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Strategies, Factors and Challenges in Core Science Subject Delivery at Cuenca Senior High School

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ABSTRACT

This study aims to identify the strategies, factors, and challenges in delivering core science subjects through quantitative non-experimental research. Using a random sampling technique, data were collected from 284 respondents via a Google Form questionnaire. The findings indicate that the most used teaching strategy among senior high school science teachers is the lecture method, primarily utilizing PowerPoint slides. This is followed by project-based learning through performance tasks and lectures that incorporate ICT tools, such as e-games and quizzes. Key factors influencing science literacy include students' prior knowledge, focus, and perceptions of the topic. The goal of this study is to develop a project to enhance core science literacy instruction within the institution. To enhance student performance, a plan of action is proposed that employs a metacognitive strategy—specifically, a contextualized or personalized scientific dictionary—to develop scientific literacy.

INTRODUCTION OF THE RESEARCH

For over 11 years, the K-12 program implemented under Republic Act No. 10533, known as the Enhanced Basic Education Act of 2013, has aimed to improve reading and language proficiency. Despite these efforts, significant gaps and challenges in literacy have emerged, contributing to a global readership crisis. The Philippines faces a concerning situation, with schools not only grappling with a learning crisis but also a potential literacy crisis. Difficulty in reading and comprehension adversely affects students' ability to grasp concepts in other subjects, including Science and Math.

Science education in the Philippines is currently challenged by poor academic performance and the need to adapt to emerging technologies. The 2018 Program for International Student Assessment (PISA) results revealed that the Philippines ranked last in science, raising alarms within the educational system. To address these issues, the Department of Education (DepEd) has introduced Order No. 010, s. 2024, which outlines the Matatag Curriculum. This curriculum emphasizes individual learners, aims to develop globally literate and future-ready citizens, and seeks to tackle current and future educational concerns. As Jabillo (2022) notes, science education encompasses teaching, learning, and understanding science. Effective science teaching leverages pedagogical theories and models, while learning focuses on strategies that foster student engagement and comprehension. Understanding science involves developing skills that apply scientific literacy to everyday life. The goal of senior high school science education is to cultivate students' scientific process skills, critical thinking, and life skills, providing a strong foundation for future studies in science-related fields.

However, these objectives can only be achieved if teaching and learning processes are evaluated within the context of each institution's learning environment. A study by Jufrida et al. (2019) highlights a significant correlation between scientific literacy and academic achievement in junior high school science.

This study is designed to identify the strategies, factors, and challenges in core science subject delivery at Cuenca Senior High School, serving as a basis for developing an intervention program to enhance science literacy.

LITERATURE REVIEW

This chapter reviews relevant literature and research findings that inform the current study, providing essential background knowledge. It is divided into four sections: Core Science Subjects, Strategies, Factors, and Challenges in Teaching and Learning Science. Each subsection is supported by related literature and studies that reinforce the framework of this research.

Core Science Subject

In the context of science education in the Philippines, the emphasis is on teaching, learning, and understanding science. Instruction at both the primary and secondary levels employ diverse pedagogies and strategies to facilitate effective knowledge transfer. According to Oliveira et al. (2019), K-12 science classrooms increasingly utilize technological representations that enhance students' learning experiences. Effective science teaching not only involves careful pedagogical planning but also aims to engage students and foster a love for science. Manzon et al. (2021) notes that gamification techniques in teaching science significantly enhance student engagement, motivation, and commitment. Continuous student engagement is essential for both learners and teachers, creating an environment where scientific skills and problem-solving abilities can flourish. Furthermore, Perez et al. (2022) emphasize the need for innovative educational practices that adapt to evolving teaching and learning contexts.

Strategies

Creating a learner-centered environment is a key objective of science education. Educators employ various pedagogical techniques to achieve this goal. Krajcik (2018) highlights the effectiveness of project-based learning in helping students understand the nature of science and engage in scientific practices. It is crucial for educators to select appropriate teaching methods that bridge knowledge gaps and meet learning objectives. Dewi et al. (2019) found that contextualized teaching enhances conceptual understanding in science education. Using meaningful, real-life scenarios allows students to grasp subject matter more deeply.

The integration of ICT is another essential strategy in modern science teaching, catering to technologically adept learners. As noted by Oliveira (2019) and Manzon (2021), technology-based instruction enables students to visualize concepts and enhances focus through gamification.

Factors

Teaching science involves transferring concepts, skills, and values from teachers to students, influenced by various factors. Teachers play a crucial role in the success of educational processes. Oppermann et al. (2019) found that teachers' efficacy beliefs significantly impact students' motivation in science, particularly among girls. Other influential factors include teachers' confidence and their ability to adapt instructional strategies in the face of challenges. Alt (2019) identified that teachers' efficacy in using ICT affects their willingness to integrate technology in science instruction. Constructivist teaching strategies that incorporate diverse, technology-enhanced activities promote student engagement and motivation. Continuous professional development is vital for teachers to enhance their ICT skills and integrate these tools effectively into their teaching.

Students' prior knowledge is also a critical factor in learning core science subjects. Prior knowledge serves as a foundational block for new learning, facilitating connections between previous and current lessons. Dong (2020) indicates that students with more prior knowledge and lower stress levels demonstrate better engagement and learning outcomes. Sutarto (2020) emphasizes that interest plays a pivotal role in motivating students and improving learning outcomes. Students' perceptions of science—shaped by their experiences, feelings, and understanding—also influence the teaching and learning processes.

Challenges

Teaching and learning encounter numerous challenges that affect classroom dynamics and educational outcomes. Gyamfi et al. (2014) highlight that these challenges can impact the effectiveness of teaching strategies. A prevalent issue in the educational system today is the reading crisis, where students who struggle with reading face significant difficulties in comprehending science concepts. This challenge particularly affects junior and senior high school students enrolled in advanced science courses. Dori (2018) notes that context-based learning (CBL) can improve students' comprehension of science by incorporating adapted scientific articles and fostering metacognitive skills.

Overall, understanding the interplay of strategies, factors, and challenges in science education is crucial for enhancing teaching and learning outcomes in this field.

RESEARCH QUESTIONS

This study focuses on the quantitative-descriptive method of research about the strategies, factors and challenges on core science subject delivery in Cuenca Senior High School as basis for intervention program to enhance science literacy in Cuenca Senior High School. Specifically, it seeks to answer the following questions:

1. What are the strategies employed in teaching Science Core subjects?
2. What are the factors that influence teaching and learning in Core Science Classes?
3. What are the challenges encountered by the students and teachers in teaching and learning Science Core subjects?
4. What intervention plan maybe proposed to enhance Science literacy as based from the result of the study?

SCOPE AND LIMITATION

This study aimed to identify the strategies, factors, and challenges in delivering Core Science subjects at Cuenca Senior High School during the 2024-2025 school year. The goal of the research was to develop an intervention plan or activities to enhance Science Literacy, based on the findings. A stratified random sampling of selected students from various tracks served as the study's respondents.

Data collection was carried out using a survey questionnaire via Google Forms to facilitate faster data gathering due to time constraints. However, the online nature of the survey introduced challenges for respondents, such as time limitations and issues with internet access, which were beyond the researcher's control and may have impacted the study's validity.

METHODOLOGY

Participants and other sources of Data and Information

The study focused on all Grade 11 students at Cuenca Senior High School during the 2024-2025 school year. It explored both students' and teachers' perceptions of the strategies, factors, and challenges in delivering Core Science subjects.

The students were enrolled in Earth and Life Science under the ABM, HUMSS, and TVL tracks, while those in the STEM track studied Earth Science. Data collection was carried out using a structured questionnaire distributed via Google Forms to facilitate efficient data gathering.

Data Gathering Methods

This study utilized a descriptive survey method to examine students' and teachers' perceptions of the current strategies, factors, and challenges in teaching and learning Science Core Subjects. The researcher employed a descriptive survey design, commonly used to describe the characteristics and behaviors of a sample population.

Formal approval to administer the research tools was sought from the school head through an official letter. The researcher ensured that all responses would be treated with the utmost confidentiality, safeguarding participants' privacy and interests. The administration of the research questionnaire adhered to ethical research standards, following the research management guidelines set by the Department of Education.

Data Analysis Plan

The researcher used a structured open-ended survey questionnaire to gather data from respondents. The questionnaire, distributed via Google Forms, consisted of three questions aimed at exploring students' and teachers' perceptions of the strategies, factors, and challenges in delivering Core Science instruction at Cuenca Senior High School.

Before distribution, the researcher obtained permission from the School Principal to conduct the study. The survey was validated by the research coordinator, who reviewed and analyzed the questionnaire, offering suggestions for improvement, which were then implemented. Participants were assured that their responses would remain confidential. Once the data was collected, the researcher organized, analyzed, and thematically interpreted the responses. Simple statistical tools, such as averages and percentages, were used to process the data.

DISCUSSION OF RESULTS AND DISCUSSION

Strategies in core science delivery.

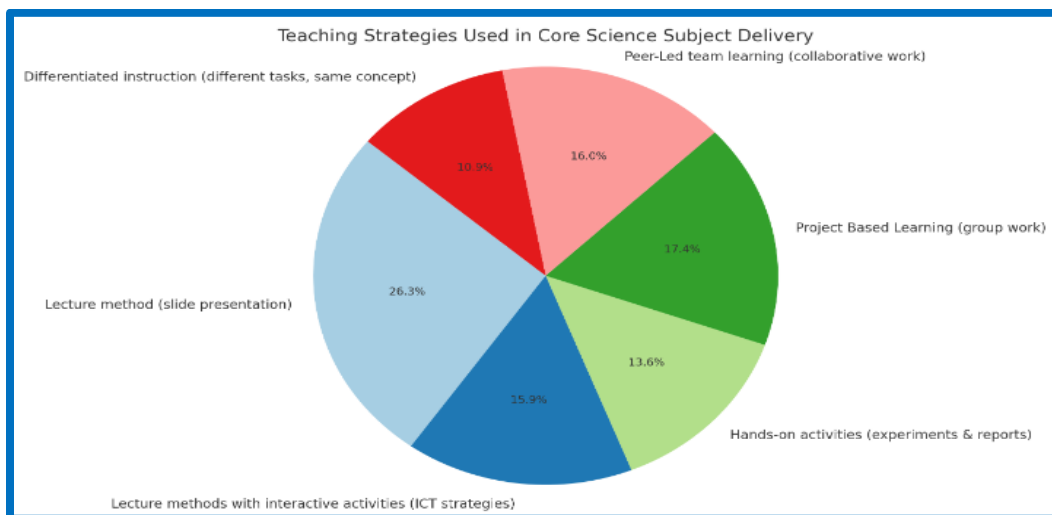


Figure 1. Strategies in Core Science Delivery.

Based on the figure above, the lecture method using slide presentations is the most employed strategy by teachers at Cuenca Senior High School for teaching Science. This is followed by project-based learning and lecture methods incorporating interactive activities, such as ICT applications like e-Games and quizzes. These findings align with Alaagib’s (2019) study, which highlights that lecture-based problem teaching is an effective active learning method that enhances student engagement. Similarly, Cabello et al. (2023) highlight the significance of gamification in the teaching and learning process, noting that motivation, exploration, and implementation are key components in creating a competitive, contextualized, and supportive learning environment. However, differentiated instruction, where different tasks are assigned to students while covering the same concept, is the least utilized approach. This is consistent with the findings of Ginja et al. (2020), who noted that while teacher educators acknowledge the importance of differentiated instruction in diverse classrooms, its implementation is limited due to a lack of professional training and misconceptions about the strategy.

Factors that affect teaching and learning in core science delivery.

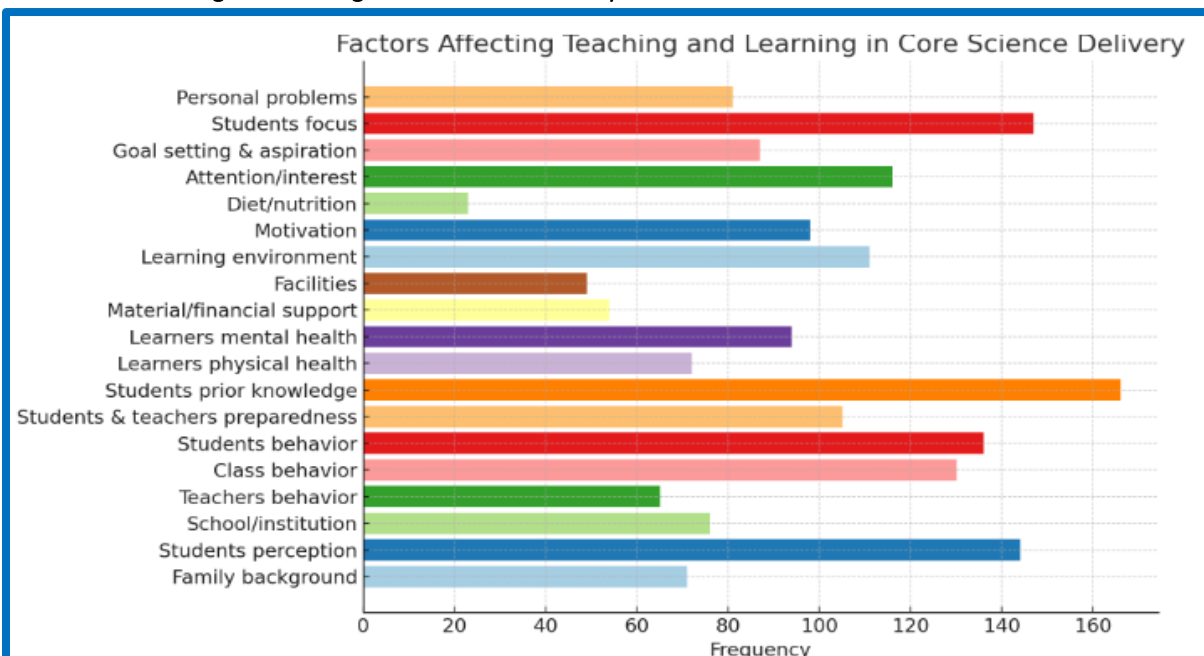


Figure 2. Factors affecting teaching and learning.

In Figure 2, the factors that most significantly affect students' learning in science are prior knowledge of the topic, student focus, and student perception. Effective knowledge transfer from teachers to students is largely influenced by students' foundational understanding of essential concepts before introducing more complex ideas. This aligns with Dong's (2020) study, which found

that students with stronger prior knowledge and lower intellectual stress tend to engage more in instrumental help-seeking, leading to better learning outcomes. Student focus also plays a crucial role in learning. To enhance this, teachers must design lessons that are engaging and incorporate technology to boost student participation. On the other hand, the least mentioned factor affecting Science learning is diet and nutrition, likely because the students are older and capable of managing their own dietary needs.

Challenges encountered in core science delivery

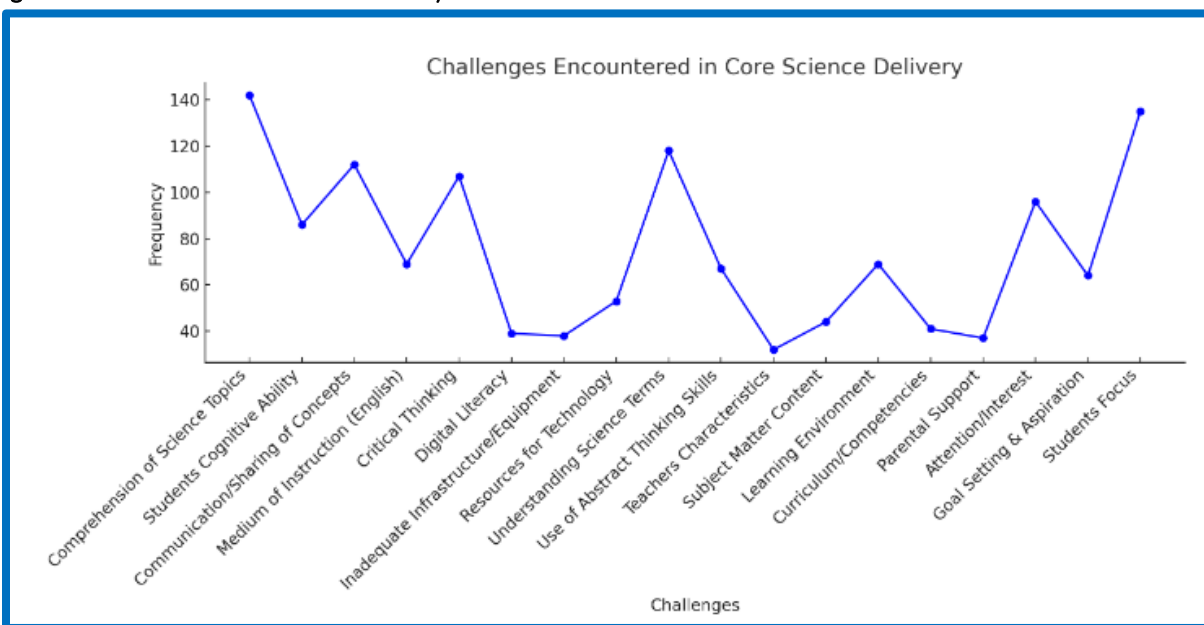


Figure 3. Challenges encountered in core science delivery.

The tabulated data reveals that the top three challenges faced by students in Core Science delivery are comprehension of science topics, student focus, and understanding science terms. This finding is supported by Dori's (2018) study, which emphasizes that learning science concepts can be enhanced through Context-Based Learning (CBL). By engaging students with adapted scientific articles and developing modules rich in metacognitive skills, CBL significantly boosts scientific comprehension. Furthermore, student focus and motivation can be improved through the integration of ICT and gamification, which have been shown to increase student engagement and participation in the learning process.

Action Plan Project ICS-LIT Intensifying Core Science Literacy.

(See attached action plan)

CONCLUSION

The delivery of core science education is heavily influenced by the methods of instruction employed, such as lecture methods using PowerPoint slides, project-based learning, and the integration of ICT applications like e-games. These methods, while effective, must take into consideration the students' prior knowledge, focus, and perceptions, which significantly affect their engagement and learning outcomes. Additionally, challenges such as the comprehension of scientific topics and the understanding of specialized terminology remain significant hurdles that impact effective teaching and learning.

RECOMMENDATIONS

Craft a project that intensify Core Science Literacy using the suggested strategy to improve students' science comprehension and performance level.

Diversify Teaching Methods: Incorporate a wider range of interactive and student-centered teaching methods, such as hands-on experiments, group discussions, and inquiry-based learning, to cater to diverse learning styles and foster deeper comprehension.

Leverage Technology: Continue integrating ICT tools, like e-games and simulations, but ensure they are aligned with the students' prior knowledge and current understanding to enhance focus and engagement.

Strengthen Foundations: Address students' prior knowledge gaps through pre-assessments and targeted review sessions to ensure they are adequately prepared for new content.

Use Clear Language: Simplify and break down complex scientific terminology using everyday language or analogies. Introduce key terms gradually and reinforce their meanings through repetition and contextual usage.

Focus on Student Perception and Motivation: Regularly assess students' perceptions of science topics and implement motivational strategies such as relating lessons to real-life applications to increase interest and relevance.

DISSEMINATION AND ADVOCACY PLANS

The conduct of this study aims to identify the different strategies, factors, and challenges encountered in core teaching science delivery. This initial step opts to address the timely need for boosting students' literacy skills, particularly science literacy.

The result of this research will serve as the concrete basis of the action plan to be undertaken by all teachers teaching core science subjects. The long-term goal of these is to implement a project that intensifies core science delivery in Cuenca Senior High School.

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