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Research Article

Electronic Strategic Intervention Material (e-SIM) in Grade 7 (Biology): Effects on Students' Performance

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ABSTRACT

As everyone is conforming to living with the pandemic, all offers and possible means in the education sector must be applied to help every learner manage their assignments. To help educators in assisting learners in doing their home works, DepEd Memo No. 177 s. 2005 -Training Workshop on Strategic Interventions for successful learning was created. This intervention aimed to enhance teachers' skills in test analysis and interpretation and capacitate them in developing varied intervention materials for remediation and enrichment of knowledge. This training prompted the teachers to develop and use Strategic Intervention Material in teaching their subject areas. This study attempted to determine the effectiveness of electronic strategic intervention material in conducting remedial lessons in Grade 7 Biology in a public national high school, Division of Antipolo City for the school year 2022-2023. This study utilized Quasi-experimental research with Non-print Rating Sheets and pretest and posttest as data gathering instruments. Pretest and posttest were administered to thirty-five (35) Grade 7 students to measure their academic performance before and after the use of the Electronic Strategic Intervention Material. The findings showed that Science experts and teachers evaluated the e-SIM with grand mean ratings of 3.88 and 3.87, respectively, verbally interpreted as Very Satisfactory in terms of content quality, instructional quality, technical quality, and accuracy and up-to-datedness. Results also showed that there is a significant difference between the academic performance of the student respondents on the pretest and posttest after the utilization of e-SIM as revealed by the computed mean scores of 13.37 for the pretest and 34.77 for the posttest.

Keywords: *Electronic strategic intervention material, students' academic performance, secondary education*

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Introduction

Schools, offices, and other facilities are forced to close in 2020 due to the emergence of the dangerous virus known as SARS-CoV-2. The education sector was unprepared for this. Globally, the learning gaps have gotten worse since the last Coronavirus pandemic outbreak (Onyema, 2020).

Researchers and international organizations evaluated the consequences of school closures on kids' learning and discovered a considerable loss in basic skill acquisition, particularly among the most disadvantaged children (Karalis, 2020). According to Bonal and González (2020), it is highly likely that the present pandemic will have a major long-term influence on pupils' skills and will exacerbate existing educational inequities.

As a result, the Department of Education has moved away from face-to-face instruction and toward various forms of learning, including (a) distance learning, which includes online digital modules, offline digital modules, TV-Radio-printed modules, and printed modules; (b) blended learning; and (c) homeschooling. Modular distance learning is defined by the Department of Education Planning Service Education Management Service Division as tailored instruction that enables students to employ Self-Learning Modules (SLMs) in print or digital format.

Teachers must assist students in developing confidence and achieving active involvement, as well as in understanding methods so that students are motivated to fulfill the objectives provided by the teacher (Menéndez and Moya Martinez, 2019). Education can no longer be limited to a single campus but can be expanded across the country through distance learning and the integration of E-Learning solutions. E-Learning is one of the excellent ways to deliver good quality education and foster learning. Encarnacion, et. al (2021), stated that E-Learning was perceived favorably by teachers and students as an excellent instrument for improving instruction delivery and developing knowledge acquisition abilities through the transfer of learning in a virtual setting. This means that by pushing the traditional classroom environment onto the web, E-Learning can alter the future of education. The entire academic community must ensure that the factors of e-learning efficacy are adequately given, and the use of e-learning must be examined on a regular basis.

Jonathan (2022) discussed the benefits of interactive digital learning. He mentioned that interactive learning engages multiple senses of the students. By using interactive learning, the education suits flexible learning which is favorable, given the situation at hand brought by COVID-19 pandemic. Furthermore, one immediate advantage of digital learning is that it saves time and resources. Teachers are frequently able to keep tabs on a student's development at all times within the context of interactive learning.

In the study of Ihejiamaizu (2019), "Utilization of Modern Electronic Instructional Materials and Biology Students' Academic Achievement in Calabar Education Zone, Cross River State" revealed that utilization of modern academic electronic instructional materials has a significant positive influence on student's learning ability. He also concluded that the students who studied in secondary schools where modern electronic instructional materials are utilized do achieve higher academic performance in learning Biology concepts compared to students from secondary schools where the learning electronic instructional materials were not utilized.

The Electronic Strategic Intervention Material (e-SIM) is the Department of Education's newest remedial material designed to reduce academic underachievement by improving learners' performance in the least mastered competencies and skills (Arpilleda, 2021). As everyone is conforming to living with the pandemic, all offers and possible means in the education sector must be applied to help every learner manage the assignments. To deal with this problem, intervention must be given. DepEd Memo No. 177 s. 2005 -Training Workshop on Strategic Interventions for Successful Learning, as mentioned by Maloloy-On (2021), aimed to enhance teachers' skills in test analysis and interpretation and capacitate them in developing varied intervention materials for remediation and enrichment of knowledge. This training prompted the teachers to develop and use

Strategic Intervention Material in teaching their subject areas.

To the knowledge of the researcher, there is in particular a scarcity of study related to the utilization and effectiveness of Electronic Strategic Intervention Material in teaching. Since most of the students already have an android phone and are knowledgeable in manipulating it to its best functionality, the researcher focused on developing an intervention material that the students can use even offline for better understanding of Science concepts taught in Second Quarter for Grade 7.

The Purpose of the Study

This study aimed to determine the effectiveness of Electronic Strategic Intervention Material in conducting remedial lessons in Grade 7 Biology in a public national high school, Division of Antipolo City, for the school year 2022-2023. More specifically, this study sought answers to the following questions:

1. What are the least mastered learning competencies in Biology for Grade 7 based on the results of the second quarterly examination from the school year 2018-2019 to 2020-2021?
2. What are the evaluations of the science experts and science teachers on the following areas of the electronic strategic intervention material:
   2.1 content quality;
   2.2 instructional quality;
   2.3 technical quality; and
   2.4 accuracy and up-to-datedness?
3. Is there a significant difference between the evaluations of the Science experts and Science teachers in the different aspects of electronic strategic intervention material?
4. What is the academic performance level of the students and the mean scores of pretest and posttest before and after the utilization of electronic SIM?
5. Is there a significant difference between the academic performance level of the students on the pretest and posttest before and after the utilization of electronic strategic intervention material?
6. What are the comments and suggestions offered by the Science experts and Science teachers on the developed electronic strategic intervention material?

Significance of the Study

This study would offer benefits to the students, parents, teachers, administrators, and future researchers.

Student. This research could be of help to the students who are struggling to learn concepts from Grade 7 Science lessons. The developed tool could be used by the students in providing them lessons, activities, and tests so that they can learn at their own pace wherever they go, especially to gain better understanding of the concepts included in the least mastered competencies for Grade 7 Biology.

Parents. The result of this study could help parents and guardians who are having difficulties in assisting their children to read and answer the provided activities and instantly check the correctness of their answer.

Secondary Science Teachers. This study will provide interactive intervention material that the teacher may use in dealing with learners that are having difficulty with Biology 7 concepts.

Administrators. The study could provide insight so that school administrators will motivate the teachers to use electronic strategic intervention material in remedial classes for the improvement of academic performance level of students in Science. The developed e-SIM will also save the school's budget in funding papers and inks for printing materials.

Future Researchers. This may serve as reference material for those who will focus on intervention programs using electronic-based strategy in Biology concepts to address low academic performance of students.

Scope and Delimitation of the Study

This study is focused on the development and evaluation of the Electronic Strategic Intervention Materials (e-SIM) in Biology for Grade 7 learners in a public national high school, Division of Antipolo City, during the school year 2022-2023. The topics included in the Electronic Strategic Intervention material were from the least mastered skills and competencies were based from the result of Second

Quarter examinations for the past 3 years (2018-2019, 2019-2020, and 2020-2021).

Participants

The participants of the study were the thirty-five (35) Grade 7 students from the population of Grade 7 students enrolled in a public national high school, Division of Antipolo City during the Second Quarter of School Year 2022-2023. The thirty-five (35) students who got the lowest scores from the Second Quarter examination for Grade 7 Biology underwent intervention class aided with the validated electronic strategic intervention material prepared by the researcher.

Research Design

A Quasi-experimental method of research is utilized to determine the effectiveness of electronic strategic intervention material in conducting remedial lessons in Grade 7 Biology. As explained in an article written by Maciejewski (2020), quasi-experimental method is a retrospective study of a single treatment cohort and a non-equivalent comparator cohort wherein patients self-select into (or a provider selects on behalf of a patient) either treatment or usual care and are then followed for a defined period. In the case of this study, the researcher utilized the developed Electronic Strategic Intervention Material to the selected Grade 7 students to determine its effect on their academic performance in the Second Quarter.

More specifically, a one-group pretest-posttest approach was adopted in this investigation. The same dependent variable is examined in one group of participants before (pretest) and after (posttest) an intervention is provided (Gopalan, 2020). The chosen Grade 7 students' academic performance level were compared using the pretest-posttest design. This research design assisted the researcher in evaluating the effectiveness of the created material in enhancing Grade 7 pupils in a public national high school, Division of Antipolo City.

Data Collection Method

The researcher used different instruments to determine the effectiveness of the electronic strategic intervention material in teaching selected concepts in Biology 7. Evaluation rating sheets for non-print and pretest and posttest were used in the conduct of this study.

Evaluation Rating Sheet for Non-print. This instrument was from DepEd LRMDS, used for assessment and evaluation of non-print materials. This instrument was the basis on how the developed Electronic Strategic Intervention Material was evaluated by the Science experts and teachers. The rating sheet was composed of four factors, as follows: (1) Content Quality which consists of 10 indicators, (2) Instructional Quality with 10 indicators, (3) Technical Quality with 10 indicators, and (4) Accuracy and Up-to-datedness which has 5 indicators.

Pretest and Posttest. The pretest and posttest include a 50-item multiple-choice type of test. The students were to choose the letter of their answer. This instrument was used to determine the difference of the students' academic performance before and after the utilization of the developed Electronic Strategic Intervention Material. Some questions were adopted from the assessment part of the Electronic Strategic Intervention Material.

Statistical Analysis

In the analysis and interpretation of data, the researcher used the statistical tools as follows:

Weighted Mean and Standard Deviation. This was used to determine the result of the evaluation rating sheet for non-print on the evaluation of the Science teachers and Science experts of the developed e-SIM based on content quality, instructional quality, technical quality, and accuracy and up-to-datedness.

Table 1. The range was used to describe the evaluation of the Science teachers and Science teachers.

Scale	Ranges	Verbal Interpretation (VI)
4	3.50-4.00	Very Satisfactory (VS)
3	2.50-3.49	Satisfactory (S)
2	1.50-2.49	Poor (P)
1	1.00-1.49	Not Satisfactory (NS)

Mean score was also used to determine the level of understanding of the Grade 7 students on the selected Biology concepts based on the result of their pretest and posttest. To determine the academic performance of the Grade 7 students based on the results of their pretest and posttest, mean scores were utilized.

Table 2. The rubrics below show verbal interpretation of the result of their scores.

Scale	Verbal Interpretation
41-50	Very Satisfactory (VS)
31-40	Satisfactory (S)
21-30	Fairly Satisfactory (FS)
11-20	Needs Improvement (NI)
0-10	Did Not Meet Expectation (DE)

T-test. This treatment was used to determine if there is a significant difference between the results of the evaluations of the Science experts and Science teachers and the significant difference between the mean performance of the students on the utilization of e-SIM as revealed by pretest and posttest results. Both hypotheses were tested at a 0.05 level of significance.

Result and Discussion

This chapter comprises the analysis, presentation and interpretation of the findings resulting from this study.

1. Least Mastered Learning Competencies in Science 7 (Biology) as Basis for the Development of Electronic Strategic Intervention Material (e-SIM)

Table 3. Top 5 Least Mastered Learning Competencies in Science 7 (Biology) As Basis for the Development of e-SIM

Least Mastered Competencies	Percentage						Average Rank	Rank
	2018 - 2019	Rank	2019 - 2020	Rank	2020 - 2021	Rank		
Differentiate asexual from sexual reproduction in terms of: number of individuals involved; similarities of offspring to parents; (S7LT-IIg-7)	25	1	30	4	19	2	2.33	1
Differentiate plant and animal cells according to presence or absence of certain organelles; (S7LT-IId-4)	28	2	23	1	30	5	2.67	2
Describe the different levels of biological organization from cell to biosphere; (S7LT-IIc-3)	35	5	28	3	25	4	4	3
Identify parts of the microscope and their functions; (S7LT-IIa-1)	37	6	25	2	37	7	5	4
Describe the different ecological relationships found in an ecosystem; (S7LT-IIh-10)	43	8	40	6	39	9	7.67	5

Table 3 shows the top 5 least mastered learning competencies in Science 7. The competencies that were used in developing the e-SIM based on learning competencies from curriculum guide for 2nd Quarter of Science 7 were as follows: (1) Differentiate asexual from sexual reproduction in terms of: a. number of individuals involved; b. similarities of offspring to parents; (2) Differentiate plant and animal cells according to presence or absence of certain organelles; (3) Describe the different levels of biological organization from cell to biosphere; (4) Identify parts of the microscope and their functions; and (5) Describe the different ecological relationships found in an ecosystem. These learning competencies were retrieved from a compiled copy of test results from the school year 2018-2019, 2019-2020, and 2020-2021 in a public national high school, Division of Antipolo City.

2. Evaluation of Science Experts and Teachers on the Developed Electronic Strategic Intervention Material (e-SIM) for Grade 7 Science (Biology)

Table 4. Respondents' Evaluation on the Electronic Strategic Intervention Material in Terms of Content Quality

CRITERIA	Experts		Teachers	
	Mean	VI	Mean	VI
1. Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended for.	4.00	VS	3.90	VS
2. Concepts developed contribute to enrichment, reinforcement, or mastery of the identified learning objectives.	3.93	VS	3.97	VS
3. Content is accurate.	3.97	VS	3.90	VS
4.Contento date.	3.97	VS	3.90	VS
5. Content is logically developed and organized.	3.90	VS	3.77	VS
6. Content is free from cultural, gender, racial, or ethnic bias.	3.90	VS	3.87	VS
7. Content stimulates and promotes critical thinking.	3.77	VS	3.90	VS
8. Content is relevant to real-life situations.	3.77	VS	3.83	VS
9. Language (including vocabulary) is appropriate to the target user level.	3.93	VS	3.77	VS
10. Content promotes positive values that support formative growth.	3.87	VS	3.83	VS
OVERALL WEIGHTED MEAN	3.85	VS	3.86	VS

Table 4 shows that the content of the developed e-SIM is consistent with topics/skills found in the DepEd Learning Competencies for the subject and year level it was intended for and that the concepts used in the developed e-SIM can contribute to enrichment, reinforcement, or mastery of the identified learning competencies.

On the other hand, indicators 7 and 8 got the lowest weighted mean ratings of 3.77 and 3.77, respectively, based on the Science experts and indicators 5 and 9 with lowest weighted mean ratings of 3.77 and 3.77, respectively, based from Science teachers evaluation which means that developed material can still be improved by providing content that stimulates promotes critical thinking, more relevant to real-life situations, more logically developed and organized and by using language that is more appropriate to the target user level.

The same results were achieved by Cancino (2019), on the evaluation of Science teachers and experts on her developed SIM for Biology 10. The findings in her study indicate that the produced additional activities as a teaching technique demonstrated high-quality information. Additionally, the extracurricular activities helped students strengthen their learning

competencies, piqued their curiosity, and advanced their understanding of scientific principles. This suggests that the created extra activities have all the information required for the students to comprehend the idea. This also implies that the respondents find Electronic Strategic Intervention Materials very acceptable in terms of Content Quality.

Table 5. Respondents Evaluation on the Electronic Strategic Intervention Material in Terms of Instructional Quality

CRITERIA	Experts		Teachers	
	Mean	VI	Mean	VI
1. The purpose of the material is well defined.	3.97	VS	3.93	VS
2.Theerial achieves its defined purpose.	3.93	VS	3.90	VS
3. Learning objectives are clearly stated and measurable.	3.97	VS	3.90	VS
4. Level of difficulty is appropriate for the intended target user.	3.90	VS	3.80	VS
5. Graphic Sounds are used for appropriate instructional reasons.	3.80	VS	3.87	VS
6. Materialable, stimulating, challenging, and engaging.	3.83	VS	3.93	VS
7. Material effectively stimulates the creativity of the target user.	3.77	VS	3.93	VS
8. Feedback on target users' responses is effectively employed.	3.83	VS	3.90	VS
9. Target users can control the rate and sequence of presentation and review.	3.87	VS	3.87	VS
10. Instruction is integrated with the target users' previous experience.	3.93	VS	3.87	VS
OVERALL WEIGHTED MEAN	3.88	VS	3.89	VS

Table 5 shows that the experts and teacher respondents evaluated the developed e-SIM with overall weighted mean ratings of 3.88 and 3.89, respectively, verbally interpreted as Very Satisfactory (VS). More specifically, indicators 1 and 3 got the highest weighted mean rating from the Science experts and Science teachers which means that the developed e-SIM has well-defined purpose, clear and measurable learning objectives. Science teachers also approved that the material is enjoyable, stimulating, engaging and effectively stimulates the creativity of the target user.

This further implies that the respondents strongly accepted the Electronic Strategic Intervention Materials in terms of Instructional Quality. As per the experts and teachers' point of view, the material is very satisfactory and has met the standards for an intervention material with respect to instructional details which mainly focus on the objectives and purpose, directions, graphical and verbal cues, the interface, and user-friendliness. This also means that the developed e-SIM has clear directions, is user-friendly and can be used independently by the students.

Table 6. Respondents' Evaluation on the Electronic Strategic Intervention Material in Terms of Technical Quality

CRITERIA	Experts		Teachers	
	Mean	VI	Mean	VI
1. Screen displays (text) are uncluttered, easy to read, and aesthetically pleasing.	3.67	VS	3.80	VS
2. Visual presentations (non-text) are clear and easy to interpret.	3.83	VS	3.80	VS
3. Visuals sustain interest and do not distract the user's attention.	3.93	VS	3.87	VS
4. Visuals provide users' an accurate representation of the concept discussed.	3.97	VS	3.83	VS

CRITERIA	Experts		Teachers	
	Mean	VI	Mean	VI
5. Their support materials (if any) are effective.	3.87	VS	3.87	VS
6. The design allows the target user to navigate freely through the material.	3.90	VS	3.83	VS
7. The material can easily and independently be used.	3.97	VS	3.90	VS
8. The material will run using minimum system requirements.	3.90	VS	3.83	VS
9. The program is free from technical problems.	3.77	VS	3.70	VS
10. There is a logical and smooth flow of ideas.	3.93	VS	3.87	VS
OVERALL WEIGHTED MEAN	3.87	VS	3.83	VS

Table 6 shows the evaluations of the Science experts and teachers on the Electronic Strategic Intervention Material in terms of technical quality. It can be seen in Table 6 that the experts and teacher respondents evaluated the developed e-SIM with overall weighted mean ratings of 3. 87 and 3.83, respectively, verbally interpreted as Very Satisfactory (VS).

Table 6 also shows that indicators 4 and 7 got the highest weighted mean rating. This means that the developed e-SIM has visuals that provides accurate representation of the concept discussed, and that the material can be used easily and independently by the students. The same result was achieved by Bebita (2022) in the evaluations of the experts and teachers on her developed video lessons. In Bebita's study, the two groups of respondents gave positive feedback in the developed material with regards to the technical quality.

The findings imply that the respondents are highly satisfied with the technical qualities of the Electronic Strategic Intervention Material. This means that the developed material can be easily used.

Table 7. Respondents' Evaluation on the Electronic Strategic Intervention Material in Terms of Accuracy and Up-To-Datedness

CRITERIA	Experts		Teachers	
	Mean	VI	Mean	VI
1. Free from conceptual errors.	3.93	VS	3.93	VS
2. Free factual errors.	3.93	VS	3.93	VS
3. Free from grammatical and/or typographical error.	3.90	VS	3.87	VS
4. Free errors in the visuals.	3.83	VS	3.83	VS
5. Free from obsolete information.	3.97	VS	3.87	VS
OVERALL WEIGHTED MEAN	3.91	VS	3.89	VS

Table 7 presents the evaluation of the Science experts and teachers on the electronic strategic intervention material in terms of accuracy and up-to-datedness. It can be seen in Table 7 that the experts and teacher respondents evaluated the developed e-SIM with overall weighted mean rating of 3.91 and 3.89, respectively, verbally interpreted as Very Satisfactory (VS).

More specifically, indicator 5 got the highest weighted mean rating of 3.97 from the Science experts' evaluation, while indicators 1 and 2 both obtained the highest weighted mean ratings of 3.93 from Science teachers' evaluation. This means that the material is free from obsolete information, conceptual and factual errors.

Cancino's (2019) study has the same result as per the perception of the Science experts and teachers in her developed Strategic

Intervention Material for Grade 10 Biology with respect to Accuracy and up-to-datedness. Both experts and teachers strongly agreed that the developed material was accurate and up to date.

Table 8. Respondents' Evaluation on the Electronic Strategic Intervention Material in Terms of the Different Criteria

CRITERIA	Experts		Experts	
	Mean	VI	Mean	VI
1. Content Quality	3.90	VS	3.86	VS
2. Instructional Quality	3.88	VS	3.89	VS
3. Technical Quality	3.87	VS	3.83	VS
4. Accuracy and Up-To-Datedness	3.91	VS	3.89	VS
OVERALL WEIGHTED MEAN	3.89	VS	3.87	VS

Table 8 reveals the summary of the perception of the Science experts and teachers on the developed e-SIM in terms of content quality, instructional quality, technical quality, and accuracy and up-to-datedness. The data in Table 8 show that the experts and teacher respondents evaluated the developed e-SIM with overall weighted mean ratings of 3.89 and 3.87, respectively, verbally interpreted as Very Satisfactory (VS).

More specifically, accuracy and up-to-datedness got the highest weighted mean rating of 3.91 from the Science experts while instructional quality obtained the highest weighted mean rating of 3.89 from the Science teacher respondents. This means that the developed e-SIM is free from conceptual, factual, grammatical and/or typographical and visual errors. Moreover, the developed e-SIM has a very satisfactory quality in connection with information, insights, and activities.

3. Test of Significant Difference in the Evaluation of the Science Experts and Teachers on the Electronic Strategic Intervention Material (e-SIM)

Table 9. The test of significant difference in the respondents' evaluation on the developed e-SIM

CRITERIA	GROUP	Mean	SD	DF	Computed *t* Value	Critical *t* Value (0.05)	Decision	VI
Content Quality	Expert	3.85	0.18	58	-0.49	2.00	Failed to Reject the Null Hypothesis	Not Significant
	Teacher	3.86	0.06					
Instructional Quality	Expert	3.88	0.07	58	-0.67		Failed to Reject the Null Hypothesis	Not Significant
	Teacher	3.89	0.04					
Technical Quality	Expert	3.87	0.10	58	2.19		Reject the Null Hypothesis	Significant
	Teacher	3.83	0.06					
Accuracy And Up-To-Datedness	Expert	3.91	0.05	58	2.11		Reject the Null Hypothesis	Significant
	Teacher	3.89	0.04					

The test of significant difference in the respondents' evaluation on the developed e-SIM is shown in Table 9.

It can be gleaned from the table that after checking and computing for the mean evaluation of both the experts and the teachers who

evaluated the Electronic Strategic Intervention Material, in terms of the different criteria, the two groups of respondents have evaluated the level of acceptance just about the same.

Since the identified critical t value for this test is 2.00, given the significance level of 0.05 for a two-tailed t-test with degrees of freedom of 58, this will be the value to which our t-values will be compared to, in identifying whether each t-value will yield to either significant or insignificant results.

The computed t value of -0.49 for content quality and -0.67 for instructional quality were lower than the critical t value of 2.00, therefore the statistical decision is to accept the null hypothesis. This means that there is no significant difference between the evaluations of the two groups of respondents in terms of content quality and instructional quality of the electronic instructional material. However, the computed t value of 2.19 for technical quality and 2.11 for accuracy and up-to-datedness are higher than the critical t value of 2.00, so the statistical decision is to reject the null hypothesis. This means that there is a significant difference between the evaluation of the two groups of respondents in terms of technical quality and accuracy and up-to-datedness .

Thus, there is sufficient evidence to conclude that there is no significant difference between the evaluations of the Science experts and Science teachers in terms of the two aspects, content quality and instructional quality. Meanwhile, their evaluation differs with the remaining two aspects, technical quality and accuracy and up-to-datedness. Meaning, both groups resulted with just about the same evaluation and perceived with such little difference; still it can be perceived that the material is very satisfactory and is useful to the field as revealed by the judgments of the two groups – the teachers and the experts.

4. Level of Performance of the Student Respondents Based on the Mean Scores of Their Pretest and Posttest

Table 10. Level of Performance of the Student Respondents Based on Their Pretest and Posttest Results

TEST	Mean	SD	Verbal Interpretation
Pretest	13.37	3.33	Needs Improvement
Posttest	34.77	5.09	Satisfactory

Table 10 shows the pretest and posttest results of the students who used the electronic strategic intervention materials. During the pretest phase, the thirty-five (35) students took a 50-item diagnostic test and scored about a mean of 13.37 with a standard deviation of 3.33 with a verbal interpretation of Needs Improvement. This implies that the students need intervention to improve their academic performance level in the least mastered competencies in the second quarter included in the pretest that the respondents took. However, after using the electronic strategic intervention materials a drastic increase can be seen in the students' posttest mean score which was 34.77 with verbal interpretation of satisfactory.

These results were consistent with those of Balcoba (2019), who found that when Grade 7 students used e-SIM in Biology, their level of performance dramatically increased. It may be assumed that the produced SIM was successful in helping people master the five least-mastered competencies, the author said.

This implies that the use of Electronic Strategic Intervention Material helped the students to learn better the least mastered competencies for second quarter of Science 7.

5. Test of Significant Difference in the Level of the Performance of the Student Respondents on the Utilization of the Electronic Strategic Intervention Material (e-SIM) Based on the Pretest and Posttest Results

Table 11. The test of significant differences in the level of performance of student respondents before and after the utilization of the e-SIM.

Test	Pretest	Posttest
Mean	13.37	34.77
SD	3.33	5.09
DF	68	
Computed t-Value	–23.55	
Critical t-Value (0.05)	2.00	
Decision	Reject the Null Hypothesis	
Verbal Interpretation	Significant	

Table 11 presents the test of significant differences in the level of performance of student respondents before and after the utilization of the e-SIM. The results of pretest and posttest were used as the basis in evaluating the effectiveness of the Electronic Strategic Intervention Material in Biology 7. Since the identified critical t value for this test is 2.00, given the significance level of 0.05 for a two-tailed t-test with degrees of freedom of 68, this will be the value to which our t-values will be compared to in identifying whether the t-value will yield to either significant or insignificant results.

As seen in Table 11, the mean scores of 13.37 for pretest and 34.77 for posttest show that there is an obvious improvement in the performance of the students. The computed t value of -23.55 is greater than the critical t value of 2.00, which gives sufficient evidence to reject the null hypothesis. This means that there is a significant difference between the academic performance of the students before and after the utilization of electronic strategic intervention material. Essentially, it means that after the use of Electronic Strategic Intervention Material, the scores of the students significantly improved as revealed by the results of their pretest and posttest scores.

This shows that the use of the developed material has been effective in helping the students better understand the concepts in Science 7 (Biology), more specifically on the competencies listed as least mastered competencies.

6. Comments and Suggestions Offered by Science Experts and Science Teacher-Respondents on the Developed Electronic Strategic Intervention Material

Table 12. Comments and Suggestions Offered by Science Experts and Science Teacher Respondents on the Developed Electronic Strategic

A. Comments of Teachers and Experts	Frequency	Rank
The material is unique and innovative.	8	1.00
The material is user-friendly and can be accessed offline.	4	3.50
The material has clear directions and impressive graphics.	2	5.33
The material is helpful in the teaching-learning process.	2	5.33
The material will enhance the students' skills, knowledge and will boost the learner's interest.	6	2.00
The material is suited for all learners with different learning styles.	2	5.33
Activities have catchy titles.	1	7.50
The topics and activities are congruent with the competencies	1	7.50
The activities are timely and engaging.	4	3.50
B. Suggestions of Teachers and Experts	**Frequency**	**Rank**
Use colors that are pleasing to the eyes.	1	3.25

Use larger font size, organize the texts, and be consistent with font style and font size.	3	1.00
Use more picture choices than word choices.	1	3.25
Add audio for texts to cater the audio-visual learners	1	3.25
Include in the last part of the material, a feedback form, and comments and suggestions from students.	1	3.25
Sub-learning objectives must be included.	2	2.00

Comments from Table 12 show that the Science teachers find the developed material unique and innovative. It implies that the researcher's choice of using the mobile phone to provide the students with interactive digitized supplementary material was seen by the Science teachers and experts as a unique way to aid in the teaching-learning process. Also, the experts and teachers believed in the quality and the capacity of the e-SIM to enhance the students' skills, knowledge and will boost learner's interest.

On the other hand, among the suggestions of Science experts and teachers, improving the text size and being consistent with the use of font style and font size ranked first. This suggestion is somewhat alike to the findings discussed in the journal written by Halamish (2018), which states that "font size has effects in the retention of ideas in one's memory". Halamish stated that "memory was better for the large than for the small font words".

Conclusion

This study attempted to determine the effectiveness of electronic strategic intervention material in conducting remedial lessons in Grade 7 Biology in public national high school, Division of Antipolo City, for the school year 2022-2023. The findings from this study are as follows:

1. The top 5 least mastered competencies in Science 7 (Biology) based on the Second Quarter examination results of the School Year 2018-2019, 2019-2020, and 2020-2021 which were the basis in developing the e-SIM are as follows: a) Identify parts of the microscope and their functions; b) Describe the different levels of biological organization from cell to biosphere; c) Differentiate plant and animal cells according to presence or absence of certain organelles; d) Differentiate asexual from sexual reproduction in terms of: number of individuals involved, and similarities of offspring to parents; and e) Describe the different ecological relationships found in an ecosystem.
2. Both the Science experts and teachers evaluated the e-SIM with grand mean ratings of 3.88 and 3.87, respectively, interpreted as Very Satisfactory (VS) in terms of content quality, instructional quality, technical quality, and accuracy and up-to-datedness.
3. There was no significant difference between the evaluation of Science experts and teacher respondents in terms of content quality and instructional quality, while there was a significant difference in their evaluation in terms of technical quality, accuracy and up-to-datedness .
4. The academic performance level of the student respondents is at a Satisfactory Level based on the posttest mean score.
5. There was a significant difference between the level of performance of the student respondents on the pretest and posttest after the utilization of e-SIM as revealed by the increased computed mean scores from 13.37 for the pretest to 34.77 for the posttest.

Nevertheless, the developed electronic strategic intervention material (e-SIM) is highly acceptable in terms of content quality, instructional quality, technical quality, and accuracy and up-to-datedness, and is also highly effective in improving the students' academic performance.

Recommendations

Based on the findings and conclusions drawn, the following are recommended:

1. The developed e-SIM for Grade 7 students of public national high school, Division of

Antipolo City may be utilized by all students in Grade 7 after it passed the evaluations of Science experts and teachers based on content quality, instructional quality, technical quality, and accuracy and up-to-datedness .

2. Science teachers of public national high school, Division of Antipolo City are encouraged to develop e-SIM in Science 8, 9, and 10.
3. Secondary teachers teaching other subjects are encouraged to develop e-SIM as supplementary materials in teaching their subject matter.
4. Other secondary public high schools in the City Schools Division of Antipolo are also encouraged to develop e-SIM.
5. School administrators and supervisors should provide support to teachers in developing e-SIM.
6. Other researchers may conduct similar studies in Science and other subjects as well. Researchers may focus on deeper study focusing on using the e-SIM in execution of lessons in Science and other subject areas.

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