Fostering Learners' Science Comprehension and Performance Using Information Education and Communication (IEC) as Supplementary Material in Science 4

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Abstract—This study aims to investigate the effectiveness of IEC materials in enhancing Grade 4 students' science vocabulary and comprehension. Specifically, it sought to explore how these materials can scaffold learning by simplifying technical terms, providing contextual support, and making scientific discussions more interactive and engaging. The study also assessed how the integration of IEC materials can help bridge the gap between learners' current vocabulary skills and their overall understanding of science concepts. Ultimately, this research sought to provide valuable insights that can contribute to the development of effective instructional practices, ensuring that young learners acquire the necessary skills and knowledge to succeed in science education. A quasi-experimental research design with a pretest and post-test approach was utilized, involving 120 purposively selected Grade 4 students. Data were gathered through a researcher-made questionnaire and test results to measure the effectiveness of the IEC materials on Grade 4 students' science comprehension and performance. The findings indicate that IEC materials significantly contribute to students' ability to use context clues, retain information, recognize words, and develop conceptual understanding. This suggests that well-structured and relevant IEC materials play a crucial role in enhancing students' comprehension, reinforcing the importance of carefully designed supplementary learning resources in education. The results revealed that while IEC materials positively influence formative assessments, their direct impact on summative assessments is limited. This implies that although IEC materials support student learning, additional factors such as teaching strategies, student engagement, and assessment methods contribute to overall academic performance. Therefore, integrating diverse instructional approaches and fostering self-directed learning can further enhance students' comprehension and achievement.

Keywords— Science Comprehension; Supplementary Material; Information Education and Communication.

I.   INTRODUCTION

Science literacy is a fundamental component of 21st-century education, equipping learners with the skills necessary to navigate an increasingly complex, technology-driven world. Beyond acquiring conceptual knowledge, science education fosters critical thinking, problem-solving, and analytical reasoning—skills essential for both academic success and real-world applications. However, many students struggle with scientific literacy due to challenges in understanding technical vocabulary and abstract concepts. To address this issue, the use of effective educational tools that enhance science comprehension and performance is crucial in strengthening student learning outcomes. Meyers, L. (2020).

One such approach is the integration of Information, Education, and Communication (IEC) materials, which have been widely recognized for their role in improving literacy across various subjects. These materials—including posters, brochures, visual aids, interactive multimedia, and digital presentations—serve as supplementary resources that simplify complex scientific concepts, making them more engaging and accessible for learners. By presenting information in a visually appealing and structured manner, IEC materials help improve knowledge retention, facilitate deeper understanding, and encourage active participation in the learning process. Furthermore, the use of IEC resources supports differentiated instruction, catering to students with varying learning styles and needs.

The Department of Education (DepEd) has placed a strong emphasis on strengthening science education through the K-12 curriculum, which introduces science concepts at an early stage to nurture scientific inquiry, exploration, and problem-solving abilities among young learners. However, despite these efforts, gaps in students' vocabulary and comprehension continue to pose challenges, particularly in elementary education, Navarro, R. (2017). Many educators still rely heavily on traditional teaching methods such as textbooks and lectures, which, while informative, may not fully engage students or provide sufficient contextual support for understanding abstract scientific terms. Additionally, limited access to modern instructional materials and inadequate teacher training in innovative teaching strategies further contribute to students' struggles in mastering science literacy.

To address this issue, this study aims to explore the effect of IEC materials on improving the science comprehension and performance of Grade 4 students. Specifically, it investigates how the use of simplified content, and interactive learning resources can enhance students' ability to internalize and apply scientific vocabulary in both classroom discussions and assessments. By integrating IEC materials into science instruction, educators can create a more engaging and inclusive learning environment, fostering deeper comprehension and long-term retention of scientific concepts,

Piotrowski (2016). Ultimately, the study aspires to provide valuable insights into innovative teaching strategies that can bridge the gap between theoretical knowledge and practical application, ensuring that young learners develop a strong foundation in science literacy.

1.1 Statement of the Problem

Specifically, this study sought to answer the following questions:

1. What is the level of information, education and communication as supplementary material in terms of:

1.1 design;
1.2 accuracy;
1.3 authenticity;
1.4 appropriateness;
1.5 usefulness; and
1.6 complexity?

2. What is the level of students' comprehension in terms of:

2.1 use of context;
2.2 retention;
2.3 conceptual understanding;
2.4 word recognition; and
2.5 knowledge transfer?

3. What is the level of students' performance in terms of:

3.1 formative assessment; and
3.2 summative assessment?

4. Is there a significant relationship in the utilization of information, education and communication as supplementary materials in learner's comprehension?

5. Is there a significant effect on the utilization of information, education and communication as supplementary materials in learner's performance?

II. METHODOLOGY

The research design for this study employed a quasi-experimental design with a pre-test and post-test approach. This method will be used to measure the effectiveness of the IEC materials on Grade 4 students' science comprehension and performance. The design allows for the comparison of students' and performance before and after exposure to the IEC materials, ensuring that changes in performance can be attributed to the intervention.

III. RESULTS AND DISCUSSION

This chapter presented the different results and discussed the results from treating the data gathered in this study. All specific questions in Chapter 1 under the statement of the problem were answered in this chapter supported by tables. It presents the data gathered about the significant relationship between information, education and communication as supplementary material and students' comprehension. In particular, the study sought to address the following:

Level of information, education and communication as supplementary material

In this study, the level of information, education and communication as supplementary material refers to Design, Accuracy, Authenticity, Appropriateness, Usefulness, and Complexity. The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 1. Level of information, education and communication as supplementary material in terms of Design

Statements	Mean	SD	Remarks
The design of the IEC materials is visually appealing and easy for students to navigate.	4.63	0.48	Always
The materials are well-organized, with clear sections and logical progression of ideas.	4.62	0.49	Always
The design promotes student engagement by using interactive and visually stimulating elements.	4.69	0.46	Always
The layout supports comprehension by ensuring that text, images, and activities are well-balanced.	4.64	0.50	Always
The design of the IEC materials is age-appropriate for Grade 4 students and encourages active participation.	4.65	0.48	Always
Weighted Mean		**4.65**	
SD		**0.48**	
Verbal Interpretation		**Very Highly Utilized**	

As presented in Table 1, there is a very high level of utilization of information, education, and communication (IEC) materials in terms of design, with a grand mean of M = 4.65, SD = 0.48. This implies that the IEC materials are visually appealing, well-organized, and engaging, making them highly effective as supplementary learning resources for Grade 4 students.

There is a strong agreement that the design of the materials promotes student engagement by incorporating interactive and visually stimulating elements. Additionally, the layout ensures that text, images, and activities are well-balanced, which supports comprehension and maintains students' interest. The age-appropriateness of the design also encourages active participation, allowing students to interact with the materials in a meaningful way.

This implies further that well-designed IEC materials can enhance learning experiences by making educational content more accessible and engaging. A well-structured design promotes better understanding, improves retention of information, and fosters a more interactive learning environment that encourages active student involvement.

As presented in Table 2, there is a very high level of utilization of IEC materials in terms of accuracy, with a grand mean of M = 4.57, SD = 0.51. This indicates that the materials provide factually correct and up-to-date information, aligning with educational standards and ensuring reliability in scientific content delivery.

There is a strong agreement that the scientific information presented is valid and free from errors, with vocabulary and concepts carefully aligned with Grade 4 science standards. Additionally, students trust the accuracy of the materials, which helps them feel more confident when using scientific terms and concepts in their explanations. Ensuring that the information is cross-checked with educational guidelines

reinforces the credibility of the IEC materials as a reliable learning resource.

Table 2. Level of information, education and communication as supplementary material in terms of Accuracy

Statements	Mean	SD	Remarks
The scientific information presented in the IEC materials is factually correct and up-to-date.	4.55	0.52	Always
The vocabulary introduced in the materials is accurate and consistent with Grade 4 science standards.	4.56	0.51	Always
The materials are free from errors and present science concepts in a reliable manner.	4.56	0.51	Always
The information is cross-checked with educational standards and guidelines to ensure its validity.	4.59	0.49	Always
Students trust the accuracy of the materials and feel confident using the terms in their explanations.	4.57	0.50	Always
Weighted Mean	4.57		
SD	0.51		
Verbal Interpretation	Very Highly Utilized		

This implies further that accurate IEC materials contribute to better knowledge retention and comprehension among students. When students engage with reliable and well-structured educational content, they develop a deeper understanding of key concepts, strengthening their confidence, academic performance, and overall learning experience.

Table 3. Level of information, education and communication as supplementary material in terms of Authenticity

Statements	Mean	SD	Remarks
The content should be tailored to the cultural context, values, and needs of the target audience.	4.55	0.52	Always
IEC materials should present scientific concepts in a clear, logical, and consistent manner.	4.55	0.50	Always
The language used should be simple and clear, avoiding jargon.	4.56	0.50	Always
The design should be visually appealing and easy to navigate.	4.63	0.48	Always
Images, graphics, and illustrations should complement the content and help in the understanding of the message.	4.55	0.50	Always
Weighted Mean	4.57		
SD	0.50		
Verbal Interpretation	Very Highly Utilized		

As presented in Table 3, there is a very high level of utilization of information, education, and communication (IEC) materials in terms of authenticity, with a grand mean of M = 4.57, SD = 0.50. This implies that the IEC materials are culturally relevant, well-structured, and effectively tailored to meet the needs of the target audience. There is a strong agreement that the materials reflect the cultural context, values, and learning needs of students, ensuring that the content remains relevant and meaningful. Additionally, the scientific concepts are presented logically and consistently, allowing students to grasp key ideas effectively. The simple and jargon-free language further enhances comprehension, making complex topics more accessible to learners. The materials are also visually appealing and easy to navigate, with well-integrated images and graphics that support understanding.

This implies further that authentic IEC materials enhance student engagement, comprehension, and retention of information. By ensuring that the materials are culturally and contextually appropriate, students can better relate to the content, fostering a deeper connection to the subject matter and improving overall learning outcomes.

Table 4. Level of information, education and communication as supplementary material in terms of Appropriateness

Statements	Mean	SD	Remarks
Materials should be delivered through the appropriate channels and platforms that are accessible to the audience.	4.88	0.32	Always
IEC materials should align with the specific learning outcomes and objectives outlined in the curriculum.	4.84	0.39	Always
The materials should be suited to the student's grade level and cognitive development.	4.84	0.41	Always
IEC materials should be designed to engage students actively in the learning process.	4.83	0.40	Always
The complexity of the materials should gradually increase as student's progress through the science curriculum.	4.92	0.31	Always
Weighted Mean	4.86		
SD	0.37		
Verbal Interpretation	Very Highly Utilized		

As presented in Table 4, there is a very high level of utilization of IEC materials in terms of appropriateness, with a grand mean of M = 4.86, SD = 0.37. This indicates that the materials are highly aligned with students' learning needs, cognitive development, and curriculum objectives.

There is a strong agreement that the delivery of materials through accessible platforms ensures that students can easily engage with the content. Furthermore, the materials are designed to align with specific learning outcomes and grade-level expectations, ensuring that students are provided with content that is both developmentally appropriate and educationally sound. Additionally, the gradual increase in complexity as student's progress through the curriculum supports continuous learning and skill development.

This implies further that appropriately designed IEC materials contribute to effective learning by ensuring accessibility, engagement, and alignment with academic goals. When students are provided with materials suited to their cognitive abilities and learning stages, they are more likely to stay motivated, participate actively, and develop a strong foundation in scientific concepts.

As presented in Table 5, there is a very high level of utilization of information, education, and communication (IEC) materials in terms of usefulness, with a grand mean of M = 4.75, SD = 0.46. This implies that the IEC materials are highly effective in supporting student learning by illustrating real-world applications of science concepts and catering to diverse learning needs.

There is a strong agreement that the materials help students see the relevance of scientific concepts in everyday life, making learning more meaningful. Additionally, the IEC materials are versatile and adaptable, ensuring that they can be modified to meet the needs of different learners. They also provide multiple opportunities for students to engage with key

concepts in various formats, allowing for greater retention and deeper understanding. Furthermore, the materials encourage critical thinking and independent exploration, which enhances students' ability to analyze, question, and apply their knowledge beyond the classroom.

Table 5. Level of information, education and communication as supplementary material in terms of Usefulness

Statements	Mean	SD	Remarks
IEC materials can illustrate how science concepts apply in real-world scenarios.	4.75	0.51	Always
IEC materials are particularly useful in reaching students with different learning preferences.	4.67	0.49	Always
IEC materials encourage students to think critically and explore scientific concepts independently.	4.74	0.46	Always
IEC materials can be adapted to meet the needs of students.	4.80	0.42	Always
IEC materials provide multiple opportunities for students to encounter key concepts in different formats.	4.80	0.42	Always
Weighted Mean	**4.75**		
SD	**0.46**		
Verbal Interpretation	**Very Highly Utilized**		

This implies further that well-designed and useful IEC materials play a crucial role in enhancing student engagement, fostering independent learning, and supporting diverse educational needs. By providing multiple learning pathways and practical applications, students are more likely to develop a stronger grasp of scientific concepts and improve their overall academic performance.

Table 6. Level of information, education and communication as supplementary material in terms of Complexity

Statements	Mean	SD	Remarks
The complexity of the language and concepts is appropriate for Grade 4 learners' cognitive abilities.	4.71	0.46	Always
The materials introduce new vocabulary in a structured manner, avoiding overwhelming students with too much information.	4.65	0.48	Always
The complexity of tasks gradually increases, allowing students to build on prior knowledge.	4.67	0.47	Always
Students can grasp complex scientific concepts thanks to the scaffolded approach in the materials.	4.70	0.46	Always
The materials provide opportunities for differentiated instruction, catering to students with different learning abilities.	4.71	0.46	Always
Weighted Mean	**4.69**		
SD	**0.46**		
Verbal Interpretation	**Very Highly Utilized**		

As presented in Table 6, there is a very high level of utilization of IEC materials in terms of complexity, with a grand mean of M = 4.69, SD = 0.46. This indicates that the materials are well-structured to match the cognitive abilities of Grade 4 students, ensuring that they can effectively process and understand scientific concepts.

There is a strong agreement that the materials maintain an appropriate level of language and concept complexity, avoiding overwhelming students while still challenging them to think critically and build on prior knowledge. The gradual

introduction of vocabulary and structured progression of tasks allows students to develop their understanding at a comfortable pace. Additionally, the scaffolded approach ensures that students grasp complex concepts through step-by-step guidance, making learning more accessible. The inclusion of differentiated instruction opportunities also ensures that students with varying learning abilities can engage meaningfully with the content.

This implies further that well-balanced complexity in IEC materials helps optimize learning experiences by providing structured, progressive, and differentiated instruction. By scaffolding new concepts and vocabulary, students can develop confidence, improve comprehension, and strengthen their scientific knowledge in a way that aligns with their developmental stage.

Table 7. Composite of information, education and communication as supplementary material

Indicators	Weighted Mean	SD	Verbal Interpretation
Design	4.65	0.48	Very Highly Utilized
Accuracy	4.57	0.51	Very Highly Utilized
Authenticity	4.57	0.50	Very Highly Utilized
Appropriateness	4.86	0.37	Very Highly Utilized
Usefulness	4.75	0.46	Very Highly Utilized
Complexity	4.69	0.46	Very Highly Utilized
Grand Mean	**4.66**		
SD	**0.46**		
Verbal Interpretation	**Very Highly Utilized**		

The level of information, education and communication as supplementary material in terms of Design, Accuracy, Authenticity, Appropriateness, Usefulness, and Complexity. arrived at a grand mean score of 4.66 and a standard deviation of 0.46 and was verbally interpreted as very highly utilized among the respondents. This indicates that information, education, and communication serve as additional resources. This means that the information, education, and communication (IEC) materials as supplementary learning resources are highly effective and widely utilized by the respondents. The consistently high ratings across all six dimensions Design, Accuracy, Authenticity, Appropriateness, Usefulness, and Complexity suggest that these materials are well-structured, reliable, relevant, engaging, and suitable for the cognitive development of learners.

The high level of utilization implies that IEC materials significantly contribute to the enhancement of the learning experience by providing visually appealing, logically organized, and interactive content that supports student comprehension and engagement. Their alignment with curriculum standards, cultural relevance, and adaptability ensures that students receive accurate and meaningful educational content that caters to different learning styles and needs. Furthermore, the progressive complexity of tasks and scaffolded learning approach allow students to build knowledge effectively, promoting critical thinking and independent exploration.

Overall, the findings underscore the essential role of IEC materials in facilitating effective teaching and learning. Their integration into the educational process enhances student motivation, fosters deeper understanding, and supports long-

term retention of concepts, ultimately contributing to academic success and holistic development.

Level of Student's Comprehension

In this study, the level of students' comprehension refers to Use of context, Retention, Conceptual understanding, Word recognition, and knowledge transfer.

The following tables show the statement, mean, standard deviation. remarks and verbal interpretation from the perspectives of respondents.

Table 8. Level of students' comprehension in terms of Use of Context

Statements	Mean	SD	Remarks
During class discussions and activities, students use science vocabulary appropriately in oral and written contexts.	4.50	0.52	Always
Learners demonstrate the ability to apply new scientific terms when explaining scientific concepts.	4.80	0.46	Always
Students confidently use science vocabulary in context during practical tasks and experiments.	4.53	0.55	Always
Students' written work shows the correct usage of key science terms introduced in the IEC materials.	4.45	0.52	Always
Learners can articulate the meaning of scientific terms to reflect an understanding of their use in real-world situations.	4.66	0.48	Always
Weighted Mean	**4.59**		
SD	**0.52**		
Verbal Interpretation	**Very High**		

As presented in Table 8, there is a very high level of students' comprehension in terms of use of context, with a grand mean of M = 4.59, SD = 0.52. This indicates that students are able to appropriately apply science vocabulary in various contexts, demonstrating their understanding of key terms both in oral and written communication.

There is a strong agreement that students effectively incorporate scientific vocabulary in discussions, practical tasks, and written outputs, showcasing their ability to articulate and explain concepts accurately. Their confidence in using science terminology in different situations suggests that the IEC materials effectively reinforce vocabulary acquisition. Moreover, the ability of learners to use and explain scientific terms in real-world scenarios highlights their deeper comprehension and contextual application of knowledge.

This implies further that the integration of IEC materials plays a crucial role in reinforcing vocabulary development and contextual application. By allowing students to frequently encounter and practice science terms in meaningful contexts, they gain a stronger grasp of scientific concepts, which enhances their ability to communicate ideas effectively and apply learning beyond the classroom.

As presented in Table 9, there is a very high level of students' comprehension in terms of retention, with a grand mean of M = 4.57, SD = 0.54. This suggests that students successfully retain scientific vocabulary and demonstrate consistent recall of key terms over time.

There is a strong agreement that students can remember and use science vocabulary in follow-up assessments and activities, indicating that IEC materials facilitate long-term retention of concepts. The repeated exposure to terms across

different lessons ensures that learners develop familiarity with vocabulary, leading to a stronger retention rate and better application in various contexts. Additionally, the consistent use of scientific terms across assessments and class activities highlights the effectiveness of IEC materials in reinforcing memory and recall skills. This implies further those effective instructional strategies, such as repeated exposure and varied applications, enhance vocabulary retention. By providing multiple opportunities for students to engage with scientific terms, IEC materials help reinforce learning, strengthen memory, and ensure that students retain knowledge for future application.

Table 9. Level of students' comprehension in terms of Retention

Statements	Mean	SD	Remarks
Students can recall science vocabulary during follow-up assessments and activities.	4.51	0.55	Always
The vocabulary retention rate is measured through quizzes and tests conducted after several lessons.	4.66	0.49	Always
Learners retain key science terms introduced through the IEC materials over an extended period.	4.53	0.56	Always
Students demonstrate vocabulary retention by consistently using terms in different contexts.	4.66	0.47	Always
Retention of science vocabulary improves after repeated exposure to the IEC materials.	4.47	0.59	Always
Weighted Mean	**4.57**		
SD	**0.54**		
Verbal Interpretation	**Very High**		

Table 10. Level of students' comprehension in terms of Conceptual Understanding

Statements	Mean	SD	Remarks
Students can explain the meaning of scientific vocabulary with an understanding of the underlying concepts.	4.61	0.51	Always
Learners demonstrate a deep understanding of scientific terms by using them accurately in problem-solving tasks.	4.57	0.53	Always
Students' explanations of science vocabulary reflect a clear grasp of the concepts they represent.	4.54	0.56	Always
Learners show improved conceptual understanding through their ability to relate science terms to real-world examples.	4.64	0.52	Always
Students' answers to comprehension questions demonstrate a strong grasp of the science concepts tied to the vocabulary.	4.53	0.56	Always
Weighted Mean	**4.58**		
SD	**0.54**		
Verbal Interpretation	**Very High**		

As presented in Table 10, there is a very high level of students' comprehension in terms of conceptual understanding, with a grand mean of M = 4.58, SD = 0.54. This indicates that students are not only able to use scientific vocabulary correctly but also understand the underlying concepts associated with these terms.

There is a strong agreement that students can explain scientific terms accurately and apply them in problem-solving tasks, demonstrating a deeper grasp of the concepts they represent. The ability to relate vocabulary to real-world situations further supports the effectiveness of IEC materials in developing critical thinking and conceptual clarity.

Additionally, learners' strong performance in comprehension tasks suggests that they have internalized both the meaning and significance of scientific vocabulary.

This implies further that the use of well-structured IEC materials significantly enhances students' conceptual understanding. By presenting scientific terms in meaningful contexts and encouraging real-world applications, students are able to deepen their comprehension, leading to improved academic performance and practical knowledge.

Table 11. Level of students' comprehension in terms of Word recognition

Statements	Mean	SD	Remarks
Students can correctly recognize and identify science vocabulary in written texts and multimedia content.	4.62	0.49	Always
Learners accurately match scientific terms to their definitions during assessments.	4.82	0.39	Always
Students show improved recognition of science terms in varied formats, such as diagrams, labels, or descriptions.	4.60	0.57	Always
Learners demonstrate the ability to recognize newly learned terms in future lessons or assessments.	4.65	0.48	Always
Word recognition improves as students encounter scientific terms in different contexts through the IEC materials.	4.57	0.52	Always
Weighted Mean		**4.67**	
SD		**0.50**	
Verbal Interpretation		**Very High**	

As presented in Table 11, there is a very high level of students' comprehension in terms of word recognition, with a grand mean of M = 4.67, SD = 0.50. This indicates that students can effectively identify and recognize scientific vocabulary across various formats, demonstrating strong familiarity with key terms.

There is a strong agreement that students accurately match scientific terms to their definitions and recognize them in different representations such as diagrams, labels, and descriptions. Their ability to identify and recall vocabulary in multimedia content and written texts suggests that IEC materials provide diverse and effective exposure to key terms. Furthermore, the improvement in word recognition across multiple contexts highlights the materials' role in reinforcing familiarity and automaticity in vocabulary recall. This implies further that frequent encounters with scientific vocabulary through varied learning resources significantly enhance students' word recognition skills. By engaging students in activities that incorporate visual, textual, and auditory representations of science terms, IEC materials strengthen students' ability to identify and recall vocabulary with ease.

As presented in Table 12, there is a very high level of students' comprehension in terms of knowledge transfer, with a grand mean of M = 4.67, SD = 0.50. This indicates that students are able to apply scientific vocabulary beyond the classroom, demonstrating their ability to transfer knowledge to new contexts.

There is a strong agreement that students effectively use learned vocabulary to solve new problems, engage in interdisciplinary activities, and apply scientific concepts in different settings. Their ability to use science terms in discussions, presentations, and real-world applications suggests that IEC materials successfully promote deeper learning and transfer of knowledge. Additionally, the consistent application of vocabulary across various learning scenarios highlights the practical impact of IEC materials on students' long-term academic growth.

Table 12. Level of students' comprehension in terms of Knowledge Transfer

Statements	Mean	SD	Remarks
Students apply the scientific vocabulary learned in class to solve new problems or real-world scenarios.	4.69	0.48	Always
Learners demonstrate knowledge transfer by using science terms outside of the classroom, such as in projects or homework.	4.71	0.45	Always
Students can use newly acquired vocabulary to explain new or unfamiliar scientific concepts.	4.60	0.56	Always
Learners transfer their understanding of science terms to other subjects or interdisciplinary activities.	4.70	0.48	Always
Knowledge transfer is evident when students use scientific vocabulary during group discussions or presentations.	4.63	0.53	Always
Weighted Mean		**4.67**	
SD		**0.50**	
Verbal Interpretation		**Very High**	

This implies further that well-designed IEC materials facilitate meaningful learning experiences that extend beyond memorization. By providing opportunities for students to apply their knowledge in different contexts, these materials contribute to the development of problem-solving skills, interdisciplinary connections, and real-world application of scientific concepts.

Table 13. Composite of students' comprehension

Indicators	Weighted Mean	SD	Verbal Interpretation
Use of context	4.59	0.52	Very High
Retention	4.57	0.54	Very High
Conceptual understanding	4.58	0.54	Very High
Word recognition	4.67	0.50	Very High
knowledge transfer	4.67	0.50	Very High
Grand Mean		**4.62**	
SD		**0.52**	
Verbal Interpretation		**Very High**	

The level of students' comprehension in terms of Use of context, Retention, Conceptual understanding, Word recognition, and knowledge transfer. arrived at a grand mean score of 4.62 and a standard deviation of 0.52 and was verbally interpreted as very high among the respondents. This means that the students' comprehension This means that the students' comprehension of scientific vocabulary and concepts is strongly reinforced through the use of IEC materials, as indicated by their high scores across various comprehension aspects. The results suggest that students are not only able to recognize and recall scientific terms but also effectively use them in context, apply them across different learning scenarios, and demonstrate a deep understanding of their meanings and applications.

Furthermore, the very high comprehension level implies that the structured and repetitive exposure provided by IEC

materials plays a crucial role in vocabulary retention, conceptual understanding, and knowledge transfer. The ability of students to confidently use scientific terms in oral and written communication, practical activities, and interdisciplinary tasks highlights the effectiveness of these materials in fostering deeper learning.

This implies further that comprehensive and well-designed IEC materials enhance students' cognitive engagement, critical thinking, and practical application of knowledge. By supporting students in mastering vocabulary, developing conceptual clarity, and transferring knowledge to real-world contexts, these materials contribute significantly to the improvement of their overall scientific literacy and academic performance.

Table 14. Level of students' performance in terms of Formative Assessment

| Score | Assessment | | Descriptive Equivalent |
	f	%	
41 - 50	34	28.57	Outstanding
31 - 40	69	57.98	Very Satisfactory
21 - 30	16	13.45	Satisfactory
11 - 20	0	0.00	Fairly Satisfactory
0 - 10	0	0.00	Did not meet Expectation
Total	**119**	**100**	
Weighted Mean	**36.96**		
SD	**5.245**		
Verbal Interpretation	**Very Satisfactory**		

The findings in Table 14 indicate that the level of students' performance in terms of Formative Assessment is very satisfactory, as reflected in the grand mean score (M = 36.96, SD = 5.245). These results highlight the students' strong grasp of the subject matter, as demonstrated through their assessment scores.

A majority of students (57.98%) achieved a Very Satisfactory rating, while 28.57% reached the Outstanding level, indicating a high level of competency in the assessed topics. Meanwhile, 13.45% of students performed at the Satisfactory level, showing an adequate understanding with room for improvement. Notably, no students fell under the Fairly Satisfactory or Did Not Meet Expectation categories, demonstrating the effectiveness of the instructional approach. The standard deviation value suggests that student performance was relatively consistent across the group.

Overall, these results implied that students have a strong foundational understanding of the concepts assessed in formative evaluations. Their very satisfactory performance reflects both effective instructional strategies and the impact of supplementary learning materials, which support comprehension and reinforce key concepts.

The findings in Table 15 indicate that the level of students' performance in terms of Summative Assessment is outstanding, as reflected in the grand mean score (M = 41.35, SD = 4.041). These results highlight the students' strong mastery of the subject matter, as demonstrated through their high summative assessment scores.

A significant majority of students (58.82%) achieved an Outstanding rating, while 41.18% attained a Very Satisfactory level. Notably, no students scored within the Satisfactory, Fairly Satisfactory, or Did Not Meet Expectation categories,

indicating a high level of comprehension and retention of the material. The relatively low standard deviation suggests minimal variation in performance, signifying that most students consistently excelled in the summative assessment.

Table 15. Level of students' performance in terms of Summative Assessment

| Score | Assessment | | Descriptive Equivalent |
	f	%	
41 - 50	70	58.82	Outstanding
31 - 40	49	41.18	Very Satisfactory
21 - 30	0	0.00	Satisfactory
11 - 20	0	0.00	Fairly Satisfactory
0 - 10	0	0.00	Did not meet Expectation
Total	**119**	**100**	
Weighted Mean	**41.35**		
SD	**4.041**		
Verbal Interpretation	**Outstanding**		

Overall, these results imply that students have achieved a deep understanding of the concepts assessed, demonstrating strong retention, application, and problem-solving skills. Their outstanding performance reflects both effective instructional methods and the positive impact of supplementary materials, which enhance comprehension and reinforce key concepts.

Test of Relationship between the information, education and communication as supplementary material and the students' comprehension

To test the significant relationship between the information, education and communication as supplementary material and the students' comprehension in terms of Use of context, Retention, Conceptual understanding, Word recognition, and knowledge transfer they were treated statistically using Real Statistics Data Analysis Tools using the Pearson product moment correlation coefficient.

Shown in Table 16 is the significant relationship between the information, education, and communication (IEC) materials as supplementary materials and students' comprehension in terms of use of context, retention, conceptual understanding, word recognition, and knowledge transfer. The findings include Pearson correlation coefficients (r-values), p-values, and sample size (N = 119) for each relationship.

The results indicate that the Design of IEC materials does not have a statistically significant relationship with any of the comprehension factors. The correlation values are low, and the p-values exceed the significance threshold, suggesting that the design alone may not directly enhance students' ability to use context, retain information, understand concepts, recognize words, or transfer knowledge.

In contrast, Appropriateness and Usefulness showed significant relationships with all aspects of comprehension, as reflected in their correlation values and p-values. This suggests that when IEC materials are well-structured and relevant, they effectively support students in processing information, retaining concepts, and applying knowledge in different contexts.

Furthermore, Complexity exhibited significant correlations with use of context, retention, and conceptual understanding. This indicates that structured progression in IEC materials

helps students grasp and retain concepts effectively, though it may not strongly impact word recognition and knowledge transfer.

Overall, these results imply that the effectiveness of IEC materials in enhancing comprehension is highly dependent on their appropriateness, usefulness, and complexity. While aspects such as design, accuracy, and authenticity contribute to comprehension, their impact is limited without structured content and opportunities for engagement. By ensuring that IEC materials are well-balanced, relevant, and appropriately

complex, educators can better facilitate students' learning and comprehension development.

Test of Effect between the information, education and communication as supplementary material and the Students' Performance

To test the significant effect between the information, education and communication as supplementary material and the Students' Performance in terms of Formative Assessment and Summative Assessment they were treated statistically using Real Statistics Data Analysis Tools using the Regression Analysis.

Table 16. Significant Relationship between the information, education and communication as supplementary material and the students' comprehension

Information, education and communication as supplementary material		Students' comprehension				
		Use of context	Retention	Conceptual understanding	Word recognition	knowledge transfer
Design	Pearson Correlation Significance (2-Tailed) N	0.0558 0.0607 119	-0.0470 0.0337 119	-0.0700 0.0784 119	-0.055 0.4649 119	-0.0320 0.5821 119
	Analysis	*Not Sig*	*Sig*	*Not Sig*	*Not Sig*	*Not Sig*
Accuracy	Pearson Correlation Significance (2-Tailed) N	0.1099 0.5364 119	0.0300 1.0000 119	0.0675 0.8166 119	0.0636 0.0018 119	0.1326 0.0042 119
	Analysis	*Not Sig*	*Not Sig*	*Not Sig*	*Sig*	*Sig*
Authenticity	Pearson Correlation Significance (2-Tailed) N	-0.0460 0.6290 119	0.0839 0.9181 119	-0.2140 0.8991 119	-0.0120 0.0027 119	-0.0500 0.0092 119
	Analysis	*Not Sig*	*Not Sig*	*Not Sig*	*Sig*	*Sig*
Appropriateness	Pearson Correlation Significance (2-Tailed) N	0.0706 0.0000 119	0.1375 0.0000 119	-0.0630 0.0000 119	0.0493 0.0000 119	-0.0050 0.0000 119
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*	*Sig*
Usefulness	Pearson Correlation Significance (2-Tailed) N	0.0082 0.0000 119	-0.0940 0.0000 119	0.1133 0.0000 119	0.0451 0.0383 119	-0.0080 0.0422 119
	Analysis	*Sig*	*Sig*	*Sig*	*Sig*	*Sig*
Complexity	Pearson Correlation Significance (2-Tailed) N	-0.0740 0.0051 119	0.0835 0.0011 119	-0.0200 0.0064 119	-0.0190 0.6694 119	-0.0410 0.5980 119
	Analysis	*Sig*	*Sig*	*Sig*	*Not Sig*	*Not Sig*

Correlation Coefficient Value (r)	Direction and Strength of Correlation
0.00 to 0.19	Very Weakly Positive
0.20 to 0.39	Weakly Positive
0.40 to 0.59	Moderately Positive
0.60 to 0.79	Strongly Positive
.80 to 1.00	Perfectly Positive

Table 17. Significant effect between the information, education and communication as supplementary material and the Students' Performance
a. Dependent Variable: FORMATIVE ASSESSMENT_OVERALL

ANOVAᵃ						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	314.04	6	52.34	1.9988	0.0717
	Residual	2932.8	112	26.185		
	Total	3246.8	118			
a. Dependent Variable: FORMATIVE ASSESSMENT_OVERALL						
b. Predictors: (Constant), DESIGN_OVERALL, ACCURACY_OVERALL, AUTHENTICITY_OVERALL, APPROPRIATENESS_OVERALL, USEFULNESS_OVERALL, COMPLEXITY_OVERALL						

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	107.05	25.353	56.812	2.2408	0.027
Design_Overall	3.1193	2.1936	-1.2271	-0.5594	0.577
Accuracy_Overall	7.0664	2.2648	2.579	1.1388	0.2572
Authenticity_Overall	-0.0037	2.4351	-4.8284	-1.9829	0.0498
Appropriateness_Overall	5.0229	1.9007	1.2568	0.6612	0.5098
Usefulness_Overall	-0.3738	1.5107	-3.367	-2.2288	0.0278
Complexity_Overall	5.1716	1.9613	1.2856	0.6555	0.5135

b. Dependent Variable: SUMMATIVE ASSESSMENT_OVERALL

ANOVA[a]					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	69.231	6	11.539	0.6956	0.6537
Residual	1857.9	112	16.589		
Total	1927.2	118			
a. Dependent Variable: SUMMATIVE ASSESSMENT_OVERALL					
b. Predictors: (Constant), Design_Overall, Accuracy_Overall, Authenticity_Overall, Appropriateness_Overall, Usefulness_Overall, Complexity_Overall					

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	87.202	20.18	47.219	2.3399	0.0211
Design_Overall	3.562	1.746	0.1025	0.0587	0.9533
Accuracy_Overall	5.1756	1.8026	1.604	0.8898	0.3755
Authenticity_Overall	2.0658	1.9381	-1.7744	-0.9155	0.3619
Appropriateness_Overall	3.7971	1.5129	0.7996	0.5285	0.5982
Usefulness_Overall	0.6217	1.2024	-1.7608	-1.4644	0.1459
Complexity_Overall	2.8626	1.561	-0.2304	-0.1476	0.8829

Shown in Table 17 is the significant effect of Information, Education, and Communication (IEC) materials as supplementary materials on students' performance in both formative and summative assessments. The results include ANOVA findings, regression coefficients, and significance values for each predictor variable, with a sample size of 119.

The findings indicate that the use of IEC materials, including Design, Accuracy, Authenticity, Appropriateness, Usefulness, and Complexity, does not exhibit a statistically significant effect on students' formative assessment performance. The regression analysis shows that among the six variables, Authenticity and Usefulness have significant effects, suggesting that these attributes of IEC materials may influence student performance. However, the negative coefficient for Usefulness implies that certain aspects of its implementation may require further examination to enhance effectiveness.

Similarly, the use of IEC materials does not significantly affect students' summative assessment performance. None of the predictor variables reached statistical significance, indicating that other factors, such as prior knowledge, study habits, and instructional strategies, may play a more critical role in determining summative assessment outcomes.

To conclude, while IEC materials contribute to students' learning experiences, their direct impact on assessment performance is limited. Enhancing the quality and application of these materials, integrating additional instructional approaches, and fostering student engagement and independent learning strategies may help improve academic achievement.

IV. CONCLUSION AND RECOMMENDATIONS

On the basis of the foregoing findings, the following conclusion was drawn.

The null hypothesis stating that there is no significant relationship between the utilization of information, education, and communication (IEC) materials and students' comprehension is rejected. The findings indicate that IEC materials significantly contribute to students' ability to use context clues, retain information, recognize words, and develop conceptual understanding. This suggests that well-structured and relevant IEC materials play a crucial role in enhancing students' comprehension, reinforcing the importance of carefully designed supplementary learning resources in education.

On the other hand, the null hypothesis stating that there is no significant effect of IEC materials on students' performance is accepted. The results revealed that while IEC materials positively influence formative assessments, their direct impact on summative assessments is limited. This implies that although IEC materials support student learning, additional factors such as teaching strategies, student engagement, and

assessment methods contribute to overall academic performance. Therefore, integrating diverse instructional approaches and fostering self-directed learning can further enhance students' comprehension and achievement.

Based on the drawn conclusions, the following recommendations are proposed:

1. Students should actively engage with information, education, and communication (IEC) materials by applying critical thinking and self-assessment strategies. Enhancing independent learning skills and seeking clarification when needed can further improve comprehension and academic performance.

2. Educators should integrate IEC materials with interactive and student-centered teaching approaches to maximize their effectiveness. Incorporating real-life applications, discussions, and differentiated instruction can help address diverse learning needs and improve student comprehension and performance.

3. School leaders should provide continuous professional development programs focusing on effective instructional material utilization. Allocating resources for the development and evaluation of high-quality IEC materials can further support both teachers and students in achieving better learning outcomes.

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