# Projective Reflection Approach on the Student's Evidenced-Based Reasoning and Performance in Learning Science

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***Abstract*****—** *This study aims to determine the relationship between the projective reflection approach and students' evidence-based reasoning and its effect on students' performance in science. Specifically, it examines the level of teacher's projective reflection approach; the level of students' evidence-based reasoning; and performance in science in terms of written and performance tasks. The study also investigates the significant relationship between projective reflection approach and evidence-based reasoning, as well as its effect on students' performance.*

*A quantitative experimental research design was utilized involving two sections with forty-four (44) and forty-three (43) students in one of National High School in Pangil Sub-office with participants engaged in physical science lessons where projective reflection techniques are applied. Respondents has a total eighty-seven (87) senior high school students. Data were gathered using a validated survey questionnaire and students' academic performance records. Statistical tools such as weighted mean, standard deviation, Pearson-r, and t-test were used for data analysis.*

*Findings reveal that the level of teacher's projective reflection approach and students' evidence-based reasoning both very high across all dimensions. Students' performance in science was found to be outstanding in both written and performance tasks. In addition, the results of the study show positive correlations with students' evidence-based reasoning however, the approach do not significantly affect the students' performance.*

*Thus, the study concludes that there is significant relationship between teacher's projective reflection approach and the students' evidence-based reasoning leading to the rejection of the null hypothesis. Conversely, the projective reflection approach does not have a major impact on students' performance in written and performance exams, supporting the study's null hypothesis.*

*The study recommends strengthening the implementation of the Projective Reflection Approach through improved instructional strategies and continuous teacher support, including training and mentoring. It also suggests integrating reflection across all learning stages to enhance students' reasoning and aligning reflective activities with performance assessments to ensure measurable gains in both written and practical science tasks.*

***Keywords*****—** *Evidenced-based Reasoning, Performance, Projective Reflection, Science*

## I. INTRODUCTION

The educational industry requires a deep understanding of how to continuously improve curriculum and teaching strategies. Educators recognize that expanding students' knowledge in academic subjects must be a priority, particularly in science education, which demands innovative approaches to help students experience and apply scientific concepts in real-world contexts. As a result, there is an increasing demand for tools, skills, and content knowledge that personalize learning and actively engage students.

According to the National Education Technology Plan (2016), it is essential for learners to develop a sense of agency while participating in academic experiences, which should be designed to be relevant, meaningful, and conducive to the development of both cognitive and non-cognitive 21st-century competencies. In this context, projective reflection techniques offer a valuable approach to fostering experiential learning.

Projective techniques are defined as procedures that allow individuals to respond freely to ambiguous stimuli, revealing insights into their thinking, personality, and problem-solving approaches (Ballesteros, 2018). These techniques also help identify students' strengths and challenges, highlight areas for improvement, celebrate achievements, and provide meaningful feedback (Digital, 2024).

In science education, evidence-based reasoning involves constructing logical and well-supported explanations by integrating claims, evidence, and reasoning, encouraging students to justify their scientific arguments with empirical data and promoting critical thinking and deeper understanding (Gizmos, 2019). Meanwhile, performance in learning science refers to the observable and measurable outcomes of students' ability to apply scientific knowledge and skills, demonstrated through assessments, experiments, and problem-solving tasks.

This study, therefore, seeks to examine the relationship between projective reflection and students' evidence-based reasoning, as well as its effect on their performance in science learning.

### *1.1 Statement of the Problem*

*Problem/s which were addressed by the research*

The primary aim of the study was to determine relationship between projective-reflection and the student's evidence-based reasoning and its effect on the students' performance in science. Specifically sought to answer the following questions:

1. What is the level of projective reflection approach in terms of;
   1.1 Experiential;
   1.2 Insight-oriented;
   1.3 Exploratory;
   1.4 Reflective; and
   1.5 Integrative?

2. What is the level of student's evidence-based reasoning in learning science in terms of;
   2.1 Contextual interaction;
   2.2 Data gathering;
   2.3 Analysis;
   2.4 Problem solving; and
   2.5 Decision making?
3. What is the level of student's performance in science in terms of;
   3.1 Written task; and
   3.2 Performance task?
4. Does the projective reflection approach have a significant relationship on the student's evidence-based reasoning?
5. Does the projective reflection approach have a significant effect on the student's performance in learning science in terms of written task?
6. Does the projective reflection approach have a significant effect on the student's performance in learning science in terms of performance task?

## II. Methodology

The researcher employed a quantitative experimental research design, using a survey questionnaire to collect data from the respondents in this study. The respondents consist of Grade 11 students in one of Integrated National High School in Pangil Sub-Office during the School Year 2025–2026. Specifically, these students are from two grade 11 section with forty-four (44) learners and with forty-three (43) learners with the total of eighty-seven (87) students serve as the primary source of data for identifying the relationship between projective-reflection and the student's evidence-based reasoning and its effect on the students' performance in science. The research instrument used was a researcher-developed survey questionnaire validated by experts. To analyze the data, mean, standard deviation, Pearson's r correlation and t-test were used as statistical treatments.

## III. Results and Discussion

This chapter deals with the presentation, analysis, and interpretation of data gathered to answer the sub-problem relative to the main problem of this study. This part discusses the findings of the study based on the questions.

### *Level of Projective Reflection Approach*

In this study, the level of Projective Reflection Approach refers to Experiential; Insight-oriented; Exploratory; Reflective and Integrative.

The level of the Projective Reflection Approach is presented in the following table, which includes the corresponding statements for each indicator, along with their computed mean and standard deviation. These statistical measures provide insight into the consistency and extent of students' responses. In addition, each indicator is given a remark and verbal interpretation to clearly describe the overall level of practice. This presentation allows for a comprehensive understanding of how frequently and effectively students demonstrate each dimension of the Projective Reflection Approach in the context of the study.

Table 1 show the level of Projective Reflection Approach in terms of Experiential.

Findings present that connecting classroom discussions to practical situations obtains the highest (M=4.53, SD=0.50), indicating that experiential activities effectively help learners apply scientific concepts to real-life contexts. This finding implies that instructional practices that contextualize science concepts within authentic situations are highly engaging and meaningful for students, thereby enhancing their ability to internalize and apply learned content.

Table 1. Level of Projective Reflection Approach in terms of Experiential

| *Statement* *Teacher's Projective reflection approach helps me improve my learning through experiential activities, so now I can…* | *Mean* | *SD* | *Remarks* |
|---|---|---|---|
| *…use prior experiences to understand new science topics.* | 4.43 | 0.50 | *Strongly Agree* |
| *…relate scientific concepts to real-life experiences.* | 4.51 | 0.50 | *Strongly Agree* |
| *…connect classroom discussions to practical situations.* | 4.53 | 0.50 | *Strongly Agree* |
| *…explore hands-on activities to enhance understanding of scientific concepts.* | 4.45 | 0.50 | *Strongly Agree* |
| *…analyze experiences to draw scientific conclusions.* | 4.45 | 0.50 | *Strongly Agree* |
| *Weighted Mean* | *4.47* | | |
| *SD* | *0.50* | | |
| *Verbal Interpretation* | *Very High* | | |

On the other hand, using prior experiences to understand new science topics obtains the lowest (M=4.43, SD=0.50), which means learners are somehow find difficulties in using their previous knowledge when approaching new concepts.

Overall, the level of Projective Reflection Approach in terms of Experiential is very high obtaining the weighted mean of 4.47 showing that learners strongly agree that experiential activities enhance their understanding of scientific concepts.

Table 2 shows the level of Projective Reflection Approach in terms of Insight-Oriented.

Table 2. Level of Projective Reflection Approach in terms of Insight-Oriented

| *Statement* *Teacher's Projective reflection approach helps me improve my learning by gaining insights from my experiences, so now I can…* | *Mea n* | *SD* | *Remarks* |
|---|---|---|---|
| *…examine relationships between ideas to deepen understanding.* | 4.37 | 0.57 | *Strongly Agree* |
| *…analyze assumptions to enhance understanding of science concepts.* | 4.37 | 0.65 | *Strongly Agree* |
| *…synthesize prior knowledge with new information to gain insights.* | 4.36 | 0.55 | *Strongly Agree* |
| *…evaluate information critically to form evidence-based conclusions.* | 4.29 | 0.50 | *Strongly Agree* |
| *…reflect on reasoning processes to improve evidence-based thinking.* | 4.48 | 0.50 | *Strongly Agree* |
| *Weighted Mean* | *4.37* | | |
| *SD* | *0.56* | | |
| *Verbal Interpretation* | *Very High* | | |

This table presents that reflecting on reasoning processes to improve evidence-based thinking obtains the highest (M=4.48, SD=0.50), indicating that projective reflection effectively enhances learners' ability to reflect on reasoning processes to



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improve evidence-based thinking. This implies that learners are generally in examining their own thought processes, which contributes to the development of evidence-based reasoning.

While, evaluating information critically to form evidence-based conclusions obtains the lowest (M=4.29, SD=0.50). The result implies that while learners can reflect on their reasoning, there may still be a need to strengthen their skills in analyzing and evaluating information critically.

Overall, the level of Projective Reflection Approach in terms of Insight-Oriented is very high with a weighted mean of 4.37, showing that learners strongly agree that insight-oriented reflection contributes to their understanding and application of scientific concepts.

The results implies that learners are most capable of improving their reasoning processes through reflection, which highlights the role of projective reflection in strengthening critical thinking skills. However, the lower evaluating of information critically indicates a potential area for growth, where more structured guidance on analyzing and assessing information could further enhance learners' ability to form sound, evidence-based conclusions.

Table 3 presents the level of Projective Reflection Approach in terms of Exploratory.

Table 3. Level of Projective Reflection Approach in terms of Exploratory

| Statement<br>*Teacher's Projective reflection approach helps me improve my learning by exploring different possibilities and perspectives, so now I can…* | Mean | SD | Remarks |
|---|---|---|---|
| *…investigate scientific phenomena through experimentation and observation.* | 4.36 | 0.53 | *Strongly Agree* |
| *…explore connections between concepts across different science topics.* | 4.39 | 0.51 | *Strongly Agree* |
| *…pursue additional resources to enhance scientific knowledge.* | 4.39 | 0.54 | *Strongly Agree* |
| *…apply creative strategies to explore science topics.* | 4.34 | 0.57 | *Strongly Agree* |
| *…challenge existing ideas to develop new scientific understanding.* | 4.37 | 0.53 | *Strongly Agree* |
| *Weighted Mean* | *4.37* | | |
| *SD* | *0.53* | | |
| *Verbal Interpretation* | *Very High* | | |

Findings present that exploring connections between concepts across different science topics and pursuing additional resources to enhance scientific knowledge obtain the highest (M=4.39, SD=0.51 and SD=0.54), indicating that projective reflection help students effectively challenge existing ideas to develop new scientific understanding. While, applying creative strategies to explore science topics obtains the lowest (M=4.34, SD=0.57).

Overall, the level of Projective Reflection Approach in terms of Exploratory is very high with a weighted mean of 4.37, showing that learners strongly agree that exploring multiple possibilities and perspectives enhances their understanding of science. The results imply that learners are most engaged when reflection encourages them to relate concepts across topics and seek additional information, highlighting the importance of relevance and connection in learning. However, in terms of applying creative strategies, students may be influenced by factors such as reliance on structured activities, or lack of confidence in experimenting with new approaches.

Table 4 show the level of Projective Reflection Approach in terms of Reflective.

Findings present that evaluating personal understanding after completing science tasks obtains the highest (M=4.45, SD=0.59), indicating that projective reflection effectively helps learners assess their own comprehension and progress in science. While, comparing expected outcomes with actual results in science activities obtains the lowest (M=4.29, SD=0.55), implying that some of the learners find it difficult to compare expected outcomes with actual results in science activities.

Table 4. Level of Projective Reflection Approach in terms of Reflective

| Statement<br>*Teacher's Projective reflection approach helps me improve my learning by reflecting on my experiences, so now I can…* | Mea n | SD | Remarks |
|---|---|---|---|
| *…summarize key learnings from experiments and observations.* | 4.37 | 0.49 | *Strongly Agree* |
| *…compare expected outcomes with actual results in science activities.* | 4.29 | 0.55 | *Strongly Agree* |
| *…reviewed past science activities to identify strengths and weaknesses.* | 4.31 | 0.58 | *Strongly Agree* |
| *…evaluate my personal understanding after completing science tasks.* | 4.45 | 0.59 | *Strongly Agree* |
| *…assess the effectiveness of strategies used in learning science.* | 4.36 | 0.51 | *Strongly Agree* |
| *Weighted Mean* | *4.35* | | |
| *SD* | *0.54* | | |
| *Verbal Interpretation* | *Very High* | | |

Overall, the level of Projective Reflection Approach in terms of Reflective is very high with a weighted mean of 4.35, showing that learners strongly agree that reflecting on their experiences contributes to deeper learning and self-assessment in science. The results imply that learners benefit most from reflection that allows them to evaluate their understanding, which supports self-regulated learning and the ability to monitor one's progress.

Table 5 shows the level of Projective Reflection Approach refers to Integrative.

Table 5. Level of Projective Reflection Approach in terms of Integrative.

| Statement<br>*Teacher's Projective reflection approach helps me improve my learning by integrating my experiences with prior knowledge, so now I can…* | Mean | SD | Remarks |
|---|---|---|---|
| *…connect concepts from prior learning with new scientific information.* | 4.31 | 0.56 | *Strongly Agree* |
| *…link theoretical knowledge with practical applications in science.* | 4.31 | 0.58 | *Strongly Agree* |
| *…combine knowledge from different science topics to solve problems.* | 4.29 | 0.53 | *Strongly Agree* |
| *…integrate observations from experiments to form comprehensive conclusions.* | 4.25 | 0.44 | *Strongly Agree* |
| *…apply interdisciplinary approaches to understand scientific phenomena.* | 4.41 | 0.56 | *Strongly Agree* |
| *Weighted Mean* | *4.31* | | |
| *SD* | *0.53* | | |
| *Verbal Interpretation* | *Very High* | | |



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Findings present that applying interdisciplinary approaches to understand scientific phenomena obtains the highest (M=4.41, SD=0.56), indicating that projective reflection effectively helps learners connect different areas of knowledge to develop a broader understanding of science. While, integrating observations from experiments to form comprehensive conclusions obtains the lowest (M=4.25, SD=0.44), indicating that learners are somewhat less confident in combining experimental data into well-rounded conclusions.

The level of Projective Reflection Approach in terms of Integrative is very high with a weighted mean of 4.31 showing that learners strongly agree that integrating prior knowledge with new experiences enhances problem-solving and understanding in science. This means that learners are most engaged when reflection encourages them to apply knowledge across disciplines, highlighting the relevance of integrative thinking in solving complex scientific problems.

*Level of Students' Evidence-Based Reasoning*

In this study, the level of Students' Evidence-Based Reasoning refers to Contextual Interaction; Data Gathering; Analysis; Problem Solving; and Decision Making.

Table 6 show the level of Students' Evidence-Based Reasoning in terms of Contextual Interaction.

Findings present that evaluating information from experiments to support conclusions obtains the highest (M=4.45, SD=0.59), while, integrating evidence from observations to solve science problems obtains the lowest (M=4.33, SD=0.47). This implies that students are highly capable of using evidence to justify their conclusions in context-specific scientific tasks but some of them are less confident in combining observational data to address scientific problems.

Table 6. Level of Students' Students' Evidence-Based Reasoning in terms of Contextual Interaction

| *Statement* | *Mean* | *SD* | *Remarks* |
|---|---|---|---|
| *Teacher's Projective reflection approach helps me improve my evidenced-based reasoning in learning science in terms of contextual interaction which I can now…* | | | |
| *…interpret data to make reasoned decisions in practical tasks.* | 4.41 | 0.62 | *Strongly Agree* |
| *…compare scientific findings with context-specific scenarios.* | 4.36 | 0.59 | *Strongly Agree* |
| *…analyze situations to identify relevant scientific evidence.* | 4.43 | 0.52 | *Strongly Agree* |
| *…integrate evidence from observations to solve science problems.* | 4.33 | 0.47 | *Strongly Agree* |
| *…evaluate information from experiments to support conclusions.* | 4.45 | 0.59 | *Strongly Agree* |
| *Weighted Mean* | *4.40* | | |
| *SD* | *0.56* | | |
| *Verbal Interpretation* | *Very High* | | |

Overall, the level of students' evidence-based reasoning in terms of Contextual Interaction is very high with a weighted mean of 4.40, showing that learners strongly agree that projective reflection helps them reason scientifically within relevant context.

Table 7 show the level of Students' Evidence-Based Reasoning in terms of Data Gathering.

Table 7. Level of Students' Evidence-Based Reasoning in terms of Data Gathering

| *Statement* | *Mean* | *SD* | *Remarks* |
|---|---|---|---|
| *Teacher's Projective reflection approach helps me improve my evidenced-based reasoning in learning science in terms of data gathering which I can now…* | | | |
| *…collect relevant information from experiments and observations.* | 4.38 | 0.53 | *Strongly Agree* |
| *…record data systematically during science activities.* | 4.32 | 0.62 | *Strongly Agree* |
| *…monitor progress to ensure accurate and complete data.* | 4.26 | 0.56 | *Strongly Agree* |
| *…identify patterns and trends in gathered data.* | 4.51 | 0.50 | *Strongly Agree* |
| *…verify data to maintain reliability and validity of results.* | 4.29 | 0.57 | *Strongly Agree* |
| *Weighted Mean* | *4.35* | | |
| *SD* | *0.56* | | |
| *Verbal Interpretation* | *Very High* | | |

Among the statements, identifying patterns and trends in gathered data obtained the highest mean (M = 4.51, SD = 0.50), indicating that learners can recognize relationships and regularities within collected data gathering. This suggests that the method effectively fosters higher-order data analysis skills, which are crucial for scientific reasoning.

On the other hand, students are somehow finding it difficult to monitor progress for ensuring accurate and complete data which got a (M = 4.26, SD = 0.56), this signifies that maintaining accuracy and completeness during data gathering activities may be a quite hard for the students.

Overall, the data indicate that the Projective Reflection Approach in is very high in improving students' evidence-based reasoning in terms of data gathering, as reflected by the overall weighted mean of 4.35 interpreted as Very High. This implies that learners consistently demonstrate strong agreement that the approach enhances their ability to gather and manage scientific data.

Table 8 shows the level of Students' Evidence-Based Reasoning in terms of Analysis.

Table 8. Level of Students' Evidence-Based Reasoning in terms of Analysis

| *Statement* | *Mean* | *SD* | *Remarks* |
|---|---|---|---|
| *Teacher's Projective reflection approach helps me improve my evidenced-based reasoning in learning science in terms analysis which I can now…* | | | |
| *…interpret observations to understand underlying scientific principles.* | 4.23 | 0.54 | *Strongly Agree* |
| *…connect outcomes of activities with prior experiences in learning.* | 4.24 | 0.46 | *Strongly Agree* |
| *…break down complex scientific problems to understand them better.* | 4.31 | 0.51 | *Strongly Agree* |
| *…examine data from experiments to identify patterns and insights.* | 4.26 | 0.64 | *Strongly Agree* |
| *…evaluate the accuracy and relevance of information collected.* | 4.25 | 0.58 | *Strongly Agree* |
| *Weighted Mean* | *4.26* | | |
| *SD* | *0.5* | | |
| *Verbal Interpretation* | *Very High* | | |

Findings present that breaking down complex scientific problems to understand them better obtains the highest (M=4.31, SD=0.51), while, interpreting observations to understand underlying scientific principles obtains the lowest



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(M=4.23, SD=0.54). This indicates that learners are generally capable of decomposing complex scientific tasks into simpler and more manageable components. Such a skill reflects their ability to approach problems systematically, which is an essential aspect of analytical thinking in science. It also implies that students are able to organize information and focus on specific elements of a problem to facilitate understanding and solution development.

Overall, the level of students' evidence-based reasoning in terms of Analysis is very high with a weighted mean of 4.26, showing that learners strongly agree that projective reflection helps them analyze information and develop a deeper understanding of science concepts. The results imply that projective reflection help the students excel in breaking down complex problems, highlighting their analytical thinking skills.

Table 9 show the level of Students' Evidence-Based Reasoning in terms of Problem Solving.

Findings present that reflecting on outcomes to refine strategies for future tasks obtains the highest (M=4.44, SD=0.56). This suggests that learners are able to use cognitive processes, particularly when evaluating how well their strategies are working and making any necessary adjustments. While, integrating findings from previous activities to improve problem-solving obtains the lowest (M=4.23, SD=0.47). This implies that while students are generally proficient in applying evidence-based reasoning, they may encounter slight challenges in synthesizing and transferring knowledge from earlier tasks to new problem-solving situations.

Table 9. Level of Students' Evidence-Based Reasoning in terms of Problem Solving

| Statement | Mean | SD | Remarks |
|---|---|---|---|
| *Teacher's Projective Reflection Approach helps me improve my evidenced-based reasoning in learning science in terms problem solving which I can now…* | | | |
| *…identify problems in scientific tasks based on observations and evidence.* | 4.38 | 0.61 | *Strongly Agree* |
| *…generate multiple strategies to address scientific challenges.* | 4.29 | 0.53 | *Strongly Agree* |
| *…implement evidence-based decisions to achieve accurate results in science activities.* | 4.26 | 0.54 | *Strongly Agree* |
| *…integrate findings from previous activities to improve problem-solving.* | 4.23 | 0.47 | *Strongly Agree* |
| *…reflect on outcomes to refine strategies for future tasks.* | 4.44 | 0.56 | *Strongly Agree* |
| *Weighted Mean* | *4.32* | | |
| *SD* | *0.55* | | |
| *Verbal Interpretation* | *Very High* | | |

Overall, the level of students' evidence-based reasoning in terms of Problem Solving is very high with a weighted mean of 4.32, showing that learners strongly agree that projective reflection enhances their ability to address scientific challenges effectively.

Table 10 shows the level of Students' Evidence-Based Reasoning in terms of Decision Making.

Findings reveal that applying prior knowledge and experiences to make informed decisions obtains the highest (M=4.38, SD=0.55), while integrating data and observations to support decision-making obtains the lowest (M=4.26, SD=0.74).

The results highlight students' strength in applying knowledge to guide decisions, whereas the slightly lower score in integrating data implies that more practice in synthesizing information from multiple sources could enhance their decision-making capabilities. Providing exercises that encourage evaluating alternatives and supporting choices with evidence can further develop students' reasoning skills.

Table 10. Level of Students' Evidence-Based Reasoning in terms of Decision Making

| Statement | Mean | SD | Remarks |
|---|---|---|---|
| *Teacher's Projective Reflection Approach helps me improve my evidenced-based reasoning in learning science in terms of decision making which I can now…* | | | |
| *…apply prior knowledge and experiences to make informed decisions.* | 4.38 | 0.55 | *Strongly Agree* |
| *…integrate data and observations to support decision-making.* | 4.26 | 0.74 | *Strongly Agree* |
| *…compare alternative solutions to select the most appropriate one.* | 4.31 | 0.58 | *Strongly Agree* |
| *…evaluate scientific evidence before choosing a course of action.* | 4.32 | 0.56 | *Strongly Agree* |
| *…reflect on the consequences of previous decisions to improve reasoning.* | 4.31 | 0.60 | *Strongly Agree* |
| *Weighted Mean* | *4.32* | | |
| *SD* | *0.61* | | |
| *Verbal Interpretation* | *Very High* | | |

Overall, the level of students' evidence-based reasoning in terms of Decision Making is very high with a weighted mean of 4.32, showing that learners recognize the importance of reasoning carefully and systematically when making choices in science.

*Level of Students' Performance in Science*

In this study, the level of Students' Performance in Science refers to Written Task and Performance Task.

The level of Students' Performance in Science is presented in the following table, which includes the raw scores, frequency, and percentage distribution of students across performance levels. It also provides the computed mean and standard deviation to describe the overall performance and the consistency of scores.

The Table 11 shows the level of Students' Performance in Science in terms of Written Task.

Table 11. Level of Students' Performance in Science in terms of Written Task

| Raw Score | Frequency (f) | Percentage (%) | Verbal Interpretation |
|---|---|---|---|
| 33-40 | 66 | 75.86 | Outstanding |
| 25-32 | 21 | 24.14 | Very Satisfactory |
| 17-24 | 0 | 0 | Satisfactory |
| 9 -16 | 0 | 0 | Fair |
| 1-8 | 0 | 0 | Needs Improvement |
| | 87 | 100 | Outstanding |

*Mean=34.28 SD=2.62 VI=O*

The findings reveal that the majority of students scored between 33-40 (f=66, 75.86%), which is interpreted as Outstanding, while 21 students (24.14%) scored within the 25-32 range, interpreted as Very Satisfactory. No students scored in the lower ranges of Satisfactory, Fair, or Needs Improvement.

The performance of students in written science tasks is classified as Outstanding, indicating that most learners demonstrate a high level of mastery in articulating their understanding and applying scientific knowledge in written form. This implies that most students are not only in recalling scientific concepts but are also highly proficient in organizing their thoughts, constructing coherent explanations, and applying scientific principles effectively in written form. Their ability to present accurate, well-structured, and evidence-based responses implies strong mastery of both content knowledge and scientific communication skills.

Table 12 shows the level of Students' Performance in Science in terms of Performance Task.

The rubric is used in the Projective Reflection Approach to evaluate students' performance tasks such as posters, essays, and poems by assessing five key areas: content accuracy, organization, creativity, language use, and presentation.

Each criterion is rated from 1 to 4, making the total score for each activity 20 points. These criteria reflect essential skills developed through PRA, including understanding scientific concepts, organizing reflective ideas, expressing originality, and communicating effectively.

This reveals that the majority of students scored between 65-80 (f=84, 96.55%), which is interpreted as Outstanding, while only 3 students (3.45%) scored within the 49-64 range, interpreted as Very Satisfactory. No students scored in the lower ranges of Satisfactory, Fair, or Needs Improvement.

Table 12. Level of Students' Performance in Science in terms of Performance Task.

| Raw Score | Frequency (f) | Percentage (%) | Verbal Interpretation |
|---|---|---|---|
| 65-80 | 84 | 96.55 | Outstanding |
| 49-64 | 3 | 3.45 | Very Satisfactory |
| 33-48 | 0 | 0 | Satisfactory |
| 17 -32 | 0 | 0 | Fair |
| 1-16 | 0 | 0 | Needs Improvement |
| | 87 | 100 | Outstanding |

*Mean=73.94 SD=4.48 VI=O*

Overall, the performance of students in science performance tasks is classified as Outstanding, indicating that most learners demonstrate exceptional competence in applying scientific knowledge and skills in practical activities. The results highlight students' strong abilities to perform effectively in hands-on and applied science tasks, indicating a high level of preparation and engagement.

*Significant Relationship between Projective Reflection Approach and the Students' Evidence-Based Reasoning*

In this study, the level of Projective Reflection Approach refers to Experiential; Insight-oriented; Exploratory; Reflective and Integrative while Students' Evidence-Based Reasoning refers to Contextual Interaction; Data Gathering; Analysis; Problem Solving; and Decision Making. The Significant Relationship between Projective Reflection Approach and the Students' Evidence-Based Reasoning is revealed in the following table, which shows the Multiple Regression Analysis using Pearson Product Moment Correlation Coefficient or Pearson-r, p-value, and number of observation or respondents.

Table 13 presents the significant relationships between the Projective Reflection Approach and students' Evidence-Based Reasoning across five dimensions: Contextual Interaction, Data Gathering, Analysis, Problem Solving, and Decision Making.

Findings reveal that all dimensions of Projective Reflection Approach, except for a few cases in Analysis and Problem Solving, exhibit statistically significant positive correlations with students' evidence-based reasoning (p< 0.05). Specifically, the Reflective dimension shows the strongest correlation with Contextual Interaction (r=0.715, p= 0.000), indicating that reflecting on experiences greatly enhances learners' ability to reason scientifically in context-specific situations.

Similarly, the Integrative dimension has the highest correlation with Data Gathering (r= 0.726, p= 0.000) and Analysis (r= 0.643, p =0.000), indicating that integrating prior knowledge with new experiences strongly supports students in collecting and analyzing scientific evidence.

Table 13. Significant Relationship between Projective Reflection Approach and the Students' Evidence-Based Reasoning

| Projective Reflection Approach | | Student's Evidence-Based Reasoning | | | | |
|---|---|---|---|---|---|---|
| | | Contextual Interaction | Data Gathering | Analysis | Problem Solving | Decision Making |
| Experiential; | Pearson Correlation | 0.503* | 0.621* | 0.372* | 0.143 | 0.510* |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.188 | 0.000 |
| | N | 87 | 87 | 87 | 87 | 87 |
| Insight-oriented | Pearson Correlation | 0.540* | 0.370* | 0.138 | 0.197 | 0.385* |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.201 | 0.067 | 0.000 |
| | N | 87 | 87 | 87 | 87 | 87 |
| Exploratory; | Pearson Correlation | 0.544* | 0.666* | 0.552* | 0.444* | 0.477* |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | N | 87 | 87 | 87 | 87 | 87 |
| Reflective | Pearson Correlation | 0.715* | 0.553* | 0.496* | 0.333* | 0.550* |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.002 | 0.000 |
| | N | 87 | 87 | 87 | 87 | 87 |
| Integrative | Pearson Correlation | 0.554* | 0.726* | 0.643* | 0.456* | 0.397* |
| | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | N | 87 | 87 | 87 | 87 | 87 |

In contrast, some relationships, such as Experiential with Problem Solving (r = 0.143, p = 0.188) and Insight-Oriented with Analysis (r = 0.138, p = 0.201), are not statistically significant, implying that these aspects of Projective reflection approach may have a weaker influence on certain reasoning skills. The results may also vary due the huge difference of abilities of students among the two sections.

*Significant Effect between the Projective Reflection Approach on the Students' Performance in Science*

In this study, the Projective Reflection Approach refers to Experiential; Insight-oriented; Exploratory; Reflective and Integrative. Meanwhile, the Students' Performance in Science refers to Written Task and Performance Task.

The significant effect between the Projective Reflection Approach on the Students' Performance in Science is revealed in the following table, which shows the Multiple Regression Analysis using t-Test, with the computed t-value (t-cal), p-value, number of observations or respondents, and critical t-value (t-crit) or constant.

Table 14 presents the significant effects of the Projective Reflection Approach on students' performance in science, specifically in Written Tasks.

Table 14. Significant Effect between the Projective Reflection Approach on the Students' Performance in Science in terms of Written Task

| Projective Reflection Approach | | Student's Performance in Science |
|---|---|---|
| | | Written Task |
| Experiential | t-value | 2.156* |
| | Sig. (2-tailed) | 0.034 |
| | N | 87 |
| Insight-Oriented | t-value | 1.909 |
| | Sig. (2-tailed) | 0.060 |
| | N | 87 |
| Exploratory | t-value | 0.765 |
| | Sig. (2-tailed) | 0.446 |
| | N | 87 |
| Reflective | t-value | 0.702 |
| | Sig. (2-tailed) | 0.485 |
| | N | 87 |
| Integrative | t-value | 0.983 |
| | Sig. (2-tailed) | 0.329 |
| | N | 87 |

Among the five dimensions, experiential reflection is the only variable that shows a statistically significant relationship with students' performance in written science tasks, as indicated by its computed t-value ($t = 2.156$) and p-value (Sig. = 0.034), which is less than the 0.05 level of significance.

This result signifies that students who actively engage in learning through direct experiences such as hands-on activities, experiments, and real-life applications tend to perform better in written science tasks.

It implies that experiential learning strengthens students' ability to articulate scientific concepts, likely because they can anchor their written explanations on concrete experiences, thereby enhancing both understanding and expression.

On the other hand, insight-oriented reflection ($t = 1.909$, $p = 0.060$) does not show a statistically significant relationship, although its p-value is close to the 0.05. This implies a possible influence, but not strong enough to be considered statistically significant in this study.

Meanwhile, exploratory reflection ($t = 0.765$, $p = 0.446$), reflective ($t= 0.702$, $p= 0.485$), and integrative reflection ($t = 0.983$, $p = 0.329$) all yielded p-values greater than 0.05, indicating no significant relationship with students' written task performance.

Overall, the findings highlight the critical role of experiential learning within the Projective Reflection Approach in enhancing students' written performance in science. While other reflective dimensions contribute to the broader learning process, they may require more structured integration into instruction or different forms of assessment to fully demonstrate their impact.

This finding highlights the need for reflective practices that help students organize their thoughts and clearly communicate evidence-based reasoning in their written outputs, which directly connects to the present study's focus on projective reflection.

Table 15 presents the results of the test of significance on the relationship between the dimensions of the Projective Reflection Approach and students' performance in science in terms of performance tasks.

Table 15. Significant Effect between the Projective Reflection Approach on the Students' Performance in Science in terms of Performance Task

| Projective Reflection Approach | | Student's Performance in Science |
|---|---|---|
| | | Performance Task |
| Experiential | t-value | 0.705 |
| | Sig. (2-tailed) | 0.483 |
| | N | 87 |
| Insight-Oriented | t-value | 0.753 |
| | Sig. (2-tailed) | 0.453 |
| | N | 87 |
| Exploratory | t-value | 0.474 |
| | Sig. (2-tailed) | 0.637 |
| | N | 87 |
| Reflective | t-value | -0.717 |
| | Sig. (2-tailed) | 0.475 |
| | N | 87 |
| Integrative | t-value | 1.218 |
| | Sig. (2-tailed) | 0.227 |
| | N | 87 |

Specifically, experiential reflection ($t = 0.705$, $p = 0.483$) does not significantly influence students' performance task outcomes. This implies that although hands-on experiences and real-life applications are valuable for learning, they do not directly translate into higher performance in assessed tasks within this dataset.

Similarly, insight-oriented reflection ($t = 0.753$, $p = 0.453$) shows no significant relationship, implying that students' ability to derive deeper realizations or insights does not have a measurable effect on their performance task scores.

In the same manner, exploratory reflection ($t = 0.474$, $p = 0.637$) and reflective ($t = -0.717$, $p = 0.475$) also do not exhibit significant relationships with performance. The negative t-value for reflective does not imply a meaningful inverse relationship, as the result remains statistically insignificant. These findings indicate that engaging in exploration of ideas or reviewing one's thought processes may not directly impact students' outputs in performance-based assessments.

Lastly, integrative reflection ($t=1.218$, $p=0.227$), although having the highest t-value among the variables, still does not reach the level of statistical significance. This signifies that the ability to connect and synthesize knowledge from various learning experiences may not be strongly reflected in students' performance task results.

Overall, the findings reveal that none of the dimensions of the Projective Reflection Approach significantly influence students' performance in science performance tasks. This may imply that performance tasks are influenced by other factors such as skills execution, task familiarity, assessment design, or external support, rather than reflective processes alone. It also implies that while reflection is important for learning, its effects may be more evident in other domains, such as conceptual understanding or written expression, rather than in performance-based outputs.

This implies that performance tasks allow learners to apply concepts in authentic contexts, while reflective thinking helps them evaluate their procedures and outcomes

## IV. Conclusion and Recommendations

Based on the findings of the study, it can be concluded that the projective reflection helps students to enhance their evidenced based reasoning in learning science.

Thus, it further emphasized that there is significant relationship between projective reflection approach and the students' evidence-based reasoning leading to the rejection of the null hypothesis. This implies that integrating reflective practices into instruction can positively influence enhance students' critical thinking and evidence-based reasoning skills, supporting deeper understanding and better decision-making.

On the other hand, projective reflection approach does not show significant effect on the students' performance for both written and performance task which accepts the null hypothesis of the study. This further implies that while reflection enhances reasoning skills, it may not directly translate into improved performance outcomes, which could be influenced by other factors such as skills application and assessment design. Based on the drawn conclusions resulted to the following recommendations:

Schools and teachers may continuously enhance the implementation of the Projective Reflection Approach by incorporating varied and improve strategies to further strengthen students' engagement and understanding of scientific concepts. Schools may also support teachers through training and mentoring programs focused on effective implementation of reflective and experiential learning strategies.

Teachers may continuously emphasize scientific reasoning skills, particularly in analyzing, interpreting, and integrating evidence. More opportunities should be provided for students to practice combining multiple sources of data to strengthen their reasoning abilities and continue using authentic assessments and hands-on tasks while also offering timely and constructive feedback. Enrichment activities may also be introduced to continuously develop students' critical thinking and application skills.

Teachers consistently embed reflection throughout the learning process (before, during, and after lessons) to further strengthen students' reasoning skills.

Students are also encouraged to actively engage in reflective practices by regularly analyzing their own learning processes, identifying strengths and areas for improvement, and applying insights gained from reflection to enhance their understanding of scientific concepts. They should also take initiative in participating in hands-on and inquiry-based activities to further develop their reasoning and problem-solving skills.

Future researchers may explore the effectiveness of the Projective Reflection Approach across different subject areas, grade levels, and learning contexts to validate and extend the findings. They may also consider using larger sample sizes, longer intervention periods, or mixed-method approaches to gain deeper insights into how reflective practices influence both cognitive and performance outcomes.

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