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Article

Pedagogical Practices in Teaching General Science: Senior High School Teachers' Experiences in Grade 11 Classrooms at San Guillermo Vocational and Industrial High School, Schools Division of Isabela

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Abstract

General Science is a core subject in the Senior High School curriculum that develops learners' scientific literacy, critical thinking, and problem-solving skills. Effective pedagogy is essential in promoting meaningful learning experiences and enabling learners to apply scientific concepts in real-life situations. This study explored the pedagogical practices and teaching experiences of Senior High School teachers in teaching General Science to Grade 11 learners at San Guillermo Vocational and Industrial High School, Schools Division of Isabela. A qualitative phenomenological research design was employed involving eight Senior High School General Science teachers selected through purposive sampling. Data were gathered through semi-structured interviews, classroom observations, and document analysis and were analyzed using Braun and Clarke's six-phase thematic analysis. The findings revealed that teachers employed contextualized instruction, inquiry-based learning, collaborative learning, differentiated instruction, and reflective teaching practices to enhance learner engagement and conceptual understanding. Despite challenges related to learner diversity, limited instructional resources, and time constraints, teachers demonstrated adaptability and commitment to effective science instruction. The study highlights the importance of continuous professional development, adequate instructional support, and collaborative learning communities in strengthening General Science instruction. The findings may serve as a basis for improving science teaching practices, curriculum implementation, and teacher development programs in Senior High School.

Keywords: *General Science, pedagogical practices, Senior High School, science education, teachers' experiences, phenomenology, qualitative research*

1. Introduction

Science education plays a fundamental role in preparing learners to become scientifically literate individuals who can think critically, solve problems, and make informed decisions in an increasingly technology-driven society. In the Senior High School curriculum, General Science equips Grade 11 learners with essential scientific knowledge and process skills that enable them to understand natural phenomena and apply scientific principles to everyday life. Effective science instruction therefore requires pedagogical approaches that actively engage learners in inquiry, collaboration, experimentation, and critical thinking.

The success of General Science instruction depends largely on teachers' pedagogical practices. Teachers are expected to design learner-centered lessons that encourage exploration, scientific investigation, and meaningful learning. They employ various instructional approaches, including inquiry-based learning, contextualized teaching, collaborative activities, differentiated instruction, and formative assessment, to address learners' diverse needs and promote conceptual understanding. Through these pedagogical practices, teachers create classroom environments that encourage curiosity, active participation, and scientific reasoning.

Despite these expectations, teaching General Science presents several instructional challenges. Senior High School teachers often encounter diverse learner abilities, limited laboratory facilities, insufficient instructional resources, time constraints, and difficulties in sustaining learner engagement. These classroom realities require teachers to become innovative, reflective, and adaptive in selecting instructional strategies that effectively support learners' achievement of curriculum competencies.

Teachers' experiences provide valuable insights into how pedagogical practices are implemented within authentic classroom settings. Their instructional decisions, classroom interactions, and coping strategies influence the quality of science instruction and learners' educational experiences. Examining these lived experiences contributes to a deeper understanding of effective science teaching and informs the development of responsive instructional programs and professional development initiatives.

Although previous studies have investigated science teaching strategies and learner achievement, limited qualitative research has explored the pedagogical practices and experiences of Senior High School teachers teaching General Science in Philippine public secondary schools. This gap highlights the need to understand how teachers implement effective pedagogical practices while responding to classroom challenges and curriculum demands.

Therefore, this study explored the pedagogical practices and teaching experiences of Senior High School teachers in teaching General Science to Grade 11 learners at San Guillermo Vocational and Industrial High School, Schools Division of Isabela. The findings are expected to contribute to the enhancement of science instruction, strengthen teacher professional development, and provide evidence-based recommendations for improving General Science education in Senior High School.

2. Objectives of the Study

This study aimed to explore the pedagogical practices and teaching experiences of Senior High School teachers in teaching General Science to Grade 11 learners at San Guillermo Vocational and Industrial High School, Schools Division of Isabela.

Specifically, it sought to:

1. describe the pedagogical practices employed by Senior High School teachers in teaching General Science;
2. explore the teaching experiences of teachers in delivering General Science instruction to Grade 11 learners;
3. identify the challenges encountered by teachers in implementing effective pedagogical practices in General Science;
4. examine the strategies employed by teachers to address instructional challenges and enhance learner engagement; and
5. provide implications for improving General Science instruction, teacher professional development, and science education practices in Senior High School.

3. Review of Related Literature

Pedagogical practices play a vital role in promoting meaningful learning and improving learners' achievement in science education. Effective science teaching extends beyond the transmission of knowledge by engaging learners in inquiry, experimentation, collaboration, and critical thinking. Research has shown that learner-centered instructional approaches enable students to develop scientific literacy, conceptual understanding, and problem-solving skills necessary for lifelong learning.

Inquiry-based learning is widely recognized as one of the most effective pedagogical approaches in science education. It encourages learners to investigate scientific questions, conduct experiments, analyze evidence, and construct explanations based on observations. Through inquiry, learners become active participants in the learning process, strengthening both conceptual understanding and scientific reasoning.

Contextualized instruction also contributes significantly to science learning by connecting scientific concepts to learners' daily experiences and local community contexts. Presenting science lessons through familiar situations enhances learners' motivation, engagement, and appreciation of the practical applications of science. Studies have reported that contextualized learning improves conceptual understanding and encourages learners to apply scientific knowledge to real-life situations.

Differentiated instruction has become increasingly important in science classrooms due to learners' diverse academic abilities, interests, and learning preferences. Teachers employ varied instructional strategies, flexible grouping, scaffolding, and multiple assessment techniques to ensure that all learners have opportunities to achieve the intended learning outcomes. Such practices create inclusive classrooms that respond to individual learning needs while promoting active participation.

Formative assessment likewise plays an essential role in effective science instruction. Continuous assessment through questioning, classroom discussions, performance tasks, laboratory activities, and timely feedback enables teachers to monitor learners' progress, identify misconceptions, and modify instruction accordingly. Assessment for learning supports competency development and encourages learners to become active participants in their own learning process.

Despite these effective pedagogical approaches, science teachers continue to encounter challenges such as limited laboratory facilities, insufficient instructional materials, diverse learner abilities, large class sizes, and limited instructional time. These challenges require teachers to become resourceful, reflective, and innovative in implementing instructional strategies that maintain learner engagement while achieving curriculum standards.

Although numerous studies have examined science teaching strategies and learner achievement, limited qualitative research has explored the lived pedagogical experiences of Senior High School General Science teachers in Philippine public secondary schools. This study addresses this gap by examining the pedagogical practices, instructional experiences, challenges, and coping strategies of Grade 11 General Science teachers at San Guillermo Vocational and Industrial High School, Schools Division of Isabela.

4. Theoretical Framework

This study is anchored on **Constructivist Learning Theory** by Jean Piaget, **Social Constructivism** by Lev Vygotsky, and **Experiential Learning Theory** by David Kolb. These theories explain how learners acquire scientific knowledge through active participation, meaningful experiences, and collaborative learning.

Constructivist Learning Theory (Piaget, 1972) posits that learners actively construct knowledge by connecting new concepts with their prior experiences. In General Science, teachers facilitate conceptual understanding by engaging learners in inquiry, problem-solving, experimentation, and reflective thinking rather than relying solely on direct instruction. Through active learning experiences, learners develop deeper scientific understanding and become capable of applying concepts in authentic situations.

Social Constructivism (Vygotsky, 1978) emphasizes that learning is a social process enhanced through interaction with teachers and peers. Guided discussions, collaborative learning, peer mentoring, and teacher scaffolding enable learners to develop higher-order thinking skills and scientific reasoning. This theory supports learner-centered instruction where teachers act as facilitators who provide appropriate guidance while encouraging learners to construct knowledge collaboratively.

Experiential Learning Theory (Kolb, 1984) explains that meaningful learning occurs through a continuous cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. In General Science classrooms, teachers promote experiential learning through laboratory activities, demonstrations, field-based investigations, simulations, and real-life applications of scientific concepts. These experiences help learners connect theory with practice, making science more relevant and meaningful.

Collectively, these theories provide the conceptual foundation for understanding the pedagogical practices and teaching experiences of Senior High School teachers in delivering General Science instruction. They explain how learner-centered, inquiry-based, and experiential pedagogies contribute to effective science teaching and improved learner outcomes.

5. Methodology

This study employed a **qualitative phenomenological research design** to explore the pedagogical practices and teaching experiences of Senior High School teachers in teaching General Science to Grade 11 learners at San Guillermo Vocational and Industrial High School, Schools Division of Isabela. The phenomenological approach was selected because it seeks to understand the lived experiences, perceptions, and instructional practices of teachers as they deliver General Science instruction in authentic classroom settings.

The study was conducted at **San Guillermo Vocational and Industrial High School**, Schools Division of Isabela. The participants consisted of **eight (8) Senior High School teachers** who were teaching General Science during the conduct of the study. They were selected through **purposive sampling** based on their direct involvement in teaching the subject and their willingness to share their instructional experiences.

Data were gathered using a **researcher-developed semi-structured interview guide**, supplemented by classroom observations and document analysis of lesson plans, instructional materials, and assessment tools. Prior to data collection, approval was obtained from the Schools Division Office and the school administration. Informed consent was secured from all participants, and interviews were conducted individually, audio-recorded with permission, and transcribed verbatim. Classroom observations and document reviews were conducted to validate and enrich the interview data.

The collected data were analyzed using **Braun and Clarke's (2006) six-phase thematic analysis**, which involved familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. This systematic process enabled the identification of recurring themes that described the participants' pedagogical practices, instructional experiences, challenges, and teaching strategies.

To ensure the trustworthiness of the findings, the study employed **credibility, transferability, dependability, and confirmability**. Credibility was established through member checking and triangulation of interview, observation, and document analysis data. Peer debriefing and an audit trail enhanced dependability and confirmability, while rich descriptions of the research setting and participants supported the transferability of the findings.

Ethical standards were strictly observed throughout the study. Permission to conduct the research was obtained from the appropriate authorities before data collection. Participation was voluntary, and all participants signed informed consent forms after being informed of the purpose and procedures of the study. Confidentiality and anonymity were maintained through the use of pseudonyms, and all information gathered was used solely for academic and research purposes.

6. Findings and Discussion

Theme 1: Implementing Contextualized and Inquiry-Based Teaching to Enhance Scientific Understanding

The findings revealed that Senior High School teachers consistently employed contextualized and inquiry-based instructional approaches to make General Science concepts more meaningful and relevant to Grade 11 learners. The participants explained that connecting science lessons to learners' daily experiences, community issues, and real-life situations increased classroom participation and improved conceptual understanding. They also emphasized that inquiry-based activities encouraged learners to ask questions, investigate

scientific phenomena, analyze evidence, and formulate explanations based on their observations.

Participant 2 shared:

"I always connect our lessons to situations that learners experience in their homes and community. They become more interested because they can easily relate science concepts to their daily lives."

Participant 6 stated:

"Instead of giving answers immediately, I encourage learners to investigate and discover concepts through simple activities and guided questions. They remember the lesson better when they learn through experience."

These responses indicate that contextualized and inquiry-based instruction promotes active learner engagement and meaningful learning. By relating scientific concepts to authentic situations and encouraging learners to investigate scientific problems, teachers develop learners' critical thinking, scientific reasoning, and problem-solving skills. The findings support Constructivist Learning Theory, which emphasizes that learners construct knowledge through meaningful experiences (Piaget, 1972), and align with previous studies highlighting inquiry-based learning as an effective approach to improving science achievement and scientific literacy.

Theme 2: Employing Differentiated and Collaborative Learning Strategies to Address Learner Diversity

The participants recognized that Grade 11 learners possess diverse academic abilities, learning preferences, and levels of scientific understanding. To address these differences, teachers implemented differentiated instruction by modifying learning activities, using varied teaching strategies, and providing additional support to learners who required remediation. Collaborative learning activities such as group investigations, peer discussions, and cooperative problem-solving were likewise employed to encourage learner participation and shared learning.

Participant 1 explained:

"Some learners immediately understand scientific concepts, while others need more examples and guidance. I prepare different activities so everyone has the opportunity to learn according to their ability."

Participant 7 remarked:

"Group activities allow learners to exchange ideas and help one another understand difficult concepts. They become more confident when learning together."

These findings demonstrate that differentiated and collaborative instruction creates inclusive learning environments that accommodate learners' diverse needs while promoting active classroom participation. Teachers' ability to adjust instruction according to learners' readiness contributes to improved conceptual understanding and learner confidence. The findings support Vygotsky's Social Constructivism, which emphasizes that learning occurs through interaction, collaboration, and teacher scaffolding (Vygotsky, 1978). They also reinforce previous studies showing that differentiated instruction and collaborative learning improve learner engagement, academic performance, and scientific reasoning in science education.

Theme 3: Maximizing Available Instructional Resources through Innovation and Improvisation

The findings revealed that limited laboratory facilities and instructional materials prompted teachers to become innovative in delivering General Science lessons. The participants shared that they improvised laboratory apparatus, utilized locally available materials, integrated multimedia resources, and employed virtual simulations to provide meaningful learning experiences. These practices enabled learners to visualize scientific concepts and actively participate in learning activities despite resource limitations.

Participant 3 shared:

"Our laboratory equipment is not always complete, so I improvise using locally available materials that can demonstrate the scientific concepts just as effectively."

Participant 5 stated:

"I maximize videos, simulations, and online resources whenever actual laboratory activities cannot be conducted. These materials help learners understand abstract concepts."

These responses demonstrate that teachers' creativity and resourcefulness are essential in overcoming instructional limitations. Through improvisation and the integration of technology, teachers sustained learner engagement and promoted conceptual understanding despite limited resources. The findings support Kolb's Experiential Learning Theory, which emphasizes learning through concrete experiences and active experimentation (Kolb, 1984).

Theme 4: Utilizing Formative Assessment to Improve Learners' Scientific Understanding

The participants emphasized that formative assessment is an important component of effective General Science instruction. They regularly employed oral questioning, quizzes, laboratory activities, classroom discussions, and performance tasks to monitor learners' understanding and identify misconceptions. Immediate feedback enabled teachers to modify instructional strategies and provide additional learning support when necessary.

Participant 4 explained:

"I assess my learners regularly through short quizzes, oral recitations, and classroom discussions because these help me determine whether they already understand the lesson."

Participant 8 remarked:

"Providing immediate feedback allows learners to correct their mistakes and improve their understanding before moving to the next topic."

These findings indicate that continuous assessment supports learner achievement by enabling teachers to monitor progress and adjust instruction according to learners' needs. Formative assessment encourages reflective learning, strengthens conceptual understanding, and promotes continuous improvement in science learning. The findings likewise reinforce the learner-centered assessment practices advocated in science education.

Theme 5: Demonstrating Reflective Practice and Professional Growth in Science Teaching

The participants described reflective teaching and continuous professional development as essential practices that enhanced their effectiveness as General Science teachers. They regularly evaluated their instructional practices, reflected on classroom experiences, and participated in Learning Action Cells (LACs), seminars, workshops, and peer collaboration to improve their pedagogical competence. Reflection enabled teachers to identify successful instructional approaches and make necessary adjustments to better address learners' needs.

Participant 2 shared:

"After every lesson, I reflect on what worked well and what needs improvement. Reflection helps me improve my teaching strategies and become more responsive to my learners."

Participant 6 stated:

"Attending seminars and collaborating with fellow teachers give me new ideas that I can immediately apply in my General Science classes."

These findings suggest that reflective practice and professional collaboration contribute significantly to teachers' instructional effectiveness and professional growth. Continuous

learning enables teachers to respond to curriculum demands, adopt innovative teaching practices, and improve learner outcomes. The findings underscore the importance of sustaining professional learning communities and school-based capacity-building programs that support quality science instruction.

7. Conclusion

This study explored the pedagogical practices and teaching experiences of Senior High School teachers in teaching General Science to Grade 11 learners at San Guillermo Vocational and Industrial High School, Schools Division of Isabela. The findings revealed that teachers effectively implemented contextualized and inquiry-based instruction, differentiated and collaborative learning, innovative use of instructional resources, formative assessment, and reflective teaching practices to promote learners' scientific understanding. Despite challenges related to learner diversity, limited laboratory facilities, instructional resources, and time constraints, the participants demonstrated adaptability, creativity, and professional commitment in delivering quality science instruction. Their experiences underscore the importance of learner-centered pedagogies, continuous reflection, and professional collaboration in enhancing the teaching and learning of General Science. Overall, effective science instruction depends on teachers' ability to create engaging, meaningful, and responsive learning experiences that foster scientific literacy and lifelong learning among Grade 11 learners.

8. Implications

The findings of this study provide important implications for science education and instructional practice. School administrators should strengthen institutional support by providing adequate laboratory facilities, instructional materials, and technology resources that enhance the delivery of General Science instruction. Continuous professional development programs should be conducted to strengthen teachers' competencies in inquiry-based learning, differentiated instruction, contextualized teaching, formative assessment, and the integration of educational technology. Learning Action Cells (LACs) and professional learning communities should likewise be strengthened to encourage collaboration, reflective practice, and the sharing of effective pedagogical strategies among science teachers. Curriculum developers may utilize the findings to design instructional resources and teacher support materials that promote learner-centered science education. Future researchers may replicate this study in other Senior High Schools or employ mixed-methods or quantitative approaches to further examine the effectiveness of pedagogical practices in improving learner achievement and scientific literacy.

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