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Instructional Utility of Student Intervention Sheets (SIS) and Academic Performance of Grade 9 Students in Science

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ABSTRACT

Science is a discipline that demands higher-order thinking, conceptual understanding, and the ability to apply learned principles to real-world situations. As students progress to higher grade levels, they encounter increasingly abstract scientific concepts that often lead to learning gaps. This makes instructional support tools crucial in fostering understanding, strengthening retention, and improving student performance. This study investigated the instructional utility of Student Intervention Sheets (SIS) and their impact on the academic performance of Grade 9 students in science at a public secondary school in the Philippines. Utilizing a quasi-experimental one-group pretest–posttest design, the research involved Grade 9 learners during the 2025–2026 academic year. The SIS was evaluated across four dimensions: content relevance, instructional design, student engagement, and assessment mechanisms. Data gathered through a validated five-point Likert scale revealed that students perceived the SIS as highly acceptable across all evaluated dimensions. Analysis of academic performance showed a marked improvement after the implementation of the intervention. Statistical testing confirmed that the difference between the initial and final performance was significant. The findings suggest that the integration of scaffolded, contextualized, and learner-centered intervention materials effectively bridges learning gaps and promotes the mastery of complex scientific competencies. The study concludes that the SIS is a statistically significant driver of academic improvement, offering a scalable strategy for enhancing Science education in resource-constrained environments. Recommendations include the institutionalization of SIS development for least-mastered competencies and further research into digital-interactive versions of these intervention tools.

Keywords: Science Education, Student Intervention Sheets, Academic Performance, Quasi-Experimental, Scaffolding, Instructional Utility, Grade 9 Science



INTRODUCTION

Background of Study

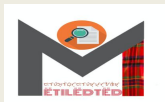
Science is a discipline that demands higher-order thinking, conceptual understanding, and the ability to apply learned principles to real world situations. As students progress to higher grade levels, they encounter increasingly abstract scientific concepts that often lead to learning gaps. This makes instructional support tools crucial in fostering understanding, strengthening retention, and improving student performance. One such tool is the Student Intervention Sheet (SIS), a structured material designed to provide guided tasks, reinforcement activities, and opportunities for independent practice.

International research has supported the efficacy of intervention-based learning resources. Tan and Lee (2021) discovered that structured learning sheets enhanced secondary students' scientific achievement and inquisitive skills in Singapore. According to Hattie and Zierer (2021), focused interventions combined with regular feedback have a significant positive impact on student performance in the US. In a similar vein, Rahman and Osman (2022) found that intervention modules improved student enthusiasm and comprehension in physics and chemistry in Malaysian classrooms. These results demonstrate that structured intervention tools promote better performance, especially in topics with a lot of material, like science.

Recent local research in the Philippine context supports these findings. Remedial worksheets improved junior high pupils' performance in Earth Science, especially among underachievers, according to Reyes (2021). According to Santos and Villanueva's (2022) classroom action research, learning activity sheets improved the General Science assessment scores of students. According to De Guzman (2023), junior high students' competency growth was influenced by varied instructional techniques that enabled modular learning. According to these studies, intervention materials are crucial for meeting a variety of learning requirements in the K–12 system.

The Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, are also related to this study. To improve learning outcomes globally, UNESCO (2023) emphasizes the significance of equitable, student-centered instruction and creative teaching techniques. This study supports worldwide agendas that support inclusive, efficient, and transformative learning systems by investigating how SIS can improve Grade 9 Science performance.

The effectiveness of Student Intervention Sheets in raising Grade 9 Science achievement in Philippine schools has not received much attention, despite the rising body of research on instructional resources. Few studies concentrate on SIS as a specific tactic for improving junior high students' science comprehension, motivation, and performance, even though many evaluate modules and intervention materials in general. The effectiveness of SIS in addressing the learning issues faced by Grade 9 pupils is unclear due to the lack of concentrated empirical evidence. By investigating the function of SIS in enhancing academic achievement, this study aimed to close that gap by providing insights for innovative education and learner assistance.



Research Questions

This study aimed to determine the effect of the Student Intervention Sheet (SIS) on Academic Performance in Science of Grade 9 learners from Kapaya National High School, Kapaya, Bagumbayan, Sultan Kudarat, for the school year 2025-2026.

Specifically, this sought to answer the following questions:

1. What is the level of instructional utility of the Student Intervention Sheet (SIS) as perceived by the Grade 9 students in terms of:
 - 1.1 Content Relevance and Alignment
 - 1.2 Instructional Design
 - 1.3 Student Engagement and Learning Support
 - 1.4 Assessment and Feedback Mechanism
2. What is the level of academic performance in Science of Grade 9 learners, as reflected in their:
 - 2.1 Pre-Tests
 - 2.2 Post-tests
3. Is there a significant difference between the pre-tests and post-tests academic performance of Grade 9 students in science following the implementation of the Student Intervention Sheet (SIS)?

METHODOLOGY

Research Design

This study utilized a quasi-experimental one-group pretest-posttest design to evaluate the instructional utility of the Student Intervention Sheet (SIS) and its impact on the academic performance of Grade 9 students in science. This design is specifically chosen to measure the growth in student achievement by comparing baseline data with post-intervention results within a single group.

In relation to Problem 1 (Instructional Utility): A descriptive research approach is employed. A researcher-made survey questionnaire, validated by experts, was administered to the students after the intervention period. This instrument measured students' perceptions across four domains: content relevance, instructional design, learner engagement, and feedback mechanisms.

With respect to Problem 2 (Academic Performance): A quantitative approach is used through the administration of pre-tests and post-tests. The pre-test established the students' baseline knowledge of Fourth Quarter Science competencies before the introduction of the SIS.

The post-test, administered after the intervention phase, measured the level of mastery achieved.

Aligned with Problem 3 (Significant Difference): To determine if the intervention resulted in statistically significant gains, a Paired-Samples T-test was utilized. This statistical tool



is appropriate for comparing the means of two measurements (pre and post) taken from the same individual participants.

The one-group pretest-posttest design is deemed most appropriate for this study as it allowed for a focused assessment of the SIS within the natural classroom setting of Kapaya National High School, where the random assignment of students to a control group is not administratively feasible.

Respondents of the Study

The respondents of this study were the Grade 9 students enrolled in Science at Kapaya National High School during the academic year 2025–2026. A total of 31 students participated in the study, representing the entire class in which the Student Intervention Sheet (SIS) was implemented.

The selection of respondents was based on availability and accessibility, consistent with the use of a one-group pretest-posttest design in a natural classroom setting. Specifically, total population sampling was employed, wherein all members of the identified group were included in the study due to the limited number of students. This approach is appropriate when the population size is small and manageable, as it allowed the researcher to gather complete data from the entire group without the need for sampling procedures, thereby increasing the accuracy and representativeness of the findings within the class context.

All students received the intervention, ensuring that the results reflect the effect of the SIS on the group as a whole. The respondents included both male and female learners with varying levels of prior knowledge, motivation, and academic performance in science. No students were excluded, as the study aimed to evaluate the effectiveness of the SIS across the full range of abilities present in the classroom.

Ethical considerations were strictly observed in the selection and involvement of respondents. Parental consent and student assent were obtained prior to participation, ensuring that involvement was voluntary. The respondents were also assured that their identities and academic performance data would be treated with confidentiality and used solely for research purposes.

By involving the entire Grade 9 class through total population sampling, the study provided a comprehensive and realistic view of the instructional utility of the SIS and its impact on student performance, while accounting for the natural diversity of learners in a typical classroom setting. Although the sample size is relatively small, it is considered acceptable and appropriate given that it represented the complete population of interest in the study.

Sampling Technique

This study employed total population sampling, a type of purposive non-probability sampling, in which all members of the accessible population were included as respondents. Since



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the study involved a single class of 31 Grade 9 students at Kapaya National High School, every student enrolled in the class was considered a participant.

Total population sampling was deemed appropriate for this research because the study utilized a one-group pretest-posttest quasi-experimental design, where the effectiveness of the Student Intervention Sheet (SIS) was measured across the entire group receiving the intervention. This approach ensured that variations in prior knowledge, motivation, and learning abilities among students are accounted for, providing a more comprehensive understanding of the SIS's instructional utility and impact on academic performance.

The use of this sampling technique also eliminated selection bias associated with partial sampling and maximizes the representativeness of the findings for the particular classroom context. All students who participated had parental consent and provided assent, ensuring ethical compliance in the sampling process.

Research Instruments

The primary instruments used in this study were the Student Intervention Sheet (SIS), a researcher-developed questionnaire, and pre-test and post-test assessments, which were designed to measure the effectiveness of the intervention in improving Grade 9 students' academic performance in science.

The Student Intervention Sheet (SIS) served as the main instructional material for the study. It was designed to provide structured guidance, simplified explanations, guided activities, and practice exercises aligned with the learning competencies specified in the Philippine K–12 Science curriculum. The SIS incorporated scaffolded exercises, contextualized examples, and mastery-oriented tasks to support learners in understanding complex scientific concepts such as force, motion, energy, and momentum. Its design was grounded in educational principles of scaffolding, guided learning, and mastery-based instruction, ensuring both instructional utility and practical applicability.

To evaluate the instructional utility of the SIS in relation to content relevance and alignment, instructional design, student engagement and learning support, and assessment and feedback mechanism, a researcher-developed questionnaire was administered. The instrument utilized a Five-Point Likert Scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), to measure the extent of students' perceptions across the specified dimensions. Prior to its administration to the actual respondents, the questionnaire was pilot tested among 30 students from another section to ensure its clarity, reliability, and validity.

Data Gathering Procedure

The collection of data for this study followed a systematic and step-by-step process to ensure accuracy, consistency, and ethical compliance. The procedure was implemented as follows:



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The researcher first obtained the necessary permissions from the Schools Division Superintendent and the School Principal of and the relevant authorities to conduct the study. Parental consent and student assent were secured to ensure voluntary participation and adherence to ethical standards in research.

Before implementing the Student Intervention Sheet (SIS), the pre-test was administered to all participating Grade 9 students. The pre-test assessed baseline knowledge and mastery of the targeted science competencies. Students were given clear instructions and sufficient time to complete the test, ensuring an accurate measurement of prior learning.

Implementation of the Student Intervention Sheet (SIS)
Following the pre-test, the SIS was implemented during regular Science class sessions. The intervention included guided activities, simplified explanations, contextualized examples, and practice exercises aligned with the K–12 Science curriculum.

The researcher and/or Science teacher ensured consistent delivery and monitored student engagement throughout the implementation period.

After completing the SIS intervention, the post-test was administered to the same group of students. The post-test assessed learning gains and mastery of the competencies targeted by the SIS. Instructions and testing conditions mirrored those of the pre-test to maintain consistency.

Pre-test and post-test responses were scored according to a pre-determined rubric, with mastery set at 75% or higher. Scores were carefully recorded for each student to track individual and group performance. Observations on student engagement and the SIS were also documented.

Collected data were analyzed using descriptive statistics (mean, percentage, and standard deviation) to summarize pre-test and post-test performance. To determine whether the SIS intervention had a significant effect on student learning, the paired-samples t-test was employed, comparing pre-test and post-test scores. The analysis provided evidence of learning gains and the effectiveness of the SIS as an instructional intervention.

Throughout the data-gathering process, the confidentiality of student responses was maintained. All data were used solely for research purposes, and individual scores were anonymized to protect participants' identities.

Data Analysis

Data organized, tabulated, analyzed, and interpreted in accordance with the objectives of the study. To address the stated research problems, the following statistical tools was utilized:

First, Mean and Standard Deviation were used to compute and describe the respondents' level of performance in science before and after the use of the Student Intervention Sheet (SIS). The mean indicated the overall level of mastery of the targeted science competencies; the



standard deviation reflected the variability of scores among the Grade 9 learners, showing how consistent or dispersed their performance is.

Second, the paired-samples t-test (dependent t-test) was employed to determine whether there is a significant difference between the pre-test and post-test scores. This test helped determine whether the Student Intervention Sheet (SIS) has significantly improved the students' academic in science.

Finally, all hypotheses of the study were tested at the 0.05 level of significance. This ensured that the findings are statistically sound, reliable, and not due to chance, allowing the researcher to draw valid conclusions regarding the effectiveness of SIS as an instructional intervention.

Scope and Limitations

This study focused on determining how the Instructional Utility of Intervention Sheet (SIS) influenced the academic performance of Grade 9 students in science. It was conducted at Kapaya National High School for the School Year 2025–2026. The study examined the extent to which the instructional utility of SIS, covering content relevance and alignment, instructional design, student engagement and learning support, and assessment and feedback mechanism was associated with students' academic achievement in science.

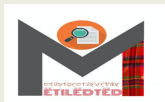
It aimed to investigate whether learners who utilized SIS as effective and beneficial to achieve higher academic performance as reflected in their pre-test and post-test. The research involved both students and science teachers, with Grade 9 learners as the primary participants, as they had been identified as the target group for this study.

The study was delimited to Kapaya National High School and focused only on the relationship between the Instructional Utility of Student Intervention Sheets (SIS) and Grade 9 students' science performance during the fourth quarter of the school year 2025–2026. It does not include other grade levels, subjects, or schools outside the identified research sites.

Furthermore, this study aimed to provide evidence that maximizing the SIS effectiveness can improve performance in content-heavy subjects such as Science. The measurement of academic performance is based solely on pre-tests and post-tests results and teacher's records of written and performance in science. The study does not consider external variables such as socio-economic status, learning environment, parental involvement, or technological access that might also influence student outcomes, as these are beyond the scope of the investigation.

RESULTS AND DISCUSSIONS

The use of intervention materials such as the Student Intervention Sheet (SIS) in Science education has gained increasing attention due to its potential to enhance students' understanding, improve academic performance, and address least mastered competencies. Instructional materials



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that are structured, contextualized, and learner-centered are essential in helping students navigate complex concepts, particularly in subjects like Physics. This study employed a quantitative research design to evaluate the instructional utility of the SIS and its impact on the academic performance of Grade 9 students in Science at Kapaya National High School. The study involved Grade 9 learners who were selected as respondents, and data were gathered using a researcher-developed questionnaire and validated pre-test and post-test assessments. Statistical tools such as weighted mean, standard deviation, and t-test were used to analyze the data. Ethical considerations were strictly observed throughout the conduct of the study.

Based on the results, the Student Intervention Sheet (SIS) was perceived by students as highly acceptable across all dimensions, namely content relevance and alignment, instructional design, student engagement and learning support, and assessment and feedback mechanisms. Among these, the assessment and feedback mechanism obtained the highest recognition from students, indicating that learners highly valued immediate feedback, guided corrections, and opportunities for self-assessment embedded in the SIS. This finding aligns with the principle that timely and specific feedback is a critical factor in improving student learning outcomes, as it helps learners identify misconceptions and adjust their understanding in real time (Hattie & Timperley, 2020). Similarly, Nicol and Macfarlane - Dick (2021) emphasize that formative feedback strengthens self-regulated learning by allowing students to close the gap between current and desired performance. These results highlight the importance of structured instructional materials that are not only aligned with curriculum standards but also responsive to learners' needs, particularly in Science education where conceptual complexity often leads to learning difficulties.

Further, the study revealed that students initially demonstrated low academic performance, indicating gaps in their understanding of essential Science concepts. However, after the implementation of the SIS, a notable improvement in academic performance was observed, with learners progressing from lower performance levels to higher achievement categories. This substantial improvement suggests that the SIS functioned effectively as both a remedial and instructional support tool. According to Richard E. Mayer (2021), well-structured instructional materials that reduce cognitive overload and provide clear guidance significantly enhance learners' ability to process and retain information. In addition, Sweller et al. (2020) explain that scaffolded learning materials support working memory by breaking down complex information into manageable steps, thereby improving comprehension and mastery. In Science education, intervention-based instructional tools have been widely recognized for addressing learning gaps and supporting struggling learners, particularly in content areas that require conceptual and procedural understanding (OECD, 2023).

Moreover, the findings confirmed a statistically significant improvement in students' academic performance following the use of the SIS, leading to the rejection of the null hypothesis. This indicates that the observed improvement is not due to chance but is strongly associated with the intervention. The structured and step-by-step design of the SIS provided learners with guided learning experiences that promoted understanding, confidence, and skill development. According to Zimmerman (2020), structured instructional support enhances self-regulated learning by enabling students to set goals, monitor progress, and evaluate their own understanding. Likewise,



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Hattie (2021) identifies scaffolding and explicit instruction as high-impact teaching strategies that significantly improve student achievement. These findings suggest that the SIS served as an effective pedagogical tool that supported learners in gradually mastering difficult Science competencies.

Finally, the results underscore the value of structured and learner-centered intervention materials in Science education. The SIS not only improved academic performance but also enhanced learner engagement, independence, and self-regulated learning behaviors. Recent research shows that learner-centered instructional tools foster autonomy and motivation by allowing students to actively participate in the learning process rather than passively receive information (Ryan & Deci, 2020). Furthermore, Tomlinson (2020) emphasizes that differentiated and structured instructional materials are essential in addressing diverse learner needs and promoting equity in classroom instruction. The findings of this study suggest that integrating similar intervention tools into Science instruction can help bridge learning gaps, strengthen mastery of competencies, and create a more supportive and effective learning environment for students.

Conclusion

Based on the findings of the study, the following conclusions are drawn:

The SIS is a Validated Instructional Tool: The exceptionally high perception scores prove that the SIS is a pedagogically sound instrument that meets the specific psychological and academic needs of Grade 9 learners.

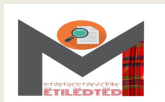
The SIS Effectively Bridges Learning Gaps: The transition of all students out of the "Poor" performance range proves that the SIS is an effective remedial tool for "at-risk" learners or those struggling with abstract Science concepts.

Scaffolding is Key to Mastery: The significant increase in test scores confirms that breaking down complex competencies into guided, step-by-step activities (scaffolding) is more effective than traditional lecture-based methods for this specific student population.

Recommendations

In the light of the findings, the following were recommended:

1. For Science Teachers: Integrate Student Intervention Sheets (SIS) or similar structured materials into daily Science instruction, particularly for "Least Mastered Competencies" (LMCs), to ensure that learning gaps are addressed in real-time. Embrace Scaffolding: Prioritize the use of guided activities and contextualized examples that move from simple to complex. This approach reduces cognitive load and allows students to build the confidence necessary for higher-order thinking. Data-Driven Remediation: Continue the practice of using pre-tests and post-tests as



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diagnostic tools to pinpoint specific areas where students struggle, allowing for "precision medicine" in education rather than a one-size-fits-all approach.

2. For School Administrators and Curriculum Developers: Resource Development Support: Allocate time and resources for the localized development of learner-centered materials like the SIS. Providing teachers with a "bank" of validated intervention sheets can standardize the quality of remediation across the Science department. Professional Capacity Building: Organize workshops and professional development sessions focused on the design and evaluation of scaffolded materials. This ensures that the high "Instructional Utility" found in this study can be replicated by other teachers. Collaborative Learning Communities: Encourage "Learning Action Cells" (LAC) where Science teachers can share SIS templates, best practices, and student feedback to continuously refine instructional delivery.

3. For Students: Active Ownership of Learning: Students should be encouraged to see the SIS not just as a worksheet, but as a personal "roadmap" to mastery. Engaging deeply with the practice exercises is key to transitioning from "Satisfactory" to "Excellent" performance. Metacognitive Growth: Learners should apply self-regulated strategies—such as reflecting on their own mistakes identified through the SIS feedback—to build long-term retention of complex Physics concepts.

4. For Future Researchers: Scale and Diversity: Conduct similar studies with larger, more diverse populations or different grade levels to verify if the SIS is equally effective in Biology, Chemistry, or Earth Science. Digital Transformation: Investigate the transition of the SIS into a digital or "blended" format. Exploring how technology-enhanced interactivity affects engagement could be a valuable next step in modernizing the intervention. Longitudinal Tracking: Perform follow-up assessments to determine the "decay rate" of the knowledge gained. Investigating whether students who used the SIS in Grade 9 perform better in Senior High School Physics would provide powerful evidence of the intervention's long-term value.

Compliance with Ethical Standards

Before commencing this study, it is essential to underline the critical significance of ethical considerations in research focused on the impact, strategies, outcomes, and challenges related to Instructional Utility of Student Intervention Sheets (sis) and Academic Performance of Grade 9 Students in Science, for the school year 2025-2026.

To prepare for implementation, the plans and recommendations were presented to EWMCI to ensure adherence to prescribed procedures and protocols. Consequently, the following ethical principles were emphasized.

Informed Consent. Before participating, explicit and informed consent was diligently obtained from all school heads involved in the study. They needed to comprehensively understand the study's objectives, methodologies, potential risks, and benefits (Creswell & Poth, 2018). Furthermore, participation remained entirely voluntary, allowing participants to withdraw from the study at any point without encountering any adverse consequences (Israel, 2015).



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Anonymity and Confidentiality. To safeguard the learners' identities and responses, rigorous measures were enacted to ensure anonymity and confidentiality. Rather than actual names, pseudonyms or codes were employed to uphold participants' privacy. The collected data was securely stored, with access restricted solely to the research team (Wiles, 2013).

Avoiding Harm. Delicate subjects, such as the challenges inherent in their roles, were discussed with meticulous consideration for the potential emotional and psychological impact on the participants. Strategies were implemented to minimize distress, and a support system readily assisted participants when needed (Liamputtong, 2020).

Researcher-Participant Relationship. The researcher maintained a professional and respectful rapport with the school heads. Any actions that might exploit or harm the participants were scrupulously avoided, ensuring their utmost dignity and respect throughout the research process (Orb, Eisenhauer, & Wynaden, 2001).

Data Protection. Data protection regulations and laws were unwaveringly adhered to in order to safeguard the personal information of the participants. Stringent measures were employed to ensure the secure storage and transmission of data (Saunders, Kitzinger, & Kitzinger, 2015).

Voluntary Participation. Participants were assured that their participation in the study was wholly voluntary and devoid of any form of coercion or external pressure (Bryman, 2016).

Researcher Bias. The researcher remained vigilant regarding potential biases that might influence data collection and analysis, upholding objectivity and transparency throughout the research (Merriam & Tisdell, 2016).

Institutional Approval. Before initiating the study, the researcher sought ethical clearance from the pertinent institutional review boards or ethics committees (Flick, 2018).

Honesty and Integrity. The research findings were reported truthfully and accurately, without manipulation or distortion, to align with preconceived notions or biases (Tracy, 2019).

Beneficence. The potential benefits of the research to educational practices and policies were thoughtfully considered, ensuring that the study positively enhanced the education system (Beauchamp & Childress, 2019).

Cultural Sensitivity. The researcher displayed cultural sensitivity by respecting local customs, beliefs, and practices within the research setting and refraining from imposing external values on the participants (Smith, 2021).

Inclusion and Diversity. The research design prioritized inclusivity and diversity, encompassing a broad range of implementations of Indigenous Peoples Education (Ngag, 2023).



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By diligently upholding these ethical principles, the study was carried out conscientiously and with due regard to the rights and welfare of the involved IP learners (Chilisa, 2020).

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Declaration AI Tools Utilization

I do hereby declare the use AI tools, such as Chat GPT and Grammarly for grammar checking and sentence organization purposes only.

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