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Inquiry-Base Learning to Enhance Scientific Literacy and Process Skills of Students: Private Secondary School Teachers in Focus

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Abstract: This research explored how private secondary school science teachers implement Inquiry-Based Learning (IBL), focusing on their actual classroom experiences and teaching methods. Through the shared stories of seven science teachers, who were selected using universal sampling, from the Philippine Women's College of Davao City, the study uncovered both the obstacles they face and the practices that work. Data were collected through in-depth interviews, classroom observations, and document reviews. Thematic analysis revealed that key challenges to effective IBL included limited instructional time, inadequate resources, and insufficient training in IBL techniques. Despite these hurdles, the teachers managed to employ successful strategies such as hands-on student experimentation and the use of guided questioning to promote critical thinking. From these insights, the study suggests practical actions like adjusting time allocations, investing in IBL materials, and providing relevant training for educators. The findings point to the need for stronger institutional backing and more adaptable curricula, while also highlighting the value of ongoing professional development. Overall, the study offers meaningful guidance for school leaders and policymakers aiming to improve IBL practices, ultimately supporting the growth of students' scientific thinking and inquiry skills. It emphasizes that improving IBL demands not only changes at the policy level but also concrete support for teachers within their daily classroom realities.

Keywords*: Inquiry-Based Learning, Enhance Scientific Literacy and Process Skills, Private Secondary School Teachers*.

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I. INTRODUCTION

Inquiry-based learning has really come to the forefront as a powerful method for cultivating both scientific literacy and critical thinking skills in secondary students. Our current investigation zeroes in on how private secondary school teachers are actually putting these inquiry-driven strategies into practice to deepen student engagement and understanding in science. By carefully examining these teachers' approaches and firsthand experiences, this research aims to uncover effective pedagogical methods and, just as importantly, shed light on the challenges inherent in fully integrating this dynamic learning approach.

From a global perspective, advancing students' scientific literacy has always been a core objective of science education. Yet, despite these efforts, reports from the International Science Education Community, as cited by Suryanti et al. (2023), referencing Faisal and Martin (2019), consistently revealed that many individuals still fall short on critical 21st-century scientific literacy skills. The PISA 2018 report further underscores this issue by documenting low scientific literacy outcomes in several countries. It is precisely because of this pervasive need that inquiry-based learning is widely recognized as a potent strategy for cultivating stronger scientific literacy among students.

Looking at efforts to improve scientific literacy, Indonesia provides a clear example. Harefa (2023) explained that their national curriculum leans on a scientific approach, which is decidedly student-centered and prioritizes the inquiry process through structured stages, all with the goal of tackling low scientific literacy. This perspective is echoed by Iskandar, et.al (2019), who noted that the Indonesian curriculum specifically recommends an Inquiry model aimed at enhancing students' scientific literacy skills. It seems that inquiry learning is

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considered particularly effective for improving scientific literacy because it directly involves learners in hands-on science activities.

Moving to Finland, Kang (2020) posited that Inquiry-based learning (IBL) has been fundamental to their science education for quite some time. What's compelling about IBL in this context is its ability to simulate and reflect the genuine work of scientists for students. Rather than a highly teacher-directed, prescriptive method, it's designed as a more student-centered approach to learning, fostering the use of learners' individual experiences.

It's clear that the global push for scientific literacy strongly champions inquiry. For instance, Wang et al. (2022) highlighted that even the National Research Council (NRC) in the USA considers scientific inquiry absolutely essential for developing students' scientific literacy. What's interesting is that even though educators might not totally agree on how to teach inquiry, there's a strong shared understanding among science educators and researchers regarding how to categorize different aspects of it.

Here in the Philippines, the Department of Education's (DepEd) MATATAG curriculum explicitly underlined the foundational role of the inquiry approach in facilitating science content learning. It's designed to be supported by other strategies that tailor challenges to students' existing knowledge and needs. Furthermore, the curriculum itself has benefited from the inclusion of other valuable approaches that enhance inquiry, such as applications-led learning, the science-technology-society approach, problem-based learning, and multi-disciplinary learning (DepEd Order 10, series 2024).

Supporting the broader claims about IBL, Ederon and Aliazas (2024) from San Pablo City had provided empirical evidence demonstrating that inquiry-based learning materials are highly effective in fostering students' integrated science process abilities. Their findings suggest that the pedagogical approach embedded in the developed resources significantly enhances student comprehension, thereby contributing to higher academic achievement.

Interestingly, another local study, conducted by Canoy (2024) in Tagum City, also found that inquiry-based learning certainly engages students through active exploration and thoughtful questioning, helping them connect concepts to the real world. However, their research presented a noteworthy nuance: they observed that, for college students, inquiry-based learning didn't show a direct association with the development of science process skills. This particular finding certainly warrants further investigation.

It's clear that Inquiry-Based Learning (IBL) offers a lot of promise. For instance, right here in Davao City, Posadas (2024) makes a strong case for IBL as an innovative teaching method that truly revolutionizes traditional education. Instead of just passively receiving information, students become active participants, diving into exploration, experimentation, and problem-solving. It's about putting them right at the front of their learning journey.

However, in our own school, our science teachers are grappling with some real challenges when it comes to boosting students' scientific literacy and process skills. To tackle this head-on, they've adopted the Inquiry-Based Learning (IBL) strategy, hoping to get students genuinely involved and help them develop those crucial 21st-century scientific competencies. The tricky part is, even with IBL in place, many of our science teachers are still feeling dissatisfied with both how they're teaching and what their students are actually learning. This situation is precisely what motivates our study: we need to really dig into the experiences and challenges private secondary school teachers face when using IBL to develop students' scientific literacy and process skills.

This study is significant because it dives into the actual experiences and challenges our private secondary school teachers face when putting Inquiry-Based Learning (IBL) into practice. As we know, IBL is a key strategy highlighted in the MATATAG curriculum, and it's absolutely crucial for building students' scientific literacy and process skills. The insights we gain from this research can directly help shape more effective teaching methods, ultimately improving science education and equipping students with the critical skills they'll need to tackle real-world problems.

II. METHOD

This research employed a qualitative phenomenological approach to examine the experiences of private secondary school teachers in their efforts to implement inquiry-based learning, with the aim of enhancing students' scientific literacy and process skills. The goal of phenomenology is to gather unprocessed data that offered a rich understanding of the teachers' lived experiences. As noted by Flood (2010) and referenced in Tomaszewski et al. (2020), the phenomenological approach to qualitative research emphasized the key components of lived experiences or phenomena, which could be perceived from diverse perspectives, thereby providing insights into the teachers' personal and professional experiences.

To ensure adherence to the highest ethical standards, this study underwent approval from the RMC Review Ethics Committee (REC). Research ethics played a critical role in ensuring that the researcher fulfilled obligations to participants and the communities impacted by the findings. In-depth interviews served as the primary data collection method for this phenomenological study. These interviews facilitated detailed, reflective conversations with seven (7) secondary school science teachers from the Philippine Women's College of

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Davao. Using well-structured, open-ended questions, active listening, and thoughtful probing, participants shared their lived experiences regarding the challenges and strategies encountered while implementing Inquiry-Based Learning (IBL).

Since all the teachers from this private school participated in the research, the selection of participants employed universal sampling, ensuring that the study captured a comprehensive range of experiences and insights specific to this group of educators. Moreover, performing my role as the researcher, I extracted information from the in-depth interviews which served as the primary data collection method for this phenomenological study. Also, classroom observations were conducted during science lessons to further enrich the data. Documentary Analysis of teachers' lesson plans and IBL activity sheets was likewise performed to validate information. Following O'Connor and Gibson's (2003) systematic framework for qualitative analysis, I implemented rigorous, iterative steps to examine the gathered data. This approach enabled the identification of meaningful patterns and emergent themes.

III. RESULTS AND DISCUSSIONS

This chapter discusses the results of the study that explored the experiences and challenges faced by private secondary school teachers in applying Inquiry-Based Learning (IBL) to improve students' scientific literacy and process skills. It offers an in-depth look at the qualitative data gathered, explaining how the researchers analyzed participant stories, classroom observations, and documents to identify and group recurring themes that emerged throughout the study. Below are the themes of this study.

- *Student-Centered Experimentation*

When it comes to developing students' scientific literacy and process skills, the participants shared that they used student-centered experimentation as a key strategy. This method allowed students to take charge of their own learning by designing and carrying out investigations, which proved effective in strengthening both their understanding and inquiry skills. Classroom observations supported this, as the researcher noticed that teachers took on the role of facilitators rather than direct instructors. This supportive approach encouraged students to think independently and sharpen their analytical thinking. These findings reflect the work of Musharrat (2020), who emphasized that hands-on, exploratory activities help students grasp subject matter while also developing essential thinking skills, an observation echoed by the teachers in this study, who noted increased student engagement and critical thinking in their classrooms.

- *Guided Questioning for Deeper Thinking*

In this study, the teacher-participants made use of guided questioning as an effective way to improve students' scientific literacy and process skills. Rather than relying on direct instruction, they used thoughtful, open-ended questions to encourage deeper thinking. During classroom observations, the researcher saw how teachers intentionally used these types of questions to prompt analysis and critical reflection. Likewise, a review of lesson plans and student outputs showed that learners demonstrated increasingly complex reasoning in their responses. These findings support the claims of Ederon and Aliazas (2024), who emphasized that Inquiry-Based Learning keeps students engaged by promoting investigation and posing challenging questions that relate classroom lessons to real-life situations.

Exploring on the challenges of private secondary school teachers in using Inquiry-Based Learning (IBL) to enhance scientific literacy and process skills of students, this study has the developed the following themes:

- *Time Constraints and Limited Resources*

The findings of this study showed that time limitations and a lack of resources pose significant challenges to successfully implementing Inquiry-Based Learning (IBL) in science classrooms. Classroom observations clearly illustrated how these issues affected teaching—teachers often had to shorten student-led experiments due to tight schedules or replace hands-on activities when materials were unavailable. These observations reflect the concerns raised by Wang et al. (2022), who reported that science educators frequently deal with shortages of instructional materials and scheduling problems, both of which undermine the depth and quality of IBL. Such limitations restrict meaningful scientific exploration and slow down the development of students' critical thinking skills. This concern is echoed by Nicol (2021), who pointed out that despite the known benefits of IBL, these persistent obstacles contribute to its slow and inconsistent adoption in schools..

- *Lack of Teacher Training in IBL*

A lack of adequate training in Inquiry-Based Learning (IBL) emerged as a major obstacle to its effective implementation. Many teachers struggle to design student-led investigations and face difficulties in developing appropriate assessment tools, such as rubrics. These challenges are consistent with the findings of Wang et al. (2022), who pointed to broader systemic issues, including limited access to teaching materials and the absence of ongoing professional development, that hinder the full integration of IBL. In many cases, teachers are left to depend on brief seminars or resort to trial-and-error approaches due to the lack of structured training programs. This concern is also reflected in the observations of Lopez (2021), who noted that science teachers in the Philippines often experience gaps in training, leading to uneven and inconsistent IBL practices in the classroom.

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Based on the teachers' strategies and challenges in implementing Inquiry-Based Learning (IBL), this study offers several key insights to support and improve its practice. It recommends adjusting instructional schedules to allow more time for inquiry activities, allocating sufficient funding for science-related resources, and providing meaningful, in-depth training for teachers. Schools are encouraged to set aside a dedicated annual budget specifically for IBL needs, including laboratory tools, consumable materials, and digital technologies, to ensure students consistently benefit from engaging, hands-on learning experiences. Additionally, professional development should go beyond one-time seminars and focus on ongoing, practical training. This includes modeling effective IBL techniques, such as formulating open-ended questions, creating step-by-step inquiry tasks, and assessing students' process skills, to better equip teachers for real classroom application.

In conclusion, this study highlights the powerful impact of Inquiry-Based Learning (IBL) in improving students' scientific literacy and process skills, especially in private secondary schools where there is often more room to adopt innovative teaching approaches. Yet, ongoing issues such as lack of time, insufficient resources, and limited teacher training continue to pose significant barriers. These findings point to the need for targeted efforts to bridge these gaps. The study calls on educational stakeholders to commit to long-term investments and structural support that will enable IBL to become an integral part of science education.

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