

## ACTIVE LEARNING STRATEGIES AND HIGHER-ORDER THINKING SKILLS OF GRADE 10 STUDENTS

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### ABSTRACT

*The study aimed to determine the effect of active learning strategies in higher-order thinking skills of Grade 10 students of Dr. Panfilo Castro National High School during the School Year 2020-2021. One hundred (100) selected grade 10 students were used as respondents of the study, including pre-test and post-test experimental design. The first group was exposed to case-based learning, and the second group was exposed to visual-organization activity. A validated sixty (60) item test was used in the study to determine significant differences in pre-test and post-test scores of the two groups. The study found out that the pre-test scores of the respondents in the two experimental groups as to their higher-order thinking skills in critical thinking and creative thinking skills were the same, indicating that the students have low-performance levels before subjecting to the treatment. The post-test scores of the students of both groups showed improvement in their scores after the treatment. Likewise, a significant difference was found in both groups' pre-test and post-test scores in terms of their critical thinking and creative thinking skills. Furthermore, it also showed a significant difference in the post-test (critical thinking skills) scores between the case-based learning and visual-organization groups.*

*Keywords: Active Learning Strategies, Higher-Order Thinking Skills, T-test, Philippines*

### INTRODUCTION

Higher-order thinking skills are critical elements of the 21st century that teachers want their students to use (Cox, 2019). It is because learners use complex ways of thinking about what they are learning. Higher-order thought brings belief to an entirely new level. Students use it to understand higher levels rather than simply memorize complex facts (Powell & Kalina, 2009). They will have to comprehend, conclude, and relate the facts to other concepts. The challenge of life in the 21st century requires learners to have learning skills, namely collaboration, critical thinking, creativity, and communication. As specified in Order No.62 of the DepEd Memorandum, series 2018, the pedagogical

paradigms of the 21st-century state that the teaching process must provide learners with opportunities to develop Higher Order Thinking Skills (HOTS) through different activities that will enable them to think critically and creatively and cooperate.

The development of 21st-century life requires higher-level thinking ability developmental for learners. HOTS learning is characterized by analysis, evaluation and creating, logical reasoning, consideration, critical thinking, problem-solving and creative thinking (Nurlela, 2015). Compared to passively listening to an expert, one initiative that educators should make to improve higher-level cognitive skills for learners by involving learners in constructive learning engages students in the learning

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process through classroom exercises and or conversation. This illustrates higher order, which also incorporates group practice. Freeman et al., 2014. "No face-to-face classes until safe" (DO. 012 s. 2020). This emphasizes the safety of the learners, teachers, and staff. However, it also highlights that learning opportunities for our students can be provided through blended learning modalities until face-to-face classes are possible. In response to the nationwide outbreak of COVID-19, the government finds ways for learning to continue in a safe and healthy environment. Distance learning will be the possible modality of learning in the incoming school year. The COVID-19 pandemic has a significant impact on the changes in the function of government and societies around the world. Since there is an unknown cure for these diseases, the government must have plans to prevent the spread of these viruses and the public's safety.

The government implements the physical distancing and community quarantine measures, which significantly challenge the basic education on the traditional mode of learning the face-to-face interaction between the teachers and the students. Despite the current public health emergency, DepEd remains committed to education rights by ensuring that learning opportunities shall continue to be provided in S.Y. 2020-2021 (DepEd No. 008 s. 2020). In its Basic Education Learning Continuity Plan (BE-LCP), the DepEd offers different learning delivery modalities such as blended learning, distance learning, and homeschooling.

The DepEd discussed blended learning wherein it combines face-to-face with any learning modality such as online distance learning, modular distance learning, and TV/Radio based- instruction. The DepEd also suggests using print/non-print learning materials such as modules, worksheets, and activity sheets.

## OBJECTIVES OF THE STUDY

The study sought to find out the effectiveness of active learning strategies in higher-order thinking skills of Grade 10 students.

Specifically, to 1) to determine the Higher-Order Thinking Skills scores in terms of Critical Thinking and Creative Thinking; 2) determine the effect of case-based learning and visual-organization activity in the students' higher-order thinking skills. 3) identify which of the case-based learning strategies and visual-organization activities had more effect on the students' higher-order thinking skills.

## METHODOLOGY

This study utilized the experimental design. Tests were administered to two groups of respondents exposed to different treatments to determine the effectiveness of case-based learning and visual-organization activity as an active learning strategy in teaching Grade 10 Science lessons. The researcher used two groups of grade 10 students, and each group consisted of fifty (50) students from heterogeneous classes from the modular delivery modality in terms of academic status. The study was conducted during the third quarter of the school year 2020-2021. The experimental group was exposed to different active learning strategies such as case-based learning and visual organization groups.

Self-Learning Module, weekly home learning plan, and achievement test were utilized as instruments of the study. The topics for the study were the lessons in the third quarter of the school year 2020-2021. The researcher constructed the Science Achievement test. It consisted of a 60-item multiple choice-type of questions. The questions were designed to assess the acquisition of learning of the two experimental groups. The study used descriptive statistics such as frequency and percentage were used to interpret the scores in the pre-test and the post-test. T-test of difference was used to determine the possible presence of a significant difference in the scores of the G10 students and the groups before and after the treatment at a 0.05 level of significance.

## RESULTS AND DISCUSSION



## 1. Higher-Order Thinking Skills scores in terms of Critical Thinking and Creative Thinking

### 1.1. In terms of Critical Thinking

**Table 1**  
*Pre-test and Post-test scores of the Respondents on Higher-Order Thinking Skills in terms of Critical Thinking*

Scores	Pre-test		Post-test		VI
	f	%	f	%	
<b>Case-Based Learning</b>					
25-30	0	0	0	0	A
19-24	0	0	5	10	P
13-18	1	2	10	20	AP
7-12	34	68	24	48	D
1-6	15	30	11	22	B
<b>Visual-Organization Activity</b>					
25-30	0	0	0	0	A
19-24	0	0	13	26	P
13-18	0	0	16	32	AP
7-12	38	76	15	30	D
1-6	12	24	6	12	B

The table above shows the respondent's pre-test and post-test scores on higher-order thinking skills in terms of critical thinking skills. Scores of 8-15 with a percent distribution of 76 were interpreted as Developing levels. The table showed that most respondents belong to the Developing level before exposing to the treatment. Maybe they have little knowledge about the topic since we were at the spiral curriculum. Specifically, 34 out of 50 students under case-based learning obtained a score range from 7-12 with a percent distribution of 68. The same result was observed among students under visual-organization activity, where most of the students got the same as those under case-based learning. This result merely shows that the students have the same level of critical thinking skills before being exposed to two strategies.

It was noted that there is one student (2%) who reached the Approaching Proficiency level on case-based learning before the conduct of the study. It is noted that most of the students find it

hard to answer critical thinking questions with regards to the topic such as nervous, endocrine, and reproductive system. This is because the respondents may have little knowledge of these topics and find it hard to understand the terms and concepts in each question. This can be the reason why most of the students were at the developing level of proficiency. On the other hand, after the post-test, most of the students from the case-based learning group, 24 respondents with a percent distribution of 48, were still in the Developing level. However, ten (10) students or 20% of the respondents who reached Approaching Proficient, and five students with a percent distribution of 10 obtained a score ranging from 19-24 with Proficient level as interpreted.

Meanwhile, 16 students or 32 percent of the respondents exposed to the visual-organization activity reached a score ranging from 13-18; therefore, most respondents reached the "Approaching Proficient". And there are 13 students with a percent distribution of 26, obtained the "Proficient" level, who got scores ranging from 19-24. This observation was given that students were asked questions that require them to think critically during the study. Such as in conducting activities where students answer open-ended questions and real-life situation scenarios. Another example in the visual-organization activity, the students were asked to critique the sample pictures, state the similarities and differences of the given images, and present their answers through a diagram.

### 1.2. In terms of Creative Thinking

Table 2 displays the pre-test and post-test of the respondents on the Higher-Order Thinking Skills in terms of creative thinking skills. Based on the pre-test results, 27 of the students, 54% of the respondents, got scores ranging from 7-12, most of the students under the case-based learning obtained the Developing level. Like the result of the visual- organization group, most of the respondents or 60 percent of the students obtained the scores from 7-12 and interpreted as "developing" level.



**Table 2**  
*Pre-test and Post-test scores of the Respondents on Higher-Order Thinking Skills in terms of Creative Thinking*

Scores	Pre-test		Post-test		VI
	f	%	f	%	
<b>Case-Based Learning</b>					
25-30	0	0	0	0	A
19-24	1	2	17	34	P
13-18	12	24	13	26	AP
7-12	27	54	16	32	D
1-6	10	20	4	8	B
<b>Visual-Organization Activity</b>					
25-30	0	0	1	2	A
19-24	0	0	20	40	P
13-18	11	22	13	26	AP
7-12	30	60	16	32	D
1-6	9	18	0	0	B

In view of the table, students are hard to find new ways to solve problems in the given questions before exposing to active learning strategies. Likewise, the students have low skills to think creatively before the conduct of the study. However, after the two groups exposed in a

different activity, the post-test results showed that the respondents under the case-based learning improved. As a result, 17 students with a percent distribution of 34 reached the “Proficient” level, who got scores ranging from 19-24, and 26 percent of the case-based learning group got scores ranging from 13-18, which is interpreted as “Approaching Proficient”.

On the other hand, 20 students with a percent distribution of 40, reached the “Proficient” level who were obtained scores ranging from 19-24. Likewise, one student reached the “Advanced” level of proficiency, and none of the respondents under the visual-organization activity group got the “Beginning” level of ability. Therefore, most students from visual-organization activity improved well in terms of their creative thinking skills. These results showed that in terms of creative thinking skills, the visual-organizational group has the most improvement in thinking creatively than the case-based learning group. They developed their ability to think differently and provide new angles and perspectives to a solution using concept maps and diagrams.

## 2. Test of Differences on the Mean Pre-test Performance between Case-Based Learning and Visual-Organization Activity

**Table 3**  
*Test Difference Between the Mean Pre-test Scores of the Case-Based Learning Group and Visual-Organization Activity Group on Higher-Order Thinking Skills*

Dependent Variable	t	df	Sig. (2-tailed)	95% CID	
				Lower	Upper
Critical Thinking Skills	1.352	98	.179	-.318	1.678
Creative Thinking Skills	.590	98	.557	-.994	1.834

The table above presented the test difference between the mean pre-test scores of the case-based learning and visual-organization activity groups on higher-order thinking skills in critical thinking. It was seen on the table that there is no significant difference in the mean pre-test scores of the students in terms of critical thinking. The study's implication shows that the students before the conduct of the study have the same

level of ability to answer the given questions and concepts critically. The data in Table 3 also presents the test difference between the mean pre-test scores of the case-based learning group and visual-organization activity group on higher-order thinking skills in terms of creative thinking. The computed significance value for the two strategies, as mentioned earlier, is 0.557. it only shows no significant difference in the pre-test



scores of the two groups. Most of the students in the two groups found the lesson on the nervous system, endocrine system, and reproductive system very hard to understand concepts because they obtained low scores. It implies that

students in both groups have the same ability to understand the questions and express their answers creatively before they are exposed to the treatment.

### 3. Test of Differences between Pre-test and Post-test Performance in Critical Thinking Skills and Creative Thinking Skills

**Table 4**

*Test of Difference in the Pre – Test and Posttest Performance of the Students Case-Based Learning and Visual-Organization Activity in Critical Thinking Skills*

Independent Variable	Pre-Test		Post Test		t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation			
Case-Based Learning	8.4400	2.68906	10.5200	4.63016	-2.817	49	.007
Visual-Organization Activity	7.7600	2.32607	13.8000	5.75344	-7.609	49	.000

Table 4 presents the t-test of difference between the mean pre-test and post-test performance of the case-based learning group and visual–organization activity group in terms of critical thinking skills. It is shown that the result on the level of significance with regards to critical thinking skills was .000, which indicates that there is a significant difference in the pre-test and post-test scores of the students on critical thinking when exposed to case-based learning and visual–organization activity as an active learning strategy.

The result implies that most of the students from the case-based learning and visual–organization activities are improved with critical thinking skills. The post-test increased as most of them as developing to approaching the proficient and proficient level of proficiency. The study's implication also shows that students acquire more knowledge after exposing to active learning strategies in which the students give their attention and eagerness for learning. The results showed that the two groups exposed to the different activity under active learning strategies remarkably improved the post-test compared to their pre-test results. This may indicate that the case-based learning and visual-organization activity significantly enhance the student's critical thinking skills.

During the treatment process, the students under the case-based learning improved their way of answering the guide questions. For example, in nervous system topics, some students could relate their own experiences regarding the given scenarios, so they answer the guide questions based on their experiences. Some of them, triggered to explore more and give some effort to research the given scenarios for them to answer the open-ended questions. Likewise, on the students under visual-organization activity, the activities helped them think outside of the box or in the different perspective to answer the given questions in their worksheets and present those answers using diagrams and concepts maps.

It can be confirmed from the study of Bean (2021), who said that active-learning strategies that teach students to think critically must therefore be the type of activities that are designed to stimulate and engage thinking in a relevant context mentally. Thus, active-learning exercises are strategies that make students more powerful thinkers and better arguers. He recommends using case studies, role-playing, small group work, and creative activity that stretches thinking skills that can be applied to applicable situations.



**Table 5**

*Test of Difference in the Pre-test and Post-test Performance of the Students Case-Based Learning and Visual-Organization Activity in terms of Creative Thinking Skills*

Independent Variable	Pre-Test		Post Test		t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation			
Case-Based Learning	9.9800	3.81987	14.4800	5.73653	-5.395	49	.000
Visual-Organization Activity	9.5600	3.28360	16.5200	5.54845	-7.098	49	.000

Table 5 shows the test difference in pre and post-test performance of the students on case-based learning and visual–organization activity in terms of creative thinking skills. It can be gleaned from the table that there were 0.000 due to the level of difference which was less than 0.05 level of significance. The results suggest a significant difference in the pre-test and post-test performance of the students in creative thinking. Using case-based learning and visual–organization activity as active learning strategies in teaching science is effective with regard to creative thinking skills.

Based on the results, both treatments improved the creative thinking skills of the students. Since both experimental groups were in a modular learning modality, the students could interact with the provided materials for the treatment. Each of the students received three sets of answer sheets for three different topics with different content depending on their group.

However, in the visual-organization activity, they received different tasks, that involved visual representation of the concepts and topics. Also, the students were encouraged to think about how to use concept maps and diagrams to present their ideas in the given task creatively.

The statistical results were supported by Abdulameer (2020), conceiving on active learning and its importance in the educational process and creative thinking and its importance in the educational process. Active learning represents an educational philosophy that depends on the learner's positive academic learning situation (Tientongdee, 2018). It includes all educational practices and teaching procedures to activate and maximize the learner's role, where learning occurs through work, research, and experimentation. Thus, the learner is self-reliant in obtaining information and acquiring skills.

**4. Test of Differences on the Mean Post-test Performance between Case-Based Learning and Visual-Organization Activity**

**Table 6**

*Test Difference Between the Mean Post-test Scores of the Case-Based Learning Group and Visual-Organization Activity Group on Higher-Order Thinking Skills*

Dependent Variable	t	df	Sig. (2-tailed)	95% CID	
				Lower	Upper
Critical Thinking Skills	-3.141	98	.002	-5.353	-1.207
Creative Thinking Skills	-1.807	98	.074	-4.280	.200

The mean post-test scores of the case-based learning and visual–organization activity regarding critical thinking skills at 95 percent

confidence level of difference are presented in Table 6. It can be gleaned from the table that the level of significance was 0.002, indicating a

significant difference between the post-test of two groups in critical thinking skills. Using case-based learning and visual-organization activity as active learning strategies in teaching science are both effective. However, the mean post-test result of both strategies, the statistical results wherein most of the students from the case-based learning group obtained “Approaching Proficient” level of proficiency. On the other hand, most students from visual-organization activity reached the “Proficient” level of ability. This means the students from the visual-organization activity group performed well than in case-based learning.

In the visual-organization activity, the students improved critical thinking skills through visual images. The provided teacher-made worksheet encouraged the students to use different diagrams, graphs, and concept maps to do the given task or present their ideas to the given topic.

The results are supported by the notions of Thomas and Thorne (2017) stated that Higher order thinking skills are more than memorizing facts or saying something back to someone exactly the way it was told. HOT takes thinking to higher levels than restating the facts and requires students to do something with the facts — understand them, infer from them, connect them to other facts and concepts, categorize them, manipulate them, put them together in new or novel ways, and apply them as we seek new solutions to new problems. They give some strategies enhancing the HOTS, including teaching concepts, categorizing concepts, connecting ideas, teaching inference, and expanding discussions at home.

The table shows the  $t$  – value in terms of creative thinking is 0.74 and with the level of significance of 0.000, indicating that there is no significant difference between the mean post-test scores of the two groups. Honeycutt (2018) suggested that active learning depends on the learner's active participation in learning materials that make him able to retrieve information better. The result implies using both case-based learning and visual-organization activity as active learning strategies. Both groups performed the same level of creative thinking skills even after the treatment.

## CONCLUSIONS

Based on the study's findings, the following conclusions were drawn: First, there is no significant difference between mean pre-test scores of the case-based learning activity group and those of the visual-organization activity group. Second, the mean pre-test and post-test scores obtained by students exposed to the case-based learning activity and those of visual-organization activity significantly differed. Lastly, the mean post-test scores obtained by students exposed to case-based learning activity significantly differed from those exposed to visual-organization activity in terms of both creative and critical thinking skills.

## RECOMMENDATIONS

Aligned with the findings and conclusions of the study, the following recommendations are offered: First, School administrators may focus on active learning strategies to enhance the students' performance in a new standard set - up of education. Second, teachers may challenge themselves in using different strategies in new normal education to impart more knowledge and understanding to the students. Lastly, future researchers may conduct further research for the same study in a larger group, in a more extended period, even in other disciplines or subjects. They may also study the effect of different active learning strategies on other learning skills of the students.

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