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Transformation City: A Pocket Strategic Intervention Material (SIM) for Science 6

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ABSTRACT

International science assessments consistently show the Philippines scoring low, highlighting a critical gap in the effectiveness of current learning materials. This study aimed to address this gap by assessing a Strategic Intervention Material (SIM) designed to improve student learning in science. The researchers developed a pocket SIM titled "Transformation City" to target the least mastered competency in the topic 'Transformation of Energy' for Grade 6 students. A mixed-methods research design was employed to analyze the impact of the SIM on 30 students at DMMMSU-MLUC Laboratory Elementary School. The study utilized pre-tests, post-tests, student perception surveys, and student feedback to assess knowledge gained and gather insights for improvement. The findings revealed a significant increase in student learning outcomes after using the "Transformation City" SIM, demonstrating its potential to bridge the gap in science education.

RESUMO

As avaliações científicas internacionais mostram consistentemente que as Filipinas obtiveram uma pontuação baixa, destacando uma lacuna crítica na eficácia dos atuais materiais de aprendizagem. Este estudo teve como objetivo colmatar esta lacuna através da avaliação de um Material de Intervenção Estratégica (SIM) concebido para melhorar a aprendizagem dos alunos em ciências. Os pesquisadores desenvolveram um SIM de bolso intitulado "Cidade da Transformação" para atingir a competência menos dominada no tópico "Transformação de Energia" para alunos da 6ª série. Um desenho de pesquisa de métodos mistos foi empregado para analisar o impacto do SIM em 30 alunos da Escola Primária Laboratório DMMMSU-MLUC. O estudo utilizou pré-testes, pós-testes, pesquisas de percepção dos alunos e feedback dos alunos para avaliar o conhecimento adquirido e coletar insights para melhorias. As conclusões revelaram um aumento significativo nos resultados de aprendizagem dos alunos após a utilização do SIM "Cidade em Transformação", demonstrando o seu potencial para colmatar lacunas no ensino das ciências.

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Introduction

Science teachers need a deep understanding of topics, and the ability to connect concepts and address students' challenges. Teachers aim to make science relatable, promote hands-on experiences, and focus on process skills over memorization (Raghavendra, 2022). Techniques like problem-based learning and educational technology integration are used to enhance science education.

The Philippines scored low in international assessments for math, science, and reading. In the TIMSS 2019 study, Singapore and Korea excelled in math and science while the Philippines scored the lowest in science (Ambag, 2018). Also, second lowest in reading comprehension and second to last in science and math based on the 2018 Program for International Student Assessment (OECD, 2023).

Singapore's education system and MOE syllabus, including Singapore Math, are highly regarded globally. According to Tan (2022), the success is attributed to well-trained teachers who undergo rigorous preparation at the National Institute of Education. Only the top 5% of graduates can become teachers. Singapore excels in reading, math, and science based on PISA 2018 results. Other factors that contributed to their success are the structured education system, early exposure to science, and quality teachers contributing to Singapore's success in international assessments like TIMSS and PISA.

Descartin et al. (2023) reiterated that the Philippines is facing challenges in science education, resulting in low student performance on assessments. One factor is a lack of student mastery in specific skills. To address this, they encourage teachers in the Department of Education (DepEd) to create Strategic Intervention Materials (SIM) that target these weaknesses (DepEd Memorandum 117, Series of 2005). These resources come in various formats and focus on a single skill for improvement. Campbell et al. (2021) added that any educational system must make a huge effort to overcome these obstacles.

Since teachers are the driving forces behind education, the Philippines' poor performance in science and scientific literacy presented a severe challenge to them. One may argue that instructors have a responsibility and a privilege to contribute to solving some problems in our educational system. This privilege is valuable since instructors directly shape students' thoughts and help to create the next generation of leaders for the country. However, this privilege came with a higher level of obligation on the part of the teachers (Reyes & Falle, 2021). Since teachers are the driving forces behind education, the Philippines' poor performance in science and scientific literacy presented a severe challenge to them.

Framework of the Study

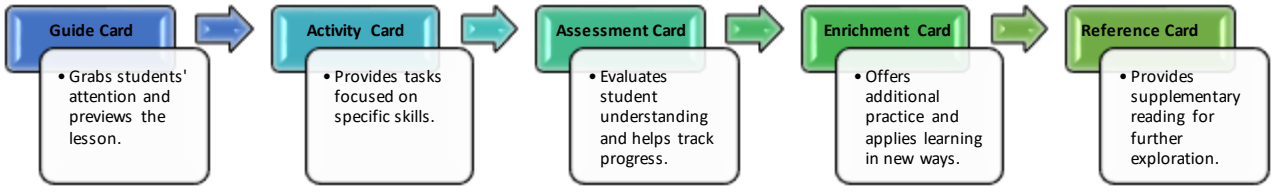
This study drew upon several educational theories to develop and evaluate Strategic Intervention Materials (SIM) for improving science learning outcomes. These theories include (1) Instructional Design Theory which provides a framework for creating effective learning experiences tailored to specific situations and goals, (2) Behaviorism Theory which informs the use of positive reinforcement and clear explanations within the SIMs to encourage desired learning behaviors, (3) Constructivism Theory which emphasized the importance of active learning and student engagement in knowledge construction, and (4) Cognitive Theory that influenced the design of SIMs to cater to different learning styles and promote information retention, reasoning, and problem-solving skills. The SIMs were designed to incorporate activities and discussions that promote student reflection and integration of new information with their prior knowledge.

Filipino teachers see promise in using Strategic Intervention Materials (SIM) - kits with activities and assessments tailored to individual student needs - to improve science learning (Cordova et al., 2019). This aligns with recent science curriculum recommendations that emphasize using research-based interventions (Sung 2018).

Nowadays, 21st-century teachers use Strategic Intervention Material (SIM) and combine it with the creativity and resourcefulness of teachers. It is one of the instructional materials for remediation or reteaching the least mastered competencies suited for 21st-century learners. The SIM helps the learners to develop competencies that they did not master during regular classes. The five parts of should be planned and constructed properly (Rosal et al., 2022, Rodrigo & Limay, 2015).

Figure 1.

Parts of the SIM



This study explored how Strategic Intervention Materials (SIM) can improve students' weak science skills. While many methods have been tried before, poor science performance remains a problem in the local context based on the initial interview the researchers conducted prior to developing the intervention material. Teachers play a key role, but good teaching materials are also essential. Affordable course materials can improve learning outcomes (Baltes, 2022). Furthermore, Su et al. (2018) have found in their meta-analysis the

nonsignificant effect of font size on the self-paced study with font sizes, suggesting that font size does not produce differences in processing fluency measured by study time.

Therefore, these were ideologies used to address the least mastered competency that challenged students thereby overcoming teaching challenges.

This study aimed to develop a Strategic Intervention Material (SIM) in Science 6 and specifically test its effectiveness. It sought to answer the following questions: What Strategic Intervention Material (SIM) can be developed based on the identified least mastered Science competency of Grade 6 pupils in science? What is the performance rating of Grade 6 based on the pretest and posttest before and after the implementation of SIM? Is there a significant difference between the pretest and posttest performance ratings of Grade 6 using the SIM developed?What is the feedback of the student after the implementation of Strategic Intervention Material (SIM)?

Methodological Procedure

The researchers utilized a mixed-methods research design, a one-group experimental design, and descriptive analysis for the evaluation of the developed SIM and analysis of feedback. A one-group experimental design was employed, meaning all participants received the SIM intervention and were measured before and after. Generally, the purpose was to establish the effect that a factor or independent variable has on a dependent variable. The principles of experimental design play an important role in research that does not follow the strict tenets of hypothesis testing and this article holds relevant information for this type of research (Creswell, 2014).

For SOP 1, two LES Science teachers were interviewed to determine the least mastered competency in Grade 6 Science. As for SOP 2, the performance rating of Grade 6 based on the pre-test and post-test after the implementation of SIM was determined. Thirty (30) Grade-6 pupils enrolled at Laboratory Elementary School at DMMMSU-MLUC LES were the respondents. Moreover, the feedback of the pupils who utilized the SIM was utilized to answer the SOP3.

The developed SIM was evaluated by the same experts and was scored and interpreted using the Guidelines and Processes for Assessment and Evaluation of Locally Developed and Procured Materials by the Department of Education Memorandum (DepEd No. 441 s. 2019).

DepEd LRDMS Passing Scores (for Print Materials):

Content Quality	21 to 28 points
Format	54 to 72 points
Presentation and Organization	15 to 20 points
Other Findings (Technical Errors)	24 points (No error)

Moreover, the questions in the SIM (pretest) underwent content validation. Five teachers who were experts in the field of science validated the test instrument (Evaluation Card of the SIM). The test is a researcher-made test consisting of 20 multiple-choice items that were based on the Curriculum Guide of the Department of Education for Science 6. The overall response of the five evaluators with regard to the questionnaire was Much Valid for it generated a Median of 4.

Pilot Testing of the test instrument was done among 30 Grade 6 pupils who were not part of the study. Based on the computed Cronbach alpha value (1.108), the test questionnaire has excellent reliability. Therefore, the internal validity of the question is strong. There was consistency in the test questions and the questions developed were related.

Mean and a one-sample mean test (t-test) was used to compare the performance ratings. This was necessary to show if the sample mean is not significantly different from the population mean, or that the sample mean is greater than or less than the population mean before making conclusions. In addition, the results of the pretest and posttest scores were analyzed and categorized using the score interpretation of the National Educational Testing and Research Center (NETRC) (Santos & Boyon, 2020):

Range (%)	Equivalent	Description
96- 100	19.1- 20	Mastery (M)
86-95	17.1 -19	Closely Approximating Mastery (CAM)
66-85	13.1- 17	Moving Towards Mastery (MTM)
35-65	7 - 13	Average (AVR)
15-34	3.1 - 7	Low (L)
5-14	1.1 - 3	Very Low (VL)
0-4	0 - 1	Absolutely No Mastery (ANM)

The students' feedback on the SIM was determined using the Students' Perception Survey patterned by (De Jesus 2019). The survey contains 15 statements that the students rated using a four-point rating scale for Agreement.

Scale Range for Agreement	Description
3.26 – 4.00	Strongly Agree
2.51 – 3.25	Agree
1.76 – 2.50	Disagree
1.00 – 1.75	Strongly Disagree

The study focused on ethical considerations by obtaining approvals from relevant authorities, seeking consent from participants' parents, ensuring confidentiality, and following data protection regulations. The research process was conducted professionally and

respectfully, with data being used only for academic purposes and disposed of appropriately after the study.

Results and Discussion

The Developed Strategic Intervention Material (SIM)

Science teachers identified the 'transformation of energy' as the most challenging learning competence to teach in Grade 6 Science. As they explained, "Since this is a physical science, students can't see the transformation. Energy takes on many different forms and can be converted in many ways. This requires teachers to use a variety of teaching strategies, making it a difficult topic for students to learn." The teachers also found it challenging to present real-world examples that would help students understand the concept of energy transformation.

To address these challenges, we developed the "Transformation City" as a pocket-sized version of the typical, large-format SIM. This portable and convenient size allows students to carry it in a handbag, making the knowledge within it more easily accessible.

Johns Hopkins Institute for Education highlights a key finding: all instructional materials are not created equal, and high-quality materials don't necessarily cost significantly more (Baltes, 2022). When students and teachers lack access to affordable course materials, they may resort to outdated materials or forgo them entirely, impacting learning outcomes. Ong and Ancheta (2023) support this, suggesting that inadequate funding and administrative support often lead to insufficient instructional materials in schools.

Features of the Pocket SIM

The Pocket SIM prioritizes portability, cost-effectiveness, accessibility, and ease of use. Students can use it anywhere, anytime, with adequate light, without requiring special equipment. The development of this material was guided by DepEd Memorandum No. 117 s. 2005.

Figure 2.

The Front Page of the SIM

The SIM consists of five key components: Guide Card, Activity Card, Assessment Card, Enrichment Card, and Reference Card. It incorporates engaging elements like pop-ups, attractive caricatures, and QR codes for accessing additional information. The cover page of the SIM was designed to be visually appealing and capture the interest of intermediate-level students. It clearly displayed the school's name and address at the top. The topic and title of the SIM were also prominently featured in the header. The first page included characters from the following pages, such as an engineer, a cook, and a camp leader. These characters, whom students might encounter in real life, served as tour guides, leading users through different parts of Transformation City.

Figure 3.

Guide Card of the SIM

Images have a strong influence on a user's mindset, and words alone cannot achieve the same impact. Many students struggle with topics they find uninteresting, making it difficult for them to put in the necessary effort. Visuals offer the best solution in these situations. Engaging materials like photographs, motion pictures, infographics, and other media can prevent students from getting bored and encourage better performance (Ngonyani, 2018; Ong and Ancheta (2023).

Figure 3 illustrates how the guide card introduces the topic by outlining learning competencies, goals, and tasks for students. This component sparks student interest in the subject matter. All competencies addressed in the SIM are aligned with the Grade 6 Science textbook. The guide card also provides information about the process and steps involved in using the strategic intervention material.

Interactive Features with QR Codes

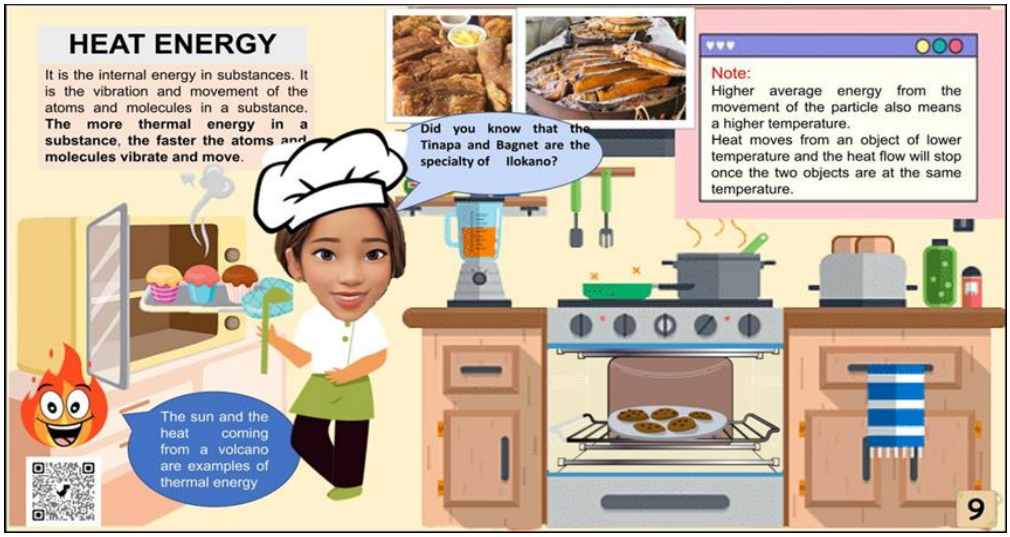
For further exploration of different energy types and real-world examples, students are instructed to scan QR codes embedded within each lesson's content. Scanning these codes directs them to websites and YouTube videos. Technology empowers students with quick access to knowledge, accelerating learning and fostering engaging opportunities to apply their newly acquired skills (Tan, 2022).

Engaging Visuals and Interactive Elements

The illustrations and text in Transformation City are both interesting and relevant, effectively capturing student attention. We understand the inherent challenge of engaging young learners. Recognizing their highly creative nature, we incorporated several strategies to grab their interest. These include captivating images, music, embedded YouTube videos, and pop-up elements.

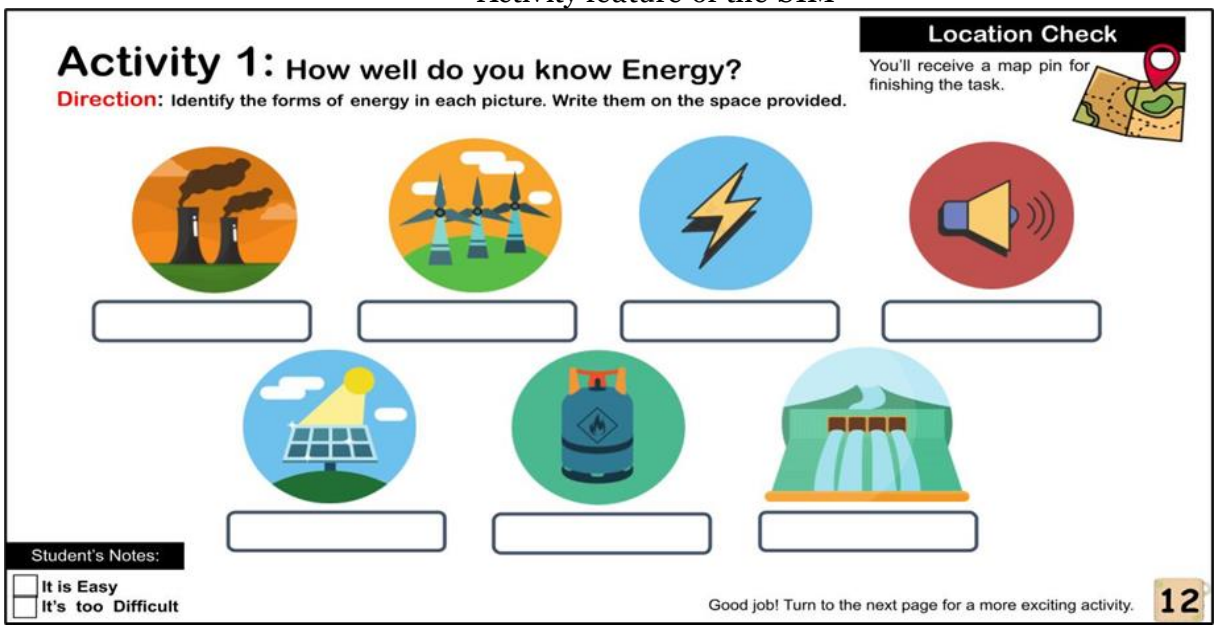
Figure 4.

Interactive QR Code-based feature of the SIM



Assessment Features

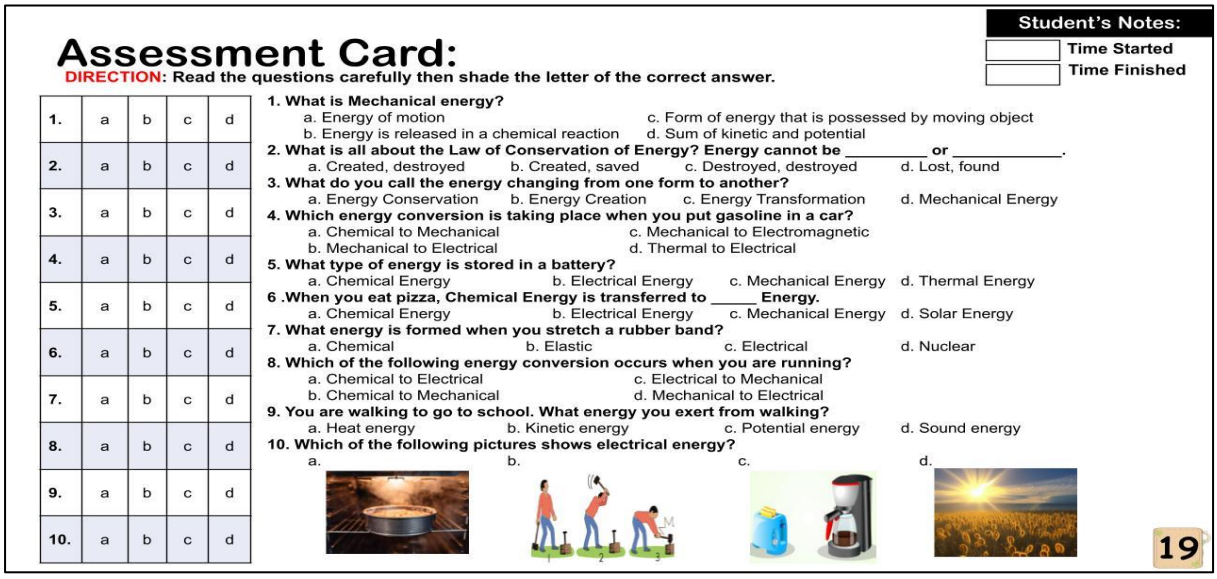
Figure 5.
Activity feature of the SIM



The SIM incorporates various assessment features throughout its components, including the guide card, activity card, enrichment card, and assessment card. These features include exercises, drills, or other tasks that allow students to evaluate their comprehension of the learned material, identify and correct any mistakes, monitor their learning progress, and utilize feedback to gauge their understanding.

By engaging with these assessments, students gain a deeper understanding of the subject matter. The evaluation tasks require students to apply their knowledge and respond to presented questions. The Activity cards offer quick exercises that allow students to check their understanding of the concepts covered. These exercises help clarify any misunderstandings students might have.

Figure 6.
Assessment card for evaluation



Raghavendra (2022) suggests that students presented with challenging activities are more likely to seek connections within their lessons, which naturally keeps them motivated. Additionally, Descartin (2023) and Campbell (2021) highlight that developing the ability to overcome challenges helps students view them as a normal part of the learning process, fostering a growth mindset.

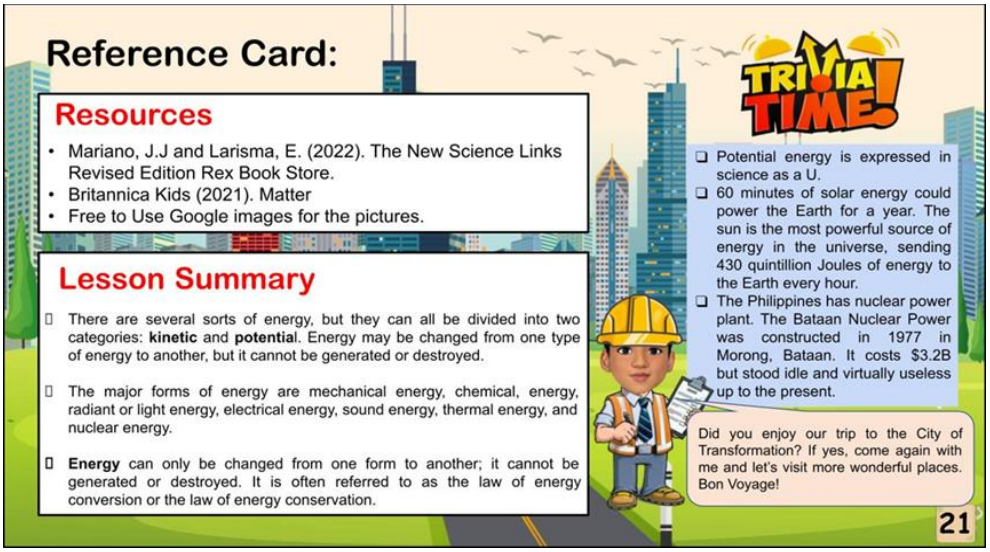
The respondents utilized the assessment instruments in SIM Science 6 to evaluate their learning throughout the course and measure their science competency. These instruments encompass various components, including the guide card, activity card, enrichment card, assessment card, and key card.

This section challenges students' critical thinking as they apply their understanding to justify the importance of energy transformation. By going beyond science knowledge, the SIM aims to shape students into individuals who can effectively fulfill their social, moral, and economic responsibilities while adapting to changing circumstances. The integration of value education reinforces these benefits (Villonez, 2018). These benefits include promoting students' mental and physical development, teaching manners, fostering a sense of camaraderie, and instilling patriotism.

Figure 7 provides students with access to a curated selection of materials that support continued learning and reinforce previously acquired topics and skills.

Figure 7.

Reference Card SIM



Evaluation of the SIM in Science 6

The evaluation of the SIM Science 6 was determined by five (5) teachers who were experts in the field.

Table 1.

Validation results

Criteria	Mean	Remarks
Content Quality	27.40	Passed
Format	66.20	Passed
Presentation and Organization	19.16	Passed
Other Findings (Technical Errors)	24.00	Passed

Legend: DepEd LRDMS Passing Scores:
Content Quality - 21 to 28 points
Format – 54 to 72 points
Presentation and Organization – 15 to 20 points
Other Findings (Technical Errors) – 24 points (No error)

Content Quality

The "Transformation City" content received a total score of 27.4 out of a possible 28 points for content quality, significantly exceeding the minimum passing score of 21. This high score indicates that "Transformation City" aligns well with the learning objectives for Grade 6 science and covers the intended topics comprehensively. The content effectively reinforces learning and helps students achieve the stated learning objectives. Additionally, the content is factually accurate, up-to-date, logically organized, and free of bias based on race, gender, ethnicity, or culture.

Format

The Transformation City scored exceptionally well in format, achieving 66.2 points out of a possible 72. This score surpasses the minimum passing requirement of 54 points. These results highlight how the resource's design directly supports its instructional goals. The material's well-structured design effectively facilitates the intended learning outcomes.

The content caters to the appropriate grade level and clearly outlines the expected learning objectives and student achievements. The information is presented in a well-organized and logical manner, with a clear time allocation for studying the topic. The visuals, including photos, are creative, engaging, and easy to understand. Although a comment on the size was mentioned, the researcher still pursued to test also Su et al.'s (2018) findings on font size and its impact on learning.

Presentation and Organization

For presentation and organization, the Transformation City for Science 6 received a final score of 19.6. This score fell significantly close to the objective of 15 points out of a possible 20 points to pass this creation.

The way the Transformation City material is shown suggests how it is organized and presented. The presentation and organization of Transformation City were interesting, understandable, and engaging. The sentence lengths were appropriate for the intended reader's understanding level.

Other Findings (Technical Errors)

The Transformation City of Science 6 had a final score of 24 for Other Findings (Technical Defects). The needed score to satisfy the requirements is this one. All of this served to emphasize how miscommunication and confusion will no longer be caused by material progress. The records are accurate and relevant. Every grammatical mistake, inaccurate fact, out-of-date information, and visible flaw has been fixed.

Performance Rating based on the Pretest and Posttest

The results presented in Table 2 show a significant increase in learning outcomes. The average score on the post-test increased by 24.35 percentage points compared to the pre-test, indicating a statistically significant improvement. In simpler terms, "Transformation City," the SIM developed for Grade 6 Science, has been effective in raising student achievement on the topic covered in Quarter 3.

The table also highlights the difference in student performance between the pre-test and post-test. The average score on the pre-test was 42.50 % (Average), while the post-test average was 66.85 % (Moving Towards Mastery). This translates to a notable improvement of 4.87 points on average, suggesting that the use of the SIM is an effective strategy for enhancing student performance in competency.

These findings align with previous research. Villonez (2017) found that students who used SIMs demonstrated a significant increase in knowledge. Their understanding of scientific concepts improved compared to those who did not use the materials. A similar finding with Rosal et al. (2022), supports the notion that SIMs are effective in addressing the needs of students struggling to meet learning standards in a particular subject.

Similarly, De Jesus (2019) highlighted the benefits of SIMs in improving students' science process skills and understanding of subject matter. Teaching science can be challenging for instructors, as certain concepts can be difficult for some students to grasp, especially for those encountering them for the first time.

Table 2.

Performance Rating based on the Pretest and Posttest

Respondent	Pretest	Level	Posttest	Level	Difference
R1	6	L	6	L	0
R2	11	AVR	14	MTM	3
R3	5	L	14	MTM	9
R4	11	AVR	14	MTM	3
R5	7	L	11	AVR	4
R6	11	AVR	12	AVR	1
R7	12	AVR	13	AVR	1
R8	6	L	11	AVR	5
R9	3	VL	10	AVR	7
R10	11	AVR	13	AVR	2
R11	12	AVR	17	MTM	5
R12	11	AVR	17	MTM	6
R13	13	AVR	11	AVR	2
R14	9	AVR	16	MTM	7
R15	10	AVR	18	CAM	8
R16	11	AVR	13	AVR	2
R17	8	AVR	11	AVR	3
R18	7	AVR	12	AVR	5
R19	10	AVR	14	MTM	4
R20	9	AVR	17	MTM	8
R21	7	AVR	11	AVR	4
R22	8	AVR	9	AVR	1
R23	8	AVR	17	MTM	9
R24	9	AVR	13	AVR	4
R25	8	AVR	18	MTM	10
R26	11	AVR	13	AVR	2
R27	4	L	17	MTM	13
R28	7	L	13	AVR	6
R29	5	L	13	AVR	8
R30	5	L	13	AVR	8
Weighted Average	**8.50**		**13.37**		**4.87***
Percentage	**42.50 %**	**AVR**	**66.85 %**	**MTM**	**24.35%***

*Significant at 0.05

Legend: 19.1- 20 Mastery (M)
17.1 -19 Closely Approximating Mastery (CAM)
13.1- 17 Moving Towards Mastery (MTM)
7 - 13 Average (AVR)
3.1 - 7 Low (L)
1.1 - 3 Very Low (VL)
0 - 1 Absolutely No Mastery (ANM)

Feedback from the Students

Table 3.

Learners' Perceived Benefits

Benefit	Mean	Remarks
Cognitive Benefits	3.07	Agree
Affective	3.00	Agree
Psychomotor Benefits	3.05	Agree
Overall	**9.12**	**Agree**

Table 3 illustrates the level of perceived benefits of SIM in terms of Cognitive, Affective, and Psychomotor benefits. The learners agreed that they learned some useful information not mentioned in the worksheet after using the SIM as it yielded the highest mean score of (M=3.23). With a mean score of 3.17, they believed that the SIM made use of the words and terms that were suited to their reading comprehension (See Appended Results on Student's Feedback). On the other hand, the statement "I can easily analyze the presentation of concepts in the SIM" received the lowest mean score of responses with (M=2.83) yet was also remarked Agree.

Overall, a mean score of 3.07 was reached for the reported cognitive advantages of SIM. This suggests that SIM helped add some useful information not mentioned in the worksheet after using the SIM. Furthermore, the text included vocabulary and supporting details that were appropriate for their reading comprehension. Additionally, the objectives and activities included in the SIM were straightforward and met the needs of the students. According to De Jesus (2019), numerous students struggle with science, according to studies on the subject. SIM helps students learn and perceive difficult lessons as exciting yet achieving activities.

Moreover, the learners agreed that they had fun reading and doing all activities required in the SIM as it yielded the highest mean score (M=3.23) (See Appended Results on Student's Feedback). With a mean score of (M=3.10), they believed that they could easily relate to the presented concepts and examples in the SIM. On the other hand, the statement "I am eager to use SIM as a tool to enhance my learning" received the lowest mean score of responses with (M=2.80) yet was also remarked Agree. Overall, the average score for perceived benefits of SIM in terms of affective was 3.0. According to the findings, the SIM motivated and inspired students to read the assigned readings and complete the accompanying exercises.

As for Psychomotor benefits, the learners agreed that they could easily react to the presented concepts and examples in the SIM which yielded the highest mean score (M=3.23). With a mean score of (M=3.17), the respondent agreed the interactive activities were easy to control. The statement "The SIM was easy to manipulate" on the other hand, had the lowest mean score of replies (M=2.70), but was marked Agree. Overall, the level of perceived advantages of SIM in terms of Psychomotor reached a mean score of 3.05. The findings show

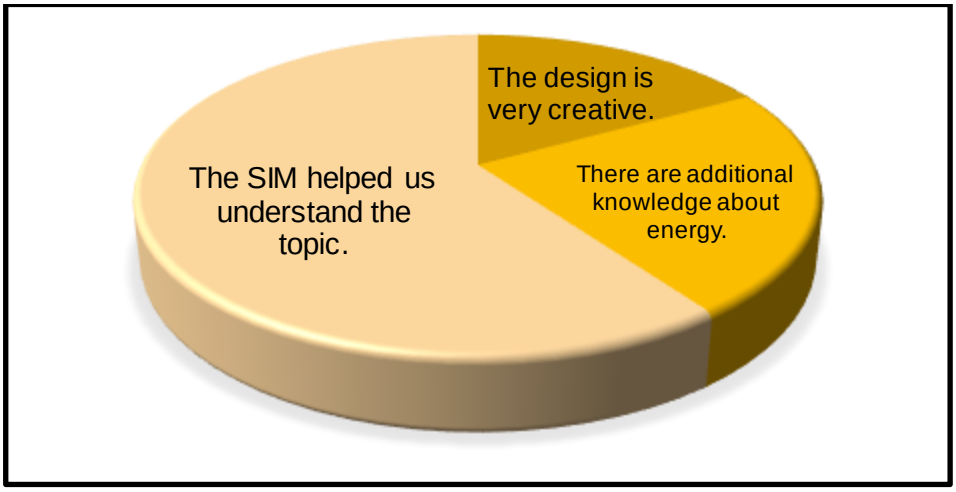
that the learners agreed that they could quickly respond to the ideas and examples given in the SIM. The SIM also had a visually appealing graphic display, and the students loved controlling it.

Research has shown that visual information helps in improving knowledge retention. Additionally, visuals are simply simpler to understand and retain (Ambag, 2018). One activity that students like to engage in to understand challenging scientific ideas is manipulation. As a result, educators are encouraged to employ as much creativity as they can to create a successful SIM that will aid students in improving their science abilities.

Figure 8. Student's Feedback on the Pocket SIM

Figure 8.

Student's Feedback on the Pocket SIM



In addition to the numeric findings, sixty percent (60%) of students who commented on the SIM said it improved their understanding of the subject. This enhanced comprehension likely contributed to higher scores on the post-test compared to the pre-test. Positive student feedback highlighted the creative design (17%), the introduction of new energy knowledge (23%), and improved subject comprehension (60%).

Tan (2022) highlights this strategy, suggesting that a strong information base improves cognitive processes like reasoning and problem-solving in students like what Singaporeans made in their curriculum.

One concern was the SIM's fragility and difficulty flipping. Rodrigo and Limay (2015) emphasize the importance of student interaction with instructional materials, so durability is a factor to consider in future versions.

Overall, student feedback suggests that "Transformation City" has promise for enhancing science learning. However, improvements can be made to the SIM's durability.

Summary

The Philippines consistently scores low in international assessments like TIMSS and PISA, particularly in Science and this study contributes to efforts to improve science education in the Philippines by exploring the potential of SIMs to address specific learning challenges. This study aimed to develop a Pocket Strategic Intervention Material (SIM) for Science 6 and assess its impact on learning. The research sought answers to what SIM can be developed based on the least mastered Science competency of Grade 6 pupils, how the SIM influences Grade 6 pupils' performance on pre-and post-tests, and determine whether significant differences exist in the performance between the pre-test and post-test, and to gather student feedback for the enhancement of the SIM.

A mixed-methods research design was employed, specifically a one-group experimental design combined with descriptive data analysis on the evaluation and feedback from students. The intervention material, titled "Transformation City," was developed based on DepEd Memorandum No. 117, Series of 2005, to address the Least Mastered Competency in Science. It incorporates five key features: a Guide Card, Activity Card, Assessment Card, Enrichment Card, and Reference Card. The design includes pop-ups, engaging caricatures, and QR codes for accessing additional information. The SIM was validated by five experts before implementation. A validated researcher-made test instrument was also used for the pre-test and post-test.

The findings revealed a significant improvement in Grade 6 pupils' performance in Transformation of Energy which was the determined least mastered competency based on the interview with Science teachers. Moreover, the average score increased from 42.50% (Average) to 66.85% (Moving Towards Mastery), reflecting a 24.35% increase. This suggests that the "Transformation City" SIM was effective in enhancing science learning.

Encouragingly, 60% of the 30 students who provided feedback reported that the SIM helped them understand the subject better. This improved comprehension likely contributed to the higher post-test scores. Lastly, while the study considered Su et al.'s (2018) research on font size, the primary focus was on the overall design and content of the SIM. The findings suggest that a well-structured and interactive learning tool can be impactful regardless of specific details like font size. This highlights the importance of engaging content and instructional design in promoting student success.

Conclusions

Based on the study's findings, the following conclusions can be drawn:

1. Strategic Intervention Materials (SIMs) should be developed to be interactive and visually engaging for students. They may also be pocket-sized for easy portability and accessibility.

2. The use of pocket-sized SIMs significantly increased student performance in understanding Energy Transformation.
3. The exercises within the pocket-sized SIMs were enjoyable for students and contributed to their development in cognitive, emotional, and psychomotor learning domains.

Recommendations

In light of the study's findings and conclusions, the following recommendations are made:

1. To further enhance student understanding of least mastered skills, the developed SIMs should be upgraded.
2. The use of SIMs targeting the least mastered competencies should be continuously implemented.
3. Schools should promote the development and implementation of SIMs as interventions for least mastered competencies across all learning areas.
4. Teachers should be trained in creating SIMs to enrich learning and improve student performance. School administrators should also support teachers in utilizing SIMs for student improvement.

Limitations of the Study

This study provides valuable insights into the potential of SIMs for improving science learning in the Philippines. However, the study involved a relatively small sample of 30 Grade 6 students. This may limit the generalizability of the findings to a wider population. Moreover, it was conducted in a single elementary school. The results may not be representative of students in other schools or regions with different learning environments and resources.

The study assessed the immediate impact of the SIM on student performance. Long-term effects on knowledge retention and application of skills were not explored.

The intervention focused on a single least mastered competency, "Transformation of Energy." Thereby, the effectiveness of the SIM in addressing other science concepts remains unknown. These limitations highlight the need for further research with larger sample sizes, across diverse settings, and with longer follow-up periods. Additionally, future studies could explore the effectiveness of SIMs for various science concepts and investigate the impact of teacher training on successful implementation.

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