

S.M.A.R.T.: Enhancing the Performance in Identifying Cell Parts and Functions Among Grade 7 Learners of Maddela Integrated School of Arts and Trades

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Abstract

Understanding cell parts and their functions is fundamental in Grade 7 science education, yet many learners struggle with these concepts, making Strategic Intervention Materials (SIMs) a promising strategy to improve comprehension and engagement. This study evaluates the effectiveness of the SIM titled “Cell: Mini Me, The Essence of Life” in enhancing Grade 7 learners’ understanding of cell biology concepts and promoting active learning. Using a one-group pre-test and post-test mixed methods design, thirty randomly selected Grade 7 students participated. Quantitative data from pre- and post-tests were analyzed with a paired t-test to determine performance changes, while qualitative feedback was gathered to assess learner perceptions. Despite a limitation in sample size and the absence of a control group, results revealed a significant increase in post-test

scores compared to pre-test scores, with a very large effect size (Cohen’s *d*). Participant feedback was mainly positive, highlighting the SIM’s clarity, interactive elements, and effective remediation, although some learners noted difficulties in time management due to the self-paced format. Overall, the SIM proved to be an effective and engaging instructional tool that enhances student learning outcomes in cell biology. It is recommended that SIMs be integrated into regular curricula with additional support for time management to maximize learner success. Further research is encouraged to investigate long-term retention and the applicability of SIMs across diverse educational contexts in the Philippines. These findings underscore the significant potential of SIMs to improve academic achievement and foster student engagement in science education.

Keywords: *Science Education; Cell Biology; Mixed Methods; Philippines; Strategic Intervention Material (SIM)*

INTRODUCTION

The science curriculum equips learners with essential skills for career success in a skill-based society and lifelong learning. It aims to develop scientifically, environmentally, and technologically literate students capable of solving critical problems, making informed decisions, and working collaboratively. This aligns with the broader goals of science education, emphasizing critical thinking, problem-solving, and informed decision-making (DepEd MATATAG Curriculum, 2025). Effective science instruction fosters higher-order thinking skills by engaging students in scientific inquiry and real-world applications. Furthermore, the curriculum promotes a strong link between science and technology, including indigenous knowledge and practices, contributing to the preservation of the Philippines' cultural heritage (DepEd MATATAG Curriculum, 2025). However, without mastering core scientific competencies, these objectives cannot be achieved (DepEd MATATAG Curriculum, 2025).

Globally, countries are striving to improve scientific literacy to prepare students for a rapidly advancing technological world. According to the 2019 PISA results, the Philippines ranked lowest among 79 countries in science (OECD, 2019). Nationally, the Department of Education (DepEd) has identified science education as a priority area for improvement. Locally, data from the Quirino Division show that students' science performance has consistently lagged behind other subjects, underscoring the need for targeted interventions at the school level.

The primary indicators of this issue include consistently low scores in science subjects on standardized tests such as TIMSS, PISA, and NAT, as well as internal assessments conducted at MISAT. These results underscore a significant gap in scientific knowledge and skills among learners, necessitating immediate educational interventions (GMA Network, 2020; OECD, 2019; Mullis et al., 2020). Based on PISA (2022) and TIMSS (2015), the results show the decline in scientific literacy. These findings suggest that the problem is both long-standing and ongoing (PMC, 2023; OECD, 2019; SEI-DOST & UP NISMED, 2011).

Scientific literacy among Grade 7 learners at Maddela Integrated School of Arts and Trades (MISAT) has been alarmingly low, as evidenced by performance metrics from the National Achievement Test in 2018 (NAT) with 43.33% MPS and as part in both international and national assessments such as the Trends in International Mathematics and Science Study (TIMSS), the Programme for International Student Assessment (PISA). This problem reflects a broader issue within the educational system where students struggle to grasp fundamental scientific concepts, resulting in poor performance in science subjects. Addressing this issue is crucial for enhancing educational outcomes and aligning with the Basic Education Research Agenda (BERA) thematic area focusing on quality and relevance of education

The problem affects Grade 7 learners at MISAT, particularly those in the Maddela II District of Quirino. Teachers and the wider school community are also impacted, as the low performance in science subjects reflects on the overall quality of education provided and influences the school's reputation and effectiveness.

The proposed action research "S.M.A.R.T.: Enhancing Performance in Identifying Cell Parts and Functions among Grade 7 Learners of Maddela Integrated School of Arts and Trades aims to enhance Grade 7 learners' science performance through the use of the Strategic Intervention Material (SIM) "CELL: Mini Me, The Essence of Life". The research title SMART stands for (SIM as a, Abridgment and Re-teaching Tutor) because an intervention is designed to make complex scientific concepts more accessible and engaging, thereby improving comprehension and retention. The SIM will serve as both a supplementary teaching tool and a self-paced learning resource.

The research gap in investigating the effectiveness of Strategic Intervention Materials (SIM) lies in addressing the persistent issue of low mastery among Grade 7 learners in identifying cell parts and their functions, a critical competency in the science curriculum. At Maddela Integrated School of Arts and Trades (MISAT), this challenge has been observed as a least-mastered skill, particularly in differentiating plant and animal cells. Despite the inclusion of this competency in DepEd's Most Essential Learning Competencies (MELCs) for Grade 7 Science, students continue to struggle with understanding cellular structures and their corresponding functions (DepEd, 2020; Science 7 Module 3, 2023).

A relevant study that demonstrates the effectiveness of Strategic Intervention Materials (SIM) in improving academic performance is the research conducted at Doos Sur Elementary School, Hindang, Leyte, Philippines. This study assessed the impact of SIM on Grade VI students' mastery of homogeneous and heterogeneous mixtures, a least-mastered skill in Science VI. Furthermore, electronic SIMs have shown significant potential in enhancing scientific literacy in Earth and Life Science topics (De Gracia & Dumlaog, 2024). However, limited research has focused specifically on cellular biology, particularly the identification of cell parts and functions. This gap highlights the need for targeted interventions to address this persistent learning challenge.

This study aims to fill this gap by implementing and evaluating a SIM designed to improve mastery of cell parts and functions among Grade 7 learners at MISAT. By providing evidence-based strategies that can be scaled and replicated across similar educational contexts, the research seeks to contribute to improving science education quality and supporting DepEd's goals for fostering mastery of key competencies.

Innovation, Intervention, and Strategy

The Strategic Intervention Material (SIM) *CELL: Mini Me, The Essence of Life* is a teacher-made, validated, and quality-assured educational tool designed to enhance the academic performance of Grade 7 learners. The SIM is intended to serve as both a supplementary teaching tool and as learning intervention, providing a structured approach to re-teaching complex scientific concepts, particularly cell biology.

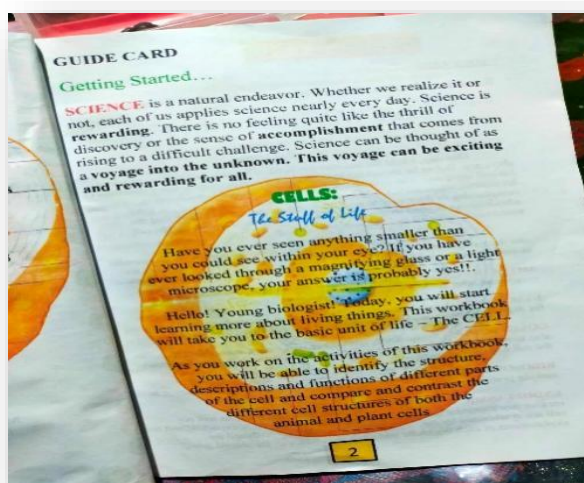


Fig. 1. The Guide Card

The **Guide Card** provides an introduction, learning objectives, and an outline of tasks. The teacher is responsible for introducing the guide card and explaining the objectives, while students review and prepare for the activities. This card is introduced at the start of the intervention period in the classroom setting.



Fig. 2. The Activity Card

The **Activity Card** includes interactive activities such as "Tour of the Cell" and "Spot the Difference." The teacher facilitates these activities, and students participate and engage with them. These activities are conducted throughout the intervention period in the classroom and potentially in outdoor spaces for certain activities.

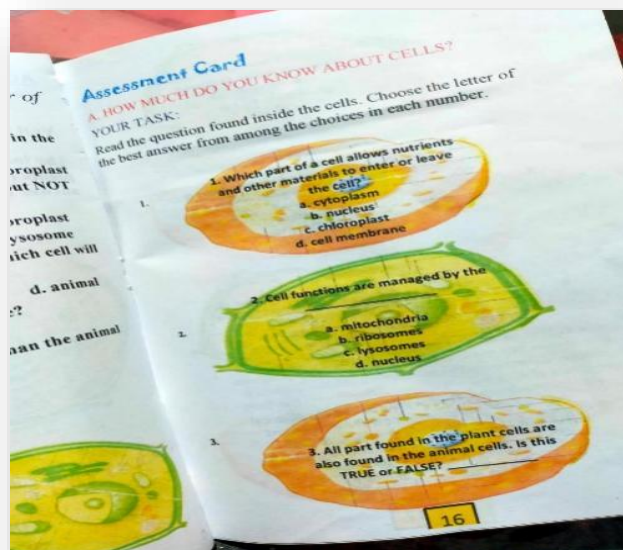


Fig. 3. Assessment Card

The **Assessment Card** contains quizzes and drills to assess students' understanding. The teacher administers these assessments, and students complete and review the results. These assessments are scheduled to take place midway and at the end of the intervention period, primarily in the classroom.

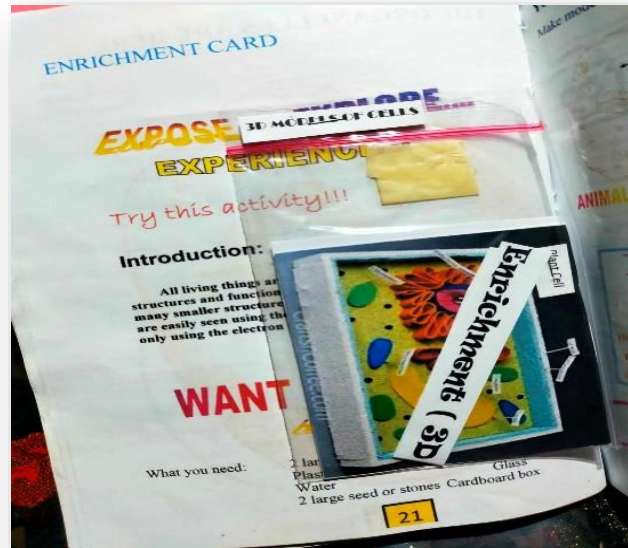


Figure 4. Enrichment card

The **Enrichment Card** provides additional tasks like creating 3D cell models. The teacher assigns and oversees these tasks, while students work individually or in groups. These enrichment activities are scheduled throughout the intervention period and can take place in the classroom.

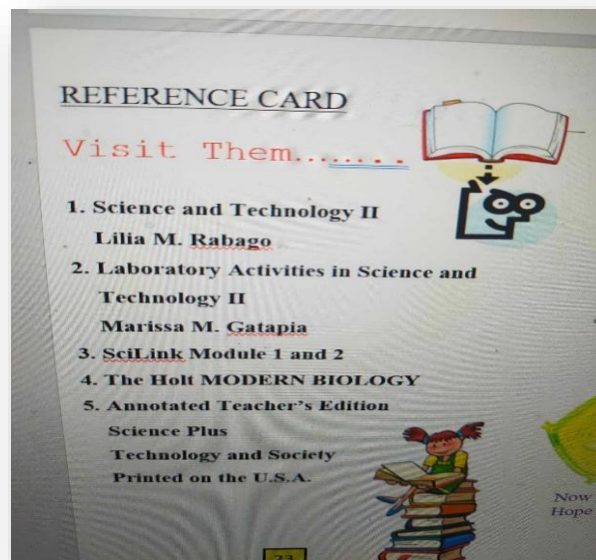


Figure 5. Reference card

The **Reference Card** lists additional readings and resources. The teacher provides these resources, and students review and utilize the materials. This card is used ongoing throughout the intervention period, both in the classroom and at home.

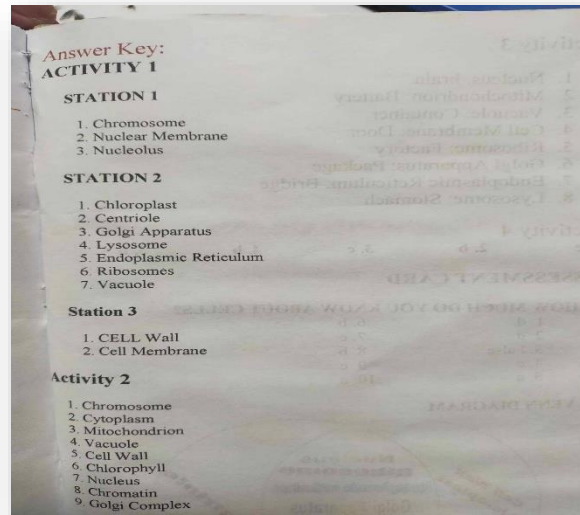


Figure 6. The Answer Card

The Answer Card provides answers to the different tasks or activities found in the material.

The SIM involves several key component activities. The Guide Card stimulates learners' interest and provides an overview of the topic, setting clear learning objectives. The Activity Card is the heart of the Strategic Intervention Material. It defines the tasks needed to be accomplished by the learners. The activities will unfold the understanding of the learners in the target objective in the lesson stated in the guide card. This card translates focus skills into interactive activities such as games, puzzles, and practical exercises, based on Ausubel's Meaningful Verbal Theory and Cognitive Load Theory. It is important to note to provide clear directions and instructions that are easy to understand and follow and always relate the activities in real-life situations. (J. Policarpio, 2011). The Assessment Card contains drills and exercises to assess understanding and correct errors. Will help learners measure their own level of mastery of the skills upon completion of the tasks. The result of this assessment identifies the knowledge and skills that the learner may need to enhance or develop. The activities The Enrichment Card provides additional activities to reinforce content and apply knowledge in new contexts. It extends learning by providing additional exercises that involves realistic applications of the topic in their daily life, in school, and in the community as a whole. The Reference Card offers readings and resources related to the topic, enhancing learning through real-life connections. Lastly, the answer card that provides answers to the activities incorporated in the material. The Teacher-Proponent designs and will implement the SIM, conduct pre-tests and post-tests, facilitate activities, and analyze data. Grade 7 learners will participate and engage with the SIM and provide feedback as to their perceptions on the use of the SIM. The School Head and Advisers will provide support and facilitate coordination and communication, while parents will provide consent and support for their children's participation.

The rationale for implementing the SIM is based on the researcher's motivation to address the persistent issue of low mastery on competency on identifying cell parts and functions among Grade Seven learners as manifested in test results and personal teaching experiences. The SIM is expected to fill gaps in understanding and retention of scientific concepts that are abstract, thereby improving academic performance.

The scope of the SIM aims to improve specific performances and academic achievement in cell biology part or competencies in Grade 7 science. It focuses on re-teaching and reinforcing difficult concepts through engaging and interactive methods. However, the study will not address other science topics outside cell biology or broader educational issues such as overall curriculum effectiveness or socio-economic factors affecting learning.

The SIM provides a structured and interactive approach to learning, making complex scientific concepts more accessible and engaging. By allowing learners to progress at their own pace and offering targeted interventions, the SIM helps improve understanding and mastery of the material. This method is supported by educational theories like the Constructivist Learning Theory, Game-based Learning Theory, Vygotsky's Zone of Proximal Development, Social Cognition Theory and past researches conducted, demonstrating its potential effectiveness in enhancing scientific literacy.

How to Utilize the SIM as a "Re-teaching Tutor"?

Strategic Intervention Material (SIM) can serve as a valuable tool in education by acting as a "*re-teaching tutor*" for Grade 7 students who are struggling with certain concepts in lesson on Cell. Through interactive activities as inclusions of the SIM, they help reinforce key ideas and provide additional practice opportunities for students.

The following is the sequential design in utilizing the SIM:

Phase 1: Identify Learning Gaps

The researcher conducted pre-assessments or diagnostic tests to identify the least mastered competencies in the lesson on cells for Grade 7 students. Then, she analyzed the results to determine specific areas where her students struggled.

Phase 2: Develop or Select Appropriate SIM

The researcher created or chose a SIM that focused on the identified learning gaps. She ensured it was aligned with the curriculum and objectives of the lesson. She included interactive activities and clear instructions to make the material engaging and easy to follow. She designed the SIM to allow self-paced learning, enabling her students to revisit challenging concepts as needed.

Phase 3: Introduce the SIM

The researcher explained to her students how the SIM would help them understand the lesson better. She provided an overview of the activities and expected outcomes.

Phase 4: Facilitate Independent Learning

The researcher distributed the SIM to her students and allowed them to work through it independently or in small groups. She encouraged them to ask questions if they encountered difficulties.

Phase 5: Monitor Progress

The researcher observed how her students interacted with the material and provided guidance when necessary. She used progress monitoring tools, such as activity completion checklist to assess their understanding.

Phase 6: Provide Feedback and Reinforcement

The researcher reviewed completed activities with her students, offering constructive feedback on their performance. She reinforced key concepts through additional practice or discussions if needed.

Phase 7: Conduct Post-Assessment

The researcher administered a post-test to evaluate improvements in her students' understanding of the lesson on cells. She compared pre- and post-test results to measure the effectiveness of the SIM.

Phase 8: Reflect and Adjust

The researcher analyzed the outcomes of using the SIM and gathered feedback from her students about their experience. She modified or enhanced the SIM based on its effectiveness and student feedback for future use.

By following these phases, the researcher effectively utilized SIM as a re-teaching tutor, providing targeted interventions that supported her students in mastering challenging concepts in science.

Action Research Questions

The purpose of the study is to find out how well Maddela Integrated School of Arts and Trades, Maddela II District Grade Seven junior high school students perform academically when using Strategic Intervention Material in Science as a remediation tool, especially when it comes to identifying cell structures and functions.

Specifically, this study sought to answer the following questions:

1. What is the pre-test and post-test mean scores of the Grade 7 learners in identifying cell parts and functions after the utilization of the SIM, *Cell: Mini Me, The Essence of Life*?
2. Is there a significant difference between the pre-test and post-test scores of the Grade 7 learners after the utilization of the SIM, *Cell: Mini Me, The Essence of Life*?
3. What is the effect-size of SIM in identifying cell parts and functions of Grade 7 learners of Maddela School of Arts and Trades?

4. To what extent do students consider the effectiveness of SIM in identifying cell parts and functions?

METHODOLOGY

The study is a mixed method one group pre-test posttest design which utilized an explanatory sequential design where quantitative data collection and analysis occurs first, followed by a qualitative data collection and analysis. It is quantitative in nature because data were collected and interpreted before and after using the SIM. It is also qualitative in nature since it measured the learners' perception on the effectiveness in using the SIM which is *Cell: Mini Me, The Essence of Life*.

a. Participants and/or other Sources of Data and Information

The study was conducted at Maddela Integrated School of Arts and Trades, Maddela, Quirino. The respondents of the study were the Grade 7 learners from two sections which are heterogeneous in nature who fall below the standard criterion of 75% during the summative test. There are 60 learners from two sections which are heterogeneous in nature. Random sampling strategy was utilized to select 30 participants, ensuring that every member of the population has an equal probability of being chosen. This method helps to achieve high internal and external validity in the study, minimizing biases such as selection and sampling bias. The diverse nature of the selected sections allows for a more comprehensive picture of the impact of the intervention being studied. In totality, the characteristics of the participants were carefully chosen to ensure the reliability, generalizability, and validity of the research results. Random sampling method was applied to select learners using software or random number generators to select participants or utilized methods such as Lottery Method by writing each learner's name on a slip of paper, place them in a container and drawing as many slips as needed to randomly select learners from defined groups.

b. Data Gathering Methods

Before the intervention, the learners were given a 30- item multiple choice pre-test that is teacher-constructed and validated by the School and District Quality Assurance Team. group will utilize the researcher-made SIM. In validating the SIM made by the researcher, the Standard Criteria for SIM "DepEd Memo No. 225, series of 2009, Enclosure No. 2" was used. The SIM entitled *CELL: Mini Me, The Essence of Life* underwent validation process during the Regional Science Quest held at Enrile, Cagayan on December 2010 and followed by the 8th National Science Quest held at Sta. Cruz, Laguna in 2011 and complied with the criteria in crafting SIM and in the validation/ Q & A portion. Hence, was ranked 2nd place among 27 entries in the country. The content of the research study including the authenticity of the SIM to be utilized was assessed, evaluated, validated and certified by the District Learning Resource Quality Assurance Team. In addition, the proponent of the SIM consulted the management of SDO- Quirino Learning Resources Management and Development System (LRMDS) as to Guide on Reviewing or Judging the SIM and general evaluation checklists and LRMDS specification and guidelines for intellectual property rights management. The material and its attachments were validated as to content and authenticity of the material by college instructors at Quirino State University- Maddela Campus. Next phase will be the utilization of the Strategic Intervention Materials by the randomly selected learner-respondents. Since most of the activities incorporated in the SIM can enhance learners' knowledge and skills in reading and an avenue for values formation, learners can use their time in answering their materials during scheduled "Catch Up Fridays" as stipulated in DepEd Memorandum 001, S. 2024. The same but re-arranged, 30 multiple choice test items will be given as post-test test after the intervention. After gathering the needed information in this study, the raw data will be tallied, encoded, and interpreted. Score in the

pre-test and post-test of the Grade Seven students will serve as the basis in determining whether this Strategic Intervention Materials was effective and improved their performance level. To know the respondents' perception on the effectiveness of the SIM and experience while reacting with the material, a questionnaire will be given for them to answer. The learners can also state their comments in the blank provided in the questionnaire.

Table 1. Matrix of Activities in Gathering Data

Activity	Task	Persons Involved
Implementation Phase		
1. Randomly select respondents from the list of Grade 7 learners who fall below the 75% MPS.	1. Apply random sampling to determine the respondents	Teacher-proponent Learner- respondents
-conduct pretest among the respondents	2. conduct of the pretest and analysis of results	
2. utilization of the SIM <i>CELL: Mini Me, The Essence of Life</i>	3. Utilization of the material by the respondents	
3. conduct post test	4. Conduct post-test among the respondents	
4. Conduct the survey on to what extent do learners consider the effectiveness of the SIM in learning the concepts using questionnaires	5. Get feedbacks from the respondents about the intervention utilizing the template on Students' Perception on the use of Strategic Intervention Material in learning the concepts on cell or sharing of experiences in the reflection notes	

c. Ethical Issues

The researcher will obtain a letter of authorization from the principal of the school before beginning the data collection process. The researcher will schedule the intervention once the administrator of the school gives their approval. In order to obtain information regarding their learners' science grades for the second quarter, the researchers also obtain consent and arrange a time to speak with the advisers of students in grade seven. Parents' consent will still be requested even though this research project is strictly academic in nature and no sensitive data will be collected from the respondents. Additionally, prior to the study's execution, participant—respondents will be guaranteed that all data collected would be handled with the utmost confidentiality and utilized exclusively for this research as anchored in the Data Privacy Act Of 2012.

RESULTS AND DISCUSSIONS

Table 1. Pretest and posttest mean scores after the implementation of the SIM in identifying cell parts and functions of the respondents

	n	mean	SD
pretest	30	9.83	1.96
posttest	30	21.13	1.19

The table presents the number of learners (30) who participated in the study, mean scores, and standard deviations (SD) for the pre-test and post-test performance in identifying cell parts and functions before and after the utilization of the SIM, "Cell: Mini Me, The Essence of Life. The pre-test performance of the Grade 7 learners (M=9.83, SD=1.96) exhibits a lower understanding of the cell parts and functions. After utilizing the SIM, CELL: Mini Me, The Essence of Life, the post-test performance of the learners (M = 21.13, SD = 1.19) had increased.

The data suggests a significant improvement in the learners' performance after utilizing the SIM. The mean score increased from 9.83 to 21.13, this imply that the instructional material was effective in enhancing their understanding of cell parts and functions.

The pre-test mean score of 9.83 indicates a low initial understanding of cell parts and functions among the learners. After utilizing the SIM, the post-test mean score of 21.13 reflects a marked improvement, emphasizing the effectiveness of SIMs as educational tools. This finding aligns with studies conducted in the Philippines, such as Cabildo's (2024) research on the SIM Mission poCELLble, which demonstrated significant gains in students' mastery of cellular structures and functions after using a similar intervention material. Similarly, Mojar (2021) found that SIMs significantly improved Grade 8 students' performance in biology compared to traditional teaching methods.

A paired t-test could validate the statistical significance of the observed improvement. Previous studies have consistently shown that SIMs produce statistically significant increases in student performance. For instance, a study conducted at Quezon National High School revealed that SIMs effectively addressed least-mastered competencies, leading to significant improvements in post-test scores ($p < 0.05$). These findings reinforce the conclusion that SIMs are powerful tools for bridging learning gaps.

The results underscore the potential of SIMs to enhance science education by making complex topics more accessible and engaging for learners. Cabildo (2024) emphasized that SIMs are particularly effective in addressing persistent challenges in science education, such as low mastery of critical concepts. Additionally, Mojar (2021) recommended integrating SIMs into regular teaching practices to improve student engagement and academic outcomes.

While this study demonstrates immediate improvements in test scores, further research could explore long-term retention of knowledge gained through SIMs. It would also be valuable to investigate their effectiveness across other subjects or educational levels. Cabildo (2024) suggested that qualitative feedback from learners could provide deeper insights into how SIMs impact their learning experiences.

In conclusion, this study highlights the significant positive impact of the Strategic Intervention Material Cell: Mini Me, The Essence of Life on Grade 7 learners' understanding of cell parts and functions. The substantial increase in mean scores, coupled with reduced variability, underscores the effectiveness of this educational intervention. These findings align with existing literature on the benefits of SIMs in improving student performance and suggest their broader applicability in enhancing science education.

Table 2. Significant Difference Between the Pretest and Posttest Scores of The Grade 7 Learners After the Implementation of the SIM

	Mean	SD	t	Sig	Remarks
Pretest	-11.3	1.84	0.34	29	Overall, the study shows that SIMs can significantly improve student performance in science. This suggests that using innovative teaching materials can help students learn more effectively.
Posttest					

The researcher employed a paired t-test to determine whether the observed improvement in Grade 7 learners' scores before and after using the Strategic Intervention Material (SIM), Cell: Mini Me, The Essence of Life, was statistically significant. This method revealed a notable increase in students' scores, with a mean difference of -11.3 (SD-1.84) and a p-value of 0.000, confirming that the improvement was not due to chance. These results align with previous studies conducted in the Philippine education context, highlighting the effectiveness of SIMs in improving academic performance.

The statistically significant results indicate that the SIM had a strong positive impact on learners' understanding of cell structures and functions. This finding is consistent with the study by Dumigsi and Cabrella (2019), which demonstrated that SIMs significantly improved Grade 9 students' problem-solving skills in mathematics, as measured by pre-test and post-test scores. Similarly, a study conducted in Leyte, Philippines, showed that SIMs effectively addressed least-mastered competencies in science, resulting in substantial improvements in student performance (Gonzalez-Ferrer et al., 2023).

The findings underscore the potential of SIMs as effective tools for enhancing science education. Research by Cabildo (2024) revealed that SIMs designed for specific competencies significantly improved students' mastery of complex topics in biology. The interactive nature of SIMs engages learners more effectively than traditional teaching methods, as also observed in studies on science education in Sta. Cruz Elementary School (Academia.edu, 2023). These materials enable students to grasp difficult concepts through structured activities and localized content.

In addition to biology, SIMs have been proven effective across various subjects. For instance, Santos and Reyes (2020) found that SIMs improved performance in Araling Panlipunan by addressing specific learning gaps through interactive and culturally relevant content. Such findings suggest that SIMs can be applied broadly across subjects to enhance learning outcomes.

While this study demonstrates immediate improvements in student performance, further research could explore long-term retention of knowledge gained through SIMs. Studies like those by Mojar (2021) recommend investigating how well students retain concepts over time and whether similar results can be achieved across different grade levels or educational settings.

As with many educational interventions, this study's small sample size limits its generalizability. Future research should include larger and more diverse groups to validate these findings further. Additionally, qualitative feedback from students could provide deeper insights into how they perceive and engage with SIMs.

The findings confirm that the Strategic Intervention Material Cell: Mini Me, The Essence of Life significantly improved Grade 7 learners' understanding of cell structures and functions. This aligns with existing literature on the effectiveness of SIMs in addressing learning gaps and enhancing academic performance. By incorporating interactive and engaging materials into the curriculum, educators can foster deeper learning and improve outcomes across various subjects.

Table 3. The Effect-Size of SIM in Identifying Cell Parts and Functions of Grade 7 Learners of Maddela ISAT

	N	Mean	SD	variance	Cohen's d
pretest	30	9.83	1.97	3.87	5.42
posttest	30	21.13	2.19	4.81	

Table 3 presents the effect size of the Strategic Intervention Material (SIM), Cell: Mini Me, The Essence of Life in the performance of grade 7 learners in Cell Structures and Function as assessed through Cohen's d. The average score of the learners in their post-test is 5.42 standard deviations greater than the average scores of the learners in their pre-test. This only implies that the Cohen's d value of 5.42 presents a very large effect size. This suggests that the intervention program had a high positive impact in improving the performance of the learners in identifying cell structures and function.st scores among learners.

The large effect size observed in this study demonstrates that the SIM was highly effective in improving students' comprehension of cell structures and functions. This result is consistent with the findings of Mojar (2021), who reported that SIMs significantly enhanced students' understanding of biology concepts by providing interactive and engaging learning experiences. Similarly, Cabildo (2024) found that SIMs helped bridge learning gaps in science education, leading to substantial improvements in post-test.

The increase in scores from pre-test to post-test highlights the ability of SIMs to address knowledge gaps and improve students' application of learned concepts. The interactive nature of SIMs allows learners to engage more deeply with the material, fostering improved understanding.

The slight reduction in variability between pre-test and post-test scores suggests that most learners benefitted uniformly from the intervention. This finding aligns with Laccay's (2016) research, which emphasized that SIMs provide equitable learning opportunities by catering to diverse student needs. By standardizing instructional content, SIMs ensure consistent academic gains across different learners.

The results suggest that SIMs are valuable tools for teaching complex science topics like biology. Teachers could integrate similar materials into their curricula to enhance student engagement and comprehension. Research by Gonzalez-Ferrer et al. (2023) highlighted how SIMs effectively addressed least-mastered competencies in science, making them an essential resource for improving educational outcomes.

While this study demonstrates immediate improvements, further research could investigate whether students retain their knowledge over time. Mojar (2021) recommended exploring the long-term effects of using SIMs to determine their sustainability as a teaching strategy

Given the strong results observed in this study, it may be beneficial to test similar materials across different grade levels and subjects. Cabildo (2024) suggested that applying SIMs in other areas could validate their effectiveness as a general teaching tool.

This study had a small sample size, limiting its generalizability. Future studies should include larger and more diverse groups to confirm these findings. Additionally, qualitative feedback from students could provide deeper insights into their experiences with SIMs, as suggested by Santos and Reyes (2020).

The findings confirm that the Strategic Intervention Material Cell: Mini Me, The Essence of Life significantly improved Grade 7 learners' understanding of cell structures and functions. The large effect size and substantial increase in mean scores underscore the effectiveness of SIMs as educational tools. These results align with existing literature on the benefits of using interactive materials to enhance learning outcomes in science education.

For Research Question number 4, to what extent do students consider the effectiveness of SIM in identifying cell parts and functions? The following tool was also applied by the researcher:

Verbal Description	Scale	Explanation
5-Strongly Agree (SA)	(4.21-5.00)	The respondent is 81-100% agree with the effectiveness of SIM.
4- Agree (A)	(3.41-4.20)	The respondent is 61-80% agree with the effectiveness of SIM.
3- Moderately Agree (MA)	(2.61-3.40)	The respondent is 40-60% agree with agree with effectiveness of SIM.
2-Disagree (D)	(1.81-2.60)	The respondent is 21-40% agree with agree with effectiveness of SIM.
1-Strongly Disagree (SD)	(1.00-1.80)	The respondent is 1-20% agree with effectiveness of SIM.

Results of the Survey:

Here is the **summary means and verbal categories**

<i>To what extent do learners perceive the following</i>	<i>w $\bar{x}$</i>	<i>Verbal Description</i>	<i>Equivalent</i>
1. The SIM inspired and encouraged me to learn more concepts in Cell Parts and Functions.	4.50	Strongly Agree	Very High
2. The instructions are simple and easy to follow.	4.84	Strongly Agree	Very High
	4.65	Strongly Agree	Very High
3. The SIM helps me understand the parts and functions of cell that were not understood during regular classroom teaching.			
4. Confusing concept of cell parts and functions was clearly presented.	4.81	Strongly Agree	Very High
5. I enjoyed reading and doing all the activities provided in the SIM.	4.55	Strongly Agree	Very High
6. I want to use SIM during remediation class.	4.66	Strongly Agree	Very High
7. The SIM offers interesting activities.	4.89	Strongly Agree	Very High
	4.57	Strongly Agree	Very High
8. After using the SIM, I learn the concepts that were not fully understood in the regular classroom instruction.			
9. The SIM is student-friendly material.	4.49	Strongly Agree	Very High
	4.05	Agree	High
10. I can set up my own pace in learning without feeling pressured about time.			
	4.60	Strongly Agree	Very High
Composite			
Legend:	Scale	Verbal Description	Equivalent
	4.21 – 5.00	Strongly Agree	Very High
	3.41 – 4.20	Agree	High
	2.61 – 3.40	Moderately Agree	Moderate
	1.81 – 2.60	Disagree	Low
	1.00 – 1.80	Strongly Disagree	Very Low

To interpret the provided data using Creswell's (2015) thematic analysis framework, we can analyze learners' perceptions of the Strategic Intervention Material (SIM) for teaching Cell Parts and Functions. The following interpretation will follow the thematic analysis process outlined by Creswell, focusing on identifying, analyzing, and reporting themes within the data.

The study analyzed learners' perceptions of the Strategic Intervention Material (SIM), Cell: Mini Me, The Essence of Life, using thematic analysis. The findings revealed that learners highly rated the SIM for its effectiveness in enhancing their understanding of cell structures and functions, with a composite

mean score of 4.60. This indicates strong agreement among respondents regarding the SIM's positive impact on their learning experience.

Thematic Table

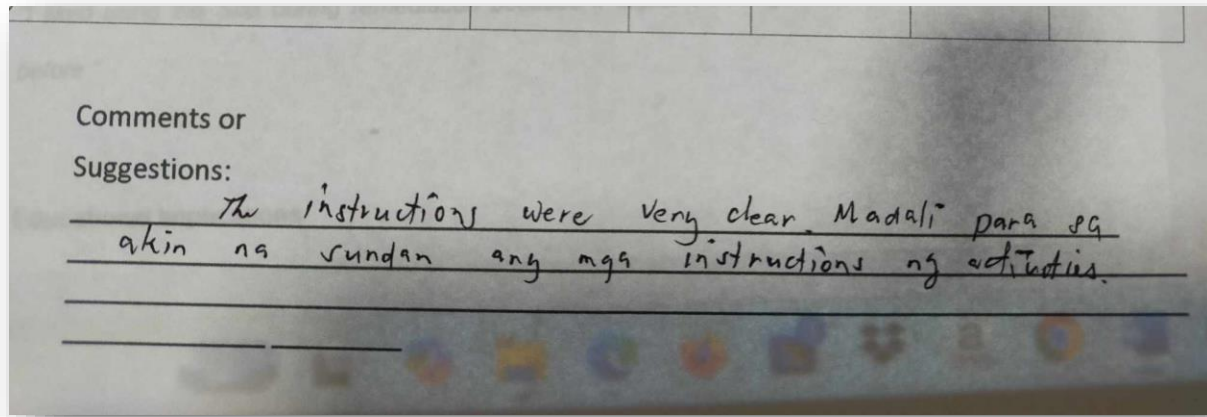
KEY STATEMENT	CODES	THEMES	THEMATIC DESCRIPTION
SIM inspires engagement and clarifies complex topics	Inspiration, clarity	Engagement and motivation	Learners find the SIM engaging and motivating, which enhances their understanding of complex concepts
SIM improves performance by addressing learning gaps	Understanding, Application	Improved performance	The SIM helps learners better understand and apply what they learn, bridging specific knowledge gaps
SIM provides consistent benefits across learners	Consistency Equity	Consistency in Performance	The SIM offers equitable learning opportunities, ensuring most learners benefit uniformly from the intervention
Learners enjoy and are motivated by SIM activities	Enjoyment Interest	Engagement and Motivation	Interactive in the SIM foster enjoyment and motivation, leading to deeper learning experiences
SIM is valued for remediation support	Unity Remediation	Support for Remediation	Learners perceive the SIM as a valuable tool for addressing learning gaps during remediation classes
Learners appreciate self-paced learning but face time management challenges	Autonomy Pressure	Navigating Autonomy vs Pressure	While learners value self-paced study options, they sometimes struggle with managing their time effectively

Key Findings

The identified themes found to have coherence and alignment with the collected data are the following:

1. Effectiveness of SIM

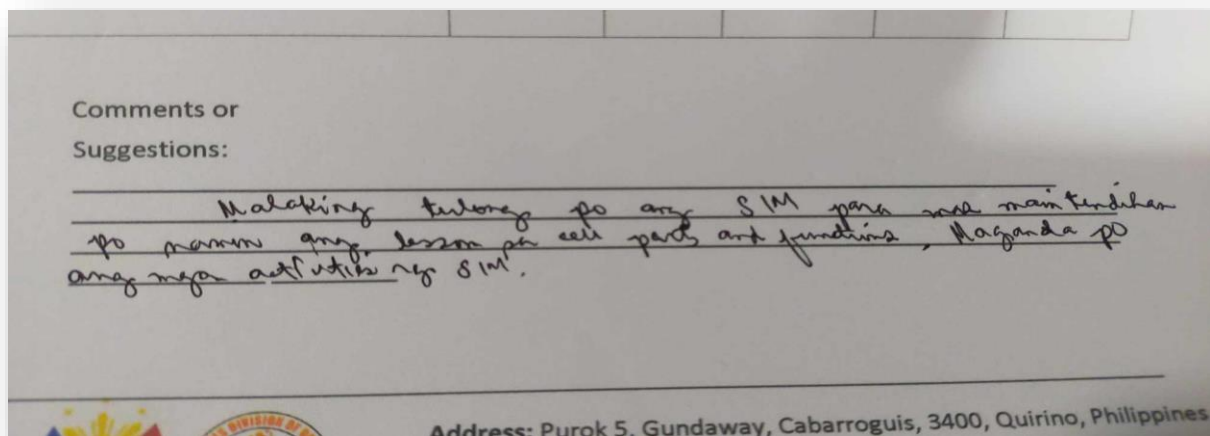
The learners' feedback highlights the SIM's ability to inspire engagement, clarify complex topics, and provide enjoyable learning activities. These findings are consistent with studies by Villaran et al. (2023), which demonstrated that SIMs significantly improved students' mastery of least-learned competencies in science by making lessons more engaging and accessible.



"The instructions were very clear, making it easy for me to follow each activity."

2. Improved Performance

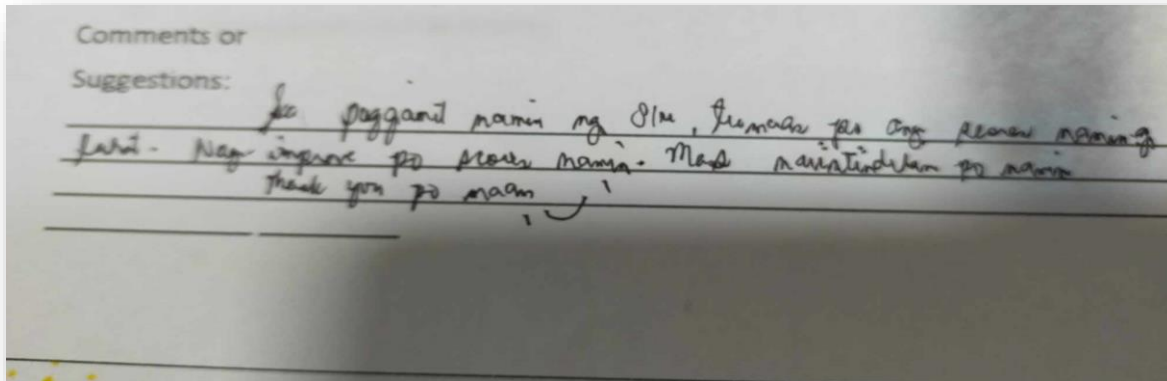
Learners reported that the SIM helped them better understand cell functions and apply what they learned. This aligns with Barredo's (2014) findings that SIMs significantly improve academic performance by addressing specific learning gaps through interactive activities.



"SIM is a big help for me so that I can understand our lesson on cell parts and functions. The activities are nice"

3. Consistency in Performance

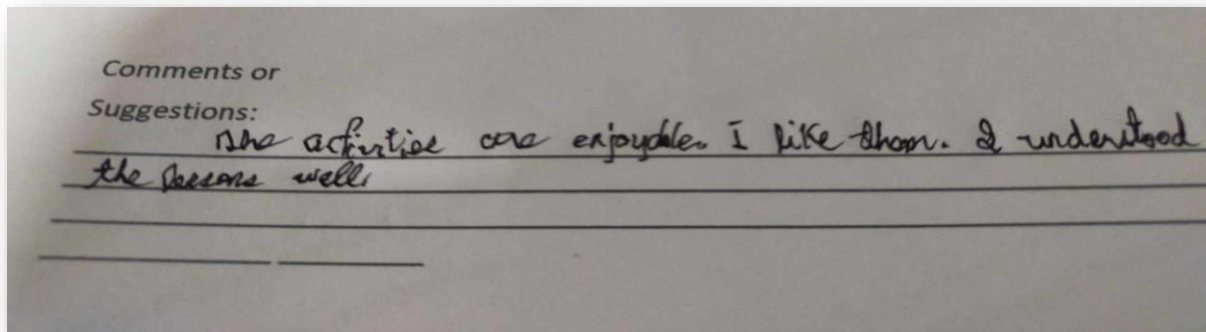
The slight reduction in score variability indicates that most learners benefitted uniformly from the intervention. This supports Laccay's (2016) conclusion that SIMs provide equitable learning opportunities for diverse learners.



"In using the SIM, my score increased. I can understand now the topic on cell parts and functions"

4. Engagement and Motivation

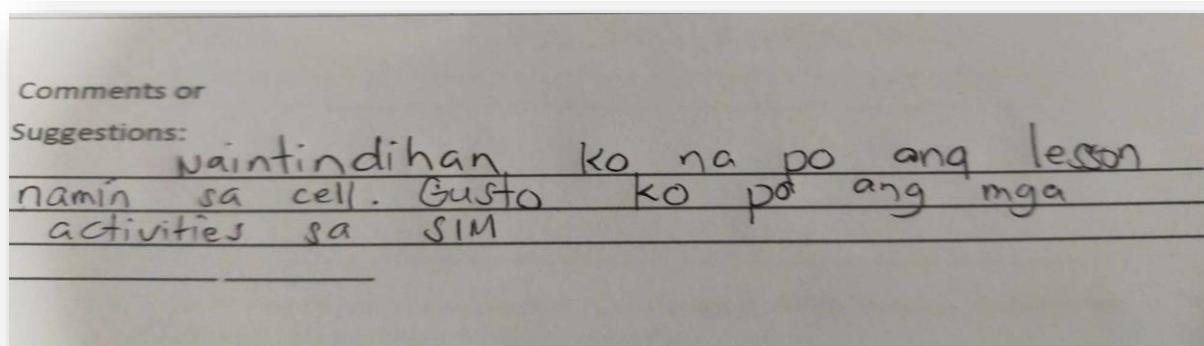
Learners found the activities in the SIM engaging and enjoyable, as reflected in high scores for statements on interest (4.89) and enjoyment (4.55). This finding is consistent with research by Cabildo (2024), which emphasized that interactive materials foster motivation and deeper learning.



"The activities are enjoyable. I like them, I understood the lessons well"

5. Support for Remediation

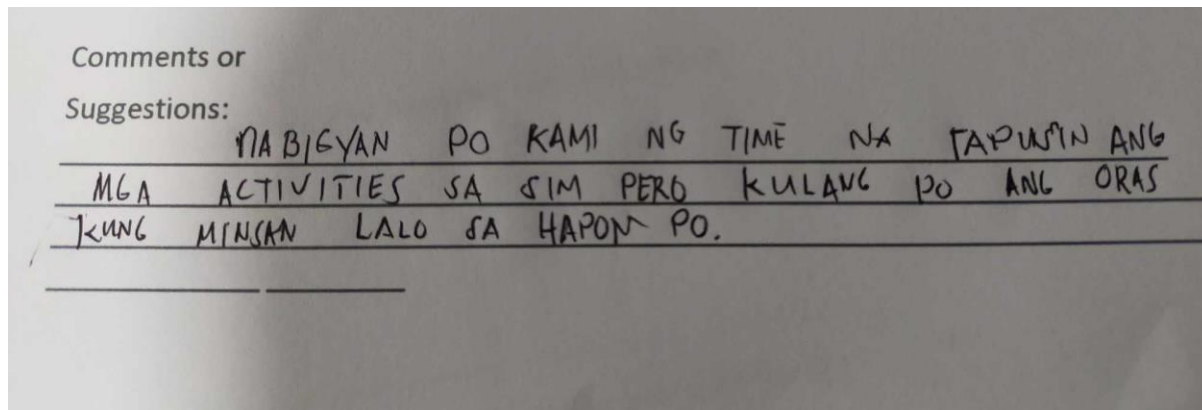
Respondents viewed the SIM as a valuable tool for addressing learning gaps, as indicated by a mean score of 4.66 for its utility during remediation classes. Villaran et al. (2023) similarly found that SIMs effectively support struggling students in mastering challenging concepts.



"I can understand now our lesson cell. I like the activities in the SIM"

6. Navigating Autonomy vs. Pressure

While learners appreciated self-paced learning (mean score of 4.05), some felt pressured when managing their time effectively. This echoes findings by Barredo (2014), who noted similar challenges with independent learning.



"The material allowed me to study at my own pace, but sometimes I felt rushed to finish everything"

Educational Implications

This study reinforces the importance of using strategic intervention materials in science education, particularly in addressing least-mastered competencies and fostering engagement among learners. Research by Villaran et al. (2023) and Barredo (2014) highlights how SIMs can bridge learning gaps while promoting active participation in lessons.

Future Directions

While this study demonstrates the effectiveness of the SIM, further research could explore:

- Long-term retention of knowledge gained through SIMs.
- The applicability of similar materials across different grade levels or subjects.
- Qualitative analyses of learner feedback to refine future iterations of SIMs.

In conclusion, the thematic analysis underscores the effectiveness of Cell: Mini Me, The Essence of Life in enhancing Grade 7 learners' understanding of cell structures and functions. By addressing key challenges such as engagement, comprehension, and remediation support, this study contributes to a growing body of evidence supporting the use of SIMs as effective teaching tools in Philippine education.

Reflection on the Study: An Experiential Narrative Account

As I reflect on this study involving the Strategic Intervention Material (SIM), Cell: Mini Me, The Essence of Life, I am struck by the profound insights it offers into the potential of interactive educational tools. The significant improvement in learners' performance, marked by a substantial increase in post-test scores, underscores the effectiveness of the SIM in bridging learning gaps and fostering deeper comprehension. This experience has shown me firsthand how such materials can transform the way students engage with complex scientific concepts.

One of the most striking aspects of this study was how the SIM inspired engagement and comprehension among learners. The high ratings from students on the SIM's clarity, enjoyment, and utility for remediation highlighted its ability to engage students while providing clear instructions and enjoyable activities. This aligns with research by Cabildo (2024), which emphasized that interactive materials can significantly enhance student engagement and motivation. Witnessing students become more motivated and interested in learning about cell structures and functions was truly rewarding.

The educational impact of the SIM was equally impressive. The large effect size (Cohen's $d = 5.42$) indicated a profound impact on learners' ability to identify cell structures and functions. This supports the conclusion that SIMs can be powerful tools for improving educational outcomes in science education, as noted by Mojar (2021). Seeing students grasp complex concepts more easily and confidently was a testament to the potential of SIMs to revolutionize science education.

However, as promising as these findings are, there is still much to explore. While the study demonstrates immediate improvements, further research should delve into long-term retention and broader applicability across subjects. This could involve qualitative feedback mechanisms to refine SIMs and address emerging challenges, as suggested by Santos and Reyes (2020). I believe that by continuing to refine these materials and incorporating learner feedback, we can unlock even greater potential for educational innovation.

Looking forward, several key recommendations emerge from this study. Firstly, integrating SIMs into regular curricula can enhance student engagement and understanding of complex topics. Secondly, providing resources to help students manage their time effectively during self-directed learning can mitigate challenges. Implementing a feedback system can also help refine instructional materials and address emerging challenges. Lastly, training educators on effective SIM implementation can further enhance learning outcomes.

In conclusion, this study has shown me the transformative power of SIMs like Cell: Mini Me, The Essence of Life in making complex scientific concepts more accessible and engaging. By addressing key challenges and incorporating learner feedback, educators can leverage these materials to improve educational outcomes significantly. As I reflect on this experience, I am convinced that the strategic use of SIMs holds the key to unlocking deeper learning and engagement in science education.

Summary, Conclusion and Recommendations

This study reveals the remarkable impact of the Strategic Intervention Material (SIM) titled Cell: Mini Me, The Essence of Life in revolutionizing science learning. With a dramatic boost in post-test scores and enthusiastic student feedback, the SIM not only bridges learning gaps but also sparks genuine engagement and enjoyment. The significant effect size (Cohen's $d = 5.42$) highlights its power to deepen understanding of complex cell structures and functions, fostering confidence and motivation among learners. While these exciting results prove SIM's immediate effectiveness, the journey continues—future research will explore long-term retention and wider applications, paving the way for a new era of interactive, student-centered science education

CONCLUSION

The findings of this study underscore the transformative impact of Strategic Intervention Materials (SIMs) such as Cell: Mini Me, The Essence of Life in making intricate scientific concepts more understandable and stimulating for students. By proactively addressing challenges and integrating learner feedback, educators can maximize the effectiveness of these innovative tools to significantly enhance educational outcomes. Reflecting on this experience, I am convinced that thoughtfully implemented SIMs not only deepen students' conceptual understanding but also spark sustained curiosity and engagement in science learning. Ultimately, strategic use of SIMs represents a powerful approach for fostering meaningful, lasting learning in the classroom.

RECOMMENDATION

Unlock the full potential of Strategic Intervention Materials (SIMs) by embedding them into every lesson to transform ordinary courses into interactive adventures that ignite student curiosity and simplify complex topics. Empower educators with hands-on training to seamlessly integrate SIMs into their teaching, maximizing learning outcomes. Establish real time feedback loops with students and teachers to ensure SIMs remain fresh, relevant, and continuously improving. Focus SIM design on the toughest challenge's students face, turning learning roadblocks into breakthroughs. By embracing these powerful strategies, educators and learners can revolutionize science education, sparking lasting curiosity and success.

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