

Development and Acceptability of Electronic Strategic Intervention Materials (E-SIMS) on the Selected Topics in Genetics

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Abstract —The study focused on the acceptability and effectiveness of the developed android-based Electronic Strategic Intervention Materials (E-SIMS) on the Selected Topics in Genetics. The study was conducted at Dalig National High School, to selected Grade 9 Learners during the first quarter of the School Year 2022-2023. Topics included in the material are the Different Patterns of Non-Mendelian Inheritance, which was ranked first for three consecutive school years in terms of least mastered learning competency. The study used quasi-experimental research method. The teacher-validators rated the E-SIMS as “very acceptable” in all the criteria presented in the adapted and validated research instrument. Afterward, the purposively selected 46 Grade 9 learners were divided into two groups. The higher increase in the mean score of the E-SIMS group versus the non-E-SIMS group suggests that the developed E-SIMS has greatly improved learners’ academic performance. In both groups, learners’ performance on the pretest was significantly different from their performance on the posttest. The performance of learners in the non-E-SIMS group was significantly different from that of learners in the E-SIMS group. As a result, a significant difference in assessment scores of both groups proved the effectiveness of E-SIMS. The study found out that in terms of reteaching the unmastered competency, E-SIMS has a “very acceptable” overall rating and thus aids in improving Grade 9 learners’ academic performance on the identified least mastered competency. The following recommendations are made in light of the findings: Science teachers may use the developed E-SIMS as additional teaching material in teaching Genetics; School administrators may provide learning opportunities for Science teachers such as seminars, Learning Action Cell (LAC) Sessions, and Focus Group Discussions (FGDs) on how to develop their E-SIMS in their area of expertise so that there are still prepared materials for distance learning in the occurrence of an unexpected event; Learners may concentrate more on learning the newly developed E-SIMS in Genetics to improve their academic performance; and Future researchers may develop E-SIMS that can work not only in android but also in other operating systems.

Keywords — *Electronic Strategic Intervention Materials, Quasi-experimental, Acceptability, Effectiveness*

I. Introduction

As the last country in the Southeast Asian region to implement the twelve-year Basic Education Program (Seameo-Innotech, 2010), the Philippines has strengthened its curriculum and restructured the cycle of primary and secondary education through the RA 10533, or "Enhanced Basic Education Act of 2013," was signed into law by the Late President Benigno Simeon S. Aquino III to satisfy global education standards for the twenty-first century. This law gave birth to K to 12 Basic Education Curriculum. Moreover, the additional two years in the country's basic education will give the children in public school an equal chance at succeeding (Aquino III, 2011). The congested curriculum content in elementary and secondary education and the idea of providing world-class education are the root causes of this commendable paradigm shift in the Philippine Education System (Seameo-Innotech, 2010).

The world is unpredictably changing over time, proving that there is no permanent thing in this world except change, from a new paradigm in education to suitable learning modalities that are adaptive to difficult circumstances, including pandemics, earthquakes, typhoons, and any other uncontrollable disaster caused by the force of nature. Indeed, education must continue despite the challenges people worldwide have encountered. As the education system gets back to its normal operation, the government implemented three days of limited face-to-face classes and two days of blended learning during the first quarter of the School Year 2022-2023. Teachers and learners, through the years, have learned how to be proactive, adaptive, and resilient to different learning modes in the Philippine education system that is responsive to the current situation (DO 31 s. 2020).

Adapting to unusual learning modes makes the teaching and learning process nowadays, driven by technology, making acquiring knowledge and transferring learning easy, fun, and enjoyable. From conventional to contemporary ways, the advancement of technology brings forth a doorway to creative and innovative ways of designing modern teaching materials, tools, and strategies that ensure optimal learning experiences and assess the learning progress of future generations of learners effectively.

The utilization of modern technology inside the classrooms to make education relevant is stipulated in Article XIV, Section 10 of the 1987 Philippine Constitution which states:

“Science and Technology are essential for national development and progress. The state shall give priority to research and development, invention and utilization and to science and technology, education, training and services. It shall support indigenous, appropriate and self-reliant scientific and technological capabilities and their application to the country’s productive system on national life.”

The need for developing instructional materials or evaluating existing instructional materials, such as technology-based resources, is stated clearly in the law. In this case, it can improve the teaching-learning process and student performance.

According to Montemayor (2018) and as cited by Dolojan (2022), educators are encouraged to foster creativity in developing various ICT-based materials. These ICT-based materials include using various modern software devices, with the aid of android applications and android-based instructional resources currently being the most accessible.

Teachers must consider using android-based electronic materials in transferring content, specifically those that are difficult for the students to master in regular teaching. Teachers should upskill their technical capabilities in using and creating such android apps and android-based electronic materials to do that.

As a result, the researcher validated the necessity of utilizing android-based electronic materials as supplemental tools for intervention, particularly in Science, in this study. Farida's (2018) study supports this, that the android-based electronic material was: (1) visually engaging, easy to use, flexible, and practical; (2) suitable for teaching in terms of material validation and assessment results; and (3) effective for teaching.

Science is among the most challenging subjects that junior high learners should take. Some of them consider it a difficult subject, and most likely, it is one of the subjects wherein learners come up with low achievement levels, a lot of learning competencies where they get the least mastered skills, and in the worst-case scenario, even get a failing grade.

In the context of Dalig National High School, the Mean Percentage of Scores in the Periodical Test for the past three years revealed a continuous decline in the learners' scores in Science which was reported in the context of the researcher's experience in teaching Science and assessing learners' scientific abilities in the pre-pandemic, pandemic and post-pandemic settings. Data on the Average Mean Percentage Scores (MPS) of Grades 7-10 for the School Years 2019-2020, 2020-2021, and 2021-2022 revealed that Grade 9 had the lowest MPS for the first quarter of three consecutive School Years: 51.80 for the School Year 2019-2020, 50.66 for the School Year 2020-2021, and 49.59 for the School Year 2021-2022. Also, the researcher determined the top three critical contents exhibited in DepEd's Most Essential Learning Competencies. These top three critical contents may be one of the factors contributing to the low academic performance of Grade 9 learners, as revealed by a summary of the Learning Outcomes Assessment (LOA) that 45 or 9% of the enrolled learners received a grade of 74 or lower during the first quarter of the previous School Year 2021-2022.

Moreover, this study focuses on the selected topics in Grade 9, particularly in Genetics, since for the past three school years, it has been the first in rank in terms of least mastered competencies. Topics in Genetics for Grade 9 learners under different patterns of Non-Mendelian Inheritance caught the researcher's attention and paved the way to think of supplementary material that can help in improving learners' academic performance and addressing learners' difficulties on the identified least mastered competency.

To make learning Science easily understood by the students, which eventually leads to mastery of the identified least learned competency, an Electronic Strategic Intervention Material (E-SIMS) was employed. Similarly, Alboruto (2017) asserted that Strategic Intervention Material could help learners improve their science process abilities and conceptual comprehension even in large classes. As specified in DO 39, s. 2012, SIMS is one of four types of interventions that must be used to bridge learning gaps among learners. The provision of intervention is based on DO 8, s. 2015, to prevent a learner from failing in any subject at the closing of the school year.

Since enrollment is continuously increasing every school year and there are no existing printed SIM and E-SIMS in the school, the researcher, currently serving as the Science Department's Chairperson at Dalig National High School, has an extreme desire to contribute to the improvement of Grade 9 Learners' performance in Science, particularly in Genetics. As a result, the initiative of developing an android-based Electronic Strategic Intervention Materials (E-SIMS) on Selected Topics in Genetics was conceived.

Literature Review

SIMS in the Philippine educational system is defined by Sadsad (2022) as one of the educational tools that enable teachers to deliver high-quality instruction by being able to help students who are performing poorly academically, targeting the least mastered competencies. DepEd planned competitions like science fairs per cluster, division, regional, and national levels every year to encourage the widespread use of SIMs further. This was done under DM No. 117, s. 2005, which capacitates teachers with relevant training and seminars on crafting this intervention material for effective learning. The study of Verano and Comighud (2020) found that Grade VI learners' Science achievement resulted in the low mastery of the identified four least learned competencies. Similar findings were obtained in the Alboruto (2017) research, where the average pretest scores were 48.25 percent and 70.73 percent in the Sinco (2018) study, both below the 75% passing rate required by DO 8, s. 2015. The study conducted by three researchers can be used as a basis for crafting SIMS. The study of Hulleman et al. (2017) supported the replication and expansion of intervention materials for low-performing students due to their effectiveness.

Moreover, Acedillo et al. (2019) found that the teacher and student participants have positive perceptions and appreciation of the effectiveness and acceptability of utilizing strategic intervention material in Science as a supplementary material that helps the students in mastering the least learned competencies, thereby making it highly recommended to conduct and apply in schools. Locally constructed SIMS were emphasized in action research conducted by Castaneda (2017), that learners exposed to teacher-made SIM in Science had a better probability of developing their mastery of unmastered skills. Sadsad (2022) gathered the same results for Physical Education. Furthermore, Alboruto (2017) cited the usefulness of SIM in students' mastery of concepts and development of skills in Science.

SIM is intended for intervention, as the term suggests. However, several studies used it in teaching or re-teaching (Sinco, 2018; Aranda et al., 2019; Suarez & Casinillo, 2020). In the study by Sinco (2018), SIM is defined as a teaching tool used during remediation to encourage student activity and raise their level of understanding. Consequently, Suarez and Casinillo (2020) stated that SIM was used to study the significant effect of the material on the learners' academic performance.

The study employed a pretest-posttest design with a total sample size of 40 grade VI learners in Doos Sur Elementary School. The experimental group was exposed to developed SIM as a teaching tool, while the control group was exposed to old-fashioned teaching. The study's findings disclosed that SIM effectively enhanced the academic performance of sixth-grade learners on the target least mastered skills in Science. Aranda et al. (2019) cited that the SIM is an effective instructional material in teaching grade seven who were not performing well. Therefore, the studies of (Sinco, 2018; Aranda et al., 2019; Suarez & Casinillo, 2020) confirmed that SIM is effective as a teaching tool and instructional material during the learning process.

II. Methodology

Research Design. The study employed a quasi-experimental research design to determine the level of acceptability of the developed E-SIMS on the selected topics in Genetics for Grade 9 Learners in terms of content, organization and presentation, learning activities, assessment, design and layout, language and style, and usefulness.

Quantitative research generates numerical data, is primarily informed by positivist or post-positivist paradigms, and is based on several assumptions (Davies & Fisher, 2018). Belief in a single truth or Reality, objectivity, and deduction are examples. As such, quantitative research seeks to discover the correct answer by testing hypotheses using objective and unbiased scientific methods (Davies & Fisher, 2018).

Moreover, quasi-experimental design, as one of the types of quantitative research, uses a pretest and a posttest. Thus, the researcher has used the abovementioned method to test the effectiveness of the developed E-SIMS on the Selected Topics in Genetics by allowing the experimental group to use the developed E-SIMS and the control group to use the learner's module provided by DepEd.

Population and Sampling. The study population comprised Grade 9 learners of Dalig National High School, a Public High School in the Division of Antipolo City, who were chosen using a purposive sampling procedure based on the learners' first quarter grades in Science.

Respondents of the Study. Selected Grade 9 Learners in a public high school in Dalig National High School Antipolo City were the respondents of this study during the School Year

2022-2023. These students were enrolled in a blended learning modality; three days of in-person classes and two days of distance learning.

The aim of the study pertains to the Development and Acceptability of E-SIMS on the Selected Topics in Genetics for Grade 9 learners. It is a supplementary learning material carefully planned and strategically designed to address learners' learning difficulties on the unmastered learning competencies (Alboruto, 2021).

To evaluate the developed E-SIMS on the Selected Topics in Genetics for Grade 9 Learners in terms of the abovementioned criteria. Twenty (20) teacher-respondents from the two secondary schools of the City Schools Division Office of Antipolo, District II-C's: Dalig National High School and Marcelino M. Santos National High School, were purposively chosen for expert validation.

Research Instrument. A questionnaire checklist was used as the instrument in the study. This was an adapted questionnaire checklist from the study of Mariño (2016) and modified in the study of Gapuz et al. (2021), in which the variables considered were the level of acceptability of the developed E-SIMS on the Selected Topics in Genetics. The adapted questionnaire checklist was validated by six (6) science experts from the University of Perpetual Help System-Dalta, Schools Division of Rizal and Antipolo; one (1) Professor, two (2) Education Program Supervisors and three (3) Master Teachers in Science Education.

The adapted and validated questionnaire checklist in google form was used by twenty (20) science experts to test the acceptability of the developed E-SIMS on the Selected Topics in Genetics in terms of the abovementioned criteria. The four-point Likert scale was used to determine the developed E-SIMS level of acceptability. The researcher also administered a 15-item pretest and posttest to determine the performance of the learner respondents.

Validation of the Instrument. The instrument was validated by experts. To perform content validation of the developed E-SIMS, the researcher specifically requested the assistance of twenty (20) science experts in two secondary schools of Division of Antipolo City, District II-C's: Dalig National High School and Marcelino M. Santos National High School. The selected science experts used the adapted and validated questionnaire checklist to evaluate the E-SIMS. Following validation, the pretest and posttest were revised, and other features were added, such as unlocking unfamiliar terms in Genetics based on the validation results.

Data Gathering Procedure. The following activities were undertaken in the development of the E-SIMS on the Selected Topics in Genetics for Grade 9 Learners. The researcher requested consent and permission from the Antipolo City Schools Division Superintendent and the principal of Dalig National High School to conduct this research. The researcher developed E-SIMS to improve the academic performance of Grade 9 learners in Science.

The basis of the content and scope of the developed E-SIMS was the identified most challenging competency in Science 9. The developed E-SIMS was presented using the intended format: title card, guide card, activity card, assessment card, enrichment card, answer card, and reference card. E-SIMS was used during the implementation of the intervention as prescribed by DepEd. In every activity, the researcher considered the needs and capabilities of the learners to improve their performances and to achieve the target performance result. A pretest and posttest administered to both groups of respondents determined the learners' performance level.

Six (6) science experts from the University of Perpetual System-Dalta, Schools Division of Rizal and Antipolo validated the content of the questionnaire checklist, one (1) Professor, two (2) Education Program Supervisors and three (3) Master Teachers in Science Education. Afterward, the validated questionnaire checklist was answered by twenty (20) science teacher-respondents from Antipolo City's District II-C expert validation of the developed E-SIMS.

The experimentation started during the first quarter of the School Year 2022-2023 with forty-six (46) selected Grade 9 learners as respondents, which were heterogeneous in nature. The researcher administered a 15-item pretest to both groups of respondents during the implementation of the intervention. After the exposure to the learner's module provided by DepEd, the posttest was given to the control group. On the other hand, the experimental group of respondents was exposed to the E-SIMS, answering the posttest in each lesson. In this case, the researcher determined whether the respondents' performance levels increased after exposure to the E-SIMS.

The results of the assessments were compared to establish the level of performance of the control and experimental groups of respondents. The data gathered from testing of the developed E-SIMS, pretest and posttest results and the questionnaire checklist were tabulated and analyzed, subjected to appropriate statistical tools, and interpretation of results.

Before the experiment began, the two groups took a pretest to assess their knowledge of the selected topics in Genetics, specifically the identified learning competency. The experimental group received a posttest after exposure to the developed E-SIMS, whereas the control group received a posttest even after not being exposed to the developed E-SIMS. The researcher used the same set of pretests, but the test placement was altered. The results of both respondents' pretest and posttest were compared to determine the level of effectiveness of the developed E-SIMS on the Selected Topics in Genetics.

To answer the problems presented quantitative procedures were followed. The weighted mean was used to determine the level of acceptability of the developed E-SIMS. Mean and standard deviation were used to determine the learners' performance level before and after exposure to the developed E-SIMS in Genetics for Grade 9 learners. To determine if there is a significant difference on the level of performance of the learners before and after exposure to the developed E-SIMS in Genetics for Grade 9 learners to the abovementioned competency, dependent

samples T-test was used. In line with the results, the results of the study were used as input for the improvement of the developed E-SIMS in Genetics and were applied for revisions.

III. Results and Discussion

Problem 1: What is the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to Content, Organization and Presentation, Learning Activities, Assessment, Design and layout, Language and style, and Usefulness?

Table 1. The Computed mean on the Level of Acceptability of the developed E-SIMS on Selected topics in Genetics as to Content

Indicators	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
<i>The contents of the developed android-based E-SIMS...</i>		
1.a are accurate, recent, and relevant.	3.95	Very Acceptable
1.b are aligned with the current K to 12 Curriculum guide prescribed by DepEd.	3.95	Very Acceptable
1.c have specific, measurable, attainable, relevant, and time-bounded (SMART) learning objective.	4.00	Very Acceptable
1.d provide seamless and logical connections to all parts of the material.	4.00	Very Acceptable
1.e are free from conceptual and factual errors.	3.90	Very Acceptable
Overall Weighted Mean	3.96	Very Acceptable

Point Value	Mean Scale	Verbal Interpretation
4	3.26 – 4.00	Very Acceptable
3	2.51 – 3.25	Acceptable
2	1.76 – 2.50	Slightly Acceptable
1	1.00 – 1.75	Not Acceptable

In totality, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to content was found to be "Very Acceptable," with an overall weighted mean of 3.96. The data revealed that the developed E-SIMS passed content-wise for having a SMART objective and was accepted as it provides seamless and logical connections to all parts of the E-SIMS. The findings implied that the contents of the developed E-SIMS were attained and congruent to the selected topics in Genetics for Grade 9 Learners.

This was supported by the study of Andal (2022), which found that the contents of the developed learning activities were clear and easy to understand, aligned with the current curriculum guide and Specific, Measurable, Attainable and Time-bounded (SMART) learning objectives. It obtained an overall rating of "Very Highly Acceptable" as evaluated by Science Experts.

Table 2. The Computed mean on the Level of Acceptability of the developed E-SIMS on Selected topics in Genetics as to Organization and Presentation

Indicators	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
2.a The topics are presented in logical and orderly sequence.	4.00	Very Acceptable
2.b The topic headings are clear and well presented.	3.95	Very Acceptable
2.c The directions are clearly stated which helps the learners to answer the questions.	3.95	Very Acceptable
2.d The varied activities, assessments, and enrichments are sufficient to narrow down the objective.	3.90	Very Acceptable
2.e provide directions to the learners and to the learning contents.	4.00	Very Acceptable
Overall Weighted Mean	3.96	Very Acceptable

In sum, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to presentation and organization was found to be "Very Acceptable," with an overall weighted mean of 3.96. The findings suggested that the developed E-SIMS was organized and presented to satisfy the teacher-respondents to fully evaluate the entire material.

This was supported by the study of Vitug (2018), which found that topics should be laid out and presented in a logical and orderly sequence, content should be arranged in simple to complex, and directions should be concise, readable, and easy to follow. It obtained an overall rating of "Very Highly Acceptable" as evaluated by Science Experts.

Table 3. The Computed mean on the Level of Acceptability of developed E-SIMS on Selected topics in Genetics as to Learning Activities

Indicators	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
<i>The learning activities of the developed android-based E-SIMS...</i>		
3.a are appropriate to the needs and abilities of the learners for the grade level.	3.90	Very Acceptable
3.b allow the learners to become actively engaged while learning.	3.90	Very Acceptable
3.c are properly aligned with the identified unmastered competency.	3.95	Very Acceptable
3.d provide clear and concise instructions that can be easily performed by learners with no assistance needed from the teacher.	3.85	Very Acceptable
3.e promote mastery of the subject matter and in-depth understanding among the learners.	3.95	Very Acceptable
Overall Weighted Mean	3.91	Very Acceptable

Overall, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics, as evaluated by Science Experts with respect to learning activities, was found to be "Very Acceptable," with an overall weighted mean of 3.91.

The findings suggested that the learning activities aid learning progress as they were aligned with the identified unmastered competency and promote subject matter mastery and in-depth understanding among the learners as perceived by Science-Experts.

The findings were supported by a study of Rahmatullah et al. (2022), which revealed that learning activities of the android-based contextual teaching materials have a positive outcome on students' problem-solving skills in Physics due to their interactive and engaging capabilities and alignment to the students' existing learning competencies, needs, and abilities. This was also supported by the study of Samosa et al. (2021), that including cartoons in the SIM promotes students' intrinsic motivation making the learning process more enjoyable and engaging from abstract to concrete examples of the discussed complex concepts in a simple yet easy-to-understand way. Cartoons create meaning for the students by interpreting them based on their prior knowledge and experiences.

Table 4. The Computed mean on the Level of Acceptability of developed E-SIMS on Selected topics in Genetics as to Assessment

Indicators <i>The assessments of the developed android-based E-SIMS...</i>	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
4.a are aligned with the learning objectives and content presented.	4.00	Very Acceptable
4.b are relevant to the achievement of learning goals.	3.95	Very Acceptable
4.c directions are clearly presented and understandable.	4.00	Very Acceptable
4.d purpose is well-defined.	3.95	Very Acceptable
4.e are varied and appropriate to the target grade level with increasing levels of difficulty.	3.85	Very Acceptable
Overall Weighted Mean	3.95	Very Acceptable

Generally, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to assessment was found to be "Very Acceptable," with an overall weighted mean of 3.95. The findings confirmed that the assessments were aligned with the learning objectives and content presented, the directions were clear and understandable, relevant to achieving learning goals, and the purpose was well-defined as evaluated by Science Experts.

This was supported by Abridonda's (2017) study, which revealed that assessments should be congruent with the objective of the lesson presented, truly assess learning gained, directions are presented and understandable, and have a clear purpose. It obtained an "acceptable" rating from content validators.

Table 5. The Computed mean on the Level of Acceptability of the developed E-SIMS on Selected topics in Genetics as to Design and Layout

Indicators <i>The design and layout of the developed android-based E-SIMS...</i>	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
5.a contain images that are properly cited, relevant and meaningful to the content.	4.00	Very Acceptable
5.b use font styles and sizes that are easy to read.	3.95	Very Acceptable
5.c are visually appealing, sustain interest, and do not cause distractions to learners.	4.00	Very Acceptable
5.d are uniform to all parts of the material.	4.00	Very Acceptable
5.e are clear and intuitive, allowing learners to always find what they need.	4.00	Very Acceptable
Overall Weighted Mean	3.99	Very Acceptable

In totality, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics, as evaluated by Science Experts with respect to design and layout, was found to be "Very Acceptable," with an overall weighted mean of 3.99. According to the findings, the design and layout have the highest overall mean among the criteria. This means that the developed android-based E-SIMS has images that are properly cited, relevant, and meaningful to the content, font styles and sizes that are easy to read, visually appealing, sustain interest, and do not cause distractions to learners, are uniform to all parts of the material, are clear and intuitive, and allow learners always to find what they need.

This was supported by the study of Luzano (2020), that the design of the SIM was rated "excellent" as evaluated by the content experts. Moreover, the study by Dolojan (2022), confirmed that layouts are consistent on all pages, clear, intuitive, and easy to navigate through the information so that learners can easily find what they need and was rated "highly agree" by science experts.

Table 6. The Computed mean on the Level of Acceptability of developed E-SIMS on Selected topics in Genetics as to Language and Style

Indicators <i>The language and style of the developed android-based E-SIMS...</i>	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
6.a are simple and easy to understand in terms of vocabulary and technical terminologies.	3.95	Very Acceptable
6.b have enough vocabulary to ensure the smooth facilitation of learning.	3.95	Very Acceptable
6.c have sufficient provisions for learning new meanings.	3.85	Very Acceptable
6.d are appropriate to the ability of the target learners.	3.95	Very Acceptable
6.e are strategically designed in terms of correct grammar, spelling, syntax, punctuation, capitalization, and other writing mechanics that were appropriately employed.	4.00	Very Acceptable
Overall Weighted Mean	3.94	Very Acceptable

In sum, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to language and style was found to be "Very Acceptable," with an overall weighted mean of 3.94.

The findings signified that the language and style used were understandable and easy to comprehend for the learners and that they were strategically designed in terms of correct grammar, spelling, syntax, punctuation, capitalization, and other writing mechanics that were appropriately employed, as evaluated by Science Experts.

This was supported by the study of Gapuz et al. (2021) that language and style should be based on the level of understanding of the learners as they were directed to learn the lesson. This criterion was rated "very highly acceptable" as evaluated by Science Experts and Learners.

Table 7. The Computed mean on the Level of Acceptability of developed E-SIMS on Selected topics in Genetics as to Usefulness

Indicators <i>The developed android-based E-SIMS...</i>	Teacher-Respondents	
	\bar{x}	Verbal Interpretation
7.a provide self-guided instructions which limit teacher assistance/facilitation.	3.95	Very Acceptable
7.b serve as supplementary material that helps in addressing learners' difficulty in mastering the least mastered competencies.	3.95	Very Acceptable
7.c allow the learners to construct new ideas or concepts based on their prior or current knowledge.	4.00	Very Acceptable
7.d can easily navigate to any part of the material and ensures the successful completion of tasks.	3.90	Very Acceptable
7.e run offline making it adaptable and applicable to learners of any learning modality.	4.00	Very Acceptable
Overall Weighted Mean	3.95	Very Acceptable

Overall, the level of acceptability of the developed Electronic Strategic Intervention Materials (E-SIMS) on the selected topics in Genetics as evaluated by Science Experts with respect to usefulness was found to be "Very Acceptable," with an overall weighted mean of 3.95. The findings intended that the developed E-SIMS, in terms of usefulness, allows learners to construct new ideas or concepts based on prior or current knowledge and run offline, making it adaptable and applicable to learners of any learning modality. This means that the developed material effectively improves learners' academic performance, particularly those with low achievement. It is paperless and cost-effective, making it more environmentally friendly and functional.

This was comparable to the findings of Contreras (2018), who found that the developed (MI-SIM) satisfied the functional and technical criteria. It was evaluated as highly acceptable by a panel of Science Experts.

Problem 2: What is the level of performance of the learners in the pretest and posttest?

Table 8. Level of Performance of the Learners in the Pretest and Posttest

	Control			Experimental		
	Mean	Mean Difference	SD	Mean	Mean Difference	SD
Pretest	5.52	2.57	2.54	5.57	7.52	2.56
Posttest	8.09		3.78	13.09		1.08

Data from Table 8 revealed that for the control group, the Pretest mean score was found to be 5.52 with a standard deviation of 2.54, while its posttest mean score was found to be 8.09 with a standard deviation of 3.78. Its mean difference of 2.57 suggests a low increase in performance. The increase in the standard deviation of 1.24 suggests that the scores became more scattered, and the learners' performance became more heterogeneous. Moreover, for the experimental group, the Pretest mean score was 5.57 with a standard deviation of 2.56, while its Posttest mean score was 13.09 with a standard deviation of 1.08. Its mean difference of 7.52 suggests a big increase in performance. The decrease in the standard deviation of 1.48 suggests that the scores became less scattered, and the learners' performance became more homogenous.

From the above results, the students from the experimental group performed better than the learners from the control group, and the E-SIMS have greatly affected the increase in performance of the learners.

This was supported by the study of Alboruto (2017), entitled "Beating the Numbers through Strategic Intervention Materials (SIMs): Innovative Science Teaching for Large Classes," that the mean difference in the score of the experimental group is greater than the mean difference of in the score of the control group. This implied that exposure to the developed SIMs improved the experimental group's understanding of science concepts more than the control group.

The study's respondents were eight Grade 9 sections that were not managed by the researcher throughout the School Year 2022-2023. Respondents were Grade 9 learners who obtained a grade of 74% or lower or "did not meet expectations" during the first quarter. Each section in Grade 9 consists of 69 learners, and only five to six (5-6) learners from each section were chosen to participate in the study. The study's chosen participants were not handled but monitored by the researcher, who also acted as the Department Chairperson of Science.

The selected 46 Grade 9 learners took the pretest simultaneously. The pretest results were analyzed and served as the basis for assigning them to experimental and control groups. The composition of learners in the control and experimental groups has an equal level of mastery concerning the content presented in the pretest. Furthermore, the control group received the same posttest administered to the experimental group after exposure to the material.

Table 9. Significant Difference on the Level of Performance of the Learners in the Pretest and Posttest

Categories	Mean	Coefficient of t		P-value	Decision	Interpretation
		Critical (2-tailed)	Computed			
Control Group	Pretest: 5.52 Posttest: 8.09	2.074	12.911	<0.001	Reject Ho	Significant
Experimental Group	Pretest: 5.57 Posttest: 13.09	2.074	2.931	0.008	Reject Ho	Significant

Legend: $t = t\text{-test}$; $\alpha = \text{level of significance} = 0.05$

Data from Table 9 revealed that for the control group, the t -computed value of 12.911 was greater than the critical t -value of 2.074; its P -value of <0.001 is less than the hypothesized significance level. Thus, H_0 is rejected. This suggests that the pretest and posttest results differ significantly.

Similarly, for the experimental group, the computed value of 2.931 was greater than the critical t -value of 2.074; its P -value of 0.008 is less than the hypothesized significance level. Thus, H_0 is rejected. This indicates that the pretest and posttest results differ significantly.

The figures above revealed that the learners' performance in the pretest differed significantly from their performance in the posttest.

This was supported by the study of Ebojo et al. (2019) which indicates that there was a substantial improvement in the performance of learners who utilized the e-sims from pretest to posttest scores, which was confirmed by expert evaluations that were statistically described as valid.

The findings that the control group's posttest scores improved without E-SIMS implied that the DepEd module effectively improved the learners' least mastered abilities. The following factors may have contributed to the improved performance of learners in the control group: 1. provision of a 1:1 copy of the learner's module prescribed by DepEd; 2. utilization of Science laboratory as room for intervention; 3. instant checking of answers in all the activities in the learner's module; and 4. timely and immediate feedback to learners assessment scores.

Problem 3. Is there a significant difference in the level of performance of the learners in the pretest and posttest?

Table 10. Significant Difference on the Level of Performance of the Learners in their Posttest Scores

Categories	Mean	Coefficient of t Critical (2- tailed)	Computed	P-value	Decision	Interpretation
Posttest scores	Control Group: 8.09 Experimental Group 13.09	2.015	6.103	<0.001	Reject Ho	Significant

Legend: $t = t\text{-test}$; $\alpha = \text{level of significance} = 0.05$

Table 10 data indicated that the t -computed value of 6.103 was more than the t -critical value of 2.015; however, the P -value of 0.001 was less than the anticipated significance level. As a result, H_0 was rejected. This indicates that the learners' posttest performance varies significantly.

According to the findings, learners' performance in the control group differed significantly from that of learners in the experimental group.

The result suggests that the performance of the learners in the control group was significantly different from the performance of learners in the experimental group.

This was supported by the study of Santos (2019) which showed that the experimental group surpassed the control group in terms of performance.

This insinuates that using E-SIMS has improved learners' academic performance. The findings of the study were anchored with John Dewey's Learning by Doing theory and Jerome Bruner's theory of constructivism, in which learners learned through active engagement and personally experiencing various learning activities in the developed material with less assistance from the teacher, allowing them to develop an in-depth understanding of the concepts and develop problem-solving skills that focus on selected topics in Genetics: Non-Mendelian Patterns of Inheritance easily and enjoyably.

Problem 4. Based on the result of the study what enhancements be made for the improvement of the E-SIM?

Even though Science experts gave a "Very acceptable" rating to all the indicators, further enhancements for the improvement of the E-SIMS were based on the three indicators with the lowest computed mean.

Table 11. Summary of the Original and the Enhanced parts of the developed E-SIMS

Indicators with the Lowest Computed Mean	Original	Enhanced
4.e The assessments of the developed android-based E-SIMS are varied and appropriate to the target grade level with increasing levels of difficulty	The pretest and posttest are composed of 15-items, which include two types of tests namely, Multiple Choice and Matching types. The multiple-choice test is composed of 10-items with four (4) choices while the Matching type is composed of 5-items.	Addition of "Problem-Solving" with four (4) choices and images for each problem. The items in the posttest specifically in the multiple choice were altered and revised; for matching type column A was replaced with column B. Multiple choice type has 5-items, Matching type has 5-items, and Problem Solving has 5-items a total of 15-items.
3.d The learning activities of the developed android-based E-SIMS provide clear and concise instructions that can be easily performed by learners with no assistance needed from the teacher	The researcher overlooked to include the instruction or direction to follow in Activity 2.3: Problem-Involving Incomplete Dominance	An addition of instruction or direction was made to a particular learning activity; Activity 2.3: Problem-Involving Incomplete Dominance. This revision was made in response to the needs and abilities of the target learners.
6.c The language and style of the developed android-based E-SIMS have sufficient provisions for learning new meanings	Includes a short introduction with corresponding examples for each of the following topics: Incomplete Dominance, Codominance, Multiple Alleles, and Sex-linked traits.	Addition of "Exploring Terms in Genetics" in each topic, making learning new meanings attainable for target learners. This added feature consists of difficult terms in Genetics that were highlighted in each activity with their corresponding definition, utilizing words that learners were familiar with and matching the learners' level of understanding.

IV. Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. The developed E-SIMS as an instructional material was found to be "Very Acceptable" in terms of Content, Organization and Presentation, Learning Activities, Assessment, Design and layout, Language and style, and Usefulness as evaluated by the Science experts.
2. The learners' performance levels increased in both the control and experimental groups. The higher increase in the mean score in the experimental group suggests that the developed E-SIMS has greatly improved compared to the mean scores in the control groups.

3. The level of performance of the learners in the pretest was significantly different from the level of performance in the posttest in both control and experimental groups. The level of performance of the learners in the control group was significantly different from that of the learners in the experimental group.
4. The indicators with the lowest computed mean of 3.85 were used as bases for the enhancements of the developed E-SIMS on the selected topics in Genetics.

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