories, updated instructional materials, and educational technology restricts the implementation of inquiry-based and experiential learning approaches that are fundamental to science education (OECD, 2014). These resource-related difficulties often result in teacher-centered practices, thereby reducing opportunities for active learning and scientific skill development.

Differences in teachers' age, educational attainment, and length of service also influence how these difficulties are experienced and managed. Beginning teachers frequently encounter difficulties related to instructional confidence and classroom management, whereas more experienced teachers may struggle to adapt to curriculum reforms and evolving pedagogical innovations (Darling-Hammond, 2017). These persistent difficulties have direct implications for the quality of instruction and student achievement. Addressing them contributes to the attainment of Sustainable Development Goal 4 of the United Nations, which advocates for inclusive and equitable quality education, and reinforces global efforts to strengthen educational systems through sustained teacher development.

Literature Review

The reviewed literature reveals that teachers encounter multifaceted difficulties in teaching science, particularly in areas of professional development, instructional resources, leadership support, and technology integration. Studies by Sharma (2018) and Eroğlu and Kaya (2021) emphasize that limited access to sustained professional development and financial constraints hinder teachers' instructional competence and career growth. Similarly, Anto et al. (2023) and Bumagat et al. (2023) identified inadequate laboratory facilities, insufficient infrastructure, and limited administrative support as persistent barriers affecting the quality of science instruction. In the Philippine context, Sanoy (2020) and Gonzales (2021) highlighted deficiencies in assessment practices and ICT integration, noting that teachers often lack the technical skills and resources necessary to effectively implement modern teaching strategies. These findings collectively underscore the need for enhanced institutional support systems, targeted training programs, and improved resource allocation to address the ongoing challenges faced by science teachers.

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Moreover, the literature consistently demonstrates that empowerment initiatives, leadership models, mentoring, and collaborative approaches significantly contribute to improving teachers' competence and job satisfaction. Longitudinal and comparative studies by Johnson (2016) and Adams (2019) show that empowerment programs positively influence teachers' morale, leadership capacity, and professional engagement over time. Technology integration, as discussed by Brown (2020) and Sasota et al. (2020), further strengthens instructional delivery when teachers possess adequate ICT skills and access to digital tools. Locally, action research and mentoring initiatives examined by Reyes (2018) and Ana P. Santos (2020) affirm that structured professional development and collaborative networks enhance science teachers' effectiveness in curriculum implementation and student assessment. Taken together, these studies provide a strong empirical foundation for the present research, which seeks to further examine the difficulties encountered by science teachers and identify responsive strategies that may improve instructional quality and educational outcomes.

Theoretical Underpinnings

This study is anchored on Cognitive Load Theory (CLT), proposed by Sweller (1988) and expanded by Sweller et al. (2011), which explains how the limited capacity of human working memory affects learning and task performance, particularly when individuals are exposed to complex or unfamiliar information. CLT identifies three types of cognitive load: intrinsic load, which refers to the inherent complexity of the subject matter; extraneous load, which results from ineffective instructional design, limited resources, and curriculum overload; and germane load, which involves the mental effort devoted to meaningful learning. In science teaching, intrinsic cognitive load is naturally high due to abstract concepts, technical terminology, and laboratory procedures. In contrast, extraneous load is often intensified by inadequate instructional materials, insufficient physical infrastructure, and limited professional training. These conditions contribute to teachers' difficulties in lesson planning, content delivery, and sustaining learner engagement. Cognitive Load Theory is relevant to this study as it provides a psychological and instructional framework for understanding the challenges faced by science teachers and supports the development of targeted action plans aimed at reducing unnecessary cognitive burden through improved training, well-designed instructional materials, and enhanced learning environments, ultimately leading to more effective science instruction and improved student learning outcomes.

Objectives

This paper aimed to determine the level of difficulty teachers experienced in teaching science during the School Year 2024-2025 in a district of a large-sized division in Central Visayas, Philippines, to inform the development of an action plan. Specifically, this study sought to answer the following questions: (1) What is the profile of the respondents in terms of age, highest educational attainment, and length of service? (2.) What is the level of difficulty teachers have in teaching science in terms of pedagogical content knowledge, physical infrastructure, and training in science? (3.) What is the level of difficulty of teachers in teaching science when grouped according to the aforementioned variables? (4.) Is there a significant difference in the level of difficulties teachers experience in teaching science when grouped and compared according to the aforementioned variables?

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Methodology

The study's methodology-related components, such as the research design, respondents, research instrument, data collection process, and ethical issues, are described in this section.

Research Design

This study adopts a descriptive research design to evaluate the level of difficulty teachers face in teaching science and to develop an action plan for the School Year 2024-2025 in a large-sized Division in Central Visayas, Philippines. Descriptive research involves gathering data describing events and organizing, tabulating, depicting, and describing the data (Shuttleworth, 2014).

Respondents

The respondents for this study comprise 45 science teachers. The respondents were pretty manageable; total enumeration was employed.

Data-gathering Instrument

The instrument underwent rigorous face and content validation by three experts in research and education to ensure its accuracy in measuring the intended demographics. The validation process yielded a final validity score of 4.55, indicating excellent validity. Cronbach's Alpha was used to assess the instrument's reliability and internal consistency. The reliability coefficient of 0.804 is considered 'good,' indicating that the instrument has strong internal consistency, which is acceptable in most research situations.

Procedures for Data Collection

This section fully adhered to established research protocols. Upon securing approval from the Schools Division Superintendent, the researcher personally administered the questionnaires to target respondents to ensure a high response rate and data accuracy.

Data Analysis and Statistical Treatment

Objective 1 used a descriptive-analytical scheme and the mean as a statistical tool to determine the profile of the respondents. Objective 2 used the same analytical scheme and statistical tool to determine the level of difficulty teachers face in teaching science, grouped by pedagogical content knowledge, physical infrastructure, and science training. Objectives 3 used the same analytical scheme and statistical tool to determine the level of difficulty teachers face in teaching science, grouped according to the aforementioned variables. Objective 4 used comparative analytical schemes and Mann-Whitney U tests as statistical tools to determine whether significant differences exist in the level of difficulty teachers experience when teaching science, grouped and compared according to the variables mentioned earlier.

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Ethical Considerations

The protection of human subjects through the application of appropriate ethical principles is important in all research studies. In a qualitative study, ethical considerations have a particular resonance due to the in-depth nature of the study process (Arifin, 2018).

Results and Discussion

Profile of the Respondents

Table 1
Profile of the Respondents

Variable	Category	Frequency	Percentage (%)
Age	Younger (Below 37 years old)	22	48.9
	Older (37 years old and above)	23	51.1
	Total	**45**	**100.0**
Highest Educational Attainment	Lower (Bachelor's degree)	19	42.2
	Higher (MA and PhD)	26	57.8
	Total	**45**	**100.0**
Length of service	Shorter (Below 10 years)	20	44.4
	Longer (10 years and above)	25	55.6
	Total	**45**	**100.0**

As presented in Table 1, 22, or 48.90%, are younger respondents (below 37 years old), while 23, or 51.10%, are older respondents (37 years old and above). For the highest educational attainment, 19, or 42.20%, of the respondents are bachelor's degree holders, while 26, or 57.80%, are master's and doctorate holders. Moreover, for variable length of service, 20, or 44.40%, of the respondents had served for less than 10 years, while 25, or 55.60%, had served for more than 10 years. It implies that older groups contributed more respondents with higher educational qualifications and longer years in the service. This trend suggests that as individuals advance in their careers, they pursue further education and gain more experience, which may enhance their professional development.

Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge, Physical Infrastructure, and Training in Science

Table 2
Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge

Pedagogical Content Knowledge		
Items	**Mean**	**Interpretation**
As a teacher, I find difficulties in…		
1. explaining complex scientific concepts to students clearly.	3.69	High level
2. adapting the science curriculum to meet the needs of students with different learning abilities.	3.56	High level
3. designing engaging science experiments that align with the learning objectives.	3.58	High level
4. utilizing appropriate instructional strategies for different science topics.	3.60	High level
5. incorporating up-to-date scientific discoveries into classroom lessons.	3.29	Moderate level
6. connecting science theories to real-world applications in my lessons.	3.58	High level
7. effectively using technology to enhance science teaching and learning.	3.58	High level

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8. assessing students' understanding of scientific concepts through varied assessment methods.	3.78	High level
9. balancing the theoretical and practical aspects of science education.	3.53	High level
10. providing sufficient hands-on experiences in science within time constraints.	3.49	Moderate level
Overall Mean	**3.57**	**High level**

Table 2 presents the level of difficulties teachers have in teaching science in pedagogical content knowledge. The respondents obtained an overall mean score of 3.57, interpreted as a high level. The finding implies that the respondents have difficulty applying various assessments to determine students' understanding of scientific concepts and theories in science. The result suggests that teachers may lack the tools or strategies to evaluate student knowledge and experience in science effectively. The finding aligns with Sanoy (2020), indicating that while science teachers demonstrate competence in pedagogical content knowledge, they still lack the training and resources to effectively assess students' understanding of science concepts, theories, and experiments. This gap in resources not only hinders their ability to evaluate student comprehension but also limits the overall effectiveness of science education.

Table 3
Level of Difficulties of Teachers in Teaching Science in Physical Infrastructure

Physical Infrastructure Items	**Mean**	**Interpretation**
As a teacher, I find difficulties in…		
1. Accessing adequate laboratory equipment and materials for science experiments.	3.78	High level
2. Using science laboratory facilities due to poor maintenance or lack of resources.	3.69	High level
3. providing students with enough classroom space for hands-on science activities.	3.73	High level
4. Securing sufficient budget for purchasing new science materials and equipment.	3.56	High level
5. dealing with outdated or non-functional laboratory tools and apparatus.	3.71	High level
6. Ensuring classrooms have proper ventilation and lighting for conducting science experiments.	3.76	High level
7. Using technology in the classroom due to limited access to computers, projectors, or internet connectivity.	3.78	High level
8. Storing laboratory materials safely and securely in the available school infrastructure.	3.84	High level
9. Arranging field trips or external science activities due to a lack of transportation or resources.	3.38	Moderate level
10. integrating multimedia resources into science lessons due to insufficient equipment.	3.87	High level
Overall Mean	**3.71**	**High level**

Table 3 shows the level of difficulties teachers have in teaching science in the physical infrastructure. The respondents obtained an overall mean score of 3.71, interpreted as a high level. The finding implies that the respondents have trouble integrating multimedia resources into science lessons. This is because some teachers lack the necessary training or support to effectively incorporate these tools, which could hinder student engagement and learning outcomes. The finding relates to Emily M. Brown's study, titled "Technology Integration in Teacher Empowerment: Lessons for SCIENCE Teachers" (2020), which delves into the intersection of technology and teacher empowerment, specifically focusing on its relevance to coordinators involved in science. The study likely investigates various ways in which technology can enhance the capabilities of teachers and coordinators, such as through professional development tools, online resources, collaborative platforms, or innovative teaching methodologies. By

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drawing lessons from integrating technology in teacher empowerment initiatives, Brown's work may provide valuable insights into how science teachers can leverage technology to enhance their leadership roles and improve moral and values education delivery.

Table 4
Level of Difficulties of Teachers in Teaching Science in Training in Science

Training in Science		
Items	**Mean**	**Interpretation**
As a teacher, I find difficulties in…		
1. Attending relevant science training workshops or seminars due to time constraints.	3.62	High level
2. Keeping up with advancements in scientific knowledge through professional development.	3.76	High level
3. applying new teaching strategies learned from science training programs in the classroom.	3.62	High level
4. finding opportunities for specialized training in specific science subjects or topics.	3.71	High level
5. receiving adequate support from the school administration for attending science-related training.	3.47	Moderate level
6. Accessing training programs that are updated with the latest trends in science education.	3.53	High level
7. finding training that focuses on practical science applications in real-world contexts.	3.49	Moderate level
8. Participating in continuous professional development to improve my science teaching skills.	3.44	Moderate level
9. Engaging in collaborative learning experiences with other science teachers.	3.36	Moderate level
10. receiving mentorship or coaching in science teaching from experienced educators.	3.47	Moderate level
Overall Mean	**3.55**	**High level**

Table 4 discloses the level of difficulties teachers have in teaching science in science training. The respondents obtained an overall mean score of 3.55, interpreted as a high level. The finding implies the respondents seldom update themselves on the latest scientific knowledge and discoveries because of the limited training opportunities. The government and private sector offered a few free trainings and seminars related to science. In addition, most science teachers do not undergo professional development training because there is no government sponsorship for teachers in public secondary schools. With this, most science teachers finance themselves to pursue postgraduate education and use their own money to pay for the training and seminars offered by private institutions, just earning various certificates related to science. The result relates to Antonio R. Santos' research, titled "Professional Development Strategies for Science Teachers in the Philippines" (2019), which explores the realm of professional development for coordinators within the context of science in the Philippine education system. This study will likely provide a comprehensive exploration of practical strategies specifically tailored to address the unique needs and challenges science teachers face.

Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge, Physical Infrastructure, and Training in Science, and when grouped according to Age, Highest Educational Attainment, and Length of Service

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Table 5
Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge when grouped according to Age

Pedagogical Content Knowledge	Age			
	Younger		Older	
Items	Mean	Interpretation	Mean	Interpretation
As a teacher, I find difficulties in…				
1. explaining complex scientific concepts to students clearly.	3.68	High level	3.70	High level
2. adapting the science curriculum to meet the needs of students with different learning abilities.	3.64	High level	3.48	Moderate level
3. designing engaging science experiments that align with the learning objectives.	3.55	High level	3.61	High level
4. utilizing appropriate instructional strategies for different science topics.	3.73	High level	3.48	Moderate level
5. incorporating up-to-date scientific discoveries into classroom lessons.	3.32	Moderate level	3.26	Moderate level
6. connecting science theories to real-world applications in my lessons.	3.36	Moderate level	3.78	High level
7. effectively using technology to enhance science teaching and learning.	3.77	High level	3.39	Moderate level
8. assessing students' understanding of scientific concepts through varied assessment methods.	3.86	High level	3.70	High level
9. balancing the theoretical and practical aspects of science education.	3.64	High level	3.43	Moderate level
10. providing sufficient hands-on experiences in science within time constraints.	3.68	High level	3.30	Moderate level
Overall Mean	**3.62**	**High level**	**3.51**	**High level**

Table 5 presents the level of difficulties teachers experience in teaching science in pedagogical content knowledge when grouped according to age. Younger respondents obtained an overall mean of 3.62, interpreted as a high level, while older respondents obtained an overall mean of 3.51, interpreted as a high level. The finding implies that younger respondents have difficulty applying various assessment methods to determine students' understanding of scientific concepts. In comparison, older respondents find connecting science theories to real-world applications challenging. This discrepancy may highlight a generational gap in educational training and experiences, suggesting that younger educators may benefit from more hands-on, practical approaches to science teaching. Conversely, older educators might require additional resources or professional development to bridge theoretical knowledge with tangible applications in everyday life. The result relates to that of Broce (2020), revealing that science teachers should develop and use appropriate assessment strategies to monitor and evaluate learners' performance.

Table 6
Level of Difficulties of Teachers in Teaching Science in Physical Infrastructure when grouped according to Age

Physical Infrastructure	Age			
	Younger		Older	
Items	Mean	Interpretation	Mean	Interpretation
As a teacher, I find difficulties in…				

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1. Accessing adequate laboratory equipment and materials for science experiments.	4.00	High level	3.57	High level
2. Using science laboratory facilities due to poor maintenance or lack of resources.	3.95	High level	3.43	Moderate level
3. Providing students with enough classroom space for hands-on science activities.	3.64	High level	3.83	High level
4. Securing sufficient budget for purchasing new science materials and equipment.	4.27	High level	2.87	Moderate level
5. dealing with outdated or non-functional laboratory tools and apparatus.	4.00	High level	3.43	Moderate level
6. Ensuring classrooms have proper ventilation and lighting for conducting science experiments.	4.05	High level	3.48	Moderate level
7. Using technology in the classroom due to limited computer access, projectors, or internet connectivity.	3.95	High level	3.61	High level
8. Storing laboratory materials safely and securely in the available school infrastructure.	3.82	High level	3.87	High level
9. Arranging field trips or external science activities due to a lack of transportation or resources.	3.82	High level	2.96	Moderate level
10. integrating multimedia resources into science lessons due to insufficient equipment.	3.64	High level	4.09	High level
Overall Mean	**3.91**	**High level**	**3.51**	**High level**

Table 6 depicts the level of difficulties teachers experience in teaching science in physical infrastructure when grouped according to age. Younger respondents obtained an overall mean of 3.91, interpreted as a high level, while older respondents obtained an overall mean of 3.51, interpreted as a high level. The result implies that younger respondents have difficulty securing a sufficient budget for new science materials and equipment. Compared to older respondents, younger respondents struggle to integrate multimedia resources into science lessons because of inadequate equipment. This lack of resources hampers their ability to engage students effectively and limits the overall quality of science education. Consequently, both age groups face significant challenges that could impact student learning outcomes and interest in science subjects. The result aligns with that of Sasota et al. (2020), revealing that factors affecting ICT integration in science are the lack of ICT skills and the availability of ICT resources. The researchers also concluded that high ICT integration in teaching is more likely among single science teachers, highly positive attitudes towards ICT, high ICT skills, and schools with more available ICT resources.

Table 7

Level of Difficulties of Teachers in Teaching Science in Training in Science when grouped according to Age

Training in Science	**Age**			
	Younger		**Older**	
Items	**Mean**	**Interpretation**	**Mean**	**Interpretation**
As a teacher, I find difficulties in…				
1. Attending relevant science training workshops or seminars due to time constraints.	3.82	High level	3.43	Moderate level
2. Keeping up with advancements in scientific knowledge through professional development.	3.82	High level	3.70	High level
3. applying new teaching strategies learned from science training programs in the classroom.	3.64	High level	3.61	High level

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4. finding opportunities for specialized training in specific science subjects or topics.	3.86	High level	3.57	High level
5. receiving adequate support from the school administration for attending science-related training.	3.77	High level	3.17	Moderate level
6. accessing training programs that are updated with the latest trends in science education.	3.82	High level	3.26	Moderate level
7. finding training that focuses on practical science applications in real-world contexts.	3.82	High level	3.17	Moderate level
8. participating in continuous professional development to improve my science teaching skills.	3.73	High level	3.17	Moderate level
9. engaging in collaborative learning experiences with other science teachers.	3.41	Moderate level	3.30	Moderate level
10. receiving mentorship or coaching in science teaching from experienced educators.	3.77	High level	3.16	Moderate level
Overall Mean	**3.75**	**High level**	**3.36**	**Moderate level**

Table 7 shows the level of difficulties teachers experience in teaching science in training when grouped according to age. Younger respondents obtained an overall mean of 3.75, interpreted as a high level, while older respondents obtained an overall mean of 3.36, interpreted as a moderate level. The results imply that younger respondents struggle to find specialized training opportunities for specific science subjects or topics. In comparison, older respondents showed they were less active in updating and advancing themselves on the latest scientific knowledge and discoveries. The results align with Ricardo M. Gomez's research, titled "Policy Implications for the Empowerment of Science Teachers in Philippine Schools" (2018), which comprehensively examines policy frameworks and their direct implications for the empowerment of coordinators within the science context in Philippine schools. This study likely involves an analysis of existing education policies in the Philippines, focusing specifically on those relevant to science teachers. Gomez may explore how these policies influence the professional development, roles, and support systems for coordinators and how they align with the broader goals of science.

Table 8

Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge when grouped according to Highest Educational Attainment

Pedagogical Content Knowledge	**Highest Educational Attainment**			
	Lower		**Higher**	
Items	**Mean**	**Interpretation**	**Mean**	**Interpretation**
As a teacher, I find difficulties in…				
1. explaining complex scientific concepts to students clearly.	3.95	High level	3.50	High level
2. adapting the science curriculum to meet the needs of students with different learning abilities.	3.95	High level	3.27	Moderate level
3. designing engaging science experiments that align with the learning objectives.	3.63	High level	3.54	High level
4. utilizing appropriate instructional strategies for different science topics.	3.74	High level	3.50	High level
5. incorporating up-to-date scientific discoveries into classroom lessons.	3.42	Moderate level	3.19	Moderate level
6. connecting science theories to real-world applications in my lessons.	3.68	High level	3.50	High level

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7. effectively using technology to enhance science teaching and learning.	3.63	High level	3.54	High level
8. assessing students' understanding of scientific concepts through varied assessment methods.	3.96	High level	3.65	High level
9. balancing the theoretical and practical aspects of science education.	3.53	High level	3.54	High level
10. providing sufficient hands-on experiences in science within time constraints.	3.58	High level	3.42	Moderate level
Overall Mean	**3.71**	**High level**	**3.47**	**Moderate level**

Table 8 exposes the level of difficulties teachers have in teaching science in pedagogical content knowledge when grouped according to the highest educational attainment. Respondents with lower educational attainment obtained an overall mean of 3.71, interpreted as high. Respondents with higher educational attainment obtained an overall mean of 3.47, which is only moderate. The result implies that both groups of respondents perceived the same issues in applying various assessment methods to determine students' knowledge and understanding of science concepts and theories. The outcome indicates a consensus among the respondents, suggesting they encountered similar challenges in assessing students' comprehension of scientific material regardless of their educational backgrounds or perspectives. Such an agreement can highlight common areas for improvement in assessment practices. Assessment is an integral part of teaching. Thus, teachers must know the various methods and techniques for assessing students' learning (Paren, 2016). Taking an assessment is always an integral part of the teaching-learning process that makes "teaching worth teaching." The only way the teacher is convinced that his learners have learned is to conduct an assessment.

Table 9
Level of Difficulties of Teachers in Teaching Science in Physical Infrastructure when grouped according to Highest Educational Attainment

Physical Infrastructure	**Highest Educational Attainment**			
	Lower		**Higher**	
Items	**Mean**	**Interpretation**	**Mean**	**Interpretation**
As a teacher, I find difficulties in…				
1. accessing adequate laboratory equipment and materials for science experiments.	3.79	High level	3.77	High level
2. using science laboratory facilities due to poor maintenance or lack of resources.	3.89	High level	3.54	High level
3. providing students with enough classroom space for hands-on science activities.	3.68	High level	3.77	High level
4. securing sufficient budget for purchasing new science materials and equipment.	3.74	High level	3.42	Moderate level
5. dealing with outdated or non-functional laboratory tools and apparatus.	3.63	High level	3.77	High level
6. ensuring classrooms have proper ventilation and lighting for conducting science experiments.	4.37	High level	3.31	Moderate level
7. using technology in the classroom due to limited access to computers, projectors, or internet connectivity.	3.95	High level	3.65	High level

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8. storing laboratory materials safely and securely in the available school infrastructure.	4.00	High level	3.73	High level
9. arranging field trips or external science activities due to a lack of transportation or resources.	3.42	Moderate level	3.35	Moderate level
10. integrating multimedia resources into science lessons due to insufficient equipment.	3.74	High level	3.96	High level
Overall Mean	**3.82**	**High level**	**3.63**	**High level**

Table 9 displays the level of difficulties teachers experience in teaching science in physical infrastructure when grouped according to the highest educational attainment. Respondents with lower educational attainment obtained an overall mean of 3.82, interpreted as high. Respondents with higher educational attainment obtained an overall mean of 3.63, interpreted as high.

Examining the table further, respondents with lower educational attainment obtained the lowest rating of 3.42 on item 9, stating to arrange field trips or external science activities due to lack of transportation or resources, interpreted as a moderate level, while the highest mean of 4.37 was on item 6, stating to ensure that classrooms have proper ventilation and lighting for conducting science experiments, interpreted as a high level.

Contrary to respondents having higher educational attainment, who obtained the lowest rating of 3.31 on item 6, stating, ensure that classrooms have proper ventilation and lighting for conducting science experiments, interpreted as a moderate level, while the highest mean of 3.96 was on item 10, stating, integrate multimedia resources into science lessons due to insufficient equipment, interpreted as a high level.

The result implies that respondents from lower educational background groups experience difficulty providing proper ventilation and lighting during science experiments. In comparison, respondents from higher educational background groups experience challenges integrating multimedia resources into science lessons due to insufficient equipment. The finding suggests that educational background influences the types of challenges faced in science education, with those from lower backgrounds struggling with basic environmental conditions. In comparison, those from higher backgrounds grapple with technological integration. Consequently, addressing these distinct needs could enhance the overall effectiveness of science teaching across different educational levels.

The finding supports Gonzales's (2021) revelation that, on average, JHS science teachers lack proficiency with technology and struggle to integrate it into their teaching practices. Given the findings, it is recommended that training/seminars on ICT use in teaching-learning practice be conducted. Moreover, teachers are encouraged to incorporate technology into daily instruction, and LCDs/laptops may be purchased to assist teachers in delivering quality education.

Table 10

Level of Difficulties of Teachers in Teaching Science in Training in Science when grouped according to Highest Educational Attainment

Training in Science	**Highest Educational Attainment**			
	Lower		**Higher**	
Items	**Mean**	**Interpretation**	**Mean**	**Interpretation**
As a teacher, I find difficulties in…				
1. attending relevant science training workshops or seminars due to time constraints.	3.79	High level	3.50	High level
2. keeping up with advancements in scientific knowledge through professional development.	3.84	High level	3.69	High level

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3. applying new teaching strategies learned from science training programs in the classroom.	3.68	High level	3.58	High level
4. finding opportunities for specialized training in specific science subjects or topics.	3.89	High level	3.58	High level
5. receiving adequate support from the school administration for attending science-related training.	3.74	High level	3.27	Moderate level
6. access training programs updated with the latest trends in science education.	3.84	High level	3.31	Moderate level
7. finding training that focuses on practical science applications in real-world contexts.	3.79	High level	3.27	Moderate level
8. participating in continuous professional development to improve my science teaching skills.	3.68	High level	3.27	Moderate level
9. engaging in collaborative learning experiences with other science teachers.	3.53	High level	3.23	Moderate level
10. receiving mentorship or coaching in science teaching from experienced educators.	3.79	High level	3.22	Moderate level
Overall Mean	**3.76**	**High level**	**3.39**	**Moderate level**

Table 10 divulges the level of difficulties teachers experience in teaching science and training in science when grouped according to the highest educational attainment. Respondents with lower educational attainment obtained an overall mean of 3.76, interpreted as high. Respondents with higher educational attainment achieved an overall mean of 3.39, indicating only a moderate level.

Evaluating the table further, respondents with lower educational attainment obtained the lowest rating of 3.53 on item 9, stating to Engage in collaborative learning experiences with other science teachers, interpreted as a high level, while the highest mean of 3.89 was on item 4, stating to find opportunities for specialized training in specific science subjects or topics, interpreted as a high level.

Respondents having higher educational attainment obtained the lowest rating of 3.22 on item 10, stating to receive mentorship or coaching in science teaching from experienced educators, interpreted as a moderate level, while the highest mean of 3.69 was on item 2, stating to keep up with advancements in scientific knowledge through professional development, interpreted as a high level.

The results imply that respondents from lower educational backgrounds struggle to find free specialized training opportunities for specific science subjects or topics. In comparison, respondents from higher educational backgrounds seldom attend professional development to keep up with advancements in scientific knowledge. The finding suggests a disparity in access to educational resources, where those with less education face barriers to specialized training. In comparison, those with more education may not prioritize ongoing professional development. Consequently, the findings could lead to a widening knowledge gap in the scientific community based on educational attainment.

The result relates to Sharma's (2018) findings, which indicate that the lack of professional development significantly affects teachers' careers by enhancing their skills and motivating them to improve their practice and orientation. Significant barriers to teachers' professional development are financial problems, unsatisfactory performance evaluations, and a lack of professional opportunities (Erroğlu & Kaya, 2021).

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Table 11

Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge when grouped according to Length of Service

Pedagogical Content Knowledge	Length of Service			
	Shorter		Longer	
Items	Mean	Interpretation	Mean	Interpretation
As a teacher, I find difficulties in…				
1. explaining complex scientific concepts to students clearly.	3.85	High level	3.56	High level
2. adapting the science curriculum to meet the needs of students with different learning abilities.	3.80	High level	3.36	Moderate level
3. designing engaging science experiments that align with the learning objectives.	3.60	High level	3.56	High level
4. utilizing appropriate instructional strategies for different science topics.	3.80	High level	3.44	Moderate level
5. incorporating up-to-date scientific discoveries into classroom lessons.	3.55	High level	3.08	Moderate level
6. connecting science theories to real-world applications in my lessons.	3.60	High level	3.56	High level
7. effectively using technology to enhance science teaching and learning.	3.85	High level	3.36	Moderate level
8. assessing students' understanding of scientific concepts through varied assessment methods.	4.00	High level	3.60	High level
9. balancing the theoretical and practical aspects of science education.	3.65	High level	3.44	Moderate level
10. providing sufficient hands-on experiences in science within time constraints.	3.80	High level	3.24	Moderate level
Overall Mean	**3.75**	**High level**	**3.42**	**Moderate level**

Table 11 shows the level of difficulties teachers experience in teaching science in pedagogical content knowledge when grouped according to length of service. Respondents with shorter years in the service obtained an overall mean of 3.75, interpreted as a high level. Respondents with longer years in the service obtained an overall mean of 3.42, interpreted as a moderate level only.

Scanning the table further, respondents with shorter years in the service obtained the lowest rating of 3.55 on item 5, stating to incorporate up-to-date scientific discoveries into classroom lessons, interpreted as a high level, while the highest mean of 4.00 was on item 8, stating to assess students' understanding of scientific concepts through varied assessment methods, interpreted as a high level.

In the same way, respondents with longer years in the service obtained the lowest rating of 3.08 on item 5, stating to incorporate up-to-date scientific discoveries into classroom lessons, interpreted as a high level, while the highest mean of 3.60 was on item 8, stating to assess students' understanding of scientific concepts through varied assessment methods, interpreted as a high level.

The result implies that regardless of their years in teaching, both groups of respondents encounter the same difficulties in applying various assessment methods to determine students' learning of science concepts. The finding suggests that the challenges faced are not necessarily linked to experience but may stem from broader systemic issues within the educational framework. Consequently, targeted professional development and support may be essential in helping educators effectively utilize these assessment methods to enhance student learning outcomes in science. Assessment is a critical aspect of the teaching and learning process. It enables teachers to address the current educational assessment issues and measure

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teaching effectiveness with student performance to specific learning objectives. It is important to assess the performance because it provides feedback on the extent to which students are successfully meeting the course objectives. Many assessment tools have been developed to assess students' knowledge in the classroom (Anu, 2022).

Table 12
Level of Difficulties of Teachers in Teaching Science in Physical Infrastructure when grouped according to Length of Service

Physical Infrastructure Items	Length of Service: Shorter Mean	Shorter Interpretation	Longer Mean	Longer Interpretation
As a teacher, I find difficulties in…				
1. accessing adequate laboratory equipment and materials for science experiments.	3.90	High level	3.68	High level
2. using science laboratory facilities due to poor maintenance or lack of resources.	3.70	High level	3.68	High level
3. providing students with enough classroom space for hands-on science activities.	3.60	High level	3.84	High level
4. securing sufficient budget for purchasing new science materials and equipment.	4.00	High level	3.20	Moderate level
5. dealing with outdated or non-functional laboratory tools and apparatus.	3.80	High level	3.64	High level
6. ensuring that classrooms have proper ventilation and lighting for conducting science experiments.	4.05	High level	3.52	High level
7. using technology in the classroom due to limited access to computers, projectors, or internet connectivity.	3.95	High level	3.64	High level
8. storing laboratory materials safely and securely in the available school infrastructure.	4.00	High level	3.72	High level
9. arranging field trips or external science activities due to a lack of transportation or resources.	3.55	High level	3.24	Moderate level
10. integrating multimedia resources into science lessons due to insufficient equipment.	3.90	High level	3.83	High level
Overall Mean	**3.85**	**High level**	**3.60**	**High level**

Table 12 reveals the level of difficulties teachers experience in teaching science in physical infrastructure when grouped according to length of service. Respondents with shorter years in the service obtained an overall mean of 3.85, interpreted as a high level. Meanwhile, respondents with longer years in the service obtained an overall mean of 3.60, which is a high level.

Analyzing further, respondents with shorter years in the service obtained the lowest rating of 3.55 on item, stating to arrange field trips or external science activities due to lack of transportation or resources, interpreted as a high level, while the highest mean of 4.05 was on item 6, stating to ensure that classrooms have proper ventilation and lighting for conducting science experiments, interpreted as a high level.

Contrary to respondents with longer years in the service obtained the lowest rating of 3.20 on item 4, stating to secure sufficient budget for purchasing new science materials and equipment, interpreted as a moderate level, while the highest mean of 3.84 was on item 3, stating to provide students with enough space in the classroom for hands-on science activities, interpreted as a high level.

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The result implies that respondents with shorter years of service experience difficulty providing proper ventilation and lighting during science experiments. In comparison, respondents with longer years of experience have a lack of space in the classroom for hands-on science activities. The result suggests that less experienced teachers may struggle with basic environmental conditions necessary for effective teaching. At the same time, more seasoned educators face challenges related to spatial constraints that hinder practical learning experiences. Consequently, both groups encounter obstacles that can affect the quality of science education.

The finding aligns with that of Anto et al. (2023), who revealed that the research participants are experiencing different challenges, lacking laboratory materials, dealing with uninterested students, having difficulty identifying the students' needs, lacking proficiency with new equipment, having difficulty adopting the new curriculum, and lacking administrative support. These challenges also unveiled the following effects: science neglect hinders appreciation, compromises the learning outcomes due to mediocre education, lacks actual learning, restricts students' progress, and enhances professional growth and increased motivation.

Table 13

Level of Difficulties of Teachers in Teaching Science in Training in Science when grouped according to Length of Service

Training in Science	**Length of Service**			
	Shorter		**Longer**	
Items	**Mean**	**Interpretation**	**Mean**	**Interpretation**
As a teacher, I find difficulties in…				
1. Attending relevant science training workshops or seminars due to time constraints.	3.90	High level	3.40	Moderate level
2. Keeping up with advancements in scientific knowledge through professional development.	3.90	High level	3.64	High level
3. Applying new teaching strategies learned from science training programs in the classroom.	3.75	High level	3.52	High level
4. Finding opportunities for specialized training in specific science subjects or topics.	3.90	High level	3.56	High level
5. Receiving adequate support from the school administration for attending science-related training.	3.95	High level	3.08	Moderate level
6. accessing training programs updated with the latest trends in science education.	3.95	High level	3.20	Moderate level
7. Finding training that focuses on practical science applications in real-world contexts.	4.00	High level	3.09	Moderate level
8. Participating in continuous professional development to improve my science teaching skills.	3.80	High level	3.16	Moderate level
9. Engaging in collaborative learning experiences with other science teachers.	3.60	High level	3.16	Moderate level
10. Receiving mentorship or coaching in science teaching from experienced educators.	3.90	High level	3.12	Moderate level
Overall Mean	**3.87**	**High level**	**3.29**	**Moderate level**

Table 13 exposes the level of difficulties teachers experience in teaching science in training when grouped according to length of service. Respondents with shorter years in the service obtained an overall mean of 3.87, interpreted as a high level. Respondents with longer years in the service obtained an overall mean of 3.29, interpreted as moderate.

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Investigating further, respondents with shorter years in the service obtained the lowest rating of 3.60 on item 9, stating that engaging in collaborative learning experiences with other science teachers, interpreted as a high level, while the highest mean of 4.00 was on item 7, stating, Find training that focuses on practical applications of science in real-world contexts, interpreted as a high level.

On the other hand, respondents with longer years in the service obtained the lowest rating of 3.08 on item 5, stating to receive adequate support from school administration for attending science-related training, interpreted as a moderate level, while the highest mean of 3.64 was on item 2, stating to keep up with advancements in scientific knowledge through professional development, interpreted as a high level.

The result implies that respondents with shorter years of service struggle to find training focusing on practical applications of science in real-world contexts. In comparison, respondents with longer years in the service seldom join professional development to update themselves with the latest scientific knowledge. The finding suggests a disparity in the professional development needs of individuals based on their experience levels. While newer employees seek practical training, more seasoned workers may overlook opportunities to enhance their scientific understanding.

The result related to that of Ana P. Santos' research, titled "Evaluating the Impact of Professional Development Programs on SCIENCE-Coordinators in the Philippines" (2020), is likely a comprehensive examination of the effectiveness of professional development initiatives in improving the roles and capabilities of coordinators within the SCIENCE framework. The research may explore how different professional development components, such as workshops, mentorship programs, or collaborative learning, enhance coordinators' abilities. Santos may also assess the sustained impact of these programs over time, considering factors like job satisfaction, student outcomes, and overall effectiveness in delivering moral and values education.

Comparative Analysis in the Level of Difficulties of Teachers in Teaching Science in Pedagogical Content Knowledge, Physical Infrastructure, and Training in Science, and when grouped according to Age, Highest Educational Attainment, and Length of Service

Table 14

Differences in the Level of Difficulties in Teaching Science inPedagogical Content Knowledge, and when grouped and compared according to Variables

Pedagogical Content Knowledge							
Variables	**Categories**	**N**	**Mean Rank**	**Mann Whitney U-test**	**Sig. Level**	***p*-value**	**Interpretation**
Age	Younger	22	23.45	243.00		0.820	Not Significant
	Older	23	22.57				
Highest Educational Attainment	Lower	19	25.26	204.00	0.05	0.322	Not Significant
	Higher	26	21.35				
Length of Service	Shorter	20	25.92	191.50		0.181	Not Significant
	Longer	25	20.66				

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Table 14 summarizes the comparative analysis of the level of difficulties teachers have in teaching science in pedagogical content knowledge according to profile variables.

The computed p-values are 0.820, 0.322, and 0.181, respectively, all greater than the 0.05 significance level and thus interpreted as insignificant. Therefore, the hypothesis that there is no significant difference in the level of difficulties teachers experience in teaching science in pedagogical content knowledge is accepted when compared according to age, highest educational attainment, and length of service.

The finding suggests that teachers' difficulties in teaching science related to pedagogical content knowledge do not differ based on their background profiles. Most respondents experience the same pedagogical difficulties in delivering instructions in science. The result also suggests that age, education, or experience do not significantly influence how teachers struggle with pedagogical content knowledge in science instruction. Consequently, targeted professional development may be necessary to address these common challenges across diverse teacher profiles. The result is supported by Broce (2020), who revealed no significant difference in teachers' difficulties in teaching science.

Table 15

Differences in the Level of Difficulties in Teaching Science inPhysical Infrastructure, and when grouped and compared according to Variables

Physical Infrastructure							
Variables	**Categories**	**N**	**Mean Rank**	**Mann Whitney U-test**	**Sig. Level**	***p*-value**	**Interpretation**
Age	Younger	22	26.64	173.00		0.069	Not Significant
	Older	23	19.52				
Highest Educational Attainment	Lower	19	24.29	222.50	0.05	0.573	Not Significant
	Higher	26	22.06				
Length of Service	Shorter	20	27.35	201.50		0.267	Not Significant
	Longer	25	19.52				

Table 15 reviews the comparative analysis of the level of difficulties teachers experience in teaching science in physical infrastructure according to profile variables.

The computed p-values are 0.069, 0.573, and 0.267, respectively, all greater than the 0.05 significance level and thus interpreted as insignificant. Therefore, the hypothesis that there is no significant difference in the level of difficulties of teachers in teaching science in physical infrastructure when compared according to age, highest educational attainment, and length of service is accepted.

The result implies no variation in the difficulty level in teaching science regardless of their background. Most respondents experience the same problems with the lack of sufficient equipment and materials in science. The finding aligns with that of Bumagat et al. (2023), revealing no significant variation in the difficulties respondents experienced regarding physical infrastructure, regardless of their profile variables. Many teachers struggle with physical infrastructure, which hinders them from fully utilizing the benefits that science infrastructure may provide learners.

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Table 16

Differences in the Level of Difficulties in Teaching Science in Training in Science, and when grouped and compared according to Variables

Training in Science Variables	Categories	N	Mean Rank	Mann Whitney U-test	Sig. Level	*p*-value	Interpretation
Age	Younger	22	25.34	201.50		0.241	Not Significant
	Older	23	20.76				
Highest Educational Attainment	Lower	19	25.61	197.50	0.05	0.254	Not Significant
	Higher	26	21.10				
Length of Service	Shorter	20	27.35	163.00		0.046	Significant
	Longer	25	19.52				

Table 16 presents the comparative analysis of the level of difficulties teachers experience in teaching science during science training according to profile variables. The computed p-values for age (0.241) and highest educational attainment (0.254) are both greater than the 0.05 significance level, indicating no significant difference in the level of difficulties based on these variables. Hence, the null hypotheses for age and highest educational attainment are accepted.

However, for the variable length of service, the computed p-value is 0.046, which is less than the 0.05 significance level, indicating a significant difference in the level of difficulties based on length of service. Notably, teachers with shorter lengths of service have a higher mean rank (27.35) compared to those with longer service (19.52), suggesting that novice teachers experience a higher level of difficulties in teaching science than their more experienced counterparts. This finding implies that early-career teachers may require additional support, mentoring, and targeted professional development to overcome these challenges. The result aligns with the findings of Sanoy (2020), who revealed significant differences in the competence of teachers in teaching science during professional development activities and community linkages according to length of service.

Conclusion

The findings indicate that science teachers face considerable difficulties in pedagogical content knowledge, physical infrastructure, and training in science, with overall high levels across all areas. Specifically, teachers struggle most with assessing student understanding, integrating multimedia resources, and keeping up with professional development, while the lowest difficulties were in updating lesson content, arranging field trips, and engaging in collaborative learning. These results highlight that the difficulties are largely independent of age, educational attainment, or years of service, except for training-related challenges, which vary according to length of service.

The study underscores the need for differentiated professional development programs and enhanced resource support to address these difficulties, particularly for novice teachers. It is recommended that schools provide accessible training opportunities, improved laboratory infrastructure, and mentoring systems to strengthen teacher competence and improve student learning outcomes in

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science.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding this research. Specifically, no personal, financial, or professional relationships have influenced the study's design, data collection, analysis, interpretation of results, or the reporting of findings. The authors affirm that the research was conducted objectively and independently, without any external pressures or incentives that could compromise its integrity.

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