Enhancing Scientific Inquiry Skills through Guided Inquiry using the 7E Model in Grade 7 Science

Jessa Joy Rosales Masunong [a], Bryan L. Cancio [b]

[a]*jessajoy.masunong@hcdc.edu.ph;* [b]*bryan.cancio@hcdc.edu.ph*

[a] *Faculty of Jesus J. Soriano National High School, Catalunan Grande, Davao City 8000, Philippines*
[b] *Professor of Graduate School, Holy Cross of Davao College, Poblacion, Davao City 8000, Philippines*

Abstract

Guided inquiry using the 7E model plays an important role of improving the scientific inquiry skills of students by promoting active participation, critical thinking, and reflective learning. This study employed complete enumeration as the sampling method among 100 Grade 7 Science students respondents from Jesus J. Soriano National High School. The findings revealed a very strong positive correlation with an r-value of 0.891 and p-value of 0.000 between guided inquiry and scientific inquiry skills, indicating that increased exposure to guided inquiry strategies significantly increases the abilities of students to investigate, conceptualize, and draw scientific conclusions. However, the moderate development of discussion skills highlighted the need to strengthen the capacity of students to articulate and reflect on their findings. This study was anchored on the Experiential Learning Theory of Dewey (1938), this study confirms that learning is most meaningful when grounded in experience, action, and reflection. Strengthening inquiry-based instructional strategies may further support the development of scientific inquiry competencies and enhanced the quality of science education.

Keywords: *Guided inquiry, 7E instructional model, Scientific inquiry skills, Grade 7 Science, quantitative research, Jesus J. Soriano National High School*

Introduction

Recent studies suggest how well inquiry-based scientific instruction (IBSE) may enhance secondary school student involvement and higher-order thinking skills. Despite the national curriculum usually supporting learner-centered approaches, implementation challenges still exist because of scarce resources, poor teacher preparation, and instilled tradition (Shivolo & Mokiwa, 2024).

In Vietnam, science instruction remains traditional mainly, as teachers demonstrate limited implementation of inquiry-based science and engineering practices despite the growing emphasis on STEM education (Hang & Srisawasdi, 2021). In India, teachers continue to rely on traditional frontal teaching methods due to perceived challenges in implementing cooperative learning strategies (Chakyarkandiyil & Prakasha, 2023). In Metro Manila, Philippines, science teachers face challenges in fully aligning their teaching practices with the principles of constructivism despite efforts to engage students actively and assess their understanding through diverse strategies (Chan et al., 2020).

Despite efforts to improve science instruction in the Davao City division, many schools continue to rely on didactic methods and textbook-based learning. The lack of structured pedagogical models like the 7E instructional model, such as eliciting, engaging, exploring,

explaining, elaborating, evaluating, and extending, results in little student participation in scientific inquiry processes. While DepEd supports inquiry-based learning approaches, there is limited research on how models like the 7E Learning Cycle are being implemented effectively in Grade 7 science classrooms at the local level (Miguel, 2021). This gap in the literature highlights the need to explore how guided inquiry using the 7E Model can improve students' scientific inquiry skills.

Statement of the Problem

The study examined the effectiveness of the 7E instructional model in enhancing scientific inquiry skills through guided inquiry among Grade 7 Science students. Specifically, this study sought answer the following questions:

1. What is the level of guided inquiry in terms of:
   1.1 elicit
   1.2 engage
   1.3 explore
   1.4 explain
   1.5 elaborate
   1.6 extend, and
   1.7 evaluate?

2. What is the level of scientific inquiry skills in terms of:
   2.1 orientation
   2.2 conceptualization
   2.3 investigation
   2.4 conclusion; and
   2.5 discussion

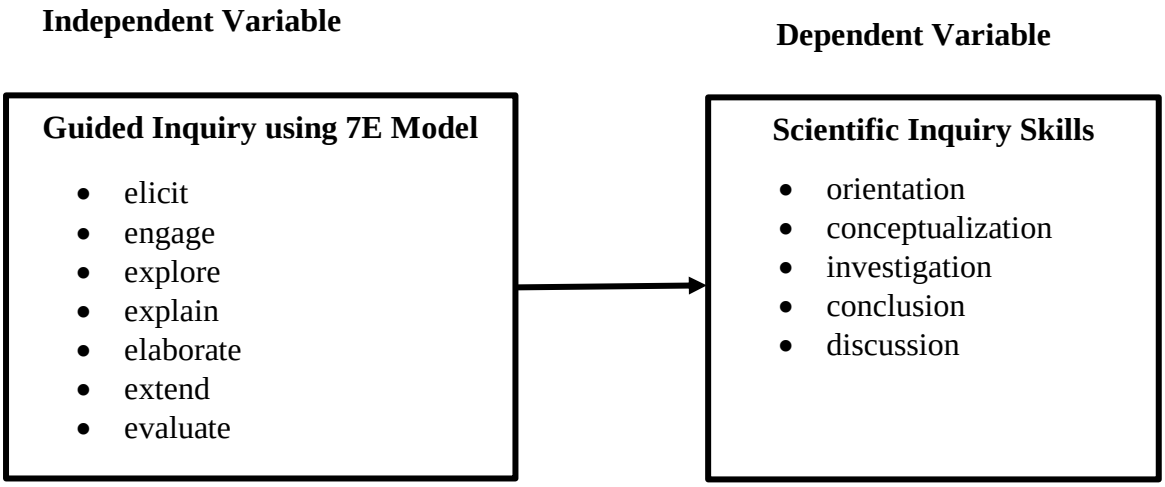
3. Is there a significant relationship between guided inquiry using 7E Model and the scientific inquiry skills of students?

Theoretical Framework

This study was anchored on the Experiential Learning Theory by John Dewey (1938), which views learning as a process grounded in experience, where knowledge is constructed through active participation and critical reflection. Dewey emphasized that education must engage with and enlarge experience, promoting learning through doing and thoughtful reflection. He asserted that meaningful learning occurs when students are actively involved in their learning environments and are encouraged to reflect on their experiences to develop understanding.

In this study, experiential Learning Theory highlights the importance of interaction between the learner and the environment, proposing that students construct knowledge best when they are engaged in tasks that stimulate critical thinking and inquiry. Also, this theory helps explain how students develop scientific inquiry skills, such as investigation, conceptualization, and drawing conclusions through hands-on, reflective, and collaborative learning activities.

Conceptual Framework of the Study



Hypothesis

The null hypotheses of this study were tested at a 0.05 level of significance:

Ho1. There is no significant correlation between guided inquiry using the 7E Model and students' scientific inquiry skills.

METHOD

This part presents the methodological procedures relevant to the research problems addressed in the study. It explains the research design, population and sampling of respondents, research instruments and materials, data gathering procedures, and the method of data analysis.

Research Design

This study employed a quantitative research design. Quantitative research involves systematically collecting and analyzing numerical data to identify patterns and trends within a defined population (Mohajan, 2020). Specifically, a correlational research design was done to determine the relationship between guided inquiry using the 7E model and the scientific inquiry skills of Grade 7 Science students. This design allowed the researcher to examine the degree and direction of the relationship between the independent and dependent variable without manipulating them. It will provide a structured approach to understanding how using the 7E instructional model may be correlated with students' development of scientific inquiry skills in the classroom.

Locale of the Study

This study was conducted at Jesus J. Soriano National High School in Davao City, involving 100 Grade 7 students as respondents. The sample size of 100 students were selected as it was sufficient to generate meaningful insights and reliable results, ensuring the credibility and validity of the research findings. The selection of Jesus J. Soriano National High School is

significant because of its commitment to improving science instruction and promoting inquiry-based learning in alignment with national educational reforms.

Sample and Sampling

In this study, the researcher selected 100 Grade 7 students from Jesus J. Soriano National High School using a complete enumeration sampling technique. Complete enumeration is a method that involves selecting the entire population that fits the criteria, ensuring a comprehensive and accurate representation of the study population (Fetzer, 2023). This approach allowed the researcher to include all relevant respondents, eliminate sampling bias, and enhance the reliability of the findings. The inclusion criteria for this study were Grade 7 students who were currently enrolled in Science classes during the academic year 2024–2025.

Research Instruments

The researcher used an adaptive survey questionnaire to assess two variables: guided inquiry and scientific inquiry skills. Two survey questionnaires were prepared to ensure comprehensive data collection, one for guided inquiry and one for scientific inquiry skills. Guided inquiry was adapted from Payne (2008) and scientific inquiry skills from Pedaste et al. (2021). All items were rated using a five-point Likert scale below, where 5 represents the highest level of agreement, and 1 represents the lowest.

Mean Interval	Descriptive Rating	Interpretation
4.20 - 5.00	Very High	This means that guided inquiry and scientific inquiry skills are excellent.
3.40 - 4.19	High	This means that guided inquiry and scientific inquiry skills are very good.
2.60 - 3.39	Moderate	This means that guided inquiry and scientific inquiry skills are good.
1.80 - 2.59	Low	This means that guided inquiry and scientific inquiry skills are poor.
1.00 - 1.79	Very Low	This means that guided inquiry and scientific inquiry skills are very poor.

Data Gathering Procedure

The researcher will begin by seeking guidance from the adviser, ensuring that all the needed corrections and suggestions are followed to improve the research design and data collection process. Once the adviser’s feedback is incorporated, the researcher will follow the necessary steps to gather data. This includes submitting an endorsement letter and obtaining the required permissions to research the selected school. After receiving approval, the researcher will ensure that all participants are fully informed about the purpose of the study and will secure their informed consent. The researcher will then distribute the modified survey instrument to gather the data. Finally, completed surveys will be collected securely, ensuring the confidentiality and privacy of the respondents' information. The researcher will ensure that the data is accurately encoded and organized for further analysis.

Data Analysis

The researcher analyzed the findings of the study through using different statistical tools to examine the relationships between guided inquiry using the 7E model and the scientific inquiry skills among Grade 7 Science students. Descriptive statistics, such as the mean, was used to determine the levels of scientific inquiry skills. The standard deviation (SD) was also used to measure the variability within the responses, indicating how much the data points differ from the mean and providing insights into the consistency of student performance. Finally, Pearson's correlation coefficient (Pearson r) was calculated in assessing the strength and direction of the relationship between the 7E model and the scientific inquiry skills of students.

Ethical Considerations

In this quantitative study, the researcher followed ethical considerations by allowing voluntary participation, informed consent, and the protection of privacy and confidentiality during the research process. Voluntary participation made sure that individuals will not be coerced or pressured to participate in the study, preserving their autonomy and freedom of choice. The researcher also followed a step-by-step process of obtaining informed consent, providing respondents with detailed information about the study's purpose, procedures, potential risks, and benefits. Emotional support resources were made available during the conduct of the study. Throughout the study, the researcher made sure that no social or economic factors affected the responses of respondents, as well as they were also assured that their participation did not impacted their academic standing. To protect privacy and confidentiality, personal identifiers were used; anonymous codes were also assigned to each respondent, and data was securely stored in password-protected files accessible only to the researcher. The researcher also followed a careful data management practices, such as encryption and de-identification to prevent unauthorized access, and all data were destroyed right after the analysis and findings of this study.

Results and Discussion

This section presents the results of the study, including the analysis of the gathered data and interpretation of findings based on the research questions. Tables are used to organize and display the data clearly, followed by a detailed discussion of each result. The interpretation is supported by relevant literature and previous studies that provide context and deepen the understanding of the findings.

Table 1. Level of Guided Inquiry

Indicators	Mean	Interpretation
Elicit	4.11	High
Engage	4.29	Very High
Explore	4.12	High
Explain	4.25	Very High
Elaborate	4.28	Very High
Extend	4.21	Very High
Evaluate	4.12	High
Overall	**4.20**	**Very High**

Presented in Table 1 is the level of guided inquiry with an overall mean of 4.20, equivalent to a *Very High* description. Among the seven indicators, engage got the highest mean of 4.29**,** equivalent to *Very High* description, followed closely by elaborate with a mean of 4.28 and explain with a mean of 4.25, both were interpreted as Very High. Meanwhile, elicit got a mean of 4.11, explore got a mean of 4.12, and evaluate got a mean of 4.12, all of which interpreted as *High*, indicating consistently positive perceptions of these indicators. This suggests that learners have excellent exposure to guided inquiry process, especially in areas where they actively engage with content, elaborate on concepts, and explain their understanding. These findings emphasize the effectiveness of guided inquiry-based learning in promoting active student participation and deeper understanding. The result of the study closely aligned with the findings of Polanin et al. (2024), confirming that the 5E model significantly improves science learning outcomes, despite variability in effects. Grijpma et al. (2024) found that expert teachers also increases student engagement by creating supportive, and active learning environments.

Table 2. Level of Scientific Inquiry Skills

Indicators	Mean	Interpretation
Orientation	3.95	High
Conceptualization	3.84	High
Investigation	4.04	High
Conclusion	4.00	High
Discussion	3.09	Moderate
Overall	**3.97**	**High**

Presented in Table 2 is the level of scientific inquiry skills of students with an overall mean of 3.97, interpreted as *High.* Among the indicators, investigation got a mean of 4.04, and conclusion got a mean of 4.00, both interpreted as high. This is also followed by orientation

with a mean of 3.95 and Conceptualization with a mean of 3.84, all interpreted as *High*. However, discussion got a lower mean of 3.09, interpreted as moderate, suggesting this is the least developed skill among the respondents. The results indicate that learners are generally very good in performing inquiry-based tasks such as designing investigations, drawing conclusions, and identifying research problems. However, their moderate performance in the discussion phase, might suggests a need for improved skills in articulating findings, reflecting on processes, and communicating results with clarity and depth.

Supporting this, Grau et al. (2021) found that the 5E model promotes long-term knowledge of students' conceptual understanding, particularly when the model is fully implemented with emphasis on all phases, such as during evaluation and explanation. Also, Leupen et al. (2020) emphasize that higher-order questioning in group settings fosters meaningful scientific discourse, which includes re-evaluation and co-construction of knowledge as an elements of effective scientific discussion. Likewise, Apdoludin et al. (2024) demonstrated that incorporating debate, analysis, and modeling into science instruction significantly improves students' science and analytical skills, further underscoring the critical role of reflective and interactive learning in scientific inquiry.

Table 3. Significance of the Relationships between Guided Inquiry and Scientific Skills

Variables	**Pearson Correlation (r)**	**p-value**	**Interpretation**	**Decision**
Guided Inquiry Scientific Inquiry Skills	0.891	0.000	Very Strong Positive Correlation	Reject the Null Hypothesis

Presented in Table 3 is the relationships between Guided Inquiry and Scientific Inquiry Skills with an r-value of 0.891, and a p-value of 0.000, hence rejecting the null hypothesis. The study revealed a very strong positive correlation between guided inquiry and the development of scientific inquiry skills. This suggests that as the level of guided inquiry strategies increases in the learning process, students' scientific inquiry skills also significantly increase. Conversely, lower implementation of guided inquiry may limit the development of these skills. The findings of this study strongly support the idea of Experiential Learning Theory as explained by John Dewey (1938). The very strong correlation between guided inquiry and scientific inquiry skills affirms Dewey's belief that meaningful learning stems from active involvement and reflective experience.

Conclusion

Based on the findings of the study, it can be concluded that the implementation of guided inquiry using the 7E instructional model is highly effective in promoting active and meaningful learning among students. Learners are consistently engaged in various phases of the inquiry cycle, especially in activities that require them to participate actively, elaborate on scientific ideas, and explain their understanding. These experiences create a rich learning environment that encourages deeper thinking and meaningful interaction with content. Although factors such as eliciting prior knowledge, exploration, and evaluation were also

practiced well, there is still room for improvement in making these stages more interactive and reflective for learners.

In terms of scientific inquiry skills, students demonstrated strong capabilities in identifying problems, designing investigations, and drawing conclusions based on evidence. These skills are important in developing scientific literacy and fostering a sense of inquiry and curiosity. However, the study also revealed that students need more support in the discussion stage, where they are expected to articulate their findings, reflect on their process, and engage in scientific discourse. The study also revealed a very strong positive relationship between the use of guided inquiry and the development of students' scientific inquiry skills. This affirms that when learners are given opportunities to actively participate in the learning process through inquiry-based strategies, their ability to think critically and conduct scientific investigations is significantly improved.

Recommendations

Based on the results of this study, the following recommendations were made:

1. Teachers may continue using and refining guided inquiry strategies, particularly focusing on the phases that encourage student interaction, application of knowledge, and explanation of concepts. There is also a need to reinforce the early and evaluative stages of inquiry by incorporating more varied and thought-provoking activities that prompt learners to connect previous knowledge and assess their learning progress.
2. Schools may conduct teacher training programs which may emphasize the use of the 7E model, ensuring that teachers are well-equipped to facilitate all phases of the inquiry cycle effectively.
3. Future researchers may conduct a study related to the impact of improving these factors on learners' long-term academic growth and engagement in Science.

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