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Basic Science Process Skills and Problem Solving Abilities of Learners

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Abstract: *This study explored the Basic Science Process Skills and Problem-Solving Abilities of Grade 6 learners in the Estancia District. The investigation examined learners' performance across six dimensions of BSPS—observing, classifying, measuring, inferring, predicting, and communicating—and four dimensions of PSA—identifying the problem, analyzing the problem, generating solutions, and evaluating the solution.*

Findings revealed that learners consistently demonstrated a moderate level of Basic Science Process Skills across all dimensions. They were able to observe details, classify information, infer logical conclusions, and communicate ideas with reasonable competence. However, their skills in measuring and predicting were also moderate but comparatively weaker, reflecting challenges in applying quantitative reasoning and anticipating outcomes. Overall, the learners' science process skills were balanced but limited, indicating that while they possess foundational scientific abilities, they have not yet reached high proficiency. Learners' Problem-Solving Abilities results were likewise interpreted as moderate across all dimensions. They were able to identify problems, analyze them, generate possible solutions, and evaluate outcomes with moderate competence. This suggests that learners can engage in problem-solving tasks but remain at a middle level of performance. Their ability to recognize and break down problems is evident, yet they require further support to advance toward mastery in generating and evaluating solutions. The consistent moderate performance across both Basic Science Process Skills and Problem-Solving Abilities dimensions highlights that learners possess the essential foundation for scientific thinking and problem-solving but have not yet developed these skills to a high level. They are capable of performing basic tasks such as observing, classifying, and identifying problems, yet their proficiency remains limited. This balanced but moderate level of performance suggests that learners are ready for more advanced instructional interventions that can elevate their skills from moderate to high. It is recommended that teachers implement instructional reinforcement for weaker skills such as measuring and predicting, integrate problem-solving activities into science lessons, and conduct skill enhancement workshops. Curriculum developers should design structured modules that build learners' competence, while teacher training and continuous assessment are essential to sustain improvement..

Keywords: Basic Science Process Skills, Problem-Solving Abilities, Grade 6 Learners

I. INTRODUCTION

Education in the 21st century demands competencies that extend beyond memorization and factual recall. Global frameworks such as those of the OECD emphasize higher-order thinking, scientific literacy, and problem-solving abilities, while UNESCO highlights science education as essential for preparing learners to address global challenges. These competencies enable learners to thrive in rapidly changing technological and scientific environments, where adaptability, inquiry, and innovation are indispensable.

Within science education, Basic Science Process Skills are foundational. These include observing, classifying, measuring, inferring, predicting, and communicating—skills that allow learners to construct knowledge through exploration and inquiry (Padilla, 2020; Harlen, 2021). At the elementary level, Basic Science Process Skills are

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particularly important as they lay the groundwork for advanced scientific thinking. Observing and classifying help learners recognize patterns, measuring and predicting foster quantitative reasoning, inferring develops logical thinking, and communicating strengthens the ability to share ideas. Together, these skills form the bedrock of scientific inquiry and prepare learners for higher-order tasks.

Equally significant is the development of Problem Solving Abilities, which involves identifying problems, analyzing situations, generating solutions, and evaluating outcomes (Anderson, 2020; Polya, 2020; Lim, 2023). In science education, Problem Solving Abilities is closely linked to inquiry-based learning, where learners investigate and experiment to arrive at solutions (Duran & Ozdemir, 2022). Problem Solving Abilities integrates knowledge, reasoning, and decision-making, making it indispensable for lifelong learning and adaptability.

Research consistently demonstrates a positive relationship between Basic Science Process Skills and Problem Solving Abilities. Learners proficient in science process skills are better equipped to gather, analyze, and interpret information, which enhances their ability to solve problems (Karamustafaoglu, 2021; Santos, 2024; Kim & Lee, 2022). This relationship forms the conceptual foundation of the present study, which assumes that Basic Science Process Skills significantly influence Problem Solving Abilities. In the Philippines, several challenges hinder the effective development of these competencies. The Department of Education promotes inquiry-based learning, yet implementation is constrained by traditional lecture methods, overcrowded classrooms, and inadequate laboratory resources (Reyes & Cruz, 2022). Local studies reveal gaps in teachers' proficiency in science process skills (Tomas, 2023) and emphasize the importance of Basic Science Process Skills in learners' ability to identify and analyze problems (Garcia, 2022).

These challenges highlight the need for targeted interventions. Without adequate support, learners may remain at a moderate level of proficiency, limiting their ability to engage in higher-order scientific thinking. Addressing these issues requires curriculum reform, teacher training, resource allocation, and instructional strategies that prioritize active learning.

Theoretical Framework and Conceptual Framework

This study is anchored on several educational theories that explain how learners acquire and apply scientific and problem-solving skills.

Constructivist Learning Theory (Piaget, as cited in Harlen, 2021) posits that learners actively construct knowledge through interaction with their environment. Basic Science Process Skills such as observing, classifying, and inferring are developed when learners engage in hands-on exploration and inquiry.

Social Constructivism (Ahmadvand & Khoshchehreh, 2023; Wibowo et al., 2025) emphasizes the role of social interaction and scaffolding in learning. Communication as a science process skill is strengthened when learners collaborate and share ideas, which also enhances their problem-solving capacity.

Problem-Solving Theory (Polya, 2020; Gulam & Arenas, 2024) outlines the stages of problem-solving: understanding the problem, devising a plan, carrying out the plan, and evaluating the solution. This framework directly aligns with Problem Solving Abilities dimensions such as identifying, analyzing, generating, and evaluating solutions.

Inquiry-Based Learning (Duran & Ozdemir, 2022; Mediana et al., 2025) supports the integration of Basic Science Process Skills and Problem Solving Abilities by encouraging learners to investigate, experiment, and reflect, thereby fostering higher-order thinking and adaptability.

Together, these theories provide the foundation for examining how BSPS influence Problem-Solving Abilities among Grade 6 learners.

The conceptual framework of this study illustrates the relationship between Basic Science Process Skills and Problem-Solving Abilities. Basic Science Process Skills are considered the independent variables, while Problem-Solving Abilities serves as the dependent variable.

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Basic Science Process Skills: Observing, Classifying, Measuring, Inferring, Predicting, Communicating (Padilla, 2020; Harlen, 2021). Problem-Solving Abilities: Identifying the Problem, Analyzing the Problem, Generating Solutions, Evaluating the Solution (Polya, 2020; Anderson, 2020; Lim, 2023).

Statement of the Problem

This study aims to determine the relationship between Basic Science Process Skills and Problem-Solving Abilities of Grade 6 learners.

Specifically, this study seeks to answer the following questions:

1. What is the level of Grade 6 learners' basic science process skills in terms of:
   1.1 Observing
   1.2 Classifying
   1.3 Measuring
   1.4 Inferring
   1.5 Predicting
   1.6 Communicating
2. What is the level of Grade 6 learners' problem-solving abilities in terms of:
   2.1 Identifying the problem
   2.2 Analyzing the problem
   2.3 Generating solutions
   2.4 Evaluating the Solutions
3. Is there a significant relationship between Grade 6 learners' basic science process skills and their problem-solving abilities?
4. Which dimension of basic science process skills significantly influences or predicts the problem-solving abilities of Grade 6 learners?
5. What output can be developed based on the result of the study?

Hypotheses

Based on the statement of the problem, the following hypotheses were formulated:

1. There is no significant relationship between Grade 6 learners' Basic Science Process Skills (BSPS) and their Problem-Solving Abilities (PSA).
2. None of the dimensions of Basic Science Process Skills (observing, classifying, measuring, inferring, predicting, and communicating) significantly influence or predict the Prob0lem-Solving Abilities of Grade 6 learners.

Significance of the Study

This study is significant because it examines the relationship between Basic Science Process Skills and Problem-Solving Abilities among Grade 6 learners. Understanding this relationship provides valuable insights into how learners develop scientific thinking and problem-solving capacity, which are essential competencies in the 21st century.

Learners

The results of this study will help learners recognize the importance of developing science process skills such as observing, classifying, measuring, inferring, predicting, and communicating. Strengthening these skills prepares them to face real-life situations and equips them with the ability to handle academic and everyday challenges more effectively.

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Teachers

This study will provide teachers with practical insights into the importance of integrating science process skills into instruction. The findings can guide teachers in designing more inquiry-based and learner-centered activities that foster critical thinking and problem-solving abilities among their students.

School Administrators

The findings may assist school administrators in planning and implementing programs that support the development of science process skills. Evidence from this study can be used to justify resource allocation, professional development, and initiatives that enhance science teaching and learning in schools.

Curriculum Developers

This study may serve as a basis for improving curriculum design by integrating science process skills and problem-solving tasks. The results can inform curriculum planners to embed structured modules that progressively build learners' competence in both BSPS and PSA, ensuring alignment with higher-order thinking skills.

Future Researchers

This study can serve as a reference for future researchers who wish to explore science process skills and problem-solving abilities further. It may encourage additional studies that consider new approaches such as problem-based learning, interdisciplinary thematic learning, and inquiry-based STEM interventions.

Scope and Limitations

This study investigated the relationship between Basic Science Process Skills and Problem-Solving Abilities of Grade 6 learners. The Basic Science Process Skills dimensions considered include observing, classifying, measuring, inferring, predicting, and communicating, while PSA encompasses identifying the problem, analyzing the problem, generating solutions, and evaluating the solution.

The respondents of the study were 350 Grade 6 learners from selected schools in the District of Estancia. Data were collected through a structured questionnaire consisting of test items designed to measure the learners' levels of science process skills and problem-solving abilities. A descriptive-correlational research design was employed to determine the relationship between the variables and to identify which dimensions of basic science process skills significantly predict problem-solving abilities.

However, the study is subject to several limitations. First, it is confined to Grade 6 learners within selected schools in the District of Estancia; therefore, the findings cannot be generalized to learners in other grade levels or districts. Second, the study relies on self-administered questionnaires, which may be influenced by the learners' honesty, comprehension, and test-taking conditions. Third, only the identified dimensions of Basic Science Process Skills and Problem-Solving Abilities are examined; other factors that may affect problem-solving abilities—such as intelligence, motivation, teaching strategies, and socio-economic background—are not included. Despite these limitations, the study offers valuable insights into how basic science process skills contribute to the development of learners' problem-solving abilities.

To ensure validity, the research instruments were reviewed by experts in science education and pilot-tested with a comparable group of learners. Content validity was established by aligning items with the competencies outlined in the science curriculum. Construct validity was ensured by clustering items according to Basic Science Process Skills and Problem-Solving Abilities dimensions, confirming that each item measured the intended construct.

Reliability was tested using Cronbach's Alpha, which confirmed the internal consistency of the instrument. The reliability coefficients were within acceptable ranges, indicating that the tools measured the intended constructs consistently and could be trusted to yield dependable results.

The following statistical tools were employed in analyzing the data, Descriptive Statistics: Mean and Standard Deviation were used to determine the learners' level of Basic Science Process Skills and Problem-Solving Abilities. Correlation Analysis: Pearson's r was applied to examine the relationship between Basic Science Process Skills and

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Problem-Solving Abilities Regression Analysis: Multiple regression was used to identify which BSPS dimensions significantly predict problem-solving ability.

II. REVIEW OF RELATED LITERATURE

Basic Science Process Skills

Basic Science Process Skills are fundamental abilities used in scientific inquiry, including observing, classifying, measuring, inferring, predicting, and communicating. These skills allow learners to actively construct knowledge through exploration and investigation. Recent studies emphasize that Basic Science Process Skills are responsive to innovative instructional approaches. For example, Abarca, Gonzales, Pawaon, & Solomon (2025) found that game-based learning significantly improved learners' ability to observe, classify, and communicate, demonstrating that interactive strategies can strengthen science process skills. Similarly, Sebastian (2025) developed a validated self-learning module that enhanced Basic Science Process Skills among junior high school students, showing that structured instructional materials can promote independent learning and confidence.

Basic Science Process Skills are also linked to improved academic performance. Kim and Lee (2022) reported that learners with strong science process skills demonstrated better cognitive flexibility and achievement in science tasks. International assessments confirm this trend; the OECD (2023) highlighted that students proficient in Basic Science Process Skills perform better in tasks requiring analysis and application. Beyond academic achievement, Basic Science Process Skills foster critical thinking and creativity. Blancia (2024) showed that problem-based learning approaches significantly improved learners' ability to apply Basic Science Process Skills in real-world contexts, enhancing their problem-solving capacity. In the Philippine setting, Montenegro & Servañez (2024) emphasized that teachers' proficiency in BSPS directly influences learners' scientific literacy, underscoring the importance of teacher training and instructional design.

Recent meta-analyses also highlight the role of STEM integration in strengthening Basic Science Process Skills. Zhang, Wang, Zeng, & Wang (2025) found that curricula embedding interdisciplinary thematic learning produced high effect sizes in science process skill development, particularly in measuring and predicting—two areas often identified as learners' weakest skills. Moreover, Basic Science Process Skills are increasingly recognized as 21st-century competencies. According to UNESCO (2022), these skills prepare learners to adapt to global challenges by fostering inquiry, innovation, and adaptability. They are not only essential for science education but also for equipping learners with transferable skills applicable across disciplines.

Higher-Order Thinking Skills and Problem-Solving Abilities

Problem-Solving Ability refers to the cognitive process of identifying problems, analyzing situations, generating solutions, and evaluating outcomes. It is recognized as a higher-order thinking skill that integrates knowledge, reasoning, and decision-making. Recent evidence shows that inquiry-based and technology-enhanced approaches foster Problem-Solving Abilities. Urdanivia Alarcon et al. (2023) conducted a systematic review and concluded that inquiry-based teaching consistently develops scientific reasoning and problem-solving skills, particularly when paired with digital platforms and STEM methodologies.

Problem-solving is also emphasized as a key competency for lifelong learning. UNESCO (2022) identified PSA as essential for adaptability in rapidly changing environments, while Lim (2023) highlighted the importance of evaluating solutions to ensure evidence-based decision-making. These perspectives align with the present study, which measures PSA through its four dimensions: identifying, analyzing, generating, and evaluating.

Recent studies further expand the understanding of Problem-Solving Abilities. Blancia (2024) demonstrated that problem-based learning approaches significantly improved learners' ability to generate and evaluate solutions, showing that PSA can be strengthened through authentic tasks. Montenegro & Servañez (2024) emphasized that teachers' proficiency in science process skills directly influences learners' problem-solving capacity, underscoring the importance of teacher training in fostering HOTS.

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International research also highlights the role of STEM integration. Zhang, Wang, Zeng, & Wang (2025) found that curricula embedding interdisciplinary thematic learning produced high effect sizes in problem-solving outcomes, particularly in tasks requiring creativity and critical thinking. This suggests that Problem-Solving Abilities is best developed when learners are exposed to cross-disciplinary challenges that mirror real-world contexts.

Moreover, Problem-Solving Abilities is closely linked to metacognition and self-regulation. Learners who monitor their own thinking processes are more effective in identifying problems and evaluating solutions. Garcia (2022) noted that accurate problem identification is essential for effective solutions, while Darling-Hammond (2021) emphasized that teaching strategies promoting reflection and self-assessment enhance higher-order thinking.

Emerging approaches such as game-based learning and digital simulations also contribute to Problem-Solving Abilities development. These methods provide learners with interactive environments where they can practice decision-making, test hypotheses, and evaluate outcomes in real time. Such innovations highlight the adaptability of Problem-Solving Abilities to modern educational contexts.

Relationship Between Basic Science Process Skills and Problem-Solving Abilities

The relationship between Basic Science Process Skills and Problem-Solving Abilities is widely supported in educational research. Science process skills provide the foundation for problem-solving because they enable learners to gather, analyze, and interpret information. Karamustafaoglu (2021) emphasized that Basic Science Process Skills directly contribute to learners' ability to solve problems, while Santos (2024) explained that each skill—observation, classification, measurement, inference, prediction, and communication—supports specific stages of problem-solving. Recent studies confirm this positive relationship. Duran & Ozdemir (2022) and Kim & Lee (2022) found that learners with higher levels of Basic Science Process Skills performed better in solving scientific problems. More recently, Blancia (2024) demonstrated that problem-based learning approaches significantly improved both Basic Science Process Skills and Problem-Solving Abilities among STEM learners, while Montenegro & Servañez (2024) reported that teachers' proficiency in Basic Science Process Skills directly influenced learners' problem-solving capacity. Zhang, Wang, Zeng, & Wang (2025) further showed that curricula embedding STEM practices and interdisciplinary thematic learning yielded high effect sizes in problem-solving outcomes.

Additional evidence highlights the role of innovative instructional strategies in strengthening this relationship. Abarca, Gonzales, Pawaon, & Solomon (2025) found that game-based learning enhanced learners' ability to apply Basic Science Process Skills in collaborative problem-solving contexts, while Sebastian (2025) demonstrated that self-learning modules allowed students to independently practice Basic Science Process Skills, which in turn improved their capacity to generate and evaluate solutions. These findings suggest that Basic Science Process Skills are not only foundational but also adaptable to modern teaching approaches that foster Problem-Solving Abilities.

Furthermore, international frameworks emphasize the synergy between Basic Science Process Skills and Problem-Solving Abilities. The OECD (2023) reported that students proficient in science process skills perform better in tasks requiring analysis and application, while UNESCO (2022) highlighted that inquiry-based science education develops both scientific literacy and problem-solving competencies. Together, these perspectives reinforce the idea that Basic Science Process Skills and Problem-Solving Abilities are interdependent skills essential for 21st-century learning.

Several factors influence the development of Basic Science Process Skills and Problem-Solving Abilities Learner-related factors such as motivation, prior knowledge, and cognitive ability play an important role in skill development. Teacher-related factors, including teaching strategies and competence, also significantly affect learning outcomes (Darling-Hammond, 2021). Environmental factors such as availability of instructional materials and classroom conditions impact the effectiveness of science instruction. UNESCO (2022) emphasized that resource-rich environments promote active learning and inquiry.

Curriculum implementation is another critical factor. Although the Department of Education (DepEd, 2023) promotes inquiry-based learning through the MATATAG Curriculum, its effectiveness depends on proper implementation.

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Challenges such as reliance on traditional teaching methods, lack of laboratory equipment, and overcrowded classrooms limit learners' opportunities to practice Basic Science Process Skills and Problem-Solving Abilities (Reyes & Cruz, 2022). These barriers highlight the need for targeted interventions, supporting the rationale for the present study.

III. METHODOLOGY

This study employed a quantitative research design, specifically the descriptive-correlational method, to determine the relationship between Basic Science Process Skills and Problem-Solving Abilities of Grade 6 learners in the District of Estancia. The design served as the framework guiding the procedures for data collection, analysis, and interpretation.

The descriptive design was used to present the level of Basic Science Process Skills and Problem-Solving Abilities among the respondents. It involved the collection of numerical data analyzed using statistical tools such as mean, percentage, and standard deviation. This approach is appropriate because it provides a clear picture of the current status of learners' skills without manipulating any variables. It describes how learners perform in terms of observing, classifying, measuring, inferring, predicting, and communicating Basic Science Process Skills, as well as identifying, analyzing, generating, and evaluating solutions Problem-Solving Abilities.

The correlational design was employed to determine the significant relationship between Basic Science Process Skills and Problem-Solving Abilities. This method identifies whether changes in one variable are associated with changes in another. It does not involve experimental manipulation; instead, it examines naturally occurring relationships among Grade 6 learners. As Miksza et al. (2023) explain, correlational research is designed to answer the question "How are things related?" and is particularly useful when variables cannot be manipulated experimentally. Similarly, Johnson (2024) noted that correlational studies in education help identify associations that can guide instructional strategies and interventions. This makes the design suitable for examining how Basic Science Process Skills contribute to the development of Problem-Solving Abilities in elementary learners.

IV. RESULT

Level of Grade 6 Learners' Basic Science Process Skills

The analysis of learners' performance in Basic Science Process Skills revealed varying levels of competence across the six dimensions. The mean and standard deviation provided insights into their strengths and weaknesses. Observing *(M = 2.75; SD = 1.24)*: Learners demonstrated a moderate ability to notice details and record observations. While they can identify features in experiments, precision and consistency remain areas for improvement. Classifying *(M = 2.63; SD = 1.41):* Learners showed a moderate level of skill in grouping objects and ideas. They were able to categorize items but struggled with abstract or complex classifications.

Measuring *(M = 2.10; SD = 1.37)*: This was among the weakest skills, reflecting difficulty in applying units, using instruments correctly, and ensuring accuracy in quantitative tasks. Inferring *(M = 2.67; SD = 1.48)*: Learners displayed a moderate ability to interpret data and connect evidence to conclusions. However, their reasoning often lacked depth and sophistication. Predicting *(M = 2.07; SD = 1.11)*: The weakest skill overall, indicating learners struggled to make accurate forecasts or apply logical reasoning to anticipate outcomes. Communicating *(M = 2.91; SD = 1.62)*: The strongest skill, showing confidence in expressing ideas orally, in writing, or visually. Learners were able to share findings effectively, though clarity and organization could still be enhanced.

As an entire group, learners *(M = 15.13; SD = 5.51)* demonstrated a moderate level of Basic Science Process Skills, indicating fair competence in performing basic scientific processes. Among the six dimensions, communicating emerged as the strongest skill, while predicting was the weakest. This pattern suggests that while learners are confident in expressing ideas, they require more support in developing quantitative reasoning and forecasting abilities.

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Table 2: Level of Basic Science Process Skills of the Learners by Dimension

Dimension	Mean	SD	Verbal Interpretation
Observing	2.75	1.24	Moderate
Classifying	2.63	1.41	Moderate
Measuring	2.10	1.37	Moderate
Inferring	2.67	1.48	Moderate
Predicting	2.07	1.11	Moderate
Communicating	2.91	1.62	Moderate
Overall BSPS Total	15.13	5.51	Moderate

Note Interpretation: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High

Level of Grade 6 Learners' Problem-Solving Abilities

The analysis of learners' performance in Problem-Solving Abilities revealed varying levels of competence across the four dimensions. The mean and standard deviation provided insights into their strengths and weaknesses. Identifying the Problem *(M = 2.78; SD = 1.53)*: This emerged as the strongest dimension, showing that learners were able to recognize and articulate problems clearly. They demonstrated competence in pinpointing issues, though some responses lacked precision in framing complex problems.

Analyzing the Problem *(M = 2.70; SD = 1.65)*: Learners showed a moderate ability to examine situations critically and break down information. While they could identify relationships among variables, the depth of analysis varied, with some learners struggling to connect evidence to broader contexts. Generating Solutions *(M = 2.50; SD = 1.51)*: This was the weakest dimension, reflecting difficulty in proposing diverse or innovative solutions. Learners tended to rely on familiar or straightforward answers, indicating a need for instructional strategies that foster creativity, metacognition, and grit. Evaluating the Solution *(M = 2.67; SD = 1.68)*: Learners demonstrated a moderate ability to assess the appropriateness of solutions. They were able to judge effectiveness based on evidence, but evaluation was often limited to surface-level criteria rather than deeper analysis of long-term outcomes.

As an entire group, learners *(M = 10.65; SD = 5.13)* demonstrated a moderate level of Problem Solving Abilities. Among the four dimensions, identifying the problem was the strongest skill, while generating solutions was the weakest. This pattern suggests that learners are capable of recognizing and analyzing problems but require more support in developing creative and effective solutions.

Table 3: Level of Problem-Solving Abilities of the Learners by Dimension

Dimension	Mean	SD	Verbal Interpretation
Identifying the Problem	2.78	1.53	Moderate
Analyzing the Problem	2.70	1.65	Moderate
Generating Solutions	2.50	1.51	Moderate
Evaluating the Solution	2.67	1.68	Moderate
Overall PSA Total	10.65	5.13	Moderate

Note Interpretation: 1.00–1.80 = Very Low; 1.81–2.60 = Low; 2.61–3.40 = Moderate; 3.41–4.20 = High; 4.21–5.00 = Very High

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Relationship Between Basic Science Process Skills and Problem-Solving Abilities

Pearson product-moment correlation revealed that all Basic Science Process Skills dimensions have a significant positive relationship with Problem-Solving Abilities. Strong Positive: Communicating ($r = 0.71$, $p = .000$), Inferring ($r = 0.57$, $p = .000$). Moderate Positive: Classifying ($r = 0.47$, $p = .000$), Observing ($r = 0.44$, $p = .000$). Low to Moderate Positive: Measuring ($r = 0.33$, $p = .000$). Low Positive: Predicting ($r = 0.29$, $p = .000$)

This indicates that higher Basic Science Process Skills levels are associated with higher Problem-Solving Abilities levels, with communicating as the strongest contributor. This finding supports **Fajardo (2023)**, who emphasized the gradual development of science process skills through structured practice, and **Mediana, Funa, & Dio (2025)**, who noted that inquiry-based learning significantly enhances problem-solving by strengthening scientific inquiry skills.

Table 4: Correlation Between Basic Science Process Skills (BSPS) and Problem-Solving Abilities (PSA)

BSPS Dimension	Pearson r	Sig. (2-tailed)	Interpretation
Observing	0.44	.000	Moderate Positive, Significant
Classifying	0.47	.000	Moderate Positive, Significant
Measuring	0.33	.000	Low to Moderate Positive, Significant
Inferring	0.57	.000	Strong Positive, Significant
Predicting	0.29	.000	Low Positive, Significant
Communicating	0.71	.000	Strong Positive, Significant
Overall	—	—	Significant Relationship

Note: Correlation is significant at the 0.01 level (2-tailed)

Abilities Prediction of Basic Science Process Skills and Problem-Solving

The regression model has a strong correlation ($R = .80$) between Basic Science Process Skills and Problem-Solving Abilities. The R Square value of .64 indicates that 64% of the variance in Problem-Solving Abilities is explained by the combined Basic Science Process Skills dimensions. The adjusted R Square (.63) confirms the stability of the model, while the standard error (3.12) suggests moderate prediction accuracy.

Table 5: Model Summary of Regression Predicting Problem-Solving Abilities from Basic Science Process Skills

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.80a	.64	.63	3.12

Note: Predictors: (Constant), Communicating, Predicting, Measuring, Observing, Classifying, Inferring

In Table 6 the ANOVA results, confirms that the regression model is statistically significant ($F(6,343) = 100.17$, $p < .001$). This indicates that the set of Basic Science Process Skills dimensions, when taken together, significantly predicts Problem-Solving Abilities. The large F-value demonstrates that the explained variance is much greater than the unexplained variance, validating the strength of the regression model.

Table 6: ANOVA Results of Regression Predicting Problem-Solving Abilities from Basic Science Process Skills

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	5858.48	6	976.41	100.17	.00b
Residual	3343.59	343	9.75		
Total	9202.07	349			

Note: Dependent Variable: Problem-Solving Abilities Overall Total. b. Predictors: (Constant), Communicating, Predicting, Measuring, Observing, Classifying, Inferring

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The regression coefficients for each Basic Science Process Skills and Pr dimension. Among the predictors, Communicating (β = .53, p < .001) is the strongest and most significant contributor to PSA, followed by Inferring (β = .19, p < .001), Classifying (β = .18, p < .001), and Observing (β = .13, p < .001). These skills highlight the importance of communication, reasoning, and organization in problem-solving. On the other hand, Measuring (β = .04, p = .30) and Predicting (β = -.03, p = .46) were not significant predictors, suggesting that while they are important in science learning, they play a supporting rather than direct role in Problem-Solving Abilities.

This finding aligns with Wibowo, Wangid, & Firdaus (2025), who emphasized communication and collaborative scaffolding in problem-solving, and Triani, Putri, & Nugroho (2024), who highlighted metacognitive skills in generating and evaluating solutions.

Table 7: Regression Coefficients of Basic Science Process Skills Predicting Problem-Solving Abilities

Predictor	B	Std. Error	Beta	t	Sig.
Constant	0.70	0.50	—	1.39	.17
Observing	0.54	0.15	0.13	3.53	.00
Classifying	0.66	0.14	0.18	4.58	.00
Measuring	0.14	0.14	0.04	1.04	.30
Inferring	0.67	0.15	0.19	4.57	.00
Predicting	-0.13	0.17	-0.03	-0.75	.46
Communicating	1.69	0.12	0.53	14.34	.00

Note: Dependent Variable: Problem-Solving Abilities Overall Total

Proposed Outputs to Address Identified Gaps

Science Process Skills Enhancement Program: Strengthening Problem-Solving Abilities of Grade 6 Learners

The development of the Science Process Skills Enhancement Program was guided by the results of the study, which revealed that learners demonstrated moderate performance across all dimensions of the Basic Science Process Skills (BSPS) — namely Observing, Classifying, Measuring, Inferring, Predicting, and Communicating. While these results indicate that learners possess foundational skills, the moderate level suggests that their abilities are not yet fully developed to meet the demands of higher-order scientific inquiry and problem-solving.

The rationale for creating this output lies in the need to transform moderate competencies into strong and consistent mastery. By providing structured, activity-based lesson exemplars, the program ensures that learners can practice and refine each skill in meaningful contexts. This approach not only addresses the moderate results but also builds upon the high results observed in certain dimensions, ensuring that learners who already excel are further challenged and guided toward advanced application of science process skills.

From a theoretical standpoint, the program is anchored in constructivist and inquiry-based learning frameworks, which emphasize active engagement, hands-on exploration, and reasoning. These approaches are particularly effective in moving learners from moderate to high levels of competence, as they encourage deeper understanding and application rather than surface-level performance.

From a practical standpoint, the program provides teachers with ready-to-use lesson plans that integrate Basic Science Process Skills with Problem-Solving Abilities (PSA) — identifying, analyzing, generating, and evaluating. This integration ensures that learners not only strengthen their science process skills but also apply them to real-world problems, thereby enhancing both academic achievement and life skills.

Ultimately, the rationale for this output is to bridge the gap between moderate performance and mastery, while simultaneously enhancing the high results to sustain excellence. The SPSEP serves as a research-based intervention that empowers Grade 6 learners to become more competent, critical, and creative thinkers, capable of applying science process skills effectively in both academic and everyday contexts.

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Lesson Plan for Each Dimension of the Basic Science Process Skills, With Integration of the Problem-Solving Abilities

Semi-Detailed Lesson Plan (Observing)

Subject: Science

Grade Level: Grade 6

School Year: 2026–2027

Topic: Observing in Science Process Skills

Duration: 1 hour

I. Objectives

Learners will use their senses to gather qualitative and quantitative data.

Learners will record observations accurately in worksheets.

Learners will apply Problem-Solving Abilities by identifying problems from observations and analyzing possible causes.

II. Subject Matter

Concepts: Observation as the first step in scientific inquiry.

Materials: Plant samples (healthy vs. wilted), magnifying glass, ruler, thermometer, observation sheets.

References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction

Engage learners with a real-life scenario.

Show two plants: one healthy, one wilted

Ask: *What differences do you notice?*

Connect to everyday observations

B. Observation Activity

Learners gather data using senses and tools.

Observe plant samples (color, texture, height)

Use ruler and thermometer for quantitative data

Record findings in worksheets

C. Analysis

Learners interpret observations to identify problems.

Discuss differences between plants

Identify possible causes (lack of water, sunlight)

Problem-Solving Abilities focus: *Identifying problems* and *Analyzing causes*

D. Generalization

Teacher emphasizes importance of observation.

Highlight observation as foundation of science

Learners share how observation helps in daily life

E. Application

Learners propose solutions based on observations.

Suggest watering or sunlight exposure

Relate to community practices (gardening, farming)

IV. EVALUATION

Observation sheet (accuracy and completeness).

Oral sharing of identified problems and possible causes.

Reflection question: *"How did observation help you identify the problem?"*

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V. Assignment

Home activity: Observe a household plant or pet for one week. Record daily changes and suggest possible reasons.

VI. Expected Outcomes

Learners demonstrate accurate observation skills.

Learners apply Problem-Solving Abilities by identifying and analyzing problems based on observations.

Semi-Detailed Lesson Plan (Classifying)

Subject: Science

Grade Level: Grade 6

School Year: 2026–2027

Topic: Classifying in Science Process Skills

Duration: 1 hour

I. Objectives

Learners will group objects based on observable properties.

Learners will analyze similarities and differences to form categories.

Learners will apply Problem-Solving Abilities by analyzing problems and generating solutions through classification.

II. Subject Matter

Concepts: Classification as a tool for organizing information.

Materials: Assorted recyclable materials (plastic bottles, paper, cans), charts, markers.

References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction (10 minutes)

Motivation: Show a mixed pile of recyclable materials. Ask: *"How can we make sense of this pile?"*

Link to prior knowledge: Learners recall how they sort items at home (clothes, toys, food).

B. Activity (20 minutes)

Learners sort materials into categories (plastic, paper, metal).

Record classifications in group charts.

Discuss criteria used (color, texture, material type).

C. Analysis (15 minutes)

Learners explain why classification is important in science.

Problem-Solving Abilities Integration:

Analyzing problems (waste management).

Generating solutions (proper segregation for recycling).

D. Generalization (10 minutes)

Teacher emphasizes that classification helps organize data and solve real-world problems.

Learners connect classification to everyday life (e.g., grouping food into healthy vs. unhealthy).

E. Application (5 minutes)

Learners propose how proper classification of waste can help their community.

IV. Evaluation

Group chart (accuracy of classification).

Oral explanation of criteria used.

Reflection question: *"How does classification help in solving problems?"*

V. Assignment

Home activity: Classify household waste into biodegradable and non-biodegradable.

Write a short reflection on how classification helps in environmental care.

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VI. Expected Outcomes

Learners demonstrate accurate classification skills.

Learners apply PSA by analyzing problems and generating solutions through classification.

Semi-Detailed Lesson Plan (Measuring)

Subject: Science

Grade Level: Grade 6

School Year: 2026–2027

Topic: Measuring in Science Process Skills

Duration: 1 hour

I. Objectives

Learners will use standard units (length, volume, temperature) to measure objects and materials.

Learners will record measurements accurately using appropriate tools.

Learners will apply Problem-Solving Abilities by generating solutions based on quantitative data.

II. Subject Matter

Concepts: Measurement as a tool for precision in science.

Materials: Rulers, thermometers, measuring cups, balances, water samples.

References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction (10 minutes)

Motivation: Show two glasses of water, one full and one half-full. Ask: *"How can we describe the difference more precisely?"*

Link to prior knowledge: Learners recall how they measure ingredients in cooking.

B. Activity (20 minutes)

Learners measure the volume of water in cups.

Measure temperature using thermometers.

Record results in worksheets.

Compare measurements across groups.

C. Analysis (15 minutes)

Learners discuss why accurate measurement is important in science.

Problem-Solving Abilities Integration:

Generating solutions (e.g., determining how much water plants need).

Evaluating results (checking consistency of measurements).

D. Generalization (10 minutes)

Teacher emphasizes that measurement ensures accuracy and reliability in problem-solving.

Learners connect measurement to everyday life (e.g., medicine dosage, cooking).

E. Application (5 minutes)

Learners propose how accurate measurement can help in solving community problems (e.g., water conservation).

IV. Evaluation

Worksheet accuracy (units and values).

Oral explanation of why measurement matters.

Reflection question: *"How does measurement help in solving problems?"*

V. Assignment

Home activity: Measure the amount of water used in daily activities (drinking, washing). Record and reflect on conservation.

VI. Expected Outcomes

Learners demonstrate accurate measurement skills.

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Learners apply Problem-Solving Abilities by generating and evaluating solutions based on quantitative data.

Semi-Detailed Lesson Plan (Inferring)

Subject: Science

Grade Level: Grade 6

School Year: 2026–2027

Topic: Inferring in Science Process Skills

Duration: 1 hour

I. Objectives

Learners will draw logical conclusions from observed data.

Learners will distinguish between direct observation and inference.

Learners will apply Problem-Solving Abilities (PSA) by analyzing problems and generating explanations based on evidence.

II. Subject Matter

Concepts: Inferring as reasoning beyond direct observation.

Materials: Plant samples (grown in sunlight vs. shade), charts, magnifying glass, worksheets.

References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction (10 minutes)

Motivation: Show two plants — one tall and green, one short and pale. Ask: *"What do you see? What do you think caused the difference?"*

Link to prior knowledge: Learners recall how they guess causes of everyday events (e.g., why food spoils).

B. Activity (20 minutes)

Learners observe plant samples and record differences.

Teacher guides learners to separate observations (e.g., "Plant A is taller") from inferences (e.g., "Plant A received more sunlight").

Groups write at least three inferences based on their observations.

C. Analysis (15 minutes)

Learners discuss how inferences help explain scientific phenomena.

Problem-Solving Abilities Integration:

Analyzing problems (why one plant is healthier).

Generating solutions (placing plants in proper sunlight).

D. Generalization (10 minutes)

Teacher emphasizes that inference is reasoning based on evidence, not guesswork.

Learners share examples of inference in daily life (e.g., inferring rain from dark clouds).

E. Application (5 minutes)

Learners propose how inference can help solve community problems (e.g., inferring pollution sources from water quality).

IV. Evaluation

Worksheet separating observations and inferences.

Oral sharing of logical explanations.

Reflection question: *"How does inference help in solving problems?"*

V. Assignment

Home activity: Observe a pet or plant, record observations, and write at least two inferences about its condition.

VI. Expected Outcomes

Learners demonstrate the ability to infer logically from data.

Learners apply Problem-Solving Abilities by analyzing problems and generating evidence-based solutions.

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Semi-Detailed Lesson Plan (Predicting)
Subject: Science
Grade Level: Grade 6
School Year: 2026–2027
Topic: Predicting in Science Process Skills
Duration: 1 hour

I. Objectives

Learners will forecast outcomes based on prior knowledge and evidence.
Learners will compare predictions with actual results.
Learners will apply Problem-Solving Abilities (PSA) by evaluating solutions through prediction and testing.

II. Subject Matter

Concepts: Prediction as a scientific skill for anticipating outcomes.
Materials: Water samples, filter paper, kettle, thermometer, worksheets.
References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction (10 minutes)

Motivation: Show a glass of dirty water. Ask: *"What do you think will happen if we boil this water? What if we filter it?"*
Link to prior knowledge: Learners recall how they predict weather by looking at clouds.

B. Activity (20 minutes)

Learners predict outcomes of boiling vs. filtering water.
Conduct the experiment in groups.
Record predictions and actual results in worksheets.

C. Analysis (15 minutes)

Learners compare predictions with outcomes.
Problem-Solving Abilities Integration:
Evaluating solutions (which method is more effective).
Analyzing problems (sources of contamination).

D. Generalization (10 minutes)

Teacher emphasizes that prediction is evidence-based, not guesswork.
Learners share other situations where prediction is useful (e.g., predicting plant growth, weather changes).

E. Application (5 minutes)

Learners propose how prediction can help in community problem-solving (e.g., predicting flood risks).

IV. Evaluation

Worksheet comparing predictions and outcomes.
Oral sharing of evaluation of solutions.
Reflection question: *"How did prediction help you evaluate the problem?"*

V. Assignment

Home activity: Predict what will happen if food is left outside overnight. Record observations and compare with prediction.

VI. Expected Outcomes

Learners demonstrate prediction skills based on evidence.
Learners apply Problem-Solving Abilities by evaluating solutions and analyzing problems through prediction.

Semi-Detailed Lesson Plan (Communicating)
Subject: Science
Grade Level: Grade 6

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School Year: 2026–2027
Topic: Communicating in Science Process Skills
Duration: 1 hour

I. Objectives

Learners will present scientific findings clearly through oral, written, and visual formats.
Learners will demonstrate teamwork and collaboration in communicating results.
Learners will apply Problem-Solving Abilities (PSA) by generating and evaluating solutions through effective communication.

II. Subject Matter

Concepts: Communication as a tool for sharing and validating scientific ideas.
Materials: Poster paper, markers, charts, experiment results, projector/slides (optional).
References: Philippine K-12 Science Curriculum Guide.

III. Procedure

A. Introduction (10 minutes)

Motivation: Show two science reports — one clear and organized, one messy and incomplete. Ask: *"Which report is easier to understand? Why?"*
Link to prior knowledge: Learners recall how they explain ideas to classmates or family.

B. Activity (20 minutes)

Learners conduct a simple experiment (e.g., testing water cleanliness).
Groups prepare posters or slides summarizing their findings.
Each group presents results to the class.

C. Analysis (15 minutes)

Learners discuss strengths and weaknesses of each group's communication.
Problem-Solving Abilities Integration:
Generating solutions (sharing findings).
Evaluating solutions (critiquing clarity and accuracy).

D. Generalization (10 minutes)

Teacher emphasizes that communication ensures scientific ideas are understood and validated.
Learners connect communication to real-world contexts (e.g., disaster warnings, health campaigns).

E. Application (5 minutes)

Learners propose how effective communication can help solve community problems (e.g., promoting recycling, water conservation).

IV. Evaluation

Rubric assessing clarity, accuracy, creativity, and teamwork in presentations.
Reflection question: *"How does communication help in solving problems?"*

V. Assignment

Home activity: Interview a family member about a household problem (e.g., waste disposal). Write a short report and suggest solutions.

VI. Expected Outcomes

Learners demonstrate effective communication of scientific ideas.
Learners apply Problem-Solving Abilities by generating and evaluating solutions through clear communication.

V. DISCUSSION

This descriptive study determined the **Basic Science Process Skills Problem-Solving Abilities** of Grade 6 learners in selected public elementary schools within the Estancia District.
Specifically, it answered the following questions:

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1. What is the level of Grade 6 learner's **Basic Science Process Skills** in terms of observing, classifying, measuring, inferring, predicting, and communicating?
2. What is the level of Grade 6 learner's **Problem-Solving Abilities** in terms of identifying the problem, analyzing the problem, generating solutions and evaluating the solutions?
3. Is there a significant relationship between Grade 6 learner's basic science process skills and their problem solving abilities?
4. Which dimension of basic science process skills significantly influences or predicts the problem-solving abilities of Grade 6 learners?
5. What output can be proposed based on the results of the study?

The respondents of this study were three hundred fifty (350) Grade 6 learners enrolled at District of Estancia for the school year 2025-2026. The respondents were selected using proportionate stratified sampling.

The study revealed that Grade 6 learners demonstrated a moderate level of competence across all six **Basic Science Process Skills** dimensions.

Observing – Learners can notice and record details but need improvement in precision and consistency. Classifying – Learners can group objects based on properties, though abstract classifications remain challenging. Measuring – Learners struggle with accuracy and consistency in using scientific tools, making this one of the weakest skills.

Inferring – Learners can interpret data and connect evidence to conclusions, but reasoning often lacks depth. Predicting – Learners find it difficult to anticipate outcomes logically, making this the weakest skill overall. Communicating – Learners are confident in expressing ideas, making this the strongest skill, though clarity and organization can still be improved.

The study found that learners also demonstrated a moderate level of competence across PSA dimensions.

Identifying Problems – Learners can recognize and articulate problems clearly, making this the strongest **Problem-Solving Abilities** dimension.

Analyzing Problems – Learners can examine situations critically, but depth of analysis varies. Generating Solutions – Learners struggle to propose diverse or innovative solutions, making this the weakest **Problem-Solving Abilities** dimension. Evaluating Solutions – Learners can assess the appropriateness of solutions, but evaluation tends to be surface-level.

The findings indicated a **positive and significant relationship** between **Basic Science Process Skills Problem-Solving Abilities**. Learners who performed better in science process skills also tended to demonstrate stronger problem-solving abilities. This suggests that BSPS serve as foundational competencies that directly support and enhance **Problem-Solving Abilities**.

Among the **Basic Science Process Skills** dimensions, **measuring** and **predicting** were found to have the most significant influence on **Problem-Solving Abilities**. Learners who improved in these skills showed greater ability to generate and evaluate solutions. This highlights the importance of strengthening these weaker skills to enhance overall problem-solving competence.

The results emphasize the need for teachers and curriculum developers to design learning activities that strengthen weaker skills while reinforcing the stronger ones, thereby fostering holistic scientific thinking and effective problem-solving among learners. Lastly, Specific action plan has been proposed based on the findings of this study.

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