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# DEVELOPMENT OF STRATEGIC INTERVENTION MATERIALS (SIMS) IN GRADE 7 SCIENCE IN KITCHARAO DISTRICT

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**ABSTRACT**

The education sector is adopting a more targeted approach to the development of appropriate materials so that educators can deliver instruction that is relevant to their specific circumstances and will lead to improved outcomes for students in science education. The present study aimed to develop and validate competency-based SIMs for Grade 7 Science to address the identified least-learned competencies of the four main domains of science in the Kitcharao District. This study employed a descriptive developmental design and a quasi-experimental design to collect evaluative data from five expert validators, 13 science teachers, and 30 students who were purposefully selected from the Grade 7 population of science classes. Data from the descriptive analyses indicate that the developed SIMs generally received ratings of "Very Satisfactory" by professional educators for content, format, presentation, and accuracy, while the student sample overwhelmingly rated the SIMs positively across all evaluation dimensions. Furthermore, paired sample t-tests (0.05) showed that there were significant mean increases in student pre-test and post-test competency scores as a result of the use of SIMs, thereby confirming a positive and significant impact on student achievement in the targeted science domains. The study also found that the SIM's

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structured and user-friendly formats were effective in reducing students' anxieties about learning and enhancing their confidence in learning at their own pace and overcoming cognitive barriers created by complex concepts. However, the findings of the study suggest that ongoing institutional support is needed for the continued implementation of the agreed-upon remediation programs, with the implication that future implementations of SIMs should include long-term, highly structured remediation periods as opposed to time-compressed remediation periods to achieve maximum retention of knowledge. Based on these findings, it is recommended that DepEd officials institutionalize the use of SIMs, school administrators establish district repositories for validated materials, and teachers consciously incorporate these intervention tools to bridge learning gaps, while the proposed Strategic Intervention Material (SIM) Remediation Program in Appendix V be adopted for school-wide implementation, ensuring that the validated SIMs are included in the DepEd's Learning Resource Management & Development System (LRMDS).

**Keywords:** *Strategic Intervention Materials, ADDIE Model, least mastered competencies, instructional, material development, intervention program, learning gaps, science education, material validation, Philippines Basic Education, Intervention*

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## INTRODUCTION

The reforms to the Philippine education system are designed to improve learner outcomes and close long-standing learning gaps. The MATATAG Curriculum, developed to help implement the aforementioned reforms, is one of the key components of the effort made to improve educational use of resources. The MATATAG Curriculum has been designed to strengthen the foundational skills of each student through: (1) creating a smaller, more focused set of competencies for the learner; (2) providing instruction that is based on competencies and is therefore mastery-oriented; and (3) honoring the diverse needs of learners.

By using this system, teachers can help students develop a solid understanding of the foundations of learning before moving on to doing more complex tasks. It is up to the teacher to help connect the curriculum objectives to effective classroom practice. The MATATAG Curriculum includes expectations for using responsive strategies with the types of materials used to help students who demonstrate difficulties with learning (Department of Education Order No. 10, s 2024). Current research indicates that curriculum improvement alone is insufficient to improve student learning unless combined with effective instructional intervention (Darling-Hammond et al., 2022; UNESCO, 2023).

Teaching and learning science in the Philippines have been a challenge for some time. The latest evidence of how poor the teaching and learning of science in this country is the results from the 2022 PISA test. Filipino students did not perform as well as students from

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other countries on this test and therefore did not achieve an average score comparable to that of students around the world (OECD, 2023).

There is consistent national research confirming that Filipino students lack basic scientific literacy or conceptual understanding and have not demonstrated adequate knowledge retention across all areas of scientific literacy. Consistently, the performance levels of the Filipino education system are significantly lower than those of most countries on a variety of international tests and local evaluations (Gabatino, 2025). Local data support the assertion that students have difficulty retaining their understanding of science concepts over time and are unable to develop their higher-order scientific reasoning skills, especially in settings with limited instructional support (Aguanta et al., 2024).

The MATATAG Curriculum for Science for 7th graders in the Kitcharao District is implemented across four domains: Earth Science, Biology, Chemistry, and Physics. An analysis of the least-learned competencies at the district level shows that students consistently did not reach expected levels of achievement in some core areas of science. District data show that students have consistently achieved low levels of competency across all identified Science areas. These consistent learning deficiencies demonstrate the need for data-driven instructional interventions, such as SIMS, aligned with the MATATAG Curriculum and designed to support the identified least learned competencies for 7th graders in the Kitcharao district.

While previous research indicates that Strategic Intervention Materials (SIMs) have been helpful in providing learners with support, key knowledge gaps remain. One such gap concerns the systematic development and validation of SIMs using data on the least-learned

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competencies for the district (i.e., data collected at the district level). This lack of systematic development and validation of SIM using district-level data is a methodological gap. For example, most studies evaluating the effectiveness of SIM were conducted after implementation, thereby limiting research on developing or validating SIM prior to implementation. The lack of systematic development and validation of SIM, and the limited evidence to date on its effectiveness, limit teachers' ability to implement responsive, data-informed remediation practices. Bajarias et al. (2024) found that many teachers experience difficulties aligning the curriculum, which affects their ability to plan lessons for students and ultimately results in poor student achievement. Wabingga and Tomaquin (2025) reported that teachers in remote locations face challenges in modifying instructional materials to meet the needs of local learners. Additionally, Cayabas Jr. and Sumeg-ang (2023) identified that instructional resources developed specifically for the context are needed to address learning gaps and support remediation efforts.

There are several ways to help students build the knowledge and comprehension needed to address persistent learning gaps. And through structured, learner-paced, and competency-based activities, SIM has proven helpful in providing students with the needed support by extending knowledge, helping them master difficult concepts, and, ultimately, bridging gaps in understanding (San Isidro & Dio, 2025; Gabucan & Sanchez, 2024). In the MATATAG Curriculum, SIM provides teachers with an opportunity to identify areas of difficulty and create customized learning experiences to meet individual student needs, ensuring that

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students receive the instructional strategies and resources to better understand and acquire the competencies required for their grade levels.

This study shares a connection to the UN Sustainable Development Goals (SDGs). With goal number 4 (Provide Quality Education), to provide quality education to all people at all ages by developing and implementing local contextualized SIMs (Strategic Intervention Materials) based upon the least learned competencies, it enables improvement in the science learning outcomes, delivery of quality instruction, and provides local access to supportive materials for learning. This study also meets Goal number 9 of the UN Sustainable Development Goals by developing and implementing Local/Evidence-Based Educational Innovations to meet the needs of their communities.

This study, titled Development of Strategic Intervention Materials (SIMs) for Grade 7 Science in Kitcharao District, was conducted for the same reasons. It involved the development and validation of SIMs, using district-level assessment data from Kitcharao District, intended to remediate or provide extra assistance to learners who demonstrated significant difficulties learning the four most problematic areas of science. The intent behind developing SIMs is to help learners improve their understanding of the key elements of science and to assist teachers in developing and using remediation strategies based on objective data from the MATATAG Curriculum.

As a result of the recently updated Philippine Basic Education System's new three-term school calendar and scheduling policy (DepEd Order No. 009, s. 2026), the issue of localized

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instructional materials remains an important concern in the Philippine Basic Education System (DepEd).

However, it should also be noted that the competencies that the SIMs are designed to help students achieve remain unchanged; therefore, the SIMs will continue to be invaluable assistance for those with learning difficulties. The fact that they are created to support curriculum standards indicates that the SIMs will remain useful and necessary regardless of the length of the student's calendar year.

## MATERIALS AND METHODS

This chapter presents the research design, research locale, participants in the research study, research instrument, data-gathering procedure, ethical considerations, and statistical treatment of the study.

### Research Design

To develop and evaluate Grade 7 Science Strategic Intervention Materials (SIMs), the study used the Research and Development (R&D) or Developmental Research Design. This design focuses on the systematic development of instructional materials to address gaps in students' content knowledge, particularly the least-learned competencies identified in the Kitcharao District. The objective of the present study was to create valid and usable classroom intervention materials for science instruction rather than merely documenting the gaps in instructional practices exhibited by Rasyid, Aini, and Ghofur.

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To provide a comprehensive evaluation of the intellectual quality and instructional effectiveness of SIMs, the study employed a descriptive-evaluative, quasi-experimental design with a quantitative methodology. The descriptive-evaluative approach was used to assess the technical quality and acceptability of the SIMs. The researcher gathered quantitative data to assess the perceived quality of the SIMs by experts, teachers, and students, using the DepEd LRMDS Evaluation Tool and a Likert-scale perception survey. Using a structured evaluation process, the researcher converted qualitative judgments from professionals and students into numerical scores to assess the accuracy and appropriateness of content, format, and function, in accordance with the Department of Education's standards.

To assess the effectiveness of the SIMs in improving student learning, the study employed a quasi-experimental design, specifically a one-group pretest-posttest design. A one-group design was employed, and SIMs were used as an intervention to assess changes in students' mastery and knowledge over time. Each student took a pretest at the beginning of the study to assess baseline knowledge. After completing the Pretest, the researcher implemented the SIMs in the classroom and administered a posttest at the end of the study. The researcher then compared the pretest and posttest means to calculate the statistically significant mean gain in student achievement resulting from the implementation of the SIMs.

Lastly, findings from the evaluation and effectiveness testing of the SIMs were synthesized to develop application pathways. When establishing pathways for later adoption of the materials, the researcher ensured that pathway selection was based on empirical data

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from the completed evaluation of implementing SIMs within schools, districts, and divisions, thereby meeting the final objective of this study.

**Research Locale**

This research was carried out in the Kitcharao District of Agusan del Norte Division, Caraga Region, Philippines, at two public Secondary Schools: Kitcharao National High School in Barangay Crossing and Jaliobong National High School in Barangay Jaliobong.

Both Schools serve as major centers for education in Kitcharao, providing Junior (7th–10th grade) and Senior High School (11th–12th grade) programs. Kitcharao National High School had approximately 1,515 students including 10 science teachers, during the school year 2025–2026 where grade 7 was made up of 313 students divided into five sections of regular classroom instruction and one section of a Science, Technology, and Engineering program (STE); while Jaliobong National High School had approximately 445 students and 4 science teachers and 105 students in grade 7 divided into four sections.

Both Schools have historically documented learning gaps in science content at the 7th-grade level, including deficiencies across both foundational and process skills, and therefore warrant additional targeted instructional interventions to improve student learning outcomes. Given the proximity of both schools, the number of available science teachers employed at each school, and the availability of administrative personnel in both schools to support the development and implementation of the Strategic Instructional Materials (SIMs), this project was feasible and appropriate for this location.

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**Research Respondents**

To identify the study's research respondents, purposive sampling was used to recruit individuals with expertise or personal knowledge through experience to accurately appraise the strategic intervention materials (SIMs). The research participants consisted of a panel of expert validators, classroom-based science teachers, and a group of Grade 7 learners who are the primary users of SIM materials.

The expert validators on the panel comprised five (5) educational professionals working in the Division of Agusan del Norte. Each validator was chosen primarily based on the area in which they had the greatest level of expertise. There was a panel member from the Division's supervisory team - the Education Program Supervisor (EPS) for Science and the EPS for Learning Resources (LRs), who were responsible for ensuring the SIMs were aligned to the MATATAG Curriculum and to DepEd quality standards.

To ensure clarity, correctness, and appropriateness of language in these new materials, a school principal specializing in English was included on the validation panel as an evaluator of grammar, sentence structure, and the overall quality of the language used throughout the SIMs. Additionally, there were 2 (two) Master Teachers of Science who evaluated the scientific accuracy of the information provided in the SIMs, along with how this information could be applied in a regular classroom setting. Collectively, this team of expert validators evaluated the SIMs for accuracy (i.e., content), language quality (i.e., grammar), and instructional design to ensure they accurately represented all three areas. These expert validators were selected for their many years of experience in curriculum implementation

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and/or the development of instructional materials. Each validator used a structured evaluation tool adapted from the Department of Education Learning Resources Management and Development System (DepEd LRMDS) Standards for Print Resources, known as the Evaluation Rating Sheet for Print Resources. This evaluation focused on content, format, presentation, organization, accuracy, and the up-to-datedness of the information.

In addition to having expert validators providing evaluations, there were also thirteen (13) Classroom Science Teachers from Kitcharao National High School, and Jaliobong National High School who provided evaluations from a Field-Based perspective using the LRMDS Evaluation Rating Sheet for Print Resources, in order to assess the practicality, usability, and alignment of the SIM to the actual needs of a teacher's classroom within the school district.

To finalize the study, a group of Grade 7 Learners participated in a pilot test and completed a Perception Survey about their thoughts on the SIMs. The Grade 7 Learners were chosen using purposive sampling from the regular sections of both schools to ensure these learners were representative of the typical Grade 7 students who would have needed additional instructional support, as well as needed additional time and/or material in order to improve their performance in science under the new MATATAG Curriculum. Using this process to select research respondents ensured that their evaluations of the SIMs indicated whether they were clear, usable, and appropriate for learners who needed assistance in science.

It is important to note that learners who were enrolled in the ARAL reading intervention program were excluded from this research study because their enrolment in this program was the key determinant for whether they were capable of independently reading and/or

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comprehending the information being presented via the Strategic Intervention Materials (SIMs), which contain minimum requirements of reading comprehension in order to use them effectively. By not including learners who have been receiving ARAL Reading Intervention services, the evaluations provided by the learners who participated in this study will more accurately reflect the clarity, usability, and effectiveness of the SIMs for learners who have not received such intensive reading interventions and are independent learners.

Using Proportional Allocation based upon the number of learners enrolled at each school, a total of thirty (30) Grade 7 Learners were randomly selected. Of the thirty (30) Grade 7 Learners, twenty-two (22) Grade 7 Learners were selected from Kitcharao National High School, and eight (8) grade Seven Learners were selected from Jaliobong National High School.

**Research Instruments**

The research study involved multiple research tools, but relied mainly on three quantitative data collection tools: the DepEd LRMDS Evaluation Tool, the Learners' Perception Survey, and the Pre-test/Post-test Assessment.

The DepEd LRMDS Evaluation Tool for Print & Multimedia Resources was the primary research tool used to provide an expert validation of the Quality of Strategic Intervention Materials (SIMS) being developed to assist Grade Seven Science Teachers. This standardized assessment was used by a panel of expert validators and science teachers evaluated on the Strategic Intervention Materials in four domains: Content; Format, Presentation & Organization; Accuracy; and Up-To-Datedness. The number of ratings received from the

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evaluation of the Strategic Intervention Materials served as the basis for determining whether to consider the materials "technically adequate and appropriate" for use in all public school systems.

The Learners' Perception Survey was used to assess students' perceptions of the materials developed. The students provided data that were analyzed using a 4-point Likert scale, yielding an aggregate measure of how well the materials addressed 7 key characteristics (Clarity, Usability, Engagement, Design, Organization, Appropriateness, and Impact). The Learners' Perception Survey Tool was validated for reliability by an expert panel and piloted with 30 learners who did not participate in the study but had characteristics similar to those of the participants. Data from the Pilot Test were evaluated using reliability analysis, which indicated high internal consistency and stability across all survey items.

The intervention's effectiveness was assessed using Pre-Test and Post-Test assessments. The assessments included a range of structured test items aligned with the identified least-mastery competencies in Grade 7 Science. The Pre-test was given prior to the implementation of SIMs to establish a baseline of performance for all learners. The Post-test was also given following the implementation of SIMs. The Post-Test contained items of equal difficulty and content coverage compared to Pre-Test items and all other assessment items. Overall, the scores were statistically evaluated to determine whether there was a significant difference in learners' performance on the Pre-Test and Post-Test assessments. To ensure the quality of this assessment tool, it was also content-evaluated by selected science teachers in the field.

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**Data Gathering Procedure**

The ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation) was used to gather data throughout the systematic, iterative process of developing, validating, and evaluating Strategic Intervention Materials (SIMs).

**Analysis Phase**

To begin the analysis phase of the study, the researcher identified specific learner needs for the Grade 7 learners. The researcher used the District Consolidated Least Learned Competencies in Science across four domains of the 2025-2026 school year. There were nine (9) to eleven (11) competencies in each domain, but the data collected were limited to the least learned competencies.

The researcher identified one competency as "least learned" for each domain based on this consolidated data, which, in turn, served as a basis for developing the four SIMs.

**Design Phase**

The design of the SIM materials was drafted to address learner gaps identified in the Analysis phase. The design of the SIM was based on Piaget's Theory of Cognitive Development to ensure that learners could develop the required skills through scaffolded activities appropriate to their cognitive level. Each SIM included all the required components specified by the Department of Education: a guide card (orientation), an activity card (practice), an assessment card (mastery measure), an enrichment card (extended learning), and reference/answer key cards (guidance/self-assessment).

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**Cover Page and Graphic Layout of the SIM.** All Strategic Intervention Materials have unique and custom cover pages that offer a visual reference point for that topic, as well as an immediate engagement benefit. The cover also includes the SIM's title, which is featured in a common, standard-sized font layout that is appropriate for Grade 7 learners so they can comfortably read their assigned material. Further, all of these materials have been designed in a way that maximizes ease of use for students, creating materials that are lightweight and user-friendly by using a structured layout with colorful and distinct visual borders surrounding each section of cards.

**Strategic AI Integration for Instructional Media**. In the development of the visuals and illustrations for all five cards Artificial Intelligence (AI) was used to create high-quality educational image that is targeted toward user-specific, culturally relevant, and age-appropriate clipart such as scenes specific to local areas, objects that are closely associated with the local area, or models of scientific instruments appropriate for the grade 7 students who will be learning from this material. All AI generated image was monitored throughout the creation process to ensure that all generated images were based on good science, free of any cultural bias, and corresponded with the text for that card.

**Guide Card.** The Guide Card is designed to be the "conceptual structure" of the material as well as the "pedagogical entry point" into the material. The Guide Card has bold and easily readable titles and target objectives with simplified language to minimize the immediate cognitive load on the Grade 7 student. Simultaneously, the Guide Card has an overview of the essential science concepts using engaging and localized illustrations or brief

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scenarios that relate to the lesson. The Guide Card's main feature is the clear naming of the target least mastered competency along with the breakdown into smaller digestible accessible learning outcomes so the students will know what they should be able to do at the end of the lesson.

**Activity Card.** The Activity Cards play an important part in the interaction component of the intervention materials that will help students develop confidence. The layout of the materials tries to eliminate heavy amounts of disproportionate text by using aesthetically pleasing elements, including activity callouts, pictures, and local stories that will connect directly to the learner's lived experience. In terms of architecture, each task is structured according to the difficulty progression in a way that facilitates an easy transition to accomplishing each task based on the levels of difficulty established through progression from easiest to most difficult baselines. The ability to provide scaffolding for all activities provides all learners with explicit definitions for each layout so they can independently navigate through the practice activities and complete the specialized activities without having to rely on the teacher to provide constant support.

**Assessment Card.** As the main formative instrument for measuring if the learner has bridged the specific learning gap, the Assessment Card was designed to maintain clear font sizes and space (as done in previous sections of the Guide Card) to reduce anxiety. This card is composed of short, highly focused multiple choice test that relate directly to the competencies that were introduced to students in the Guide Card. Because of this structural

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relationship, both the student and researcher can immediately see actual changes in student mastery after completing the intervention.

**Enrichment Card.** Engineered to provide a stronger cognitive link and real-world context for applying scientific concepts acquired through enrichment cards, the design emphasizes creative, practical scenarios both within the home and in community settings, and graphics that illustrate these activities. The greatest feature of the enrichment card is that it will convert abstract concepts/theories learned academically into a tangible representation that occurs on a daily basis. In doing so, this understanding will help to not only enhance the learner's understanding of how important such topics are but will also create a long-term memory of that concept due to the learner being able to connect how he or she uses those concepts every day.

**Reference and Answer Key Cards**. Reference and answer key cards provide a specific structure to provide students feedback immediately and allow students to track their progress independently by creating a clearly articulated design for responses within a structured format. The main function of this component is to create student meta-cognition by providing students in Grade 7 with the ability to validate their own work as soon as they finish the task. The reference and answer key cards support students' autonomy, enhance academic self-confidence, and do away with the standard delays traditionally seen when accepting student work.

In addition, the research instruments were prepared simultaneously with the SIMs. The research instruments included the LRMDS (Learning Resource Management &

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Development System)-based evaluation forms used by the experts and science teachers, the researcher-developed Learners' Perception Surveys, and the assessment tools. The Learners' Perception Survey was content-validated through expert review and reliability testing, and the assessment tool was content-validated by subject matter experts.

**Development Stage**

In this phase, SIMs were produced and refined into completed intervention materials prepared for validation. This process included producing and finalizing the layouts, illustrations, and formats of all four SIMs to make them appealing and easy to navigate. Once all the intervention materials were completed, they were formally validated by a group of five expert validators and 13 Science teachers, who used the LRMDS-based evaluation form to assess the SIMs.

After receiving specific feedback, scores, and professional recommendations on all the revisions made in this phase of validation, the revisions were painstakingly incorporated back into the materials. The iterative process included multiple revisions to ensure that the SIMs' technical design and pedagogical approach were completed and corrected before proceeding to the pilot test and implementation stages. The refinements made in this iterative process were critical because they ensured that the final version of the SIMs was compliant with DepEd and effectively addressed learners' least mastered competencies.

**Implementation Phase**

The implementation phase began with the actual use of the validated SIMs in the classroom and evaluating the degree of success of that use. First, the intervention was

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initiated by administering a pre-test to a total of 30 purposively selected Grade 7 learners drawn from the regular sections of the two participating schools. An initial assessment was used to determine the baseline level of learners' mastery of the targeted least mastered competencies prior to any intervention. The Pre-Test has a time allotment of ten (10) minutes. Second, after the Pre-Test was administered, instructional intervention sessions were conducted using the validated SIMs, which were integrated into the learning environment as an additional way for learners to engage in the specialized activities necessary to bridge their identified learning gaps. The intervention has a time allotment of thirty (30) minutes. Third, after the intervention, the same learners again took a post-test to assess their level of mastery. Ten (10) minutes were utilized in the Post-test. Finally, after completing the pre- and post-academic assessments, the learners completed the researcher-created Learners' Perception Survey, which collected quantitative data on their experience with the SIMs. The survey has a time allotment of ten (10) minutes. A total of one (1) hour was spent in administering one (1) SIM. Since four (SIMs) were administered, the morning sessions were utilized, during which four regular subject classes normally take place.

It is important to note that all four SIMs were administered during one consecutive morning session. All post-test measures were conducted immediately following a separate 30-minute intervention for each SIM. The immediate post-test measurement may not quantify the long-term retention, but rather, short-term recall of content. Due to the operational structure of administering pre-tests and immediate post-tests within a limited time frame, the

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data collected may have limitations concerning demonstrating the long-term stability and permanence of the participants' mastery.

**Evaluation Phase**

In the final phase of ADDIE, SIMs evaluated the quality and effectiveness of the SIMs developed through a comprehensive analysis of the data from expert evaluators, Science teachers, and learners. The researcher calculated the weighted mean from LRMDS evaluation form responses and the Learners' Perception Survey results to determine the overall acceptability of the materials in terms of content, format, organization, and usability. These evaluative data provide the numerical basis for describing the technical adequacy and usability of the intervention materials.

Additionally, the evaluators checked the box next to the appropriate response in the Recommendation Portion of the Evaluation Form to indicate that the developed SIMs can be utilized in public schools. This approval is a critical requirement for utilizing the developed SIMs.

To determine the instructional impact of the SIMs on learner performance, the researcher compared the mean scores for both the pre-test and post-test using a Paired-Samples T-test. This statistical analysis was used to determine whether there was a statistically significant difference between learners' baseline knowledge and their performance after completion of the instructional interventions. The Paired-Samples T-test provided empirical evidence of the effectiveness of the SIMs in increasing learners' mastery of the least-learned competencies. The researcher used results from expert evaluations, learner

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perceptions, and effectiveness outcomes to finalize the pathways for using the SIMs at the school, district, and division levels.

**Ethical Consideration**

Careful attention to ethical principles ensured the protection of the rights and welfare of all participants involved in the development, validation, and implementation of the Strategic Intervention Materials for Grade 7 Science. Before the study commenced, informed consent had to be obtained from the participating teachers and the parents or guardians of the learners. The various participants were made aware of the research objectives, procedures, and voluntary nature. They were assured they could withdraw at no cost at any time.

Confidentiality and privacy of participants were strictly maintained throughout the study. Responses from the survey, evaluation forms, and learners' performance records were treated with utmost confidentiality. The SIMs were designed to be developmentally appropriate, safe, and engaging so that no physical, emotional, or psychological harm occurred during the intervention.

This study was conducted with integrity, transparency, and adherence to academic standards. All sources used, including DepEd orders, references, and related literature, were properly cited. The subject research also strictly adhered to the ethical guidelines and policies of DepEd and the school division in order to comply with institutional requirements. In a study, the ethical framework ensured beneficence by enhancing the experiences of Grade 7 learners, and all participants were treated with dignity, respect, and fairness throughout the study.

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There was limited, responsible, and ethical use of AI (Artificial Intelligence) tools during specified phases of the study. AI tools (such as grammar/language support and generative AI applications, e.g., OpenAI ChatGPT and Microsoft Copilot) were only used as additional aids to refine language or improve sentence clarity; enhance coherence; assist in formatting; and organize certain portions of the manuscript in the research background, literature reviews and the presentation of research procedures associated with the development of Strategic Intervention Materials (SIMs).

The researcher had complete authority and responsibility over all academic, methodological, and professional decisions throughout the entire study. The identification of the least learned competencies, the conceptualization and development of the SIMs, the preparation of research instruments, the selection of validators, the implementation of validation procedures, and the interpretation of results from the study were executed by the researcher on the basis of professional judgment, teaching experience, and established educational research practices. All outputs generated by AI were comprehensively reviewed, edited, validated, and contextualized to ensure accuracy, relevance, and consistency with the research objectives.

No use of AI tools was made for the collection of any data, scoring of any instruments, or validation of any output; nor were they employed for the statistical treatment or analysis of the research results. All data to be included in the final analysis were obtained through direct engagement of human respondents and expert validators, whereas computations and interpretations were conducted using standard research methods as determined by the

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researcher. AI tools did not provide the researcher with decision-making capabilities, produce any findings, or draw any conclusions from the study.

Moreover, AI was not intended to substitute for the researcher's expertise in instructional materials development, knowledge of learner needs, contextual knowledge of the Kitcharao District, and familiarity with the MATATAG curriculum. Therefore, the final products contained in this study are the independent academic work products of the researcher.

The researcher, through this written declaration, affirms that the application of AI to the research was transparent, limited, ethical, and supportive. There were no influences on the originality, credibility, validity, or integrity of the research due to the use of AI, and the implementation of AI in the study was consistent with the generally accepted ethical guidelines for conducting academic research.

**Statistical Treatment**

The study collected data and analyzed it using appropriate methods to address its specific problems.

For Problem 1, the least learned competencies in Grade 7 Science across all four quarters in Kitcharao District were identified using the District Consolidated List of Least Learned Competencies in Science, collected at the district office. Data were analyzed using document descriptive analysis, in which each domain's competencies were presented as recorded at the district level. In addition, because the competencies were previously identified

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based on assessment results and mastery levels, no comparative (rank) or inferential statistical analysis was conducted.

For Problem 2, the development of Strategic Intervention Materials (SIMs) was based on the least-learned competencies identified above. The second phase of the study utilized descriptive instructional design analysis, using the identified competencies as the basis for the design/development of four SIMs. No statistical analysis was employed, as this portion of the study focused solely on material development.

Problem 3 evaluated the developed SIMs regarding their overall Content, Format, Presentation, and Organization, and Accuracy and Up-to-datedness using the Simple Mean. The simple mean was used to assign a level of evaluation by the expert validators and the Science Teachers who served as evaluators. The evaluators' results were analyzed using a four-point Likert-type scale, with the following values assigned to the range of responses for rating the developed SIMs: Very Satisfied – 3.50 - 4.00; Satisfied – 2.50-3.49; Poor – 1.50 - 2.49; and Not Satisfied - 1.00 -1.49.

For Problem 4, students' perceptions of the developed SIMs regarding Clarity, Usability, Engagement, Design, Organization, Appropriateness, and Impact were analyzed using both the Simple Mean and the Standard Deviation. The Simple Mean determined the students' perceptions of SIMs for each indicator; whereas, the Standard Deviation provided a description of how variable the students' responses were for each indicator. The composite mean was calculated for SIMs based on this indicator data. Students' perceptions of SIMs were also measured using a four-point Likert-type scale.

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Problem 5 (Determining the significant difference in students' pre-test/post-test scores) was analyzed using a Paired-Samples T-test, the inferential statistical analysis procedure used to determine whether there was student learning improvement as measured by pre-test and post-test scores after the implementation of SIMs. Statistical analysis was performed at the 0.05 level.

Problem 6 (Determining pathways for the utilization of SIMs at the school, district, and division levels) was analyzed using descriptive statistics based on endorsement/approval responses from expert validators/science teachers. The number of like responses (approved utilization in public schools) was calculated and summarized.

Because the evaluation materials contained predominantly checklist items, the data were categorized by similar responses and expressed as percentages relative to educators' endorsement/approval to establish the acceptability and potential pathways for implementing SIMs at all three levels of educational organization.

Descriptive analyses of the above data were used to determine the extent to which SIMs were deemed suitable for use at the school, district, and division levels, based on the expert validators' collective responses.

## RESULTS AND DISCUSSION

This chapter presents an analysis and interpretation of the data gathered in the study in relation to the stated problems. The results are organized according to the sequence of the statement of the problem.

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**Problem 1. What are the least learned competencies in Grade 7 Science across the four domains in Kitcharao District based on district assessment data?**

In the first domain, 4 competencies were identified as least learned. These are the following: (1) Explain the changes of state in terms of particle arrangement and energy changes (solid → liquid → vapor; vapor → liquid → solid) (31%), (2) Express quantitatively the amount of solute present in a given volume of solvent (33%), (3) Demonstrate how different factors affect the solubility of a solute in a given solvent, such as heat. (36%), and (4) Follow appropriate steps of a scientific investigation, including aim/problem, materials, method, results, and conclusion (40%).

In the second-domain analysis of the table results, it is clear that three skills are identified as the greatest difficulty for learners. The lowest-performing ability is explaining how genetic information is transmitted to offspring via meiosis and fertilization, with an MPS of 30%. The next-lowest-performing skill, with an MPS of 32%, is the ability to differentiate between plant and animal cells based on the organization of their organelles; both of these skills are qualitatively categorized as Not Mastered. The one with the higher MPS uses the food pyramid to describe how energy moves from one trophic level to another; with an MPS of 34%, this skill falls into the Approaching Mastery category. Current research in science education supports the argument that students find abstract concepts difficult to learn in Genetics and Cell Biology. Due to the abstract nature of genetics concepts, the complexity of the processes involved, and the introduction of scientific vocabulary, students often have difficulty creating appropriate mental models of inheritance or how cells work (M. Machová &

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E. Ehler, 2021). Studies suggest that many students also misinterpret conjugate verbs, leading them to repeat and further misunderstand biological processes (Benjamin M. Donovan, 2021).

Additionally, various studies on biology education continue to emphasize that challenges arise when students attempt to visualize microscopic structures and connect cellular functions to their real-world experiences. Meaningful learning and conceptual understanding of Life Science topics have been significantly limited (Gurmeet Singh & Radhika Khunyakari, 2023).

In domain 3, the lowest overall results for the three learning outcomes were in each of the following areas: (1) drawing free-body diagrams (29% mastery of free-body diagrams); (2) differentiating between speed and velocity while using vector image (32% mastery); and (3) explaining the process of conduction/convection based on particle theory (35% mastery). All three were designated as "Not Mastered." However, in contrast, the explanation of how to create convection/conduction based on particle theory supported approximately 35% of participants in providing conceptual explanations. There is research in physics education that supports the findings, showing that learners tend to have difficulties with the concepts of Force, Motion, and Energy due to their abstract nature and the high demand for spatial and representational reasoning. Studies have shown that students often do not draw and interpret free-body diagrams accurately and do not know how to identify and express the forces acting on objects. As a result, they hold onto misconceptions about Newtonian mechanics (Pratiwi et al., 2021; Sirait et al., 2021). Also, learners have significant difficulty distinguishing between speed and velocity, often confusing scalar and vector quantities. Therefore, when learners

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apply motion concepts to real-world situations, they often misunderstand them. Findings from Madina et al. (2022) indicate that learners have many misconceptions about straight-line motion, especially regarding velocity and its relationship to motion, as students often give incorrect reasons for their misunderstandings of displacement, speed, and direction.

In addition to previous studies, other studies indicate that students tend to have difficulty connecting macroscopic observations with conceptualized models in physics; this leads to difficulties when explaining thermal processes such as conduction and convection using particle-level reasoning (Soeharto & Csapó, 2021). By interpreting this data, one can see that students still tend to have difficulties making an accurate connection to an abstract concept in physics.

The domain 4 results indicate that three competencies were particularly challenging for students in reaching the mastery level. Of these three competencies, the greatest difficulty was experienced when using the PHIVOLCS Fault Finder to assess local earthquake risk, where students achieved a Mastery Proficiency Score (MPS) of 31%. In the second MPS, explaining how solar energy interacts with the atmosphere received a score of 33%, placing this competency in the Not Mastered category. Finally, students demonstrated a 35% level of mastery when creating physical models or drawings to illustrate the impact of Earth's tilt on the intensity of sunlight, indicating a student level of Approaching Mastery.

According to recent studies examining common ways of learning in Earth and space science education, because geoscience concepts are abstract, large-scale, and spatial, learners often struggle to interpret geospatial data and Earth system models and

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representations, such as maps and models. This is important because understanding how geospatial data and Earth system models work is critical to understanding various Earth hazards, such as earthquakes and faults (Ribeiro & Orion, 2021). In addition, students often hold misconceptions about solar radiation and atmospheric processes, particularly regarding how solar energy is absorbed and distributed throughout the Earth's system (da Rosa, 2021). Also consistent with research on astronomy education, studies consistently indicate that learners have difficulty understanding seasons and axial tilt. Often, students mistakenly attribute seasonal changes to the distance between the sun and Earth rather than to the tilt of the Earth's axis (Bykerk-Kauffman, 2021; NOAA Climate Education Resources, 2021-2023).

These studies show how learners continue to experience difficulty integrating spatial reasoning and Earth and space system models into their scientifically accurate understanding.

**Problem 2. Based on the identified least-learned competencies, what Strategic intervention Materials (SIMs) can be designed and developed for Grade 7 Science?**

Based on the identified least-learned competencies across the four domains, four (4) Strategic Intervention Materials (SIMs) were designed and developed. The development process followed a structured instructional design aimed at simplifying complex scientific concepts into student-friendly tasks.

The researcher developed one SIM for each domain of the Grade 7 Science curriculum. Each material was designed with a specific theme and a set of "Cards" to guide the learner through the intervention process.

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All of these developed SIMs used a standardized five-card structure in order to maintain consistency and effective pedagogy. This design allows all students to move from the simplest concept to the most complex application of that concept in a scaffolded way.

The visual engagement and the simplicity of the language used to guide the design of the SIMs were paramount in creating these learning materials. For example, the conceptual understanding of force from Domain SIM Arrow Power has been simplified and translated into the task of determining the direction of force and the magnitude of force, supporting the principles of Scaffolding (the provision of temporary assistance to support students in the achievement of tasks that they would otherwise be unable to complete independently).

Similarly, Domain 4 SIM Sun-Kissed uses the analogy of a Space Suit to help learners understand how atmospheric interactions (Reflection, Absorption, Scattering) occur, and to compare scientific concepts to familiar objects such as sponges and blankets, thus reducing learners' cognitive load.

The addition of an AI Declaration and Disclosure in each SIM highlights the collaborative nature of the development process. The researcher utilized AI tools to create high-quality, customized diagrams, specifically designed to align with and support the competencies identified for Grade 7 Science; thereby, providing content-accurate and visually engaging instructional materials for students who are predominantly visual learners.

The selection of the least learned competencies for each domain was based on their relevance to the anticipated learning gaps identified for the Grade 7 learner and their potential to develop into hard-copy Strategic Intervention Materials (SIMs). The chosen competencies

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were deemed appropriate for the development of SIMs, as they can be structured and documented through clear, step-by-step learning tasks supported by simple explanations, illustrations, diagrams, and guided activities, suitable for hard-copy delivery. Therefore, SIMs have been developed to be practical for classroom implementation, easy to utilize during Remediation sessions, and aligned with the instructional needs of learners engaged with the MATATAG Curriculum.

The findings of the 2021 study conducted by Arpilleda support these conclusions, as he contended that Strategic Intervention Materials are effective tools for improving learners' mastery of Least Learned Competencies in Mathematics. His research showed that SIMs improve learners' academic performance by providing clearly structured, guided activities that are tailored to address specific learning difficulties.

Similarly, in 2021 Lazo and De Guzman pointed out in their successful study of distance education in Economics that SIMs provide an effective means of remediating competency gaps through enhancing student understanding by virtue of simplified lesson delivery and targeted remediation supports for students having difficulty with complex subject matter.

Gabucan and Sanchez (2021) also found that instruction delivered using SIMs resulted in substantial improvements in learners' understanding of the scientific concepts of Global Warming and their implementation of a study of how utilizing structured intervention materials, supported through the use of guiding activities and contextualized examples, enhances learners' comprehension and level of learner engagement with challenging Science subject matter.

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Lastly, the 2024 study by Lituañas and De la Cruz demonstrates that Contextualized SIMs are effective supplemental resources when developed to meet learners' individual needs and the competencies outlined in the curriculum. Their research focused on the value of clear delivery methods, visual presentations, and organized instructional tasks in improving learners' understanding of science.

In summary, by developing the competencies selected for each SIM, SIMs have been shown to address each domain's critical learning gaps, thus providing a targeted, structured, and competency-based support system for each learner aligned with the MATATAG Curriculum. Copies of these research documents and the SIMs were provided in separate attachments for reference and review.

**Problem 3. How do expert validators and science teachers evaluate the developed SIMs in terms of content, format, presentation and organization, and accuracy and up-to-datedness?**

The evaluators gave a mean score of 4.0 (maximum possible) for each set of standards. The average number of validation points received was 27.30, which is well above the pass rate.

The teacher evaluators appear to match the expert evaluators' consensus. The two highest mean scores among the teacher evaluators were the suitability of the content to the learner's development level and the degree to which the materials could be aligned with a subject standard (both 3.96). The majority of teacher evaluators agree that the SIMs align with the Grade 7 Science Curriculum and the cognitive preparedness of the target learners.

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The mean score from the evaluator for having ample warning/caution for the activities was the lowest at 3.46 (however, it is still a strong degree of agreement). Therefore, it is clear that teacher evaluators are particularly conscious of safety in providing science. To summarize, the teacher evaluators received a total of 26.37 points, exceeding the required minimum of 21 points.

All validators (expert and teacher) rated the instructional materials as "Passed," and the point totals for the respective groups are: experts = 69.85 points; teachers = 68.81 points. These total point values significantly exceed the minimum threshold of 54 points.

In several of the most important sub-factors, the expert validators gave a mean score of 4.00, the maximum value, specifically in the areas of Illustrations (i.e., simplicity, clarity, and cultural relevance) and Paper and Binding. This indicates that, from a technical design perspective, the SIMs have successfully achieved a balance between aesthetic appeal and functional clarity. Additionally, the expert validators' high ratings of "cultural relevance" suggest that the AI-generated imagery and localized examples (e.g., "guava" or "coconut fronds" in the Grade 7 Science modules) were incorporated into the SIMs in an appropriate manner that did not appear foreign or out of context to the Philippine learner.

The teachers rated the Prints category (i.e., font and letter size) the highest at 3.98, and Design/Layout also at 3.98. As practitioners, the teachers generally rate Printed Materials relative to how readable and engaging the material will be to students when used in the classroom setting; thus, the relative differences in average scores (3.40) for "harmonious blending of elements," and (3.48) for "adequate illustration in relation to text" suggests that

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while there may be a high degree of attractiveness associated with the materials being used, teachers recognize that while students are attracted visually to the materials they will also become distracted and lose their focus on learning objectives.

In summary, the Format validation reinforces that the SIMs meet the requirements of scientific accuracy and are ergonomically and visually appropriate for Grade 7. Based on the clear fonts, adequate white space, and high-quality illustrations used in the materials, they will be "easy to handle" and "easy to read," both of which are critical characteristics of interventions designed for students who may have difficulty learning from traditional, text-heavy textbooks.

For presentation and organization, this criterion has a score of 20.00 from the experts and 18.48 from the teacher validators. Both groups of evaluators commented on the SIMs, rating them at least 15 points.

The group of Experts awarded a 100-percent mean score of 4.00 across all five indicators for this criterion. This perfect score indicates that the SIMs exhibit exceptional coherence in their development, and the terminology is appropriately leveled for students in grade 7 from a textbook perspective. The Experts all agree that the transition between the five "Cards," starting with the "Guide Card" and ending with the "Assessment Card," demonstrates a seamless flow of instruction that supports cognitive load limitations for slow-learning students.

The teacher validators' ratings were high; however, there were slight differences across sub-factors. The highest score was for the engaging and interesting qualities of the

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materials (3.90). This finding supports the ratings in the Format factor for appeal from a visual perspective. The teachers rated the sub-factor for variety in writing (sentences and paragraphs) as the lowest of the five indicators (3.50). The teacher validators' lower score of 3.50 indicates that, although their validation is highly acceptable, they have more serious reservations about the vocabulary level used to facilitate understanding through simple language in SIMs. The use of simplified language is an intentional effort in SIM development because shorter, simpler sentences help students understand difficult scientific material.

In conclusion, the data in Table 5 can be used to substantiate that the SIMs have been designed according to the principles of good structure and student-centeredness. The logical flow of ideas and the vocabulary used allow students to progress from problem identification (the least-learned competency) to competency mastery in an efficient manner.

The accuracy and timeliness of the information (the fourth and final validation factor) were again assessed by both expert and teacher validators. The information in Table 6 indicates that all created materials were rated highly accurate by both expert and teacher validators, with a rating of 4.00 on all criteria from each group, for an overall average rating of 24.00 per group. Both expert and teacher validators rated the materials as passing.

This unanimous, perfect rating by both groups provides validation that the Strategic Intervention Materials (SIMs) contain no conceptual, factual, grammatical, or computational errors.

In conclusion, the information in Table 6 provides definitive evidence of the quality of the SIMs. Both expert theoretical validators and actual classroom teacher validators provided

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a perfect rating for each item, which indicates that the intervention materials will provide reliable, accurate, current, and error-free scientific information to aid in developing confidence in students; thus, students will feel confident utilizing the information that has been provided in the SIMs when developing their least learned competencies.

The Comprehensive Validation Process Overview has been summarized in Table 7 as the Summary of Expert and Teacher Validation Across All Factors, as this is the last table displaying the results of the four Evaluation Categories of Expert Validators and Teacher Validators to show that the Strategic Intervention Materials (SIM's) have consistently met or exceeded the minimum quality level expectations for Instructional Materials.

From the summary table, it can be seen that both experts and teacher validators provided a "Passed" for all factors. The Experts' Validation Scores ranged from a perfect score to high scores in Format (69.85) and Content (27.30). Similarly, the Teachers Validation Scores were fairly robust, with only very slight variations compared to the Experts Validation Scores, because the teacher validators had a more practical perspective grounded in their actual teaching experience.

The most significant finding was in the Accuracy and Up-to-datedness category, where both groups provided the maximum score of 24.00. This indicates that both groups have determined that the materials are scientifically accurate for student use.

Overall, the results indicate a high level of inter-rater reliability, suggesting that, while the Experts and Teachers Validation Scores represent two distinct professional roles, there is agreement on the overall effectiveness of the SIMS. This agreement demonstrates that the

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materials are not only pedagogically sound (with regard to Content) and technically accurate (with regard to Accuracy), but also visually and ergonomically appropriate for Grade 7 learners (regarding Format and Presentation). The successful validation of the resulting SIMs ("The Great Science Mix-Up," "Cell-O Quest," "Arrow Power," and "Sun-Kissed") based on all of the above factors shows that they are valid instructional materials. The SIMs can be effective tools for closing learning gaps across the least-mastered competencies in what students have studied, providing students with an organized, engaging, and error-free means of achieving mastery in science.

Branch (2009) states that, through the ADDIE process, instructional materials must be designed using a carefully considered, systematic approach. The satisfactory results of the SIMs' validated evaluations demonstrate that a systematic process was followed in developing these materials.

Instructional design is an evidence-based, systematic process and clearly-defined means of developing and evaluating instructional materials against their intended learning outcomes and learner needs (Reiser & Dempsey, 2023). High ratings for the content and format of the SIMs indicate that they have been developed according to sound instructional design principles and are capable of supporting the targeted Science competencies, specifically the least-mastered skills.

Overall, the presentation and organization of the SIMs received perfect or near-perfect ratings, supporting the notion that the SIMs provide highly logical structures and clear sequences for learners to follow as they progress through lessons and activities.

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Mayer (2024) asserts that well-organized multimedia and instructional materials enhance meaningful learning by reducing cognitive overload. Clear, well-organized materials help students process and retain knowledge.

Additionally, according to the DepEd Learning Resource Management and Development System (LRMDS, 2022) guidelines, learning materials must ensure usability in both classroom and self-learning environments by providing a cohesive, logically organized, and developmentally appropriate structure. The high evaluation ratings for the presentation and organization aspects of both SIMs demonstrate their adherence to these standards.

The consistent, perfect ratings for both the accuracy and currency of the information within the SIMs correlate positively, demonstrating that the SIMs are consistent in overall accuracy and current with acceptable knowledge in the scientific field. This is paramount, as accuracy in scientific education directly impacts a learner's ability to conceptualize a scientific concept correctly.

Educational resources must be accurate, current, and aligned with up-to-date knowledge systems to provide a high-quality learning experience for learners (UNESCO, 2023). The evidence supporting the claim that the instructional materials are relevant and accurate to current knowledge is reiterated by OECD (2023), which states that the educational system must provide reliable and relevant instructional materials to produce effective teaching and learning outcomes.

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This analysis concludes that the SIMs are reliable and instructional resources aligned with current international standards for teaching and for providing effective Instructional Materials (IM).

**Problem 4. What is the level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of clarity, usability, engagement, design, organization, appropriateness, and impact?**

The highest mean of 3.85 indicates a very high level of agreement among learners with the item *"This material helped me understand the topic".* Similarly, the lowest mean of 3.74 indicates a very high level of agreement with the item *"The activities helped me clear up things about the topic that I did not understand"*. In effect, the overall mean of 3.79 implies a very high level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of clarity.

The highest mean of 3.80 signifies a very high level of agreement among the learners for the item "*The Activity Cards helped me learn one step at a time.*" On the other hand, the lowest mean of 3.73 (shared by two items) indicates a very high level of agreement for the statements *"The examples showed me exactly how to do the tasks*" and "*I finished the SIM on time without feeling too tired*." In effect, the overall mean of 3.76 implies a very high level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of usability. This suggests that the material is user-friendly, well-paced, and supports independent learning effectively.

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There is strong consensus on the favorability of items at an exceptionally high level, as indicated by the highest mean of 3.80, which reflects agreement with "The Answer Key allowed me to verify my work as soon as I completed it." The second-lowest mean of 3.73 indicates an exceptional level of agreement with "I now have more self-esteem regarding my ability in science." Since both average means are also close together (3.76), learners have a favorable overall view of the Strategic Intervention Material (SIM) as a means of engaging them in this program. In other words, learners found the material engaging and received immediate feedback on their performance. As a result, overall learner experience with this program was positive and motivating.

The highest mean of 3.89 signifies a very high level of agreement among the learners for the item "*The size of the letters (font) is easy for my eyes to read."* On the other hand, the lowest mean of 3.80 (shared by two items) indicates a very high level of agreement for the statements *"The pages look nice and easy to look at*" and "*The SIM is easy to use and carry."* In effect, the overall mean of 3.83 implies a very high level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of design. This indicates that the visual layout, typography, and physical portability of the material are highly effective in supporting a comfortable and accessible learning environment.

The highest mean of 3.83 signifies a very high level of agreement among the learners for the item *"I didn't get lost while moving from one activity to the next.*" Similarly, the lowest mean of 3.71 indicates a very high level of agreement for the statement *"Information is grouped together in a way that is easy to follow."* In effect, the overall mean of 3.77 implies

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a very high level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of organization. This suggests that the structural arrangement and logical sequence of the material effectively guide the learners through the lesson without confusion.

The highest mean of 3.83 (shared by two items) signifies a very high level of agreement among the learners for the items "*The activities are just right for my age and grade level*" and "*The drawings and stories in the SIM feel like they are for me*." Similarly, the lowest mean of 3.79 indicates a very high level of agreement for the item *"The topics are things that are important for a Grade 7 student."* In effect, the overall mean of 3.82 implies a very high level of learners' perception of the developed Strategic Intervention Material (SIM) in terms of appropriateness. This indicates that the content, complexity, and contextual elements of the material are well-suited to the developmental level and interests of the target learners.

The highest mean of 3.86 signifies a very high level of agreement among the learners for the item "*This material made me want to answer more in class."* On the other hand, the lowest mean of 3.73 indicates a very high level of agreement for the item "*I would tell my friends to use this if they are having a hard time*." In effect, the overall mean of 3.79 implies a very high level of learners' perception of the developed Strategic Intervention Materials (SIMs) in terms of impact. This suggests that the material not only improves subject comprehension but also boosts learner confidence and participation in the classroom setting.

The highest mean of 3.83 indicates a very high level of learners' perception of Design. Similarly, the lowest mean of 3.76 indicates a very high level of perception regarding Usability. In effect, the overall consistent ratings across all criteria imply a very high level of learners'

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perception of the developed Strategic Intervention Materials (SIMs). This summary highlights that while all aspects of the materials are exceptionally well-received, the visual and structural design stands out as a particular strength, while usability remains a highly effective component of the instructional package.

The calculated standard deviations for the four SIMs ranged from 0.37 to 0.43, suggesting that learners' responses were consistently highly correlated. The design's standard deviation of 0.37 indicates that learners were most consistent in their perceptions of the instructional content's visual appeal. The standard deviation of 0.43 for usability indicates that learners showed greater variability in how easily the materials are to use compared to the other three SIMs. This indicates that learners' overall perceptions of the instructional materials' effectiveness across all four SIMs are homogeneous, rather than limited to small groups.

This finding also supports Reiser and Dempsey's (2023) assertion that effective instructional materials must be well-organized and usable. If an instructional resource is clearly organized, it is easier for a learner to process and remember information, and therefore, they exhibit greater success in their learning.

Furthermore, as indicated by the DepEd Learning Resource Management and Development System (2022), all learning materials must be organized logically, suitable for development, and usable. This is especially true for modular and intervention-based instruction. High scores in organization across all SIMs demonstrate that these requirements were met. The high mean scores for the design and engagement of the SIMs, as evidenced by the consistently high means throughout the quarters, demonstrate that the learners found

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the SIMs to be visually appealing and engaging, thus suggesting that the materials were able to engage learners' attention and encourage learners to actively engage with the content.

According to Mayer (2024), effective multimedia and instructional design should employ both visual clarity and engagement strategies to facilitate meaningful learning. Well-designed instructional materials help reduce extraneous cognitive load for learners and increase their motivation to learn, particularly in science, where many concepts are abstract.

Additionally, according to UNESCO (2023), engaging, visually well-designed instructional materials significantly contribute to learners' motivation and engagement, thereby resulting in greater engagement among learners participating in basic education. Learners' perceptions of the SIMs support this global finding, as they illustrate that the design of the instructional materials has played a major role in enhancing learners' learning experience.

High mean ratings for the appropriateness and impact of the SIMs suggest that learners found them appropriate for their level and that they effectively enhanced their understanding of science concepts. This finding also supports the principle of instructional alignment as stated by Branch (2009), that instructional materials are effective when they are developed relative to the needs, abilities, and learning context of the learner(s). The high mean rating in the appropriateness area indicates that the instructional materials for the SIMs have addressed learners' learning gaps.

OECD (2023) stated that, in addition to the need for accessibility, effective educational resources should also be impactful in terms of improving the outcomes of the learner(s).

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Therefore, the strong impact in the impact area indicates that learners experienced meaningful learning gains as a result of using the SIMs.

The low to moderate standard deviation across all quarters indicates a high degree of consistency in learners' responses. This finding indicates broad agreement among respondents regarding their positive perceptions of the SIMs.

Reiser and Dempsey (2023) asserted that instructional design is an empirical, iterative process in which evaluation data are collected and analyzed to determine the effectiveness of the design and to support changes to it. Therefore, consistent performance data across groups might indicate that the SIM instructional materials are reliably supporting learners' intended engagement.

The study's overall findings indicate overwhelming agreement among learners that the SIMs are effective, exciting, well-designed, and helpful in improving their comprehension of science concepts. These findings are strongly supported by the basic principles of instructional design and the body of educational research in this area.

**Problem 5. Is there a significant difference in the mean scores of the learners before and after the implementation of SIM?**

The results of the paired t-test comparing pre-test and post-test data for learners across the four domains are displayed in Table 16. All four quarters showed statistically significant improvements in learners' performance ($p < 0.05$). Therefore, the instructional approach used throughout the study appears to be an effective means of improving students' academic performance over time. As indicated by the increase in post-test scores from the

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pre-test, the instructional process provided learners with additional knowledge and skills. i.e., formative activities that positively affect achievement (Creswell & Guetterman, 2021; Hattie, 2023).

In Domain 1 of the analysis, the pre-test and post-test mean scores were statistically significant and demonstrated a meaningful increase of 3.74 from 4.83 (pre) to 8.57 (post), yielding $p < 0.001$. This large mean score increase indicates significant improvement in learners' mastery of the competencies taught during the quarter, and it also indicates that learners had very little prior knowledge of the competencies and made progress after receiving instruction. This finding supports the notion that providing targeted, engaging instruction along with structured learning activities positively affects the cognitive development and academic success of learners (Vygotsky, 1978).

The evidence indicating that the instructional methods used during the first quarter promote learning closure and increase students' understanding is also evident in the results in Domain 2. When computing post-test scores for Domain 2 ($M = 7.01$) relative to pre-test scores ($M = 6.07$), we observe a difference of 0.94 ($p = 0.032$). Though lower than the increase shown in the previous quarter, it is still statistically significant and supports the conclusion that learners have continued their growth through intervention-based instruction, even with greater baseline knowledge than at the previous administration of the assessments. Furthermore, the smaller mean difference in Domain 2 may indicate that the competencies taught in Quarter 2 were either not as challenging or that they had prior knowledge of the content. The evidence nonetheless continues to demonstrate that effective and continuous

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instruction, along with reinforcement activities are critical elements for continual academic growth and academic success among all learners (Agarwal et al., 2021);

The results for Domain 3 of the study mirrored Domain 1 and Domain 2; that is, the pre-test and post-test scores were also statistically significant, as evidenced by similar large increases. Pre-test scores, Domain 3 had a mean score of 4.50, while post-test scores had a mean of 7.73; thus, the mean difference of 3.23, and $p < 0.001$, confirms interest in making limited improvement relative to pre and post assessments were achieved at the same time as comparable levels of student improvement between the preceding two quarters. In Domain 4, there was a similar trend: the pre-test mean was 4.90, followed by a post-test mean of 7.57, yielding a statistically significant difference of 2.67 ($p < 0.001$).

These results indicate that learners made significant progress across all domains during the final quarter of the study, with increases in mean scores attributed to cumulative learning, increased learner confidence, and access to efficient instructional practices. As supported by research, continued practice and timely feedback, delivered through actively engaged learning environments, develop a deeper understanding of concepts and promote retention in learners (OECD, 2023). Overall, the paired t-test analysis confirms a significant difference between the pre-test and post-test scores of learners across all four quarters, leading to the rejection of the null hypothesis. The findings imply that the educational intervention or instructional approach used throughout the study had a positive, meaningful effect on learners' academic performance.

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**Problem 6. Based on the developed SIMs, what are the pathways for their utilization in the following levels? School level; District level; and Division level?**

The final phase of this study focused on identifying the structured pathways for the utilization of the developed Strategic Intervention Materials (SIMs). This process ensures that the validated materials, "The Great Science Mix-Up," "Cell-O Quest," "Arrow Power," and "Sun-Kissed," reach the target learners effectively and sustainably.

The pathways for using the developed SIMs were established based on recommendations from five (5) expert validators and thirteen (13) science teachers from Kitcharao District. Table 17 also shows the results obtained from the DepEd Learning Resource Management and Development System (LRMDS) Evaluation Tool, which indicates that 100% of the total SIMs received an approval rating from the thirteen (13) science teachers. Additionally, three (3) of the five (5) expert validators recommended that the SIMs be approved immediately, and two (2) of the five (5) expert validators recommended that the SIMs be approved with minor modifications. None of the five (5) experts recommended denying any of the SIMs approval. The recommendations from expert validators for modifications address the development and evaluation phases of the ADDIE model and serve as quality control for the materials. Although the teachers' approval of the SIMs serves as an indicator that they are ready for classroom use from the practitioner's perspective, the expert validators provide assurance that the materials comply with the LRMDS quality standards. The level of support given to SIMs in this work by Picardal and Sanchez (2022) agrees that contextualized resources will be provided when they can bridge the learning gaps identified.

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The structured review process followed provides the evidence needed to meet the quality assurance requirements cited by Khutwane and Mahlangu (2025), ensuring that only refined and validated materials are used for implementation. The unanimous agreement of all parties involved to support the proposed SIM utilization pathways in DepEd reflects a collective view on the significance of validation processes to ensure the quality and relevance of instructional materials. This view is supported by research studies (Picardal & Sanchez, 2022; Limbago-Bastida & Bastida, 2022; Danes et al., 2026), which indicate that teaching resources that have been evaluated and contextualized to curriculum standards and learner needs are more acceptable than those that are not aligned. Furthermore, numerous examples demonstrate the effectiveness of SIMs in improving student learning outcomes in Science when they are developed and validated correctly before use (Limbago-Bastida & Bastida, 2022; Danes et al., 2026).

In addition, quality assurance processes in schools ensure the effectiveness of instruction and guarantee that only validated materials are used in the teaching and learning process (Khutwane & Mahlangu, 2025).

The strong endorsement from all parties involved provides the basis for establishing the utilization paths of the SIMs at the school, district, and division levels, in accordance with the DepEd LRMDS guidelines (Department of Education, 2021). Quality assurance processes for instructional resources should include multiple validation and approval levels to provide accountability and ensure that instructional resources are appropriate for classroom use (Khutwane & Mahlangu, 2025; Philippine Journal of Education Studies, 2023). This validated

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process also underscores the importance of good governance in retaining high-quality learning materials within the educational system.

At the school level, SIMs will be endorsed and used by Grade 7 Science teachers for remediation and intervention activities to address the least mastered competencies. Evidence indicates that when teachers use SIMs as targeted instructional support materials, they can improve student performance (Limbago-Bastida & Bastida, 2022; Danes et al., 2026).

At the district level, SIMs will be reviewed and disseminated through LAC sessions and instructional supervision conducted by PSDS. LACs have been shown to enhance teacher professional development and improve teacher instructional practices through collaborative professional development (Detuya & Tudlasan, 2026).

At the division level, SIMs will be submitted to the LRMDS office for possible recognition for use across all schools, and the systematic use and dissemination of validated instructional materials will improve instruction quality and support the scalability of effective practices (Mendiola & Estonanto, 2022). In addition, the systematic implementation and monitoring of SIMs will provide opportunities to sustain instructional innovations throughout the educational system.

In summary, the findings show that the SIMs developed are very acceptable and have great potential to have a structured School–District–Division approval pathway. The SIMs developed will support systematic implementation, facilitate monitoring, and ensure sustainability. Recent research studies demonstrate the need for structured quality assurance systems and collaborative professional development mechanisms to ensure the effective and

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lasting impact of instructional materials on student achievement (Khutwane & Mahlangu, 2025; Detuya & Tudlasan, 2026).

## CONCLUSIONS

The empirical findings of the data analysis provide substantial evidence to justify conclusions regarding the development, evaluation, and effectiveness of the Strategic Intervention Materials (SIMS) in Grade 7 Science.

1. The identification of the least learned competencies in Grade 7 Science revealed that learners had difficulty understanding essential concepts across all four domains. This implies the need for appropriate intervention materials to address persistent learning gaps.
2. The ability to devise and implement specific SIMs designed to address the specific learning needs indicates that the most effective manner of executing instructional design is by tailoring it in a systematic process to address the precise local needs of students who struggle academically.
3. The "Very Satisfactory" ratings from expert validators as well as classroom science teachers indicate that the developed SIMs successfully possess the four essential factors of instructional quality: content quality, format, presentation and organization, and accuracy and up-to-datedness of information. This comprehensive validation confirms that the materials meet or exceed national

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DepEd criteria, establishing them as highly credible, peer-validated, and pedagogically sound instruments for Science instruction.

4. The strongly positive feedback from the students indicates that the developed materials successfully satisfy the seven core dimensions of a learner-centered intervention: clarity, usability, engagement, design, organization, appropriateness, and impact. This comprehensive student approval proves that these structured, user-friendly layouts and design choices successfully minimized learning anxieties, built self-paced learning confidence, and lowered the cognitive barriers associated with decoding complex science concepts.
5. The statistically significant increase in scores from the post-tests demonstrates that systematically developed, self-paced strategic intervention materials have strong potential to serve as effective instructional tools for increasing baseline academic achievement levels and facilitating immediate concept mastery among students.
6. The unanimous support and recommendation for LRMDS integration establishes the SIMs developed within the current study as completely viable scalable assets to be adopted to support the academic intervention programs of the schools, districts and divisions.

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