ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
Volume 2 Issue 6 (June 2026)

Core Science Process Skills Profile of Grade 8 Learners at San Isidro National High School, Bislig City Division, Through Pre-Test and Post-Test Performance: A Quantitative Descriptive-Comparative Approach

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Date Submitted:
April 22, 2026

Date Accepted:
May 16, 2026

Date Published:
June 14, 2026

DOI:
10.5281/zenodo.20685059

ABSTRACT

This study determined the Core Science Process Skills profile of Grade 8 learners at San Isidro National High School, Bislig City Division, through pre-test and post-test performance using a quantitative descriptive-comparative approach. The respondents were 36 Grade 8 learners, composed of 16 male and 20 female students, who were included through complete enumeration. The study focused on observing, classifying, measuring, inferring, predicting, and interpreting and communicating data. A researcher-made 18-item Science Process Skills Test-Questionnaire was used, and the data were analyzed using mean, standard deviation, ranking of mean scores, and a paired samples t-test. Results showed that the learners' overall pre-test mean score was 2.69 out of 18, interpreted as Needs Enhancement, whereas their overall post-test mean score increased to 15.94 out of 18, interpreted as Highly Developed. Measuring obtained the highest mean score in both the pre-test (M = 0.89) and post-test (M = 2.97). Predicting obtained the lowest pre-test mean score (M = 0.14), while Classifying obtained the lowest post-test mean score (M = 2.42). The paired samples t-test showed a significant difference between the learners' pre-test and post-test performance, $t(35) = 37.57$, $p < .001$. The findings support the use of focused enhancement activities, particularly for Classifying and Interpreting and Communicating Data. Because the study did not include an experimental control group, the improvement should be interpreted as a significant performance difference rather than as proof of a direct causal effect.

Keywords: *core science process skills, Grade 8 learners, pre-test and post-test performance, science education, scientific literacy, descriptive-comparative research*

INTRODUCTION

Science education develops learners' ability to reason critically, solve problems, make evidence-based decisions, and understand scientific ideas in everyday situations. In the Philippine K to 12 Science Curriculum, the study of Science is intended not only to develop conceptual understanding but also to strengthen scientific processes, skills, attitudes, and values. The MATATAG Science Curriculum likewise emphasizes meaningful, hands-on, and minds-on learning experiences that encourage learners to participate actively in scientific inquiry (Department of Education [DepEd], 2016, 2023).

Despite these curricular goals, Filipino learners continue to face challenges in Science. The Programme for International Student Assessment 2022 reported that the Philippines obtained an average Science score of 356 compared with the Organisation for Economic Co-operation and Development average of 485. Only 23% of

ISSN: 3116-3475
International Journal
of Education, Research, and Innovation Perspectives
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Filipino students reached at least Level 2 proficiency in Science, compared with the OECD average of 76%. At this level, learners are expected to recognize scientific explanations and use evidence to judge whether conclusions are valid (Organisation for Economic Co-operation and Development [OECD], 2023).

One way to support scientific literacy is to strengthen Science Process Skills. These skills help learners move beyond memorizing facts by enabling them to observe, classify, measure, infer, predict, interpret data, and communicate scientific information. Basic process skills provide a foundation for more complex skills such as identifying variables, formulating hypotheses, and experimenting (Padilla, 1990). Research has also shown that Science Process Skills are related to academic achievement and critical thinking (Asio & Mondejar, 2022; Astalini et al., 2023; Jardinico & Linaugo, 2023).

Assessing learners' Science Process Skills is important because the results can guide instructional planning. Sarıoğlu (2023) developed an online Science Process Skills assessment for Grade 8 learners and emphasized that skill monitoring can inform instructional support. A recent review by Wan Hussain et al. (2026) likewise highlighted the importance of coherent and context-responsive assessment practices for promoting scientific literacy and inquiry-oriented learning.

This study determined the Core Science Process Skills profile of 36 Grade 8 learners at San Isidro National High School, Bislig City Division, through pre-test and post-test performance. Specifically, it examined observing, classifying, measuring, inferring, predicting, and interpreting and communicating data; identified the strongest and weakest skills; tested the difference between the learners' pre-test and post-test scores; and proposed enhancement activities based on the findings.

Literature Review

Core Science Process Skills as Foundations of Scientific Inquiry

Science Process Skills are fundamental competencies that allow learners to collect, organize, interpret, and communicate information. Padilla (1990) identified observing, classifying, measuring, inferring, predicting, and communicating as basic process skills that support more advanced scientific inquiry. Anjugam and Chellamani (2024) similarly explained that these foundational skills help learners reason critically, solve problems, and apply scientific knowledge in practical settings.

Observing allows learners to gather information through the senses or appropriate tools. Classifying helps them organize objects, materials, and information according to common characteristics. Measuring enables them to generate quantitative data using appropriate units and instruments. Inferring involves drawing logical explanations from observations and evidence, while predicting requires stating possible future outcomes based on patterns and scientific knowledge. Interpreting and communicating data enables learners to analyze information from tables, graphs, or observations and present conclusions clearly.

These skills are closely linked to scientific literacy. The OECD PISA Science Framework emphasizes the ability to explain phenomena scientifically, interpret data and evidence critically, evaluate scientific inquiry, and use scientific information for decision-making (OECD, 2025). Strengthening basic process skills is therefore essential for preparing learners to engage with scientific problems in school and in everyday life.

Inquiry-Based Learning and the Assessment of Science Process Skills

Inquiry-based learning provides learners with opportunities to investigate, question, analyze evidence, and construct explanations. Chengere et al. (2025) reported that guided inquiry-based laboratory activities improved the Science Process Skills of secondary learners compared with traditional laboratory instruction. Majeed et al. (2023) likewise found that inquiry-based instruction enhanced learners' process skills, supporting the use of active and evidence-oriented Science activities.

Evidence from Southeast Asia also supports hands-on and project-based approaches. Rapi et al. (2025) found that inquiry-based learning with project-based assessment improved Science Process Skills and critical thinking. Khampui et al. (2025) reported that low-cost mini science experiment kits supported the skill

ISSN: 3116-3475
International Journal
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Volume 2 Issue 6 (June 2026)

development of Thai learners, demonstrating that meaningful Science experiences can be implemented even in resource-limited classrooms.

Assessment is necessary to determine which skills require reinforcement. Nitko and Brookhart (2014) explained that educational assessment provides systematic evidence that can guide instructional decisions. Sarıoğlu (2023) showed that Grade 8 Science Process Skills can be assessed using a structured test, while Wan Hussain et al. (2026) emphasized the need for clear conceptual frameworks in Science Process Skills assessment.

Science Process Skills in the Philippine Context

The Philippine K to 12 Science Curriculum promotes learner-centered, inquiry-based, contextualized, and problem-based learning. It recognizes the importance of performing scientific processes and skills alongside developing conceptual understanding and scientific attitudes (DepEd, 2016). The MATATAG Science Curriculum similarly emphasizes the use of evidence, meaningful exploration, and hands-on and minds-on learning experiences (DepEd, 2023).

Philippine studies support the importance of examining learners' Science Process Skills. Asio and Mondejar (2022) found a moderately positive relationship between junior high school learners' Science Process Skills and academic achievement. Jardinico and Linaugo (2023) also reported a significant relationship between basic Science Process Skills and academic performance in Earth Science. These findings suggest that profiling learners' skills can provide useful information for instructional improvement.

Recent studies further indicate that Science Process Skills can be strengthened through appropriate learning resources and inquiry-oriented approaches. Esguerra et al. (2025) reported improvement in basic process skills after the use of virtual laboratory applications with guided inquiry activities, while Roa and Fajardo (2025) emphasized the need for self-learning modules that foster basic Science Process Skills. These studies support the development of targeted enhancement activities based on learners' specific strengths and areas for improvement.

METHODS

Research Design

The study employed a quantitative descriptive-comparative research design. The descriptive component was used to determine the learners' performance in the selected Core Science Process Skills, while the comparative component was used to examine the difference between their pre-test and post-test scores. The design was appropriate because the study described and compared the performance of one group of learners without introducing an experimental control group.

Research Locale

The study was conducted at San Isidro National High School in Barangay San Isidro, Bislig City, Surigao del Sur, Philippines. The school was selected because it was the researcher's current assignment and the respondents were under the researcher's direct advisory during School Year 2025-2026.

Participants and Sampling Technique

The respondents were 36 Grade 8 learners, composed of 16 male and 20 female students. Complete enumeration was used because all learners in the selected class were included in the study. Their pre-test and post-test scores served as the basis for describing their Core Science Process Skills profile.

Table 1. *Distribution of Respondents*

Grade 8 learners	Population	Sample size
Male	16	16
Female	20	20
Total	36	36

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International Journal
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Research Instrument

The main instrument was a researcher-made 18-item Science Process Skills Test-Questionnaire. The instrument measured six Core Science Process Skills: observing, classifying, measuring, inferring, predicting, and interpreting and communicating data. Each skill was represented by three multiple-choice items. One point was assigned to each correct response, and zero was assigned to each incorrect response. The highest possible score was 3 points for each skill and 18 points for the entire test.

The instrument was anchored on Padilla's (1990) Science Process Skills framework and aligned with the K to 12 Science Curriculum and the MATATAG Science Curriculum (DepEd, 2016, 2023). The source manuscript described a process of expert review and pilot reliability testing using an appropriate measure such as Kuder-Richardson Formula 20. However, the final validator details and reliability coefficient were not reported in the source document and should be inserted before journal submission.

Table 2. *Distribution of Items in the Science Process Skills Test-Questionnaire*

Core Science Process Skill	Item numbers	Number of items
Observing	1-3	3
Classifying	4-6	3
Measuring	7-9	3
Inferring	10-12	3
Predicting	13-15	3
Interpreting and Communicating Data	16-18	3
Total	1-18	18

Data Gathering Procedure

Before data collection, the researcher prepared the test materials, reviewed the alignment of the items with the study objectives, and secured permission from the school head and concerned personnel. The learners were oriented regarding the purpose and procedures of the assessment. The pre-test was administered under proper classroom conditions. After the learning period or instructional coverage, the same test was administered as a post-test. The responses were checked, scored using the prepared answer key, encoded, grouped according to the six skills, and prepared for statistical analysis.

Data Analysis

Mean and standard deviation were used to describe the learners' pre-test and post-test performance in each Core Science Process Skill. Overall means were used to summarize the learners' general profile, while ranking of mean scores was used to identify the highest and lowest developed skills. A paired samples t-test at the 0.05 level of significance was used to determine whether a significant difference existed between the pre-test and post-test scores of the same group of learners. The interpretation scale for mean scores per skill was: 2.34-3.00 = Highly Developed, 1.67-2.33 = Moderately Developed, and 0.00-1.66 = Needs Enhancement.

Ethical Consideration

Permission was secured from the school head and concerned personnel before the assessment was conducted. The learners were oriented regarding the purpose of the study, and the collected data were handled confidentially. Individual learner scores were not publicly disclosed and were used only for research purposes. Because the respondents were minors, the author should ensure that the final submission accurately reports the documented parental or guardian consent and learner assent procedures, as well as any institutional ethics-review reference number, when available.

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RESULTS AND DISCUSSION

Pre-Test and Post-Test Performance in the Six Core Science Process Skills

The learners obtained Needs Enhancement ratings in all six Core Science Process Skills during the pre-test. This indicates limited initial performance in observing, classifying, measuring, inferring, predicting, and interpreting and communicating data. In the post-test, all six skills were interpreted as Highly Developed. Predicting obtained the largest mean gain (2.58), followed by Inferring (2.31) and Observing (2.25). Classifying obtained the smallest mean gain (1.86), although its post-test performance was still interpreted as Highly Developed.

Table 3. *Pre-Test and Post-Test Performance in the Core Science Process Skills*

Skill	Pre-test M	SD	Interpretation	Post-test M	SD	Interpretation	Gain
Observing	0.39	0.60	Needs Enhancement	2.64	0.59	Highly Developed	2.25
Classifying	0.56	0.73	Needs Enhancement	2.42	0.65	Highly Developed	1.86
Measuring	0.89	0.89	Needs Enhancement	2.97	0.17	Highly Developed	2.08
Inferring	0.39	0.49	Needs Enhancement	2.69	0.47	Highly Developed	2.31
Predicting	0.14	0.35	Needs Enhancement	2.72	0.61	Highly Developed	2.58
Interpreting and Communicating Data	0.33	0.63	Needs Enhancement	2.50	0.70	Highly Developed	2.17

The overall pattern is consistent with the role of active Science learning in strengthening learners' ability to apply scientific processes. Inquiry-oriented activities give learners opportunities to observe, organize evidence, reason from data, and communicate conclusions (Chengere et al., 2025; Majeed et al., 2023; Rapi et al., 2025).

Overall Core Science Process Skills Profile

The overall pre-test mean score was 2.69 out of 18, with an equivalent mean score per skill of 0.45, interpreted as Needs Enhancement. The overall post-test mean score increased to 15.94 out of 18, with an equivalent mean score per skill of 2.66, interpreted as Highly Developed. During the pre-test, all 36 learners were classified under Needs Enhancement. In the post-test, 32 learners or 88.89% were classified as Highly Developed, while four learners or 11.11% were classified as Moderately Developed.

Table 4. *Overall Core Science Process Skills Profile*

Test	Total mean score	SD	Mean score per skill	Interpretation
Pre-test	2.69 out of 18	1.51	0.45	Needs Enhancement
Post-test	15.94 out of 18	1.33	2.66	Highly Developed

Highest and Lowest Developed Skills

Measuring obtained the highest mean score in both the pre-test and post-test. Its pre-test mean score was 0.89, while its post-test mean score was 2.97. This indicates that learners performed particularly well in items that required the use of measuring tools, the reading of values, and the application of numerical information. The finding may reflect the concrete nature of measurement-related tasks, which allow learners to connect scientific concepts with direct and practical activities.

Predicting obtained the lowest pre-test mean score of 0.14, indicating that learners initially had difficulty anticipating possible outcomes based on patterns, observations, or scientific situations. During the post-test, Classifying obtained the lowest mean score of 2.42. Although still interpreted as Highly Developed, this skill had the smallest mean gain and may benefit from continued reinforcement through sorting, grouping, comparing, and explaining the bases of classification.

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Table 5. *Highest and Lowest Developed Core Science Process Skills*

Test	Highest skill	Mean	Lowest skill	Mean
Pre-test	Measuring	0.89	Predicting	0.14
Post-test	Measuring	2.97	Classifying	2.42

Difference Between Pre-Test and Post-Test Performance

The paired samples t-test showed a significant difference between the learners' pre-test and post-test scores. The post-test mean score of 15.94 was higher than the pre-test mean score of 2.69, producing a mean difference of 13.25. The computed result was $t(35) = 37.57$, $p < .001$. Therefore, the null hypothesis was rejected.

The finding demonstrates a statistically significant improvement in the performance of the learners after the learning period or instructional coverage. However, the result should not be interpreted as evidence of a direct causal effect because the study did not use an experimental control group and the source manuscript did not specify a particular intervention that was tested.

Table 6. *Paired Samples t-Test on Pre-Test and Post-Test Performance*

Variable	N	Pre-test M	Post-test M	Mean difference	t	df	p	Decision
Overall Core SPS Performance	36	2.69	15.94	13.25	37.57	35	< .001	Significant

Proposed Enhancement Activities

The findings indicate that Classifying and Interpreting and Communicating Data should receive priority in future enhancement activities because these obtained the lowest and second-lowest post-test means. The remaining skills should also be sustained through enrichment activities. The proposed activities are presented as practical options that teachers may adapt to the learners' context.

Table 7. *Proposed Core Science Process Skills Enhancement Activities*

Priority skill	Basis from findings	Proposed activities
Classifying	Lowest post-test means, 2.42	Sorting and grouping activities; material-classification tasks; compare-and-contrast exercises; classification charts; explanations of grouping criteria
Interpreting and Communicating Data	Second-lowest post-test mean, 2.50	Table-reading exercises; graph interpretation; data-to-conclusion tasks; short Science reports; claim-evidence-reasoning activities
Observing	Post-test mean, 2.64	Guided observation sheets; object-description tasks; notice-and-record activities; use of simple tools to examine details
Inferring	Post-test mean, 2.69	Observation-versus-inference activities; mystery-object tasks; situation analysis; evidence-based conclusion exercises
Predicting	Largest gain, 2.58	Predict-observe-explain activities; pattern-based prediction tasks; simple experiments requiring expected-outcome statements
Measuring	Highest post-test means, 2.97	Measurement stations; use of measuring tools; real-life measurement problems; enrichment tasks to sustain mastery

CONCLUSION

The Grade 8 learners initially demonstrated limited performance in the six selected Core Science Process Skills. Their pre-test scores indicated the need for enhancement, particularly in Predicting. In the post-test, the learners demonstrated substantially improved performance, and all six skills were interpreted as Highly Developed. Measuring emerged as the strongest skill in both assessments, while Classifying remained the lowest-ranked post-test skill despite its improved score. The statistically significant difference between the pre-test and post-test scores confirms a meaningful improvement in performance, although the study design does not establish a direct causal effect. The findings show that regular assessment of specific Core Science Process Skills can help

teachers identify strengths and areas that require reinforcement. In this context, enhancement activities should prioritize Classifying and Interpreting and Communicating Data while sustaining the development of the other skills.

Recommendation

Science teachers should provide focused activities that strengthen Classifying and Interpreting and Communicating Data, including sorting and grouping tasks, compare-and-contrast exercises, graph interpretation, data analysis, and short evidence-based reports. School administrators should support the preparation of learning materials, classroom resources, and collaborative professional-learning opportunities that promote inquiry-oriented Science instruction. The Schools Division Office may consider using school-based Science Process Skills data when planning technical assistance, learning action cell sessions, and Science-related instructional programs. Parents and guardians may encourage curiosity and scientific thinking through simple home-based observation, measurement, and discussion activities. Future researchers should examine larger samples, other grade levels, and additional Science Process Skills; they may also evaluate the effectiveness of specific enhancement interventions using experimental or quasi-experimental designs.

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