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 evaluate The Use of Electronic Strategic Intervention Materials (e-SIM) 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 17 overall numbers of Grade VI pupils, and the respondents of this study. The study is made up of a pre-test, a 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 on 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. Given these results, the integration of e-SIMs is recommended as a meaningful instructional approach that fosters interactive, learner-centered, and sequential learning experiences in Science education at the elementary level. |

*Keywords: Electronic Strategic Intervention Materials (e-SIM), Science, Dangguinan Elementary School, ICT*

1. INTRODUCTION

Education equips individuals with the knowledge and skills necessary to navigate an ever-changing society and daily lives. It builds on foundational concepts across various disciplines, helping learners apply essential knowledge to real-world situations. However, despite continuous efforts to improve instructional strategies, challenges persist in ensuring effective learning outcomes, particularly in science education.

Significant concern is reflected in the 2022 Programme for International Student Assessment (PISA) results, conducted by the Organisation for Economic Co-operation and Development (OECD), which assessed the performance of 15-year-old students in core academic subjects. The Department of Education (DepEd) participated in this global assessment, and the results revealed a pressing issue—Filipino students ranked third from the bottom, with an average scientific literacy score of 356 points, far below the OECD average of 489 points (Lasala, 2023; OECD, 2023). These findings underscore the urgent need for innovative educational interventions to enhance science comprehension and performance among learners.

To address such issues, DepEd launched the Sulong EduKalidad initiative, which promotes the use of technology to reach learners and improve education quality (Department of Education [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

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 (Manlapig et al., 2024). 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.

According to Rosal et al. (2022), 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.

According to Asrizal, Yurnetti, and Usman (2022), in line with these thrusts and priorities for ICT integration in education, the present study was primarily motivated by the growing need to develop and utilize Electronic Strategic Intervention Materials (E-SIMs) that are aligned with the third-quarter Science VI competencies. Recognizing the challenges faced by both educators and learners, particularly in addressing difficult science concepts, this research seeks to design digital instructional materials that are not only curriculum-based but also interactive, engaging, and learner-centered. By leveraging the advantages of ICT, the study aims to provide accessible, flexible, and responsive learning tools that support differentiated instruction and remediation. Ultimately, the goal is to offer a strategic solution that enhances students' academic performance, narrows learning gaps, and promotes independent and self-paced learning through meaningful technology integration.

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. Research 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 Lituañas and Dela Cruz (2024), contextualized Strategic Intervention Materials (SIMs) were found effective in improving the academic achievement of Grade 6 pupils in science, emphasizing the importance of well-designed educational tools tailored to learners' needs. The use of interactive learning modules on friction significantly increased student engagement and conceptual understanding. Manlapig, Acuña, and Manuel (2024) emphasized that integrating electronic Strategic Intervention Materials (e-SIMs) in physics instruction led to improved academic performance and heightened student motivation. Their study revealed that the interactive and accessible nature of e-SIMs made complex scientific concepts, like friction, easier to grasp, thereby enhancing both engagement and conceptual learning. Similarly, Limbago-Bastida and Bastida (2022) found that visual-based intervention tools enhanced students’ grasp of abstract concepts such as gravity, resulting in improved assessment scores.

Further, Rizki et al. (2025) 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. Learners exposed to Strategic Intervention Materials (SIMs) for teaching simple machines demonstrated significantly higher achievement compared to those who received traditional instruction, underscoring the effectiveness of activity-based learning in developing scientific reasoning (Villonez, 2018).

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.

According to Hamza-Lup and Baird (2012), 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.

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

Asrizal, A., Yurnetti, Y., & Usman, E. A. (2022). ICT thematic science teaching material with 5E learning cycle model to develop students' 21st-century skills. *Jurnal Pendidikan IPA Indonesia*, 11(1), 61–72. <https://doi.org/10.15294/jpii.v11i1.33764>

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>

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 https://icceph.com/wp-content/uploads/2024/09/ENHANCING- SCIENCE-LITERACY-ON-SELECTED-TOPIC-IN-EARTH-AND-LIFE-SCIENCE- THROUGH-ELECTRONIC-STRATEGIC-INTERVENTION-MATERIAL-E-SIM.pdf

Dela Rosa, S. A. (2024). Electronic Strategic Intervention Materials (e-SIMs) towards students’ enhanced performance in Physics 10. *Psychology and Education: A Multidisciplinary Journal*, 24(9), 1095–1103. <https://doi.org/10.5281/zenodo.13712324>

Department of Education (DepEd). (2019). *Sulong EduKalidad: Improving the quality of basic education in the Philippines.* Department of Education. https://www.deped.gov.ph/2019/12/03/sulong-edukalidad/

Hamza-Lup, F. G., & Baird, W. H. (2012). Feel the static and kinetic friction. *In Haptics: Perception, Devices, Mobility, and Communication* (Lecture Notes in Computer Science, Vol. 7282, pp. 181–192). Springer. <https://doi.org/10.1007/978-3-642-> 31401-8\_17

Manlapig Jr, E., Acuña, E. B., & Manuel, A. M. (2024). Exploring Student Academic Performance and Motivation in Physics through Electronic-Strategic Intervention Material (e-SIM). Anatolian Journal of Education, 9(1), 145-156.

Lasala, N. J. (2023). Development and validation of E-SelfIMo: E-learning self-directed interactive module in Earth Science. Recoletos Multidisciplinary Research Journal, 11(1), 85–101. <https://rmrj.usjr.edu.ph/rmrj/index.php/RMRJ/article/view/1647>

Limbago-Bastida, R. A. C., & Bastida, G. L. (2022). Effectiveness of strategic intervention material on the learning outcomes of students. *European Journal of Social Sciences Studies, 7*(4), Article 1249. <https://doi.org/10.46827/ejsss.v7i4.1249>

Lituañas, A. B., & Dela Cruz, F. M. (2024). Development and validation of contextualized strategic intervention materials in science for Grade 6 learners. *Randwick International of Education and Linguistics Science Journal*, 5(4), 1363–1383. <https://doi.org/10.47175/rielsj.v5i4.1103>

Rosal, G. M., Aguinaldo, J. C. M., Aguinaldo, L. D. B., Casuat, G. H. U., Balagtas, R. U., & Del Mundo, E. F. (2022). Improving the Least Mastered Competencies of Grade 11 Students in General Chemistry Using Electronic Strategic Intervention Material (E-SIM). Online Submission, 33(2), 59-76.

Manlapig, E. F., Acuña, E. B., & Manuel, A. M. (2024). Exploring student academic performance and motivation in physics through electronic-strategic intervention material (e-SIM). *ResearchGate*. [https://www.researchgate.net/publication/379470104\_Exploring\_Student\_Academic \_Performance\_and\_Motivation\_in\_Physics\_Through\_Electronic- Strategic\_Intervention\_Material\_e-SIM](https://www.researchgate.net/publication/379470104_Exploring_Student_Academic%09_Performance_and_Motivation_in_Physics_Through_Electronic-%09Strategic_Intervention_Material_e-SIM)

Rizki, I. N., Marlina, L., & Ismet, I. (2025, May). Development of Augmented Reality Assisted E-Modules to Improve Critical Thinking Skills of Middle School Students. In 6th Sriwijaya University Learning and Education International Conference 2024 (SULE-IC 2024) (pp. 520-533). Atlantis Press.

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>

Villonez, G. L. (2018). Use of SIM (Strategic Intervention Material) as strategy and the academic achievement of grade 7 students on selected topic in Earth Science. *PUPIL: International Journal of Teaching, Education and Learning*, 2(3), 78–88. <https://doi.org/10.20319/pijtel.2018.23.7888>