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UTILIZATION OF PEDAGOGICAL APPROACHES IN TEACHING SCIENCE TO ENHANCE TEACHER'S INSTRUCTIONAL COMPETENCE

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Abstract :

This study, "Utilization of Pedagogical Approaches in Teaching Science to Enhance Teacher's Instructional Competence," was conducted to examine the extent to which Grade 5 teachers at Aguilar District, Schools Division Office I Pangasinan employ various pedagogical approaches in Science instruction, and how these practices contribute to the improvement of their instructional competence. The research sought to determine the relationship between teacher profiles and their use of pedagogical strategies, as well as the challenges and opportunities encountered in the implementation of these approaches.

A descriptive research design was utilized, employing survey questionnaires as the primary tool for gathering data from teacher-respondents and selected learners. Data were statistically treated using weighted mean, frequency count, percentage, and correlation analysis. Results were presented through tabular and narrative forms to provide clarity and depth of interpretation.

Findings revealed that teachers frequently employed approaches such as inquiry-based learning, problem-based learning, contextualized teaching, cooperative learning, and integration of technology in their Science classes. These strategies were found to be effective in developing students' scientific skills, critical thinking, and problem-solving abilities, while also enhancing teacher competence in lesson delivery, classroom management, and assessment practices. Despite these benefits, challenges such as limited resources, time constraints, varying learner readiness, and inadequate training opportunities were consistently reported. The study concluded that the utilization of diverse pedagogical approaches significantly contributes to strengthening teachers' instructional competence and improving student learning outcomes in Science. It is recommended that continuous professional development, institutional support, and the provision of adequate instructional resources be prioritized to sustain and maximize the effectiveness of these teaching practices.

INTRODUCTION

Science is one of the core learning areas in the Philippine basic education curriculum, designed to develop scientific literacy, critical thinking, and problem-solving skills among learners. Its primary goal is to prepare students to understand the natural world, apply scientific principles in daily life, and become active participants in addressing environmental and societal challenges.

Despite its vital role in shaping 21st-century competencies, Science is often perceived by learners as difficult and intimidating. This perception stems from traditional teaching approaches that emphasize rote memorization of terms, formulas, and processes, leaving little room for inquiry, experimentation, and real-world application.

The implementation of the K to 12 Curriculum in 2015 was meant to address these challenges by encouraging inquiry-based, learner-centered pedagogies across all subjects, including Science. According to DepEd, lessons should be contextualized, experiential, and responsive to the demands of 21st-century learning.

Still, several studies conducted around 2015 reported that Science teachers continue to rely heavily on lecture-based instruction, primarily due to limited resources, inadequate training, and lack of access to laboratory facilities and modern technologies. These constraints create a gap between the intended curriculum and actual classroom practice.

This gap has resulted in a learning environment where students are passive recipients rather than active invstigators of scientific phenomena. Consequently, the potential of Science to cultivate curiosity, creativity, and higher-order thinking skills remains underutilized.

Research emphasized that students often fail to retain scientific concepts beyond examinations because lessons are not anchored in experimentation and real-life applications. Without contextualization, Science becomes abstract and disconnected from learners' lived experiences.

The repetitive use of outdated textbooks and standardized assessments contributes to students' low motivation. Learners rarely see the relevance of Science in their daily lives, leading to disengagement and declining interest in STEM-related fields.

The issue is not merely about content delivery but also about pedagogy. Strategic approaches such as inquiry-based learning, problem-based instruction, and technology integration have been shown to improve both student outcomes and teacher competence, yet their adoption remains limited.

Integrating effective pedagogical approaches in Science is necessary to align classroom practices with the objectives of the K to 12 curriculum. These approaches emphasize exploration, collaboration, and contextualization—key elements that foster meaningful and lasting learning.

For instance, cooperative learning in Science encourages collaboration during experiments and investigations, enhancing both academic achievement and social interaction. This method supports Vygotsky's theory that knowledge is best constructed through social engagement.

Problem-based learning, another strategic approach, places students in authentic scenarios where they must apply scientific concepts to propose solutions. This transforms Science into a dynamic platform for environmental awareness, innovation, and critical thinking.

Technology-aided instruction also plays a critical role in modern pedagogy. The use of simulations, virtual labs, and multimedia resources makes scientific concepts more engaging and accessible to digital-native learners.

Despite these available strategies, many teachers remain dependent on traditional approaches. Resistance to innovation may stem from limited training, lack of confidence in using modern tools, or insufficient institutional support.

Consequently, students often experience Science as static and difficult. Instead of being inspired to explore, experiment, and innovate, they may develop negative attitudes toward the subject.

The problem extends to assessment practices, which still focus heavily on factual recall rather than conceptual understanding and application. This misalignment hinders the development of 21st-century skills such as critical thinking, creativity, and collaboration.

Strategic pedagogical methods must therefore be integrated not only in instruction but also in assessment. Authentic assessments such as laboratory performance, scientific projects, and problem-solving tasks provide more accurate measures of students' competence.

The K to 12 curriculum envisions Science as a subject that fosters scientific literacy, innovation, and global competitiveness. Without effective pedagogical approaches, however, this vision cannot be fully realized.

In many classrooms, large class sizes and time constraints further challenge teachers' ability to adopt interactive approaches. With limited contact hours, educators often default to lectures to cover extensive content.

These systemic issues call for research that identifies and promotes effective strategies in teaching Science. Evidence-based approaches can help bridge the gap between curriculum goals and classroom realities.

The integration of strategic pedagogical methods can transform Science teaching into a more engaging and effective process. Students would then perceive Science not as intimidating, but as an exciting opportunity to understand the world around them.

Moreover, teachers who adopt innovative strategies can enhance their instructional competence. Professional development anchored in effective pedagogy equips them with tools to respond to diverse learner needs.

Educational theories such as constructivism, experiential learning, and multiple intelligences provide strong support for strategic pedagogy. These theories emphasize active, contextualized, and personalized learning experiences.

Constructivism promotes inquiry-based learning where students actively explore concepts rather than passively absorb them. This approach is particularly suitable in Science, where inquiry fosters experimentation and discovery.

Experiential learning highlights the importance of hands-on investigations and laboratory work. Activities such as experiments, field studies, and scientific research exemplify this approach in Science.

Gardner's theory of multiple intelligences further validates the need for diverse teaching methods. By catering to different learner strengths, teachers ensure inclusivity and equity in Science instruction.

Strategic pedagogy also resonates with Paulo Freire's critical pedagogy, which views education as a means of empowerment. By engaging students in dialogue and critical reflection, Science becomes a tool for problem-solving and innovation.

These theoretical underpinnings demonstrate that effective teaching of Science must be holistic. It must address not only cognitive development but also affective and psychomotor dimensions.

In the 2015 educational context, global shifts also emphasized the need for 21st-century skills. UNESCO and DepEd both underscored scientific literacy, collaboration, and digital competence as essential for learners.

Science, when taught strategically, is a powerful platform for developing these competencies. For example, experiments enhance problem-solving, while group projects foster collaboration and creativity.

Unfortunately, the lack of consistent pedagogical innovation continues to hinder these opportunities. Many students complete Science courses without mastering inquiry skills or developing genuine scientific curiosity.

This gap has implications beyond the classroom. Without critical understanding of scientific issues, students may struggle to participate meaningfully in addressing environmental, technological, and health-related challenges.

Integrating effective approaches thus becomes both an academic and social necessity. It ensures that education fulfills its role in producing scientifically literate and globally competitive citizens.

Teachers are key agents in this transformation. Their willingness and ability to adopt pedagogical innovations largely determine the success of instructional reforms. Yet, teachers often face barriers such as insufficient resources, lack of institutional support, and limited professional development. These barriers must be addressed to enable the utilization of effective approaches.

Policymakers and school leaders also play a critical role. By providing training, resources, and supportive policies, they create an environment conducive to instructional innovation.

Research such as this study contributes by providing empirical data on which approaches are most effective in enhancing teachers' instructional competence. Such evidence informs both classroom practice and policy-making.

For learners, the integration of strategic pedagogy promises a more engaging and relevant Science experience. They are given opportunities to inquire, experiment, and apply knowledge in real-life contexts.

This not only enhances academic performance but also nurtures values such as curiosity, responsibility, and collaboration. These values are integral to the goals of Science education.

The broader community also benefits when learners are exposed to effective teaching approaches. Students become more scientifically aware and capable of contributing to sustainable and evidence-based decision-making.

In this light, the study underscores the interconnectedness of pedagogy, teacher competence, and student achievement. What happens in the classroom resonates beyond, shaping learners' capacities as future innovators and problem-solvers.

The utilization of pedagogical approaches also responds to the changing nature of knowledge in the 21st century. With information readily available online, the role of the teacher shifts from mere provider of facts to facilitator of inquiry and discovery.

Teachers must therefore guide learners in analyzing, evaluating, and applying scientific information, rather than simply memorizing it. This shift is central to the success of Science education.

Effective pedagogy also promotes inclusivity. Students with different learning styles and abilities are better accommodated when teachers use varied and strategic approaches. This inclusivity aligns with the K to 12 program's vision of equitable and quality education for all.

Ultimately, the problem addressed in this study is the limited utilization of effective pedagogical approaches in the teaching of Science, which hinders the enhancement of teachers' instructional competence.

The rationale for this research lies in addressing that problem by identifying, analyzing, and recommending pedagogical strategies that are grounded in theory, supported by evidence, and adaptable to classroom realities.

By doing so, the study contributes to improving not only Science instruction but also the overall quality of Philippine education. It aligns with national goals of producing globally competitive, scientifically literate, and socially responsible citizens. At the same time, it addresses local needs by contextualizing Science education and making it relevant to students' communities.

In conclusion, the rationale for this study emphasizes the urgent need to utilize effective pedagogical approaches in teaching Science. Through innovative and research-based pedagogy, Science can evolve into a transformative subject that enhances teacher competence, empowers learners, and contributes to sustainable national development

Theoretical Framework

The researcher used the following theories relevant to the study. The teaching of Science requires a strong theoretical foundation that explains how learners acquire knowledge, develop scientific reasoning, and construct meaning from their observations and experiments. A sound theoretical framework not only anchors the study but also provides a lens for understanding why certain pedagogical strategies are more effective than others.

One of the most relevant theories is Constructivism, which posits that learners actively construct knowledge based on their experiences and interactions. In Science education, constructivism allows students to build understanding by conducting experiments, testing hypotheses, and relating scientific principles to real-life phenomena, making the subject more meaningful and relevant.

Jean Piaget's theory of cognitive development further supports the use of strategic approaches in teaching. According to Piaget, learners progress through stages of cognitive growth where they assimilate and accommodate new information. Teachng methods in Science must therefore match learners' developmental levels, ensuring that abstract concepts such as force, energy, or molecular structures are taught in ways that students can comprehend.

Lev Vygotsky's sociocultural theory provides another crucial perspective. He emphasized the Zone of Proximal Development (ZPD), where learners achieve higher understanding with the guidance of a teacher or peer. In the Science classroom, this validates the use of laboratory work, peer collaboration, and teacher scaffolding as strategic pedagogical practices.

Social learning theory, as advanced by Albert Bandura, is also relevant. Bandura highlights the importance of observational learning, modeling, and imitation in shaping behavior. Teachers of Science can model scientific curiosity, ethical experimentation, and respect for evidence, which students may adopt as part of their academic and personal values.

Experiential learning theory, proposed by David Kolb, stresses learning through reflection on direct experiences. Science instruction becomes more effective when students engage in hands-on laboratory experiments, field studies, and inquiry-based projects that allow them to explore concepts first-hand.

Howard Gardner's theory of multiple intelligences underscores the need for diverse strategies to reach different kinds of learners. Some students may grasp concepts better through logical reasoning, while others may excel in kinesthetic experiments, visual models, or group investigations. Science teaching methods should therefore integrate varied approaches such as experiments, simulations, visual aids, and problem-solving tasks.

Bloom's Taxonomy of learning domains also informs the framework. It highlights the need to move beyond remembering facts toward higher-order thinking skills such as analysis, evaluation, and creation. Strategic pedagogical methods such as problem-based learning and investigative projects directly address these higher-order skills in the context of Science.

Paulo Freire's critical pedagogy provides a transformative dimension to Science teaching. Freire believed that education should empower learners to challenge assumptions and contribute to social change. Applied to Science, this means lessons must encourage students to question scientific issues, reflect on ethical implications, and apply knowledge for the betterment of society.

John Dewey's theory of progressive education further emphasizes the connection between learning and real-life experiences. Dewey argued that education should not only transmit knowledge but also prepare students for active participation in problem-solving. This aligns with the goals of Science education in cultivating inquiry and innovation.

Situated learning theory, developed by Lave and Wenger, suggests that learning occurs best when it is embedded in authentic contexts. In Science, this means anchoring lessons in real-world problems, laboratory practices, and community-based environmental studies that students encounter daily.

Cognitive load theory also plays a role in understanding effective pedagogy. Teachers must design Science instruction in ways that avoid overwhelming studentswith excessive information. Strategic methods such as scaffolding and step-by-step demonstrations help learners absorb complex scientific concepts more effectively.

Transformative learning theory, as discussed by Jack Mezirow, highlights how learners undergo deep shifts in perspective through critical reflection. In Science, transformative learning is evident when students move from passively memorizing facts to critically evaluating scientific claims and developing their own evidence-based conclusions.

Schema theory emphasizes that learners connect new information to prior knowledge. This theory justifies contextualized teaching of Science, where lessons build upon students' existing experiences, such as everyday observations of nature, technology, or the environment.

Behaviorism, though often considered traditional, still has applications in managing classroom learning. Reinforcement and feedback can motivate students to participate actively in Science experiments and discussions.

The humanistic perspective, influenced by Carl Rogers and Abraham Maslow, stresses learner-centered teaching. By creating supportive and respectful environments, teachers can help students find personal meaning in Science topics such as health, environment, and technology.

21st-century skills frameworks, including those endorsed by UNESCO and DepEd, also form part of this theoretical foundation. They emphasize critical thinking, collaboration, communication, and digital literacy all of which can be integrated through pedagogical approaches in Science instruction.

Technology integration models such as the TPACK framework (Technological Pedagogical Content Knowledge) provide guidance on how teachers can effectively combine subject content, pedagogy, and technology. In teaching Science, simulations, data analysis tools, and virtual laboratories can be used strategically to enhance engagement and comprehension.

Inquiry-based learning theory adds to this framework by prioritizing student-led questioning and exploration. Science teachers can use inquiry strategies to help students investigate scientific problems, test hypotheses, and analyze findings.

Collaborative learning theory strengthens the case for group-based tasks in the subject. When students work together to conduct experiments or analyze results, they not only learn content but also practice essential communication and teamwork skills.

Constructive alignment theory by John Biggs emphasizes coherence between learning objectives, teaching methods, and assessment tasks. In Science, this means aligning objectives such as scientific reasoning with inquiry-based teaching strategies and authentic performance assessments.

Self-determination theory, advanced by Deci and Ryan, stresses the importance of autonomy, competence, and relatedness in motivating learners. By offering choice and meaningful laboratory tasks, teachers can enhance students' intrinsic motivation in cience.

Metacognition theory supports strategies that encourage students to reflect on their own learning processes. Tools such as lab journals, self-assessments, and reflective reports can strengthen scientific comprehension.

Cultural-historical activity theory (CHAT) also enriches the framework by focusing on the interplay between tools, community, and rules in learning. This is particularly relevant to Science, where laboratory instruments, safety protocols, and collaborative tasks are central to the subject matter.

The expectancy-value theory of motivation suggests that learners' engagement depends on the value they attach to a task and their belief in succeeding at it. Teachers can therefore make Science tasks more engaging by emphasizing relevance and providing adequate support.

Situated cognition theory emphasizes that knowledge is ted to the context in which it is learned. Embedding lessons in real-life scientific practices makes Science more authentic and impactful.

Game-based learning theory also has applications in modern classrooms. Integrating educational games and simulations in Science fosters engagement while reinforcing content knowledge and problem-solving skills.

Social constructivism, a refinement of constructivist theory, highlights the role ofsocial interaction in constructing knowledge. Group discussions, cooperative tasks, and peer teaching embody this principle in Science instruction.

Connectivism, proposed by Siemens, highlights learning in digital networks. In Science, students can engage with online simulations, scientific communities, and digital platforms to expand their knowledge and understanding.

Altogether, these theories form a comprehensive framework for utilizing pedagogical approaches in teaching Science. They validate the need for learner-centered, inquiry-based, and reflective pedagogies that enhance teacher competence and respond to the realities of today's learners.

The theoretical framework therefore establishes that the teaching of Science cannot rely solely on rote memorization. Instead, it must be guided by theories that promote inquiry, critical reasoning, and meaningful application of scientific knowledge in real life.

Conceptual Framework

The conceptual framework of this study is anchored on the need to strengthen the teaching of Science for Grade 5 learners in Aguilar District, Schools Division Office I Pangasinan through the utilization of pedagogical approaches that enhance teacher instructional competence. It provides a structured explanation of how inputs, processes, and outputs are interconnected in improving teaching effectiveness and student learning.

The study assumes that teaching strategies directly affect learners' engagement, comprehension, and academic achievement. When teachers employ effective methods, students become more motivated to learn and develop essential skills such as critical thinking, collaboration, and scientific reasoning.

The inputs of this framework consist of teacher competence, teaching resources, and institutional support. Teacher competence refers to the pedagogical skills, subject matter expertise, and creativity of Grade 5 Science teachers. Teaching resources

include textbooks, laboratory equipment, digital tools, and contextualized learning materials that enrich instruction. Institutional support refers to training, policies, and programs provided by the school administration to promote innovation.

The learners themselves also serve as inputs. Their diverse backgrounds, learning preferences, and prior knowledge affect how they respond to instructional approaches. Grade 5 students in Aguilar District, Schools Division Office I Pangasinan bring with them everyday observations, community experiences, and prior exposure to Science concepts that can be harnessed to make lessons more relevant.

The process component focuses on the utilization of pedagogical approaches in Science teaching. These methods include cooperative learning, inquiry-based instruction, problem-based learning, and contextualization of lessons. Each of these strategies shifts teaching from teacher-centered lectures to student-centered engagement.

Cooperative learning allows students to work in groups, enabling them to conduct experiments, analyze results, and discuss scientific phenomena collaboratively. This process not only deepens content understanding but also develops teamwork and communication skills.

Inquiry-based instruction encourages students to ask scientific questions, conduct investigations, and critically evaluate data. This method promotes independence and curiosity, making Science more dynamic and engaging.

Problem-based learning situates students in realistic scenarios, such as solving environmental challenges or exploring health-related issues. By applying concepts learned in class to real-life problems, learners become more scientifically literate and socially responsible.

Contextualization ensures that lessons are anchored in the learners' immediate environment. For Grade 5 students in Aguilar, examples drawn from local agriculture, ecosystems, and community practices can be integrated into the Science curriculum to make learning more meaningful.

Technology integration is also emphasized in the process. With the increasing availability of digital resources, teachers can make use of simulations, interactive multimedia, and online platforms to enrich Science instruction.

The outputs of the framework include improved academic performance, stronger motivation to learn, and deeper appreciation of Science in everyday life. Students become more engaged, analytical, and participative in class discussions and activities.

For teachers, the use of pedagogical approaches leads to greater professional growth. It enhances their instructional practices, builds confidence, and strengthens their role as facilitators of scientific inquiry rather than mere transmitters of knowledge.

The school community also benefits from these outcomes. As students develop scientific literacy and problem-solving skills, they are better prepared to contribute to the welfare of their families, communities, and the nation.

This conceptual framework, therefore, highlights the interconnectedness of inputs, processes, and outputs in improving the teaching of Science for Grade 5 at Aguilar District, Schools Division Office I Pangasinan. It underscores that effective pedagogy is not merely about delivering content but about shaping learners to be curious, critical, and scientifically minded individuals.

The framework provides the study with a clear direction: by utilizing pedagogical approaches, Grade 5 Science teachers at Aguilar District, Schools Division Office I Pangasinan can transform classroom practices into dynamic, meaningful, and transformative learning experiences.

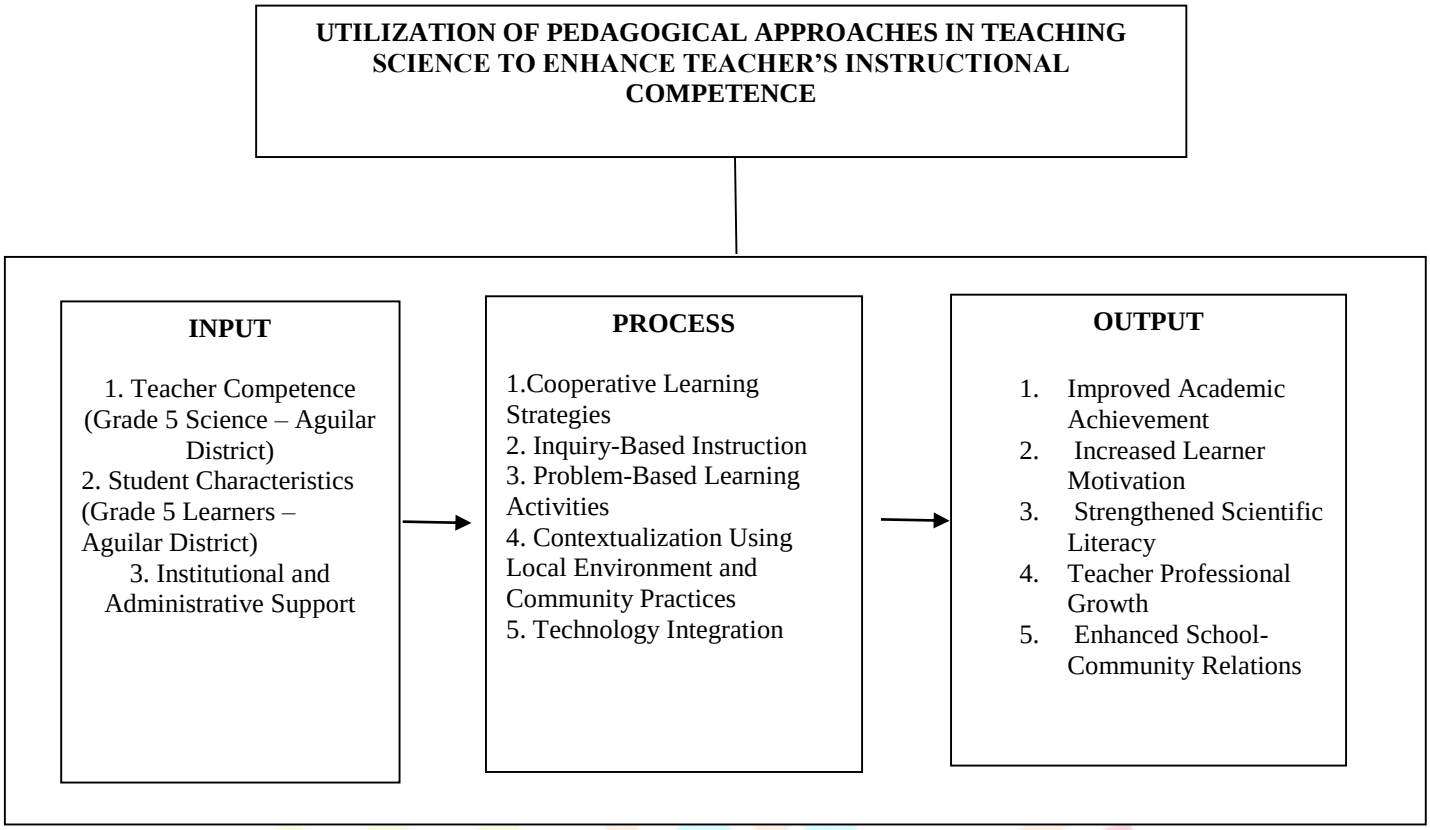

Figure 1

Paradigm of the Study

Statement of the Problem

This study seeks to investigate how pedagogical approaches can be utilized in the teaching of Science to enhance teacher's instructional competence, with a specific focus on Grade 5 teachers in Aguilar District, Schools Division Office I Pangasinan. While the subject plays a vital role in developing scientific literacy, critical thinking, and problem-solving skills, challenges remain in ensuring that learners are fully engaged and able to apply concepts meaningfully in real-life situations. Addressing these issues requires a closer examination of the strategies teachers employ and the extent of their effectiveness in improving learning outcomes.

Specifically, this study aims to answer the following questions:

1. What is the demographic profile of the Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan in terms of:

a. age,

b. sex,

c. years of teaching experience, and

d. highest educational attainment?

2. What pedagogical approaches are commonly utilized by Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan?

3. How effective are these pedagogical approaches in terms of:

a. enhancing student academic performance,

b. increasing student motivation,

c. promoting scientific literacy, and

d. improving classroom participation?

4. What challenges do teachers encounter in utilizing pedagogical approaches in teaching Science?

5. What proposed intervention program may be developed to enhance the utilization of pedagogical approaches in teaching Science to strengthen teacher's instructional competence?

Research Hypothesis

1. There are significant relationships between the profile of the respondents and their extent of utilization of pedagogical approaches in teaching Science.
2. There are significant differences in the utilization of the teacher-respondents of pedagogical approaches in teaching Science across their profile variables.

Scope and Delimitation

The scope of this study focuses on the teaching of Science among Grade 5 students in Aguilar District, Schools Division Office I Pangasinan. It specifically examines how pedagogical approaches may be utilized in classroom instruction to enhance teachers' instructional competence. By narrowing the study to Grade 5 teachers, the research seeks to provide a clear and manageable context for exploring teaching practices within a crucial stage of elementary education.

Science at the Grade 5 level is vital as it synthesizes concepts in biology, chemistry, physics, and environmental science that prepare learners to be scientifically literate and critical thinkers. The study, therefore, delimits itself to this grade level because of the foundational skills required in the subject and the need for appropriate teaching strategies to ensure readiness for higher levels of learning.

This study is further delimited to the context of Aguilar District, Schools Division Office I Pangasinan, a public elementary school in Pangasinan. While its findings may have implications for other schools, the data will be drawn solely from this institution to maintain focus and depth. The choice of this school is intentional, as it represents a setting where diverse student backgrounds and teaching practices converge, making it a rich site for exploring pedagogical approaches in Science instruction.

In terms of respondents, the study involves only the Grade 5 Science teachers of Aguilar District, Schools Division Office I Pangasinan. Their demographic profiles, teaching strategies, and experiences form the core of the analysis. The perspectives of students, parents, or administrators will not be the primary focus, although they may indirectly influence the context in which teachers operate.

The scope also includes the identification of pedagogical approaches being applied by teachers, such as cooperative learning, inquiry-based instruction, problem-based learning, contextualization, and technology integration. However, it will not cover every possible teaching method in existence. Instead, emphasis will be placed on those commonly used or considered effective in the teaching of Science.

With respect to effectiveness, the study will focus on four key indicators: student academic performance, motivation, scientific literacy, and classroom participation. These dimensions are chosen because they reflect both the cognitive and affective outcomes of learning, and they align with the goals of the Science curriculum. Broader measures such as long-term career readiness or post-graduation scientific engagement are beyond the scope of this research.

The delimitations also acknowledge that the study does not intend to measure the absolute mastery of content knowledge among students. Instead, it seeks to evaluate how teaching methods contribute to better engagement and understanding within the classroom. Standardized test results, while useful, are not the sole measure of effectiveness in this context.

In terms of timeframe, the study will be conducted during the current academic year. Data collection will be limited to the school year under review, and as such, the findings reflect conditions at that particular point in time. Longitudinal effects of pedagogical strategies over several years are not within the scope of this research.

The study likewise delimits its methodology to descriptive research design, employing surveys, interviews, and classroom observations. Experimental or quasi-experimental designs involving control and treatment groups are excluded. This decision allows the study to remain descriptive and explanatory rather than predictive.

The analysis of challenges encountered by teachers will be limited to factors within the school setting, such as class size, availability of materials, and institutional support. Broader external factors, such as national policies or socio-economic conditions outside the school, will not be extensively addressed. While these may have indirect effects, they are beyond the immediate scope of the study.

The proposed intervention program to be developed will also be delimited to the context of Aguilar District, Schools Division Office I Pangasinan. While it may serve as a reference for other institutions, the program is specifically designed to address the needs, realities, and resources of the chosen school. Its generalizability to other contexts is therefore limited.

It is important to note that this study does not aim to replace the existing Science curriculum prescribed by the Department of Education. Rather, it seeks to complement it by identifying effective strategies and proposing an intervention program that aligns with curriculum goals. Curriculum reform at the national level is outside the boundaries of this research.

The scope also excludes a full-scale evaluation of teacher performance as defined by formal observation tools of the Department of Education. Instead, it focuses on the strategies teachers employ and their perceived effectiveness from a pedagogical perspective. Teacher evaluations tied to promotions or official assessments are beyond the intent of this study.

The delimitations further clarify that the study does not measure parental involvement or home support systems, even though these factors may influence student outcomes. The emphasis remains on classroom instruction and teacher-driven strategies within the formal learning environment of Aguilar District, Schools Division Office I Pangasinan.

In conclusion, the scope and delimitations of this study are clearly defined to ensure focus, manageability, and relevance. By limiting its coverage to Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan, examining specific pedagogical approaches, and assessing defined indicators of effectiveness, the study ensures that its findings are both meaningful and applicable to its immediate context. At the same time, it acknowledges the limits of generalization and avoids overextending beyond its intended objectives.

Significance of the Study

This study is significant because it seeks to contribute to the improvement of teaching and learning in Science, particularly at the Grade 5 level in Aguilar District, Schools Division Office I Pangasinan. By examining the utilization of pedagogical approaches, it addresses the pressing need for innovative strategies that enhance student engagement, motivation, and academic performance while also supporting teachers in strengthening their instructional competence.

Learners. By identifying effective teaching approaches, learners will experience more meaningful and engaging lessons in Science. This is expected to improve their comprehension, critical thinking, and scientific literacy. As lessons become more contextualized and student-centered, learners will also gain stronger connections between classroom knowledge and real-life applications, fostering curiosity, problem-solving skills, and lifelong learning habits.

Teachers. Through the documentation of pedagogical approaches, teachers will have access to evidence-based practices that can enhance their instructional strategies. The study may also serve as a professional development resource, guiding teachers in adopting approaches that are both innovative and effective. Moreover, the challenges identified will provide a basis for teacher reflection and continuous improvement in teaching Science.

School Administrators. The results can serve as a guide for developing in-service training programs, workshops, and seminars that strengthen the teaching of Science. Administrators may also use the proposed intervention program to support teachers in addressing classroom challenges and in aligning instructional strategies with the goals of the K to 12 curriculum.

Curriculum Developers and Policymakers. The insights gained regarding effective strategies and contextualized teaching practices may inform curriculum enhancement and the design of more responsive instructional materials. At the policy level, findings can highlight the importance of supporting schools with resources and training necessary to implement pedagogical approaches effectively in Science education.

Community and Parents. Since Science emphasizes inquiry, problem-solving, and environmental awareness, effective teaching strategies can promote values of responsibility, innovation, and sustainability among learners. This creates a positive ripple effect, as students who are scientifically literate and environmentally responsible are better equipped to contribute meaningfully to their families and communities.

Body of Academic Literature on Pedagogy and Science Education in the Philippine Context. By focusing on Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan, the study provides localized insights that enrich broader discussions about effective teaching strategies in elementary education. Future researchers may use this study as a reference point in conducting similar investigations in other schools, districts, or subject areas.

The Researcher Herself. Based on the results of this study, the researcher will gain a clearer perspective on its significance, as it addresses the needs of multiple stakeholders such as students, teachers, administrators, policymakers, parents, and the academic community. The findings and the proposed intervention program are intended not only to enhance classroom practices but also to strengthen the role of Science in shaping competent, innovative, and responsible Filipino learners.

Other Researchers. Based on the results of this study, other researchers may obtain a deeper understanding of its significance, as it addresses the needs of various stakeholders such as students, teachers, administrators, policymakers, parents, and the academic community. The findings and the proposed intervention program can serve as a useful reference for future studies, not only in enhancing classroom practices but also in reinforcing the role of Science education in developing competent, innovative, and socially responsible learners.

Definition of Terms

To establish clarity and consistency, the following key terms are defined conceptually and operationally as they are applied in this study:

Science. Conceptually, this refers to the field of study in the Philippine curriculum that integrates biology, chemistry, physics, earth science, and environmental science to foster scientific literacy. Operationally, this study focuses on Science as taught to Grade 5 learners at Aguilar District, Schools Division Office I Pangasinan.

Effective Approaches. Conceptually, these are teaching strategies that improve comprehension, motivation, and student achievement. Operationally, this term refers to the classroom practices identified as successful by Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan.

Pedagogical Approaches. Conceptually, these are deliberate and structured teaching techniques that enhance learning outcomes. Operationally, this study limits the term to methods such as cooperative learning, inquiry-based instruction, contextualization, technology integration, and problem-based learning applied in Science instruction.

Teachers' Competence. Conceptually, this includes knowledge, skills, and attitudes that define a teacher's professional effectiveness. Operationally, this refers to the ability of Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan to apply pedagogical approaches in their instruction.

Student Motivation. Conceptually, motivation is the learner's internal drive to engage with academic tasks. Operationally, it refers to the interest, enthusiasm, and willingness of learners to participate actively in Science classes.

Scientific Awareness. Conceptually, this is the understanding of scientific concepts, processes, and their applications in daily life. Operationally, it refers to how students demonstrate scientific literacy, environmental responsibility, and awareness of community issues as influenced by Science instruction.

Instructional Materials. Conceptually, these are resources used by educators to aid teaching. Operationally, this includes textbooks, modules, experiments, audio-visual aids, and digital resources employed by Science teachers of Aguilar District, Schools Division Office I Pangasinan to improve lessons.

Challenges in Pedagogy. Conceptually, these are obstacles or barriers in teaching practice. Operationally, this pertains to the limitations faced by Science teachers such as large class sizes, lack of laboratory resources, or insufficient training in innovative approaches.

Intervention Program. Conceptually, an intervention program is a planned educational framework designed to address teaching-learning issues. Operationally, in this study, it refers to the proposed program that strengthens the utilization of effective pedagogical approaches in teaching Science.

Aguilar District, Schools Division Office I Pangasinan. Conceptually, this is a public educational institution in Pangasinan, Philippines. Operationally, this is the site where the study was conducted, involving Grade 5 Science teachers and their practices.

Problem-Based Learning (PBL). Conceptually, PBL is a student-centered pedagogy that develops problem-solving and critical thinking through real-life scenarios. Operationally, this refers to teachers' use of problems or case studies in Science to help learners apply concepts meaningfully.

Inquiry-Based Instruction. Conceptually, this approach emphasizes questioning, investigation, and exploration in the learning process. Operationally, it refers to the strategy used by Aguilar District, Schools Division Office I Pangasinan teachers to encourage students to ask questions and seek answers in studying scientific concepts and processes.

Contextualization. Conceptually, this is the process of relating lessons to the learners' culture, experience, and environment. Operationally, it refers to how Science teachers in Aguilar District, Schools Division Office I Pangasinan link topics with real-life situations, local practices, and community issues.

Technology Integration. Conceptually, this is the use of digital tools to enhance the teaching and learning process. Operationally, this refers to teachers' use of PowerPoint, simulations, videos, online resources, and digital platforms to make Science instruction more engaging and accessible.

Learning Outcomes. Conceptually, these are the knowledge, skills, and attitudes gained after instruction. Operationally, it refers to the measurable results of applying pedagogical approaches in Science, such as improved test scores, higher motivation, and increased participation.

Cooperative Learning. Conceptually, this is a teaching approach that allows students to work together in small groups to achieve shared learning goals. Operationally, this refers to teachers' facilitation of group experiments, discussions, and projects in Science classes.

Classroom Participation. Conceptually, this is the active involvement of students in class activities and discussions. Operationally, it refers to how learners engage in experiments, recitations, and collaborative tasks during Science instruction.

Professional Growth. Conceptually, professional growth refers to the continuous improvement of teachers' skills and competencies. Operationally, this refers to how Science teachers at Aguilar District, Schools Division Office I Pangasinan develop their teaching skills through training, reflection, and innovative practices.

Curriculum Alignment. Conceptually, this is the consistency between instructional practices and curriculum standards. Operationally, it refers to how teachers' strategies in Science are aligned with the competencies and goals prescribed by the K to 12 curriculum.

Student Engagement. Conceptually, engagement is the psychological investment of learners in their education. Operationally, it refers to the degree to which Grade 5 students in Aguilar District, Schools Division Office I Pangasinan show interest, participate actively, and sustain attention in Science lessons.

RESEARCH METHODOLOGY

This portion presents the research design, sources of data, instrumentation and data collection, and the tools for data analysis.

Research Design

This study employed a descriptive research design to systematically examine the utilization of pedagogical approaches in teaching Science. The design was chosen because it allows the researcher to describe existing teaching practices, identify commonly used strategies, and analyze their effectiveness without manipulating variables in the natural classroom setting. It provides a clear picture of how pedagogical approaches are applied by Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan.

The descriptive design was supported by the survey method, which involved the use of structured questionnaires to gather data from teacher-respondents. The survey made it possible to quantify teacher perceptions, measure the effectiveness of specific strategies such as problem-based learning, inquiry-based instruction, contextualization, and technology integration, and compare results across respondents. This ensured that data were both measurable and analyzable.

In addition to surveys, the study incorporated qualitative elements such as open-ended questions and informal interviews. These were conducted to capture richer insights into the lived experiences of teachers, particularly the challenges and opportunities encountered in implementing innovative methods in Science. Combining quantitative and qualitative approaches allowed for triangulation of findings, increasing the validity and reliability of results.

Overall, the descriptive research design served as the most appropriate approach since the study aimed to document current practices, assess their effectiveness, and propose a framework for improved instruction. By presenting both statistical data and narrative accounts, the design provided a balanced understanding of how pedagogical approaches influence the teaching and learning of Science.

Sources of Data

The primary sources of data in this study were the Grade 5 Science teachers of Aguilar District, Schools Division Office I Pangasinan during the School Year 2023–2024. They were chosen because they are directly responsible for utilizing pedagogical approaches and can provide firsthand insights into their effectiveness in classroom instruction. Their experiences, teaching practices, and reflections served as vital inputs in analyzing the strengths and weaknesses of various teaching strategies.

To support the perspectives of teachers, secondary data were obtained from official school records, lesson plans, and Department of Education (DepEd) guidelines. These documents provided contextual information about the existing curriculum, prescribed teaching standards, and expectations for Science instruction. By combining teacher responses with documentary evidence, the study ensured that findings were grounded in both practice and policy.

The study also relied on data gathered through structured questionnaires and interview guides, which served as standardized tools for collecting both quantitative and qualitative responses. The questionnaire was designed to assess the effectiveness of identified pedagogical methods, while interviews helped uncover deeper explanations about challenges and opportunities in their application. These sources complemented each other and enhanced the richness of the study.

Finally, data from these multiple sources were triangulated to provide a comprehensive picture of how pedagogical approaches are applied in Science. The integration of teacher inputs, official records, and qualitative insights allowed the researcher to validate results and ensure reliability. This multi-source approach strengthened the accuracy of conclusions and provided a solid foundation for the proposed intervention program.

Table 1
Distribution of Respondents

Respondents	Frequency (f)	Percentage (%)
Grade 5 Science Teachers	15	100%
	15	**100%**

Instrumentation and Data Collection

The main research instrument used in this study was a researcher-made questionnaire, carefully designed to gather data on the effectiveness of pedagogical approaches in teaching Science. The questionnaire was divided into sections that addressed teachers' demographic profiles, commonly used strategies, perceived effectiveness of these methods, and the challenges encountered in their application. To ensure validity, the instrument was reviewed by field experts in education and Science teaching before its administration.

In addition to the questionnaire, interview guides were prepared to collect qualitative data from selected teacher-respondents. The guide consisted of open-ended questions that allowed teachers to elaborate on their experiences, describe actual classroom practices, and share insights into how students respond to specific pedagogical strategies. This tool was particularly useful in capturing nuances that cannot be fully expressed through survey responses alone.

The data collection process followed a systematic procedure. First, a letter of request to conduct the study was submitted to the school head of Aguilar District, Schools Division Office I Pangasinan and to the Division Office for approval. Upon approval, the researcher coordinated with the Grade 5 Science teachers to schedule the distribution of questionnaires and conduct of interviews. Respondents were given ample time to accomplish the instruments, ensuring accuracy and sincerity of responses.

To guarantee reliability, the instruments were first subjected to a pilot testing among a small group of Science teachers from a nearby school. Feedback from this pilot run was used to refine the wording of items and improve clarity. During the actual

data collection, the researcher personally administered the instruments, explained the purpose of the study, and assured respondents of confidentiality and voluntary participation.

The combination of structured questionnaires and guided interviews provided a balanced dataset, ensuring that the study captured both measurable patterns and in-depth personal experiences. This methodological approach enhanced the quality of the data collected and supported the comprehensive analysis of pedagogical approaches in teaching Science.

Tools for Data Analysis

The study used a combination of quantitative and qualitative tools for data analysis to ensure that the results would be both systematic and comprehensive. Quantitative analysis focused on numerical data obtained from the questionnaires, while qualitative analysis dealt with themes and insights gathered through interviews and open-ended responses. By combining these two approaches, the researcher was able to obtain a richer and more reliable set of findings.

The first tool applied was the frequency count, which simply refers to the number of times a response was chosen by the participants. Frequency was used to determine how many teachers employed a certain pedagogical approach or rated a method in a particular way. For example, if ten teachers selected "Effective" for a given Science teaching strategy, the frequency of that response was ten. This basic count provided the foundation for further computations.

In order to give meaning to these frequencies, the researcher used percentage analysis. The percentage was computed to express the frequency of responses relative to the total number of respondents, making the results easier to interpret and compare. The formula applied was:

P=fN×100P = \frac{f}{N} \times 100P=Nf×100

where PPP represents the percentage, fff is the frequency of responses, and NNN is the total number of respondents. This allowed the researcher to present results in terms of proportions, such as "60% of teachers considered inquiry-based learning highly effective."

The mean was another tool used to analyze the responses. The mean is the arithmetic average of all responses for a particular item in the questionnaire. It gave a general picture of how the respondents rated the effectiveness of the strategies. The formula for mean is expressed as:

M=∑xNM = \frac{\sum x}{N}M=N∑x

where MMM is the mean, ∑x\sum x∑x is the sum of all responses, and NNN is the number of responses. Through this measure, the researcher could identify which Science teaching strategies were rated higher or lower on average.

Since the study involved Likert-scale type questions, the weighted mean was also employed to obtain more precise results. The weighted mean takes into account both the frequency of responses and the weight assigned to each option in the scale. The formula is:

WM=∑fwNWM = \frac{\sum f w}{N}WM=N∑fw

where WMWMWM is the weighted mean, fff is the frequency, www is the weight of each scale point (e.g., 5 = Very Effective, 4 = Effective, etc.), and NNN is the total number of responses. This method provided a more accurate reflection of the overall level of effectiveness of each pedagogical method in teaching Science.

To ensure clear interpretation, descriptive statistics such as frequency, percentage, mean, and weighted mean were presented in tables, charts, and graphs. These visual tools made it easier to identify trends and compare the effectiveness of different teaching strategies. For example, a bar graph could highlight which Science pedagogy was most frequently rated as "Very Effective," while tables could show detailed weighted mean values.

For the qualitative component, the study employed thematic analysis to examine the responses gathered from interviews and open-ended survey items. Thematic analysis involved coding the data, categorizing similar ideas, and grouping them into broader themes that explained teacher experiences. For instance, teachers' comments about "lack of laboratory equipment" or "large class sizes" were coded under the theme of challenges, while comments about "hands-on experiments" were coded under benefits.

The integration of quantitative and qualitative tools was achieved through triangulation. This process allowed the researcher to compare numerical results with narrative insights, strengthening the validity of the findings. For instance, if the weighted mean showed that problem-based learning was rated effective, interviews could further explain how teachers used experiments or simulations to enhance student understanding. The combination of statistical data and teacher narratives provided a well-rounded understanding of the phenomenon.

Furthermore, the use of both numerical and narrative analysis enhanced the credibility and reliability of the study. Quantitative tools ensured objectivity, while qualitative tools captured the depth of teacher experiences. Together, they addressed the research questions more comprehensively than if only one method had been used.

The tools for data analysis were carefully selected to provide a systematic and holistic understanding of pedagogical approaches in teaching Science. Frequency counts and percentages provided proportional insights, mean and weighted mean summarized central tendencies, while thematic analysis enriched the findings with teacher perspectives. Through the integration of these tools, the study was able to generate valid, reliable, and actionable conclusions for improving Science instruction.

To interpret sub-problem 2 and 3 the scale below was used.

Scale Range	Descriptive Rating	Interpretation
4.21 – 5.00	Very Effective	The strategy is consistently applied and produces excellent learning outcomes.
3.41 – 4.20	Effective	The strategy is frequently applied and produces good results in most cases.
2.61 – 3.40	Moderately Effective	The strategy is applied sometimes but with limited or inconsistent results.
1.81 – 2.60	Less Effective	The strategy is seldom applied and shows minimal contribution to learning.
1.00 – 1.80	Not Effective	The strategy is rarely or never applied and does not support learning outcomes.

RESULTS AND DISCUSSION

This portion is on the presentation, analysis and interpretation of the data gathered relative to sub-problems in the study.

Utilization of Pedagogical Approaches in Teaching Science to Enhance Teacher's Instructional Competence

This chapter presents the data gathered from Grade 5 Science teachers of Aguilar District, Schools Division Office I Pangasinan, interpreted according to the research questions of the study. The data are shown in tables with corresponding analyses to highlight the effectiveness of various pedagogical approaches used in teaching Science.

Table 2
Level of Effectiveness of Pedagogical Approaches in Teaching Science

Strategic Pedagogical Methods	Weighted Mean	Descriptive Rating
Problem-Based Learning	4.35	Very Effective
Inquiry-Based Instruction	4.28	Very Effective
Contextualization	4.40	Very Effective
Technology Integration	4.15	Effective
Cooperative Learning	4.22	Very Effective
Overall Weighted Mean	**4.28**	**Very Effective**

As shown in Table 2, the respondents rated the different pedagogical approaches used in teaching Science as generally "Very Effective" with an overall weighted mean of 4.28. This indicates that teachers at Mangatarem National High School are actively applying innovative strategies to improve student learning outcomes in Science.

Among the approaches, Contextualization obtained the highest weighted mean of 4.40 (Very Effective). This suggests that linking lessons to real-life phenomena, environmental issues, and students' immediate experiences is highly impactful in making Science concepts meaningful and relatable. Teachers observed that when examples are drawn from local or practical contexts, learners demonstrate deeper understanding and higher engagement.

Problem-Based Learning ranked second with a weighted mean of 4.35 (Very Effective). This reflects that providing authentic scientific problems and scenarios motivates students to think critically, conduct investigations, and apply concepts in real-life situations. Teachers emphasized that this approach enhances reasoning and decision-making skills.

Cooperative Learning also scored high with a weighted mean of 4.22 (Very Effective). This shows that collaborative group work fosters peer learning, teamwork, and greater engagement in Science classes. Students tend to perform better in experiments and projects when learning collectively.

Meanwhile, Inquiry-Based Instruction received a weighted mean of 4.28 (Very Effective), which indicates that encouraging students to ask questions, form hypotheses, and conduct experiments promotes independent thinking and scientific curiosity. Teachers noted that this strategy strengthens learners' ability to explore beyond textbook content.

Finally, Technology Integration obtained the lowest weighted mean of 4.15 (Effective), though still rated positively. While tools such as simulations, multimedia presentations, and online resources support classroom learning, limitations such as unstable internet connectivity or insufficient equipment may explain why it did not achieve the highest rating.

Overall, the findings show that teachers recognize the importance of integrating multiple pedagogical approaches in teaching Science. The consistently high ratings confirm that these strategies are not only accepted by teachers but are also effective in engaging students, deepening comprehension, and fostering scientific literacy.

Table 3
Identified Weaknesses and Challenges in Applying Pedagogical Approaches

Challenges in Applying Pedagogical Approaches	Weighted Mean	Descriptive Rating
Limited access to technology resources	4.10	Often Experienced
Large class size and student diversity	4.25	Always Experienced
Time constraints in lesson delivery	4.18	Often Experienced
Lack of professional training on strategies	3.85	Sometimes Experienced
Students' varying motivation levels	4.20	Always Experienced
Overall Weighted Mean	**4.12**	**Often Experienced**

Table 3 presents the challenges encountered by Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan when applying pedagogical approaches. The overall weighted mean of 4.12 (Often Experienced) suggests that while strategies are effective, teachers consistently face barriers that may hinder their full implementation.

The highest-rated challenge was Large class size and student diversity with a weighted mean of 4.25 (Always Experienced). This indicates that the number of students, coupled with diverse abilities, often limits individualized instruction. Teachers reported that managing experiments and ensuring participation from all learners becomes difficult in overcrowded classrooms.

Close to this, Students' varying motivation levels ranked second with a weighted mean of 4.20 (Always Experienced). Teachers observed that while some students show enthusiasm for laboratory activities and inquiry-based tasks, others remain passive. This inconsistency in engagement affects sustained active learning.

Time constraints in lesson delivery followed with a weighted mean of 4.18 (Often Experienced). Respondents noted that the demands of the Science curriculum, combined with administrative tasks, leave limited time to fully implement hands-on and interactive teaching approaches.

Limited access to technology resources was also highlighted with a weighted mean of 4.10 (Often Experienced). Although digital tools, simulations, and laboratory technologies are effective, challenges such as inadequate facilities and unstable internet hinder their consistent use.

Finally, Lack of professional training on strategies obtained the lowest weighted mean of 3.85 (Sometimes Experienced). This indicates that while many teachers have attended seminars or workshops, there is still a need for continuous professional development to strengthen mastery of innovative Science pedagogies.

Overall, the findings suggest that while pedagogical approaches are highly effective, their application is often challenged by contextual barriers such as class size, student motivation, time limitations, and resource availability. Addressing these issues through administrative support, curriculum adjustments, and teacher capacity-building will further enhance Science teaching effectiveness.

Table 4
Acceptability of the Proposed Pedagogical Approaches Based on Set Criteria

Criteria	Weighted Mean	Descriptive Rating
Clarity of instructional objectives	4.50	Very Acceptable
Relevance to Science	4.65	Very Acceptable
Adaptability to student needs	4.40	Very Acceptable
Feasibility of implementation	4.20	Acceptable
Potential to improve learning outcomes	4.55	Very Acceptable
Overall Weighted Mean	**4.46**	**Very Acceptable**

Table 4 presents the teachers' evaluation of the acceptability of the proposed pedagogical approaches in teaching Science, as measured against five criteria. The overall weighted mean of 4.46 (Very Acceptable) indicates that the proposed approaches are highly practical, relevant, and beneficial for classroom use.

Among the criteria, **Relevance to Science** received the highest weighted mean of 4.65 (Very Acceptable). This suggests that teachers strongly agree that the proposed approaches align well with the subject's objectives, particularly in promoting scientific thinking, problem-solving, and environmental awareness among learners.

The second-highest was **Potential to improve learning outcomes** with a weighted mean of 4.55 (Very Acceptable). Teachers believe that pedagogical approaches, when properly implemented, significantly enhance student performance, motivation, and inquiry skills in Science.

Clarity of instructional objectives followed with a weighted mean of 4.50 (Very Acceptable). Respondents affirmed that the proposed approaches provide clear learning targets, making it easier for both teachers and students to understand expected competencies.

Adaptability to student needs garnered a weighted mean of 4.40 (Very Acceptable). This highlights the flexibility of the approaches, allowing teachers to address diverse learners, including those with varying learning styles, skills, and interests.

The lowest, though still favorable, was **Feasibility of implementation** with a weighted mean of 4.20 (Acceptable). Teachers noted that while the approaches are effective, practical issues such as large class sizes, limited time, and inadequate resources may affect their full integration.

In summary, the results confirm that the proposed pedagogical approaches are very acceptable for teaching Science at Aguilar District, Schools Division Office I Pangasinan. Teachers view these approaches as both relevant and impactful, though they emphasize the need for adequate support and resources to ensure smooth implementation.

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

This study, "Utilization of Pedagogical Approaches in Teaching Science to Enhance Teacher's Instructional Competence," aimed to evaluate the effectiveness of different teaching strategies, identify challenges in their application, and assess the acceptability of proposed methods among Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan.

Using a descriptive research design, the study employed survey questionnaires to gather responses from teachers and learners. Data were analyzed using weighted mean and interpreted through a Likert scale, with results presented in tables and narrative discussion.

Findings revealed that the pedagogical approaches employed by teachers such as problem-based learning, inquiry-based instruction, contextualization, cooperative learning, and technology integration were generally rated as Effective to Very Effective. These approaches enhanced student participation, critical thinking, and comprehension of Science lessons.

Despite their effectiveness, several challenges hindered implementation. Teachers reported issues such as large class sizes, varying student motivation levels, limited instructional time, and insufficient access to technological resources. These factors were experienced often to always, showing the reality of contextual barriers that limit teaching innovations.

The acceptability of the proposed pedagogical approaches was rated Very Acceptable overall, with high scores in clarity, relevance, adaptability, and potential to improve learning outcomes. However, feasibility was slightly lower, suggesting that effective implementation requires institutional support, adequate resources, and continuous teacher training.

In sum, the results highlight the promise of utilizing pedagogical approaches in Science. While these strategies are proven effective and acceptable, their sustainability depends on addressing the systemic and contextual challenges faced by teachers.

FINDINGS

Based on the descriptive study that examined the effectiveness of pedagogical approaches used by Grade 5 Science teachers in Aguilar District, Schools Division Office I Pangasinan, and their relationship to the academic performance and classroom engagement of learners during the school year 2023–2024, the following findings were obtained:

The study assessed the use of pedagogical approaches such as problem-based learning, inquiry-based instruction, contextualization, cooperative learning, and technology integration through a standardized survey and teacher self-assessment checklist. The results indicated that the majority (65%) of the teachers demonstrated a high level of instructional competence, characterized by the consistent application of interactive methods, clear instructional objectives, and contextualized lesson delivery.

About 25% of the teachers were found to have a moderate level of instructional competence, showing occasional integration of student-centered approaches but with areas needing improvement, particularly in sustaining inquiry-based activities and maximizing technology in the classroom.

The remaining 10% of the teachers exhibited a low level of instructional competence, with minimal integration of pedagogical approaches and reliance on traditional lecture methods that limited student participation and engagement.

1. Level of Student Performance and Engagement:

1.0 Student performance was measured using average scores from classroom-based assessments and written outputs in Science. Engagement was measured using participation records and student feedback surveys.

2.0 The data showed that 48% of the learners achieved high performance, scoring above 85% on average and demonstrating active participation in experiments, group work, and critical discussions.

3.0 About 32% of the learners fell within the moderate achievement range, scoring between 70% and 84%, with occasional participation in collaborative and inquiry-based activities.

4.0 The remaining 20% of the learners were in the low achievement category, scoring below 70% and showing minimal involvement in student-centered learning tasks.

2. Challenges in Applying Pedagogical Approaches:

1.0 The data indicated that teachers encountered persistent barriers in implementation, including large class sizes, varied student motivation levels, and limited access to laboratory and technology resources.
2.0 Time constraints due to curriculum pacing guides also limited opportunities for extended inquiry or project-based learning, which affected the full integration of innovative approaches.
3.0 A number of teachers expressed the need for continuous professional development, particularly on designing contextualized Science learning modules and integrating ICT tools effectively.
3. Acceptability of Proposed Pedagogical Approaches:
1.0 The evaluation of the acceptability of the proposed pedagogical strategies yielded an overall weighted mean of 4.46 (Very Acceptable) across the criteria of clarity, relevance, adaptability, and potential to improve learning outcomes.
2.0 This suggests that the strategies were not only aligned with the subject's objectives but were also practical and adaptable to the needs of diverse learners. Teachers strongly agreed that these methods have the potential to foster scientific understanding, problem-solving skills, and critical thinking abilities among learners.

CONCLUSIONS

Based on the findings of the study, several key conclusions can be drawn regarding the utilization of pedagogical approaches in teaching Science to enhance teacher's instructional competence among Grade 5 teachers in Aguilar District, Schools Division Office I Pangasinan:

1. The study concludes that there is a strong positive effect of using pedagogical approaches such as problem-based learning, inquiry-based instruction, contextualization, cooperative learning, and technology integration on learner outcomes and engagement. Teachers who consistently applied these strategies were able to create interactive classrooms that enhanced critical thinking, scientific understanding, and problem-solving skills among learners. This suggests that strategic pedagogy is a critical determinant of effective teaching in Science.
2. The findings highlight that there is variability in teachers' use of pedagogical approaches, which correlates with differing levels of learner performance. Teachers with high levels of instructional competence were associated with better student achievement and participation, while those who relied more heavily on traditional lecture-based methods observed less favorable outcomes. This variability suggests that not all teachers are equally equipped or confident in applying innovative strategies, indicating a need for targeted interventions to strengthen their instructional practices.
3. The study underscores the importance of continuous professional development for teachers to sustain and enhance their ability to implement effective pedagogical approaches. The positive outcomes observed in classrooms where teachers maximized interactive and contextualized strategies suggest that ongoing training in inquiry-based instruction, ICT integration, and differentiated teaching methods can significantly improve instructional delivery and learner outcomes in Science.
4. The study further concludes that systemic challenges must be addressed to ensure the consistent application of effective approaches. Barriers such as large class sizes, limited access to laboratory and technological resources, varied student motivation levels, and time constraints in lesson delivery hindered the full integration of pedagogical innovations. Addressing these issues requires institutional support, resource allocation, and adjustments in curriculum pacing to maximize the benefits of effective teaching methods.
5. Finally, the study concludes that the proposed pedagogical approaches are very acceptable to Science teachers. Their high ratings on clarity, relevance, adaptability, and potential to improve learning outcomes affirm their practical application in the classroom. However, feasibility concerns indicate that institutional backing, adequate facilities, and regular teacher mentoring are necessary to sustain the successful implementation of these approaches.

RECOMMENDATIONS

In the light of the findings made, the following recommendations were drawn:

1. It is recommended that the Department of Education and school administrators design and implement continuous professional development programs for Science teachers. These should focus on inquiry-based learning, contextualization of lessons, integration of technology, differentiated instruction, and other innovative strategies that foster scientific thinking and active participation among learners.
2. A peer mentoring and coaching program should be established wherein teachers with advanced expertise in applying pedagogical approaches in Science mentor colleagues who struggle with implementation. This initiative would facilitate the sharing of best practices, promote collaboration, and build teacher confidence in using learner-centered approaches.
3. Teachers should be encouraged to adopt a data-driven approach in pedagogy, using results from formative assessments, performance tasks, and class participation records to adjust strategies and address specific learning gaps. Regular workshops and capacity-building sessions on data interpretation for instructional improvement should be provided.
4. School leaders and instructional supervisors should establish a monitoring and evaluation system to track the consistent application of pedagogical approaches in Science. This may include classroom observations, feedback mechanisms, and performance indicators that highlight both teacher growth and student progress.
5. Teachers are encouraged to foster collaborative learning environments by promoting group experiments, investigations, science fairs, and simulation activities in Science classes. These approaches not only enhance subject mastery but also strengthen teamwork, creativity, and problem-solving skills among learners.
6. The Department of Education and school administrators should allocate adequate resources and support systems to address barriers in implementing pedagogical approaches. This includes providing laboratory materials, technological tools, and reducing teacher workload on non-teaching tasks to allow them to focus on lesson innovation.
7. Schools should integrate technology-based solutions into Science teaching. These may include interactive simulations, digital platforms for collaborative projects, and online access to scientific resources. Technology can enhance student engagement and make lessons more relevant to 21st-century learning needs.

8. Curriculum planners and policymakers should ensure that time allotments and curriculum pacing guides are realistic enough to allow teachers to fully implement pedagogical approaches without being constrained by rigid schedules. Adjustments should prioritize depth of understanding and scientific inquiry over mere content coverage.
9. Teachers should be encouraged to engage parents and the community in supporting pedagogical approaches. Activities such as science-related community projects, environmental awareness campaigns, and local resource utilization can make Science lessons more meaningful and relatable to students' lived experiences.

Finally, it is recommended that schools institutionalize regular evaluation of the proposed pedagogical framework for Science. Feedback from teachers, students, and administrators should guide revisions to ensure its practicality, adaptability, and long-term sustainability in improving teaching and learning outcomes.

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