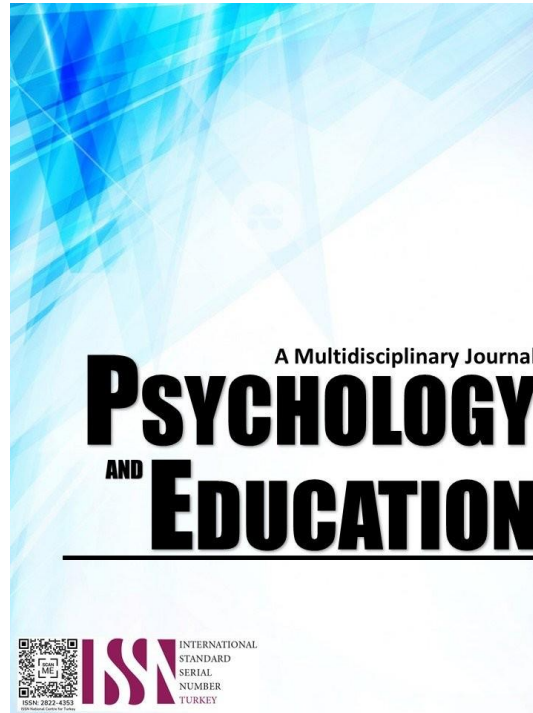


DEVELOPMENT, ACCEPTABILITY, AND EFFECTIVENESS OF COMPETENCY-BASED INFOGRAPHIC MATERIALS IN SCIENCE FOR GRADE 10 STUDENTS



PSYCHOLOGY AND EDUCATION: A MULTIDISCIPLINARY JOURNAL

Volume: 27

Issue 5

Pages: 473-479

Document ID: 2024PEMJ2576

DOI: 10.5281/zenodo.14027431

Manuscript Accepted: 08-12-2024

Development, Acceptability, and Effectiveness of Competency-Based Infographic Materials in Science for Grade 10 Students

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Abstract

The study aimed to develop, validate, and determine the level of effectiveness of the competency-based infographic materials in Science for Grade 10 students. The developed competency-based infographic materials in Science contains the selected least-mastered topics and competencies under the existing module provided by DepEd. It was conducted during the School Year 2023-2024 at Teresa Sub-Office which includes Abuyod National High School, Pantay Integrated High School, and Teresa National High School. It used descriptive and experimental designs involving two groups, Grade 10- Cypress as control group (unexposed) and Grade 10- Ebony as experimental group (exposed). They were chosen using the purposive sampling. Twenty-six (26) public Secondary Science teachers in the three public schools in Teresa Sub-Office were the respondents of the study in the validation of the acceptability of the developed competency-based infographic materials in Science for grade 10 students. Based on the findings, the study concluded that the developed competency-based infographic materials in Science for grade 10 students is acceptable and may be used as supplementary materials or teaching aids. Moreover, the findings on the level of performance of the grade 10 students in exposed and unexposed group increased their mean scores. And the overall findings revealed that there is a significant difference in level of performance of the grade 10 students as revealed in their posttest scores of the exposed and unexposed group. The study concluded that the developed competency-based infographic materials in Science for grade 10 students is acceptable and may be used as supplementary teaching aids. The result of the test after exposure to the competency-based infographic materials is significantly higher than the posttest of the unexposed group.

Keywords: *infographics, competency-based, Science*

Introduction

Education plays an important role in the development of humans by fostering intellectual growth, personal enrichment, and progress. It is more than just the acquisition of knowledge but a lifelong journey of learning, discovery, and self-improvement. It is an ultimate pathway to become successful. Through education, individual gains knowledge, skills, and competencies. It empowers individual to think critically, solve problems creatively, and to communicate effectively. Likewise, it is a prerequisite for meaningful and sustainable country's economy. It also gives a great deal of support that encourage everyone. It can help people to be more productive and skilled.

Teaching Science will be more productive and effective when there are available, sufficient, and strategically designed instructional materials suited for the different types of students. Learners nowadays are fond in using different gadgets that their attention is more than attending or listening to their class. That's why a teacher must be competitive and give something new to class every day, so that they will be more interested, challenged, and get excited everyday upon attending the class. Science is a fundamental part of the world, and it's essential that students could learn about it.

With this, the researcher, as a science teacher believes that the difficulty in teaching science particularly on different concepts should not be limited on the use of module alone. Teaching the intricate subject such as Science should not be taught in monotonous manner but instead with variety of techniques and teaching methodologies to make the flow of the lesson unpredictable and catchy to the students.

Furthermore, the researcher has been experiencing problems in teaching the subjects such as inadequate enrichment materials and student's lack of understanding of the basic concept. Likewise, the researcher also observed that some of the enhancement activities being used in science are not sufficient to sustain the needs of the students as well as the needs of the teacher to facilitate the teaching-learning. The researcher believes competency-based infographic materials in science offer a more accessible and visually appealing approach to scientific concepts. Furthermore, infographics could be a valuable tool to improve engagement and understanding.

As a grade 10 teacher, the researcher noticed that there is a need for some innovation in materials in teaching Science for grade 10 students. Thus, this led to knowing the level of acceptability of the develop competency-based infographic materials in teaching Science for grade 10 students and the effectiveness of the materials. Result to this, the researcher as a science teacher conducted this study on the development, acceptability, and effectiveness of competency-based infographic materials in Science for grade 10 students in Teresa Sub-Office, Schools Division of Rizal.

Research Questions

The study aimed to develop and assess the level of acceptability of competency-based infographic materials as well as its effectiveness in teaching Science in Public Secondary Schools in Teresa Sub-Office, Schools Division of Rizal during the school year 2023-2024.

Specifically, this study sought answers to the following questions:

1. How was the competency-based infographic materials in Science for Grade 10 students developed?
2. What is the level of acceptability of the developed competency-based infographic materials in Science for grade 10 students as evaluated by the respondents with respect to:
 - 2.1. objectives;
 - 2.2. content and format;
 - 2.3. diagrams and illustrations;
 - 2.4. language and style; and
 - 2.5. usability?
3. What is the level of performance of the grade 10 students in Science before and after exposure to the developed competency-based infographic materials as revealed in the pretest and posttest results?
4. Is there a significant difference on the level of performance of the grade 10 students in Science exposed and unexposed to the developed competency-based infographic materials as revealed in the pretest and posttest results?
5. Is there a significant difference on the level of performance of the grade 10 students in Science exposed and unexposed to the developed competency-based infographic materials as revealed in posttest results?

Literature Review

Melikuzievich (2022) stated that infographics is a graphic method of communicating information and knowledge, its task is to present complex information in a most convenient and understandable way.

Infographics change a person's perception of information materials. If the text contains graphics, then the students who read learning materials first look at the visual element, and then read the text. Infographics help to catch the main idea in the text. The highest level of understanding is achieved through the combination of graphics and text. Using infographic, the teacher can quickly transport a large amount of information to the students. According to Melikuzievich, to improve the quality of education, it is necessary to establish the correct and effective use of infographics in school and in teaching.

In the article of Tarkhova et al. (2020), cited the effectiveness of the educational process by using infographic content that allows to create interactive with the application of the original method. They also cited the importance of complex graphic information in the process of modern society, the need to know the tools for its creation, rules, and techniques of development, as well as the skill in posting infographic information as an integral part of competence.

Moreso, Abdullah et al. (2022), cited that Infographics are visual representations of information in such a way that information can be easily understood briefly. Infographics are a form of the most powerful stimulator of visual communication in the digital era, and it is gaining popularity among educators.

Aglei et al. (2021) research looked at how infographics can boost public confidence in science. This study outlines the iterative process of choosing infographics for use in a significant, randomized trial involving behavioral intentions for non-pharmaceutical preventive behaviors, misinformation about the COVID-19, and trust in science. Media specialists and digital artists developed five distinct concepts based on underlying subcomponents of trust in science and scientists and then turned them into infographics.

Likewise, Sari et al. (2023) cited that, creating infographic media in algebra material through Instagram to reduce mathematics anxiety and improve leaning outcome will be a great help in teaching-learning process. They also stated that one way to spread visual learning is through social media networks. Therefore, it is important to teachers to know the efforts that can be made to overcome and lessen mathematical in students so that the learning process can run well.

Furthermore, Basco (2020) determined the effectiveness of science infographics in improving academic performance of grade six pupils. According to him, infographics are composed of visual representations and brief explanatory texts that are put together to convey messages that are captivating and simple to understand.

Methodology

Research Design

This study utilized the descriptive and developmental method of research, and experimental, for this is the most appropriate way to determine the acceptability of the developed competency-based infographic materials in teaching science and its effectiveness.

Calmorin (2020) mentioned that descriptive design, the study focuses on the present condition. The purpose of it is to find new truth of research is valuable tool for researchers who want to understand the present. He stated that descriptive research is valuable in providing facts on which scientific judgements may be based, for closer observation methods and procedures.

Likewise, the study also used experimental research design. As defined by Good, it is a method or procedure involving the conditions for the purpose of studying the relative effects of various treatments applied to members of a sample, or the same treatment applied to members of different sample. It is also used to determine the level of performance of the grade 10 students in Science exposed and

unexposed to the developed competency-based infographic materials.

Respondents

The respondents to the study were the twenty (26) junior high school teachers of Science in public secondary schools in Teresa Sub-Office. There were five (5) from Abuyod National High School, seven (7) from Pantay Integrated High School, and fourteen (14) from Teresa National High School. They validated the development of the competency-based infographic materials in Science for grade 10 students. They were asked to evaluate the level of acceptability of the competency-based infographic materials by answering the questionnaire-checklist which composed of five criteria with 10 items each.

Additionally, the subjects of the study were Grade 10 students. They were composed of forty (40) students from section Cypress as the control or unexposed group and forty (40) students from section Ebony as the experimental or exposed group.

Instrument

The study utilized a researcher-made questionnaire-checklist as the main instrument to gather the necessary data and information on the level of acceptability of the developed competency-based infographic materials in teaching Science. The questionnaire-checklist was evaluated by the Science teachers in the public secondary schools in Teresa Sub-Office. This contains the five aspects such as objectives, content and format, diagram and illustration, language and style, and usability.

Procedure

The standard operating procedure in the conduct of the study was applied as shown in the Gantt Chart of activities. The researcher started the study with the submission of proposed title followed by the title defense. This involves the conceptualization of research problem. After it was approved, the researcher then prepared the chapters 1, 2, and 3 and start searching for the related literature and studies. Thesis proposal presentation followed. Afterwards, the researcher started to develop a competency-based infographic material in Science. Construction and validation of research instrument was done and then was validated to obtain the needed data with the help of the expert in the field of education and research. Permission to conduct the study is obtained from the office of the Schools Division Superintendent. The questionnaire-checklist was administered to the respondents by visiting them in their respective schools. In gathering the needed information, the guidelines in the Data Privacy Act of 2012 was considered.

After the retrieval, the data were encoded and processed utilizing Statistical Package for Social Sciences (SPSS). Afterwards, the researcher proceeded to the analysis and interpretation of data followed by writing of the summary of findings, conclusions, and recommendations.

Upon the completion of the manuscript, the researcher presented it for the final oral defense. After the final oral defense, the manuscript was reviewed and edited, incorporating all the corrections, comments, and suggestions of the oral examination committee. The manuscript was subjected to anti plagiarism test. When guaranteed that the thesis is free from error, the researcher had it for final retyping, and hard binding. The final manuscript was finally submitted to the Office of the Dean of the Graduate Studies Program and other offices concerned.

Results and Discussion

This portion presents the results and discussion based on the gathered data.

Development of the Competency-based Infographic Materials in Science for Grade 10 Students

The developed competency-based infographic materials in Science for grade 10 students provide both teachers and students an opportunity to learn the least mastered competencies in Science that students found it difficult to understand and boring. With the low performing learning, these infographic materials enable students to have a meaningful and fruitful learning experience equipped with various enrichment activities and instructional materials needed for their learning preferences. The developed competency-based infographic materials in Science are designed to provide each students with information, diagrams and illustrations in order for teachers to include the best practices into their daily activities, curriculum, and assessment, thus, it also gives them a better understanding on the significance of other supplementary and enrichment materials.

The discussion gives an outline of the content and presentation of the developed competency-based infographic materials in Science for grade 10 students.

Each lesson in the developed materials contain different infographic to help students be motivated to learn and to easily understand the least mastered competencies better.

The developed competency-based infographic materials in Science for grade 10 students were validated by the experts in determining the level of acceptability. A researcher-made test which intended to measure the effectiveness of the infographic materials in Science for grade 10 students was utilized.

The discussion gives an overview of the competencies and objectives included in the infographic materials. The most essential learning

competencies are aligned in the grade 10 modules.

Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Objectives, Content and Format, Diagrams and Illustrations, Language and Style, and Usability

Table 1. *Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Objectives*

<i>The objectives...</i>	<i>Objectives</i>	<i>Weighted Mean</i>	<i>Verbal Interpretation</i>	<i>Rank</i>
1.	are presented in a specific way.	4.73	Very Much Acceptable	4.5
2.	lead the students to think critically.	4.73	Very Much Acceptable	4.5
3.	enable the students caress his mastery of content.	4.65	Very Much Acceptable	8.5
4.	facilitate better understanding of the lesson.	4.85	Very Much Acceptable	2
5.	stimulate critical thinking skills of the students.	4.69	Very Much Acceptable	6.5
6.	help the students to understand the concepts presented.	4.81	Very Much Acceptable	3
7.	are aligned with science curriculum of the grade 10 students.	4.88	Very Much Acceptable	1
8.	are specific.	4.69	Very Much Acceptable	6.5
9.	enable students to think critically.	4.58	Very Much Acceptable	10
10.	facilitate student-centered learning.	4.65	Very Much Acceptable	8.5
Composite Mean		4.73	Very Much Acceptable	

The findings indicate that the respondents observed that the developed competency-based infographic materials in Science is very much acceptable with respect to objectives. The objectives stimulate teachers to present teaching materials that are aligned in the Science curriculum and to facilitate better understanding of the lesson. Teachers now have more opportunities to developed teaching-learning materials that they can used and encouraged to implement best teaching strategies in their classrooms. It implies that students will experience a clear progression of knowledge from one topic to another, fostering a deeper understanding of scientific concepts.

The findings are in relation with study of Tsai (2020) when he developed Motion Infographic System. He verified that motion infographic system can improve learning outcomes in resource class.

Table 2. *Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Content and Format*

<i>The developed infographic materials have...</i>	<i>Content and Format</i>	<i>Weighted Mean</i>	<i>Verbal Interpretation</i>	<i>Rank</i>
1.	topics that are relevant, interesting, self-motivating, and at the level of understanding of students.	4.69	Very Much Acceptable	7
2.	contents which are simple and comprehensible.	4.77	Very Much Acceptable	4.5
3.	concepts and ideas which are generated from students' point of view.	4.69	Very Much Acceptable	7
4.	prior knowledge which is evident in every topic.	4.65	Very Much Acceptable	9.5
5.	topics that are clear and easy to understand.	4.69	Very Much Acceptable	7
6.	essential concepts of the science topic.	4.65	Very Much Acceptable	9.5
7.	are relevant to the students' level of understanding.	4.77	Very Much Acceptable	4.5
8.	presented contents which are clear and concise.	4.88	Very Much Acceptable	1
9.	accurate and up to date information are properly sequenced.	4.85	Very Much Acceptable	2
10.	the content of each infographic is carefully organized and aligned with the learning competencies in science.	4.81	Very Much Acceptable	3
Composite Mean		4.75	Very Much Acceptable	

This implies that content and format of the developed competency-based infographic materials enables effective communication of key findings and data trends. Clear and concise presentation utilized simple yet visually appealing layouts, relevant imagery, and concise text to convey information effectively.

The result justified the position of Parveen and Husain (2021) that infographic helps teachers and students to understand difficult, complex, and diverse materials, that infographics is one of the promising teaching-learning tools that are preferred and using so often in online teaching-learning.

The findings of the table 3 imply that the successful use of diagrams and illustrations which are easy to comprehend, appropriate to the level of understanding of the students and clear for misinterpretations. It also implies that the diagrams and illustrations should reflect they key concepts and skills students need to grasp.

The result is aligned with the opinion of Bystrova (2020) that visualizing information, including that with the help of infographics is one of the mechanisms to optimize the learning process. He also stated that, infographics should have visual clarity, color, and image-bearing reference points that will attract the students and help the to improve their learning through visuals.

Table 3. *Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Diagrams and Illustrations*

<i>Diagrams and Illustrations</i>		<i>Weighted Mean</i>	<i>Verbal Interpretation</i>	<i>Rank</i>
<i>The diagrams and illustrations...</i>				
1.	are clear and easy to understand.	4.65	Very Much Acceptable	8.5
2.	are accurately representing the information they are intended to convey.	4.77	Very Much Acceptable	1.5
3.	are visually appealing.	4.69	Very Much Acceptable	5.5
4.	are relevant to the text they are accompanying.	4.69	Very Much Acceptable	5.5
5.	use appropriate labels and captions.	4.65	Very Much Acceptable	8.5
6.	help the reader to understand the text more easily.	4.69	Very Much Acceptable	5.5
7.	are consistent with the tone and style of the text.	4.69	Very Much Acceptable	5.5
8.	use variety of visual elements to keep the reader's attention.	4.62	Very Much Acceptable	10
9.	are free of errors in grammar and spelling.	4.73	Very Much Acceptable	3
10.	support the content of the topic presented.	4.77	Very Much Acceptable	1.5
Composite Mean		4.70	Very Much Acceptable	

The findings in table 4 suggests that the communication is highly effective. It implies that the language and style used is easy to understand. Teachers can develop infographic materials as teaching-learning method to be clear and easy to understand. The results of the study imply that the successful use of language and style should be clear and concise, free from overused phrases, and easy to comprehend, and are aligned level of understanding of the students.

Table 4. *Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Language and Style*

<i>Language and Style</i>		<i>Weighted Mean</i>	<i>Verbal Interpretation</i>	<i>Rank</i>
<i>The language and style ...</i>				
1.	are clear and concise.	4.88	Very Much Acceptable	1
2.	are appropriate for the target students.	4.81	Very Much Acceptable	4
3.	are free of errors in grammar, spelling, and punctuation.	4.54	Very Much Acceptable	10
4.	are easy to read and understand.	4.65	Very Much Acceptable	7.5
5.	are basic, simple, and easy to comprehend.	4.85	Very Much Acceptable	2.5
6.	avoids misinterpretation.	4.62	Very Much Acceptable	9
7.	are familiar to ensure learning.	4.65	Very Much Acceptable	7.5
8.	are appropriate to the ability of the student.	4.73	Very Much Acceptable	6
9.	are free of cliches and overused phrases.	4.85	Very Much Acceptable	2.5
10.	used the right level of language and complexity.	4.77	Very Much Acceptable	5
Composite Mean		4.73	Very Much Acceptable	

The result is aligned to the opinion of Abdullah et.al (2022), that infographics are visual representations of information in such a way that information can be easily understood by the readers.

Table 5. *Level of Acceptability of the Developed Competency-based Infographic Materials in Science for Grade 10 Students as Evaluated by the Respondents with Respect to Usability*

<i>Usability</i>		<i>Weighted Mean</i>	<i>Verbal Interpretation</i>	<i>Rank</i>
<i>The developed infographic materials...</i>				
1.	are easy to use.	4.92	Very Much Acceptable	1
2.	are use appropriately.	4.85	Very Much Acceptable	2
3.	visuals and text easy to distinguish.	4.65	Very Much Acceptable	8
4.	help students to understand the concepts presented.	4.65	Very Much Acceptable	8
5.	help students to find information needed.	4.73	Very Much Acceptable	6
6.	make the students interested in the applications based on the lesson gained.	4.62	Very Much Acceptable	10
7.	make the students learn and understand the subject matter easily.	4.77	Very Much Acceptable	4
8.	help the students to better understand a specific topic.	4.65	Very Much Acceptable	8
9.	helps the teacher to be innovative.	4.77	Very Much Acceptable	4
10.	magnify the learning interests of the students.	4.77	Very Much Acceptable	4
Composite Mean		4.74	Very Much Acceptable	

The findings indicate that the developed infographic materials are easy to use. This means that the respondents found the infographics exceptionally easy to use and navigate. Many highlighted the clarity of the visuals and the simplicity of the explanations, noting that even complex scientific concepts were presented in a straightforward manner. The result implies that the developed competency-based infographic materials used in the study caught the interest of the students and made them understand the competencies and were able to understand the activities.

The presented study has the same findings of Apriyanti et al. (2020) that the infographic is very helpful for students. He also concludes

that in the perspective of a student an infographic instructional media user, that infographic is an effective solution because it is more flexible, stimulates learning, and students can develop their own concepts that solve learning problems.

Level of Performance of the Grade 10 Students in Science Before and After Exposure to the Developed Competency-based Infographic Materials as Revealed in the Pretest and Posttest Results

Table 6. *Level of Performance of the Grade 10 Students in Science Before and After Exposure to the Developed Competency-based Infographic Materials as Revealed in the Pretest and Posttest Results*

Score	Performance Verbal Interpretation	Unexposed				Exposed			
		Pretest		Posttest		Pretest		Posttest	
		f	%	f	%	f	%	f	%
40	Outstanding	-	-	15	37.5	-	-	17	42.5
30 - 39	Very Satisfactory	1	2.5	20	50.0	-	-	23	57.5
20 - 29	Satisfactory	13	32.5	5	12.5	22	55.0	-	-
10 - 19	Fairly Satisfactory	26	65.0	-	-	18	45.0	-	-
0 - 9	Did Not Meet Expectations	-	-	-	-	-	-	-	-
Total		40	40	100.0	40	100.0	100.0	40	100.0
Highest Score		30		40		26		40	
Lowest Score		14		25		13		33	
Men Score		19.1		35.7		19.7		37.9	
Mean Percentage Score		47.8 %		89.1 %		49.3 %		94.6 %	
Standard Deviation		3.32		4.48		3.40		2.33	

It can be concluded therefore, that the developed competency-based infographic materials successfully improved the academic performance of students in Science 10 based on the result of their pretest and posttest after the exposure. Furthermore, using the developed competency-based infographic materials in Science 10 helped in the development of skills intended for the grade level.

The finding is like the study of Velgado (2020) that the performance of grade 7 students in experimental and control groups in the pretest and posttest showed improvement in the test scores in posttest of grade 7 students. It also means that using competency-based infographic materials will help the students in understanding lesson that is hard for them to understand. With the help of the modified learning materials, the academic performance of the students will improve.

Significant Difference on the Level of Performance of the Grade 10 Students in Science Exposed and Unexposed to the Developed Competency-based Infographic Materials as Revealed in the Pretest and Posttest Results

Table 7. *Significant Difference on the Level of Performance of the Grade 10 Students in Science Exposed and Unexposed to the Developed Competency-based Infographic Materials as Revealed in the Pretest and Posttest Results*

Group	Test	Mean	Standard Deviation	t-value	p-value	Ho	VI
Unexposed	Pretest	19.1	3.32	31.624	0.000	R	S
	Posttest	35.7	4.48				
Exposed	Pretest	19.7	3.40	54.526	0.000	R	S
	Posttest	37.9	2.33				

The findings of the study imply that the developed competency-based infographic materials in Science for grade 10 students contributed to the significant gain of mean scores of students in the expose group which exhibit the improvement of their knowledge. To add more, result shows the important role of teachers in imparting of knowledge especially when developing teaching materials that will help students to improve their level of understanding on the lessons.

This is what Sari et al. (2023) it is important to teachers to know the efforts that can be made to overcome and lessen the difficulty in teaching Mathematics in students so that the learning process can run well.

Significant Difference on the Level of Performance of the Grade 10 Students in Science Exposed and Unexposed to the Developed Competency-based Infographic Materials as Revealed in the Posttest Results

Table 8. *Significant Difference on the Level of Performance of the Grade 10 Students in Science Exposed and Unexposed to the Developed Competency-based Infographic Materials as Revealed in the Posttest Results*

Group	Mean	Standard Deviation	t-value	p-value	Null Hypothesis	Verbal Interpretation
Unexposed	35.7	4.48	2.759	0.008	Rejected	Significant
Exposed	37.9	2.33				

Findings reveals that based on the increase of mean scores from pretest to posttest, the students who were exposed to the developed competency-based infographic materials performed better that those who were unexposed. That there is a significant difference between the unexposed and the exposed group of students.



The result is the same with the findings of Salud (2019) when his developed strategic intervention materials portrayed positive effect of the students. That there is a significant difference on the level

Conclusions

The study concluded that the developed competency-based infographic materials in Science for grade 10 students is acceptable and may be used as supplementary teaching aids. Moreover, the findings on the level of performance of the students in exposed and unexposed group increased their mean scores. In addition, there is also a significant difference on the mean scores of the students as revealed on their pretest and posttest. The result of the test after exposure to the competency-based infographic materials is significantly higher than the posttest of the unexposed group.

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