INTEGRATIVE TEACHING STRATEGY IN GRADE 7 SCIENCE AND STUDENTS' LEARNING AND INNOVATION SKILLS

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ABSTRACT

The study attempted to determine the effect of integrative teaching strategy on the learning and innovation skills of Grade 7 students of Dolores Macasaet National High School during the School Year 2018-2019.The study sought to determine the mean pre-assessment and post assessment scores, and the mean gain scores of the students in terms of learning and innovation skills; the significant difference in the mean pre-assessment and post assessment scores in learning and innovation skills of students; the significant difference in the mean post assessment scores in learning and innovation skills of students; and the significant difference in the mean gain scores of students who were exposed to integrative teaching strategies as to their learning and innovation skills. The study used an experimental design where four comparable groups were utilized as experimental groups. The following statistical tools e.g., mean, standard deviation, paired sample t-test and Analysis of Variance were employed to answer the problems raised in the study. The salient findings of the study were: the mean pre-assessment scores of the four groups of students revealed that they were in the developing and approaching proficiency stages, while the post assessment scores were in the approaching proficiency and proficient stages. The mean gain scores of students exposed to the four integrative teaching strategies revealed that there was an increase in their learning and innovation skills. There was a significant difference in the mean pre-assessment and post assessment scores in the learning and innovation skills of the students who were exposed to the four integrative teaching strategies. There was a significant difference in the mean post-assessment scores in the learning and innovation skills of the students exposed to each integrative teaching strategies. There was no significant difference in the mean gain scores of students exposed to integrative teaching strategies in terms of critical thinking, collaborating, and communicating skills, whereas there was a significant difference in the mean gain scores of students in terms of creative thinking.

Keywords: Experimental design, *Grade 7 Science*, *Learning and Innovation Skills, Integrative Teaching Strategy, Philippines*

INTRODUCTION

Every Filipino must have access to a complete quality basic education that provides the necessary basic education input, provides affirmative action to learners with special needs, develop an enhanced and learner-centered curriculum, provides relevant instructional materials and quality instruction, and that the delivery of basic education services to learners is effective, efficient and collaborative (Philippine Education for All EFA, 2015). The Philippine Constitution of 1987 (Article XIV Section 1) iterates that:

> *The State shall protect and promote the right of all citizens to quality education at all levels, and shall take appropriate steps to make such education accessible to all.*

With these, the Science education aims to develop scientific literacy among learners that

will prepare them to be informed and participative citizens who are able to make judgments and decisions regarding applications of scientific knowledge that may have social, health, or environmental impacts. The science education envisions the development of scientifically, technologically, and environmentally literate and productive members of society who are critical problem solvers, responsible stewards of nature, innovative and creative citizens, informed decision makers, and effective communicators (DepEd Curriculum Guide, 2016).

To achieve the Science education goals the students should develop their learning and innovation skills such as critical thinking, creative thinking, collaborating, and communicating. According to Saxena (2013) focusing on these skills is important to prepare students for progressively complex lives and work environments. If elements of collaboration, critical thinking, creativity, and communication are combined into student learning, then the teacher can help the student develop a broader sense of community for collaboration, encourage students to work and experience victory together. To start critical thinking and indulge in problem solving, education has been transformed with increasing student participation, which has resulted in a lot of creativity and innovation. Students can deliberate a topic with each other and post their thoughts on it. It teaches them how to communicate effectively and collaborate with both students and teachers.

An important part of the right to education is to ensure that education is of adequate quality leading to appropriate, reasonable and effective learning outcomes at all levels and in all settings. It requires coherent teaching and learning methods and content that includes strategies which are appropriate to the needs of all learners. The use of appropriate teaching strategy based on the needs of the student is important to develop the skills of the students. The United Nations Educational, Scientific and Cultural Organization (UNESCO) believes that education is a human right for all and that access to education should be commensurate with quality (UNESCO Education, 2015).

In this case, the function of the teacher is very important in achieving the mandates of the Philippine Constitution, and in attaining the goal of EFA and of Science education which is to ensure that every Filipino must have scientific literacy by providing quality basic education, relevant instructional materials and using appropriate teaching strategies.

This present study aimed to determine the effect of using integrative teaching strategies such as content-based instruction, focusing inquiry, thematic teaching, and generic competency model on the development of learning and innovation skills among Grade 7 students of Dolores Macasaet National High School. The study covered the second quarter of the School Year 2018–2019, specifically from the month of August to October. The study was limited on the use of integrative teaching strategies, and its effect to the learning and innovation skills of the students.

The initiator of this present study hereby acknowledged the low academic performance of students specifically in Science subject in the school he serves. The researcher wanted to elevate the academic performance of the students by developing their learning and innovation skills. With this, the present study posed an important contribution to the educational setting.

OBJECTIVE OF THE STUDY

Specifically, the study aimed to: 1) determine the mean pre-assessment and post assessment scores in learning and innovation skills of students exposed to content-based instruction, focusing inquiry, thematic teaching, and generic competency model; 2) analyze the mean gain scores of the students in terms of their learning and innovation skills; 3) evaluate the significant difference in the mean pre-assessment and post assessment scores in learning and innovation skills of the students who were exposed to content-based instruction, focusing inquiry, thematic teaching, and generic competency model; 4) assess the significant difference in the mean post assessment scores in the learning and innovation skills of the students who were exposed to integrative teaching strategies; and (5)

evaluate the significant difference in the mean gain scores of the students who were exposed to integrative teaching strategies as to their learning and innovation skills.

METHODOLOGY

The tools in gathering relevant data of this study were the self-made lesson plan and the pre-assessment and post assessment test for the purpose of determining the performance of the students in terms of learning and innovation skills.

The researcher constructed self-made lesson plans employing the content-based instruction, focusing inquiry, thematic teaching, and the generic competency model. There were three modules for use by the students about Living Things and Their Environment which are taught during the second quarter of Grade 7 Science.

The second instrument was the assessment tool, consisting of 40-item questions in the pre-assessment and post assessment tests that measure the skills of the students in critical thinking and creative thinking. A table of specification was made to come up for the 40-item test: 20 items for critical thinking and another 20 items for creative thinking. The tests were given before and after the implementation of the program. Furthermore, part of the assessment tool is the performance assessment used to measure the collaborating and communicating skills of the students. An analytic rubric scoring was used to measure the collaborating and communicating skills of the students. The rubric has score interpretation of beginning, developing, approaching proficiency, proficient, and advance. The performance assessments were given before and after the implementation of the program for each module.

The study was conducted after securing necessary permits from the authority. A letter of request was given to the external and internal validators to validate the instruments of the study after which the researcher proceeded to the actual phase of the study. The study utilized experimental design with four heterogeneous sections of Grade 7, each section with 30 students. The four sections were matched using their first quarter grade in Science. The research applied the independent and the dependent conceptual model. Independent variables included the integrative teaching strategies such as content-based instruction, focusing inquiry, thematic teaching, and generic competency model. The dependent variables were composed of learning and innovation skills such as critical thinking, creative thinking, collaborating, and communicating.

For the preliminary phase, the researcher matched the students according to their first quarter grades in Science 7. For the pre-implementation, the researcher used the fifth section which was not part of the experimental groups to pilot test the four modes of integrative teaching strategies. The researcher used some of the lessons in the first grading period to teach the four modes of integrative teaching strategy. This aimed to familiarize the researcher in each mode of integrative teaching strategy. Moreover, the researcher also used these lessons to the four sections of respondents. This aimed to introduce the respondents with the teaching strategy under study.

In the implementation phase, the Grade 7 Ilang-Ilang was exposed content-based instruction; Grade 7 Gumamela underwent focusing inquiry; Grade 7 Rosas was exposed to thematic teaching; and Grade 7 Jasmine utilized the generic competency model. In this phase, the researcher used the three learning modules for the second grading period.

Before teaching the lessons using integrative teaching strategy, the students in the four experimental groups were given a pre-assessment test to measure their existing learning and innovation skills. For the evaluation and the validation of result, the researcher administered a post-assessment test to the students to evaluate their performance. The post-assessment test includes 40-item test for critical thinking and creative thinking; while the performance assessment tool measured the collaborating and communicating skills. The performance assessment tool was given after learning each module and it was checked by three evaluators who are teachers in Science including the researcher. The average scores gathered by

the three evaluators were computed and analyzed with proper statistical treatment.

The study used descriptive statistics e.g., standard deviation and mean to evaluate the pre-assessment and post-assessment scores of students using the integrative teaching strategy. Paired sample t-test was used as basis in testing the hypotheses at 0.05 level of significance. This is to find out the significant difference in the mean pre-assessment and post assessment scores of the students in terms of learning and innovation skills. Analysis of Variance (ANOVA) was used to determine the significant difference in the mean post assessment scores of the learning and innovation skills of students exposed to integrative teaching strategies. ANOVA was also used to determine significant difference in the mean gain scores of the students when exposed to integrative teaching strategies as to critical thinking, creative thinking, collaborating, and communicating.

RESULTS AND DISCUSSION

1. The Mean Pre-assessment and Post Assessment Scores in Learning and Innovation Skills of Students Exposed to:

1.1. Content-based Instruction

Table 1
Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Content-based Instruction

Assessment	Critical thinking			Creative thinking			Collaborating			Communicating		
	Mean	SD	I	Mean	SD	I	Mean	SD	I	Mean	SD	I
Pre-Assessment	4.97	1.87	D	5.87	2.98	D	13.94	2.35	D	10.64	1.89	D
Post Assessment	10.87	4.63	AP	10.53	5.20	AP	20.38	3.98	AP	16.99	3.49	AP

As a result, for the pre-assessment, the table shows that the students exposed to content-based instruction have prior learning and innovation skills in developing stage. After exposing the students to content-based instruction post assessment was conducted. All results revealed that students were in the approaching proficiency stage.

1.2. Focusing Inquiry

Table 2
Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Focusing Inquiry

Assessment	Critical thinking			Creative thinking			Collaborating			Communicating		
	Mean	SD	I	Mean	SD	I	Mean	SD		Mean	SD	I
Pre-assessment	5.73	1.86	D	5.50	2.62	D	13.87	2.17	)	10.58	1.21	D
Post assessment	12.33	3.74	P	12.30	3.87	P	20.74	3.51	P	16.30	2.68	AP

Table 2 shows that all the mean pre-assessment scores of students were at the developing stage. After teaching the lessons using focusing inquiry, the students undergone post assessment. The table above reveals that the learning and innovation skills of the students were in proficient and approaching proficiency stages.

1.3. Thematic Teaching

Table 3
Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Thematic Teaching

Assessment	Critical thinking			Creative thinking			Collaborating			Communicating		
	Mean	SD	I	Mean	SD	I	Mean	SD	I	Mean	SD	I
Pre-assessment	5.33	2.17	D	5.13	2.01	D	14.43	2.92	AP	11.96	1.90	D
Post assessment	12.10	3.94	P	12.47	4.93	P	22.01	4.03	P	17.68	2.91	AP

The data in Table 3 shows that the students in thematic teaching group had learning and innovation skills in developing and approaching proficiency stages before the implementation of the program. Moreover, after exposing the students in thematic teaching, the post assessment was employed. The data show that the mean post assessment scores of the students were in proficient and approaching proficiency stages.

1.4. Generic Competency Model

Table 4
Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Generic Competency Model

Assessment	Critical thinking			Creative thinking			Collaborating			Communicating		
	Mean	SD	I	Mean	SD	I	Mean	SD	I	Mean	SD	I
Pre-assessment	4.53	2.05	D	5.43	2.11	D	14.80	2.60	AP	12.53	2.44	D
Post assessment	12.73	3.65	P	13.20	5.00	P	21.01	4.33	AP	18.16	3.92	AP

Table 4 indicates that in the pre-assessment, the students have an existing learning and innovation skills in developing and approaching proficiency stages. After the generic competency model was implemented a post assessment was conducted. As a result, the mean post assessment scores of the students were found to be in proficient and approaching proficiency stages.

2. The Mean Gain Scores of the Students in Terms of their Learning and Innovation Skills

Table 5
Mean Gain Scores in the Learning and Innovation Skills of Students exposed to Integrative Teaching Strategies

Integrative Teaching Strategy	Critical Thinking		Creative Thinking		Collaborating		Communicating	
	SD	Mean	SD	Mean	SD	Mean	SD	Mean
Content-Based Instruction	3.82	5.90	4.20	4.67	2.16	6.44	2.41	6.35
Focusing Inquiry	4.15	6.60	3.46	6.80	2.10	6.88	2.29	5.72
Thematic Teaching	3.15	6.77	4.96	7.33	2.23	7.58	1.97	5.72
Generic Competency Model	3.63	8.20	4.85	7.77	2.23	6.21	2.42	5.62

Table 5 presents that in critical thinking and creative thinking skills, generic competency model had the highest mean gain score. It shows that using generic competency model made the highest positive effect in increasing the critical thinking and creative thinking of students. In the collaborating skill, the mean gain score of thematic teaching was the highest among the four integrative teaching strategies, thus thematic teaching was the most effective in enhancing the collaboration skill. Furthermore, in communicating skill the content-based instruction got the highest mean gain score, thus this strategy was the most effective in enhancing the communicating skill among integrative teaching strategies.

3. The Significant Difference in the Mean Pre-assessment and Post Assessment Scores in the Learning and Innovation Skills of the Students who were exposed to:

3.1 Content-based Instruction

Table 6
Test of Difference in the Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Content-based Instruction

Learning and Innovation Skills	Mean Difference	SD	t-value	Interpretation
Critical thinking	5.90	3.82	8.464*	S
Creative thinking	4.67	4.20	6.079*	S
Collaborating	6.44	2.16	16.283*	S
Communicating	6.35	2.41	14.411*	S

**p<.05 = Significant (S)*

The data presented in Table 6 shows that there was a significant difference between the mean pre-assessment and post assessment scores of students in each learning and innovation skills. The result implies that content-based instruction made significant improvement on the learning and innovation skills of students.

The results may be attributed to the actual conduct of the study, the students were exposed to content-based instruction which was the incorporation of content learning with language teaching. To integrate the language teaching in the lesson the teacher used an English story about microscopy, the teacher incorporated the communicative goal and the linguistic goal. The teacher observed that with the use of this strategy the students enjoyed the lesson, which was evident in the reflection of one of the students:

> *"I am very happy to know the parts of the microscope and I learned many things in science. We had an experiment about microscope and our teacher gave a story about microscope. We read the story and solved the crossword puzzle that turned out to be parts of the microscope"*

The communicative goal of content-based instruction directed the students to have group discussion of the story which in return developed the learning and innovation skills of students especially the collaborating skills.

3.2. Focusing Inquiry

The data in Table 7 reveals that there was a significant difference between pre-assessment and post assessment scores of students in all learning and innovation skills. This elucidates that the use of focusing inquiry for the students had a

positive effect on their learning and innovation skills.

Table 7
Test of Difference in the Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Focusing Inquiry

Learning and Innovation Skills	Mean Difference	SD	t-value	Interpretation
Critical thinking	6.60	4.15	8.713*	S
Creative thinking	6.80	3.46	10.770*	S
Collaborating	6.88	2.10	17.951*	S
Communicating	5.72	2.29	13.683*	S

**p<.05 = Significant (S)*

The results may be attributed to the actual conduct of the study. The teacher started the lesson by giving focusing question which was the main concept of the lesson. Then the teacher gave guide questions that led the students to discover the answer in the focusing question and the students also worked in group in performing the activity. The teacher observed that using this kind of strategy the students became curious, they thought deeply about the lesson that brings to creation of ideas, and they shared their ideas with their groupmates. This was evident on the reflections of student exposed to focusing inquiry:

"I learned so much about organisms, the guide questions given by our teacher served as the challenge for us to answer correctly. It will surely help us even after school days are over. I learned a lot. The guide questions helped me because I read them before answering. My groupmates helped me and told me to always listen to the leader of the group".

The reflection above shows that focusing inquiry had positive impact to the learning and innovation skills of students particularly in collaborating skills. In every group activity, the students encouraged their groupmates to participate and share their ideas to find the answer in the guide questions and to discover the main concept of the lesson on their own.

3.3. Thematic Teaching

Table 8
Test of Difference in the Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Thematic Teaching

Learning and Innovation Skills	Mean Difference	SD	t-value	Interpretation
Critical thinking	6.77	3.15	11.774*	S
Creative thinking	7.33	4.96	8.091*	S
Collaborating	7.58	2.23	18.601*	S
Communicating	5.72	1.97	15.891*	S

**p<.05 = Significant (S)*

Table 8 shows that there was a significant difference between the mean pre-assessment and post assessment scores in each learning and innovation skills. Since there was a difference it seems that the thematic teaching positively affected the learning and innovation skills of students.

During the implementation of thematic teaching, the teacher selected a theme that will integrate to the whole module, then the teacher gave essential questions about the theme that led the students to lesson. The high collaborating skill of the students was observed during the group activity, the students made a discussion and

created ideas about the connection of the theme to the lesson which resulted to collaboration. The teacher also observed that using a theme, the students easily understood the lesson because the theme connects the lesson to the real-life situation in which students were familiar. This was evident based on the reflection of a student exposed to thematic teaching.

> *"I learned through my teacher that "Health is Wealth", that we need to take good care of our body, that junk foods and softdrinks are not good for the body. From our activity I learned how to use the microscope. With the help of microscope, I saw the bacteria lingering in waters and how mosquito bite affects human body."*

The reflection shows that the student understood the lesson of microscopy through group activity and by using a theme. The integration of theme gave opportunity to the students to see the connection of microscopy and health awareness. With these, it seemed that thematic teaching has a positive effect in the learning and innovation skills of students.

3.4. Generic Competency Model

Table 9
Test of Difference in the Mean Pre-Assessment and Post Assessment Scores in Learning and Innovation Skills of Students exposed to Generic Competency Model

Learning and Innovation Skills	Mean Difference	SD	t-value	Interpretation
Critical thinking	8.20	3.63	12.362*	S
Creative thinking	7.77	4.85	8.763*	S
Collaborating	6.21	2.23	15.243*	S
Communicating	5.62	2.42	12.714*	S

**p<.05 = Significant (S)*

The results in Table 9 indicates that there was a significant difference between the pre-assessment and post assessment of students in each learning and innovation skills. So, it was evident that generic competency model positively affected the learning and innovation skills.

The results may be attributed to the actual implementation of generic competency model. The teacher exposed the students to the three elements of generic competencies such as personal development, social competency, and work/special skills. These generic competencies were integrated in the lesson. The teacher observed in the behavior of the students that the personal development of generic competency model developed appreciation of the students to the lesson, because students saw the importance of the lesson in their lives. The teacher also observed that the work/special skill of generic competency model utilized the critical thinking of students in evaluating information through artworks. The teacher saw that with the use work/special skill the students understood the lesson, which was evident in the reflection of one of the students:

> *"I learned the importance of microscope through poster and collage making. With these artworks I can explain the uses of microscope. Microscope is very helpful in determining the health of a person by identifying the bacteria inhabiting the body. The different group activity like collage and poster making made me participative in every task".*

The reflection of the student signifies that there was a positive effect in integrating the elements of generic competency model in the learning and innovation skills of students especially in critical thinking.

4. The Significant Difference in the Mean Post Assessment Scores in the Learning and Innovation Skills of the Students who were exposed to Integrative Teaching Strategies

Table 10
Test of Difference in the Mean Post Assessment Scores of Students in the Learning and Innovation Skills Exposed to different Integrative Teaching Strategies

Integrative Teaching Strategy		Sum of Squares	df	Mean Square	F-value	p-value	Interpretation
Content-Based Instruction	Between Groups	2085.897	3	695.299	36.352	.000	S
	Within Groups	2218.695	116	19.127			
	Total	4304.592	119				
Focusing Inquiry	Between Groups	1451.563	3	483.854	39.944	.000	S
	Within Groups	1405.159	116	12.113			
	Total	2856.722	119				
Thematic Teaching	Between Groups	1998.485	3	666.162	41.295	.000	S
	Within Groups	1871.289	116	16.132			
	Total	3869.774	119				
Generic Competency Model	Between Groups	1438.988	3	479.663	26.503	.000	S
	Within Groups	2099.414	116	18.098			
	Total	3538.403	119				

p<.05 = Significant (S)
p>.05 = Not Significant (NS)

The result indicates that there was a significant difference in the mean post assessment scores of critical thinking, creative thinking, collaborating and communicating of students in each integrative teaching strategies. This signifies that their learning and innovation skills were different from each other.

This can be attributed to the difference in the nature of each learning and innovation skills. In this study, critical thinking was the ability of students to analyze, classify, interpret and evaluate information; creative thinking was the ability to imagine, concretize concepts, conclude ideas and solve problems from a given situation using a paper and pencil test; collaborating was the ability to work jointly in activity; and the communicating was the ability to write, speak and deliver information. With these, different assessment tools were used, analytic rubric scoring was used for collaborating and communicating skills, while forty-item test was used for critical and creative thinking skills.

5. The Significant Difference in the Mean Gain Scores of the Students who were exposed to Integrative Teaching Strategies as to their Learning and Innovation Skills

Table 11
Test of Difference in the Mean Gain Scores of Students Exposed to Integrative Teaching Strategies in Terms of Learning and Innovation Skills

Learning and Innovation Skills		Sum of Squares	df	Mean Square	F-value	p-value	Interpretation
Critical Thinking	Between Groups	83.800	3	27.933	2.035	.113	NS
	Within Groups	1592.067	116	13.725			
	Total	1675.867	119				
Creative Thinking	Between Groups	170.092	3	56.697	2.913	.037	S
	Within Groups	2257.500	116	19.461			
	Total	2427.592	119				
Collaborating	Between Groups	32.608	3	10.869	2.282	.083	NS
	Within Groups	552.466	116	4.763			
	Total	585.073	119				
Communicating	Between Groups	9.875	3	3.292	.632	.596	NS
	Within Groups	604.044	116	5.207			
	Total	613.919	119				

p<.05 = Significant (S)
p>.05 = Not Significant (NS)

The data reveal that there was no significant difference in the mean gain score of integrative teaching strategies in terms of critical thinking, collaborating, and communicating. This elucidates that these integrative teaching strategies have same effect in enhancing the critical thinking, collaborating, and communicating skills of students.

The result of significant difference among integrative teaching strategies in creative thinking may be attributed in the low mean gain score of content-based instruction compared to the mean gain scores of focusing inquiry, thematic teaching, and generic competency model (see table 5). This may be attributed to the nature of content-based instruction such as the use of second language to learn the topic. The teacher observed that the students exposed to content-based instruction had a hard time to concretize concepts, conclude ideas and solve problems using the second language. The students asked the teacher to translate the question in their "mother tongue" in order for them to concretize concepts, conclude ideas and to answer the given questions. This was related to the statement of Peachey (n.d.) that there were some possible problems in content-based instruction, the student's excessive use of their mother tongue in parts of the lesson can be a problem, and the students have difficulty in understanding the lesson using the second language. Since content-based instruction focuses on the content of the lesson rather than language skills, students will find easier and faster to use their mother tongue.

CONCLUSIONS

Based on the findings of the study, the following conclusions are drawn.

1. There is a significant difference between the mean pre-assessment and post assessment scores in the learning and innovation skills of the students exposed to integrative teaching strategy. Thus, the null hypothesis is not supported.
2. The study revealed that there is a significant difference in the post-assessment scores in the learning and innovation skills of the students exposed to integrative teaching strategy. Thus, the null hypothesis is not supported.
3. There is no significant difference in the mean gain scores of students exposed to integrative teaching strategies in terms of critical thinking, collaborating, and communicating skills, whereas there is a significant difference in the mean gain score of students in terms of creative thinking. Thus, the null hypothesis is partially sustained.

RECOMMENDATIONS

Based on the results and conclusions posited in the study, the following recommendations are set forth:

1. Since the study revealed that integrative teaching strategy is effective in enhancing the learning and innovation skills of the students, the teacher may consider utilizing this strategy in teaching their lessons.
2. Based on the result of the study, the teacher may utilize generic competency model in enhancing the critical thinking and creative thinking skills; thematic teaching may be used to improve the collaborating skill of students. Likewise, the teacher may expose the students to content-based instruction to enhance their communicating skill.
3. The teacher may consider other pedagogical approaches to respond to the strengths and weaknesses of the students academically, specifically on the development of the students' learning and innovation skills.
4. The future researcher who wants to replicate the research may consider using bigger group of respondents and consider broader topics in Science 7 in a longer period of time to employ the strategies.
5. The future researcher may provide additional activities to enhance the creative thinking of students using content-based instruction and explore the dimensions of creative thinking by using performance-based assessment and rubric scoring.

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