The Use of Electronic Strategic Intervention Materials (e-SIM) In Teaching Science VI At Dangguinan Elementary School

ABSTRACT

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| --- |
| This study aimed to use Electronic Strategic Intervention Materials in Teaching Science VI at Dangguinan Elementary School. Electronic Strategic Intervention Materials (e-SIM) address the least learned competencies among learners, especially in the higher grades. E-SIMs enhance student engagement, address learning gaps in science, and support ICT-integrated instruction through interactive, flexible, and data-driven learning tools that improve academic performance. Dangguinan Elementary School in Southern Conner District is a public academic institution located at Calafug, Conner, Apayao. There are 17overall numbers of Grade VI pupils, and the respondents of this study. The study is made up of pre-test, post-test, one-group research design. It determined the pre-test and post-test performances of pupils in Science VI. The study used Electronic Strategic Intervention Materials (e-SIM) developed by the researcher to improve the performance of pupils in Science VI. Based from the result there was a significant difference in the Science performance level of the Grade 6 pupils in the least learned competencies before and after implementing e-SIM. The p-value was found to be lower than the 0.05 alpha level, indicating a significant improvement in the performance after the use of e-SIM. Generally, the integration of e-SIM should be recommended meaningful instructional approach in enhancing Science education at the elementary level, fostering a more interactive, learner-centered, and sequential learning experience. |

*Keywords: Electronic Strategic Intervention Materials (e-SIM), Science*

1. INTRODUCTION

Education prepares individuals to handle the challenges of a constantly changing society. It begins with the foundational concepts from various fields of learning that learners must apply in their daily lives.

This concern is reflected in the 2022 Program for International Student Assessment (PISA) results, conducted by the Organization for Economic Cooperation and Development (OECD), which evaluated 15-year-old students in core academic subjects. The Department of Education (DepEd) participated in this assessment, and the results were alarming: Filipino students ranked third from the bottom, with an average scientific literacy score of 356 points—well below the OECD average of 489 points (González & Ortíz, 2003; Department of Education [DepEd], 2017).

To address such issues, DepEd launched the Sulong Edukalidad initiative, which promotes the use of technology to reach learners and improve education quality (DepEd, 2019). Technology now plays a central role in educating future generations, allowing knowledge to be accessed with just a click. The promotion of a digital rise in education emphasizes ICT-assisted teaching and the use of e-learning resources for both teachers and students (Timotheou et al., 2023). The integration of information and communication technology (ICT) into science education, particularly through Electronic Strategic Intervention Materials (E-SIMs), encourages independent learning, critical thinking, and real-time feedback, which are crucial in 21st-century learning (Ladia, 2021).

The Department of Education has further endorsed the development and implementation of digital learning tools to support distance learning and expand access to quality education during and beyond the pandemic (Ladia, 2021). There is a growing need to utilize E-SIMs to improve student engagement, address learning gaps in science, and support ICT-integrated instruction through interactive, flexible, and data-driven learning tools that enhance academic performance.

Interactive quizzes and activities within E-SIMs allow learners to receive instant feedback, enabling them to monitor their understanding and progress. These digital materials are designed to focus on the competencies students find most difficult, serving as remedial tools to help struggling learners improve and keep up with lessons (Delos Reyes & Gomez, 2020).

In line with these thrusts and priorities for ICT integration, the present study was motivated by the need to develop and utilize Electronic Strategic Intervention Materials (E-SIMs) aligned with the third-quarter competencies of Science VI. This research seeks to provide accessible ICT-enabled learning materials as a strategic response to enhance student performance.

2. STATEMENT OF THE PROBLEM

Generally, this study aimed to determine the Effectiveness Electronic Strategic Intervention Materials (e-SIM) in teaching Science VI at Danguinan Elementary School.

Specifically, it sought to answer the following questions:

1. What is the level of performance of the pupils in Science VI before the use of e-SIM?

2. What is the level of performance of the pupils in the Science VI post-test after the use of e-SIM?

3. Is there a significant difference in the performance level of Grade 6 pupils in Science VI before and after the use of e-SIM?

**2.1 Hypothesis**

There is no significant difference in the performance level of Grade VI pupils in Science before and after the use of e-SIM.

3. METHODOLOGY

**3.1. Reaserch Design**

The study used the pre-test, post-test, one-group research design. It determined the pre-test and post-test performances of pupils in Science VI. The study used Electronic Strategic Intervention Materials (e-SIM) to improve the performance of Science VI pupils.

**3.2. Locale of the Study**

The study was conducted at Dangguinan Elementary School (DES) in Purok 7, Calafug, Conner, Apayao, Southern Conner District.

**3.3. Respondents of the Study**

The participants of the study were the Grade VI pupils of Dangguinan Elementary School, consisting of 8 males and 9 females, a total of 17 learners who were enrolled for SY 2024-2025. Total enumeration was used.

**3.4. Research Instrumentation**

The main instrument was a 40 multiple-choice test adapted from the Project SMART (Standardized and Meaningful Assessment Result-Based Teaching) from DepEd- CAR. There had been a pre-test and post-test assessment in Science during the Third quarter. The electronic Strategic Intervention Materials (e-SIMs) were validated by Master Teachers using the Non-Print Evaluation Rating Sheet from the DepEd LRMDS.

**3.5. Data Gathering**

Firstly, the researcher sought permission from the Public Schools District Supervisor (PSDS) of Southern Conner District and the School Head of Dangguinan Elementary School. The necessary approvals were obtained, and the Third Quarter Science VI pre-test was administered to the pupils. Following this, the Electronic Strategic Intervention Materials (e-SIMs) were implemented. To assess the cognitive level of proficiency for the e-SIM topics: friction, gravity, transformation of energy, and simple machines, aligned with Bloom's Taxonomy, categorizecognitive skills into a hierarchy: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating.

Lastly, the Science VI post-test was conducted, from PROJECT SMART (Standardized and Meaningful Assessment Result-based Teaching), and the grade 6 pupils responded positively to learning Science VI e-SIM. The data gathered were tabulated, consolidated, and analyzed by the researcher.

**3.5. Statistical Analysis**

The performance level of the pupils was computed using descriptive statistics like frequency, percentage, mean, and standard deviation in the pre-test and post-test in the third quarter of Science VI based on the DepEd scale.

To test the hypothesis “there was no significant difference in the performance of Grade VI pupils in the least mastered competencies in science before and after implementing Electronic Strategic Intervention materials (e-SIM)”, the t-test was computed.

4. results and discussion

**4.1.** **Performance level of the pupils in the third quarter of Science VI pre-test before the use of e-SIM.**

**Table 1. Mean and Standard Deviation of Performance of Pupils in Science in the Pretest.**

|  |  |  |  |
| --- | --- | --- | --- |
| Topic | No. of Items in the Pre-test | Mean of Correct Answers | Standard Deviation |
| Friction | 8 | 4 | 1.54 |
| Gravity | 6 | 2 | 0.64 |
| Sound, Heat, Light, and Electric Energy | 14 | 7 | 1.41 |
| Simple Machines | 12 | 5 | 1.71 |
| Overall Mean of Pretest | 40 | 18 (Poor) | 3. 29 |

Table 1 shows the results of the Science pretest of the pupils before the use of the e-SIM. It shows here that all pupils before the use of the e-SIM have poor performance.

The performance is supported by the mean score of 18 correct answers out of a total of 40 items pre-test, as indicated in Table 2. The scores are highly spread as reflected by the high value of the standard deviation. This implies that the pupils did not correctly answer the total 40-item multiple-choice test.

The pupils answered 4 correct answers on the topic Friction out of 8 questions, 2 correct answers out of 6 questions along Gravity, 5 correct answers in Sound, Heat, Light and Electric Energy out of 12 questions and 5 correct answers out of 12 questions on the Topic Simple machines.

**4.2.** **Post-test performance level of the learners in the third quarter of Science VI after utilizing e-SIM**

**Table 2 Frequency and Percentage Distribution according to Performance level of the pupils in the third quarter, Science VI post-test after the use of e-SIM**

|  |  |  |
| --- | --- | --- |
| Performance Level | F | % |
| Excellent | 3 | 17.65% |
| Very good | 4 | 23.53% |
| Good | 6 | 35.29% |
| Fair | 4 | 23.53% |
| Poor | 0 | 0.00 |
| Total | 17 | 100.00% |

Table 2 presents 3 or 17.65% of pupils who had excellent performance, 4 or 23.53% who obtained very satisfactory, and 6 or 53.29% of the pupils with good performance. However, 4 or 23.53% had fair performance. No pupils obtained poor performance during the post-test. This implies that the e-SIM helped bridge learning gaps that pupils may have struggled with in the four topics in the third quarter of Science VI: Friction, Gravity, Transformation of sound, heat, light, and electric energy, and Simple Machines.

Intervention materials have demonstrated significant promise in enhancing student performance in science subjects. In a study by Dela Cruz (2020), intervention materials were found effective in improving the academic achievement of Grade 6 pupils in science, emphasizing the importance of contextualized and well-designed educational tools. Supporting this, Rivera (2020) revealed that the use of interactive learning modules on friction significantly increased student engagement and conceptual understanding. Similarly, Bautista (2021) found that visual-based intervention tools enhanced students’ grasp of abstract concepts such as gravity, resulting in improved assessment scores.

Further, Cruz and Santos (2020) reported that hands-on and inquiry-based activities focusing on the transformation of energy promoted critical thinking and deeper comprehension among junior high school students. Navarro (2022) noted that learners exposed to locally developed intervention materials for teaching simple machines outperformed those who received traditional instruction, underscoring the effectiveness of activity-based learning in developing scientific reasoning.

Moreover, Buitre (2022) documented a marked increase in post-test scores following the implementation of Electronic Strategic Intervention Materials (e-SIMs) in science, highlighting the potential of differentiated activities embedded within the material. This is further validated by Suarez and Casinillo (2020), who found that students taught challenging science topics through e-SIMs interventions showed significantly higher post-test scores compared to those taught using conventional classroom methods.

**4.3. Significant difference in the performance level of Grade VI pupils in the least learned competencies in Science before and after implementing e-SIM**

**Table 3 Test of significant difference in the performance level of Grade VI pupils in Science before and after implementing e-SIM**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Performance Level | Mean | T | df | p-value | Decision at α= 0.05 |
| Before the use of e-SIM | 18 | -23.321 | 16 | .000000000000088 | Reject Ho |
| After the use of e-SIM | 34 |

Table 3 shows that, results revealed a p-value lower than the 0.05 alpha level, thus, the null hypothesis is rejected.

Therefore, there is a significant difference in the performance level of Grade VI pupils in Science before and after implementing e-SIM. This implies that the performances of the pupils statistically improved during the Third quarter of Science VI before and after implementing e-SIM.

E-SIMs allow learners to observe how friction affects the movements of different objects through simulations and drag-and-drop activities. Visual demonstrations help students better understand abstract concepts like gravity. They support dynamic presentations of how energy changes form—e.g., electrical to light or heat—making abstract concepts more accessible. E-SIMs also provide interactive experiences where learners can virtually manipulate levers, pulleys, and inclined planes, improving their understanding of mechanical advantage and usage (Anito & Morales, 2019).

Moreover, based on the interview, the e-SIM provided them more opportunities to engage, drew connections between lessons and everyday scenarios, citing real-life applications, noting that the visual examples of simple machines were particularly engaging.

According to De Gracia (2024), pupils’ responses revealed a positive reception of the e-SIMs, demonstrating an enhanced understanding of the third quarter Science VI topics. Their ability to connect these concepts to real-life contexts, along with their enjoyment of the interactive and visually engaging activities, underscores the effectiveness of e-SIMs in fostering interactive learning, deepening understanding, and addressing least learned competencies while bridging learning gaps.

**5. CONCLUSION**

Based on the findings derived from this study, the use of e-SIM in the Third quarter of Science VI demonstrated a notable improvement in pupils’ academic achievement, particularly in the least learned competencies. There was improved performance of the pupils after using e-SIM in the topics of friction and gravity, energy transformation, and simple machines. The e-SIMs were effective in addressing the least learned competencies during the Third Quarter. Therefore, the integration of e-SIM can be considered a meaningful instructional approach in enhancing Science education at the elementary level, fostering a more interactive, learner-centered, and sequential learning experience.

Consent (wherever applicable)

I affirm that the respondents voluntarily agreed to participate after being fully informed about the purpose, nature, and potential implications of the study, and their responses have been collected with utmost respect for their privacy and confidentiality.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

I acknowledge that I have used ChatGPT only for refining some of the sections in the document.

Ethical approval (wherever applicable)

The study was conducted with the approval and in accordance with the standards of the college. No ethical approval was required, as the research followed all applicable ethical guidelines, ensuring respect for the respondents’ privacy and confidentiality.

References

Anito, J. B., & Morales, M. P. E. (2019). Development and effectiveness of interactive E-

SIMs in teaching selected topics in science. *Asia Pacific Journal of Multidisciplinary Research, 7*(1), 45–52.

Bautista, K. J. (2021). Utilizing visual intervention tools to teach gravity to elementary

learners. *Asian Journal of Physics Education, 6*(2), 40–46.

Buitre, S. L. (2022). Electronic Strategic Intervention Material (e-SIM) in Grade 7 (Biology):

Effects on students’ performance. *International Journal of Multidisciplinary: Applied*

*Business and Education Research, 4*(8), 15. <https://doi.org/10.11594/ijmaber.04.08.15>

Cruz, M. C., & Santos, A. P. (2020). Improving students’ understanding of energy

transformation through hands-on activities. *International Journal of Science*

*Instruction, 7*(3), 55–63.

De Gracia, R. V. (2024). *Enhancing science literacy on selected topics in Earth and life*

*science through electronic strategic intervention materials (e-SIM).* Retrieved April 23, 2025, from [Insert URL here]

Dela Cruz, M. J. (2020). *Effectiveness of intervention materials in improving science*

*performance of Grade 6 pupils* [Master’s thesis, University of the Philippines].

Delos Reyes, G. P., & Gomez, S. D. (2020). Utilization of SIMs in improving science learning

competencies. *Journal of Basic Education, 12*(2), 101–110.

Department of Education. (2017). *Department of Education participation in the 2022 cycle of*

*the Program for International Student Assessment (PISA) of the Organization for Economic Co-operation and Development (OECD)* (DepEd Order No. 29, s. 2017).

Department of Education. (2019). *Sulong Edukalidad aimed at improving the quality of basic*

*education in the Philippines* (DepEd Order No. 14, s. 2019).

González, Y., & Ortíz, F. X. (2003). Knowledge and skills for life: First results from the OECD

Programme for International Student Assessment (PISA) 2000. *Investigación Bibliotecológica: Archivonomía, Bibliotecología e Información, 17*(34).

Ladia, M. A. (2021). ICT integration in teaching science through E-SIMs. *Journal of*

*Educational Technology & Curriculum Development, 5*(2), 78–90.

Navarro, E. J. (2022). The impact of localized intervention materials on the learning

outcomes in simple machines. *Journal of Basic Science Pedagogy, 9*(1), 15–21.

Rivera, J. L. (2020). Enhancing conceptual understanding of friction using interactive

learning modules. *Journal of Science and Education Technology, 8*(1), 22–29.

Suarez, M. G., & Casinillo, L. F. (2020). Effect of Strategic Intervention Material (SIM) on

academic performance: Evidence from students of Science VI. *Review of Socio-Economic Research and Development Studies, 4*(1), 20–32. <https://doi.org/10.5281/zenodo.4518830>

Timotheou, S., Miliou, O., Dimitriadis, Y., Sobrino, S. V., Giannoutsou, N., Cachia, R.,

Monés, A. M., & Ioannou, A. (2023). Impacts of digital technologies on education and factors influencing schools' digital capacity and transformation: A literature review. *Education and Information Technologies, 28*(6), 6695–6726. <https://doi.org/10.1007/s10639-023-11906-w>