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A Matrix of Strategies in Teaching Biology: An Input to Pre-Service Teachers

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Abstract:
A large percentage of pre-service teachers are facing problems during their practicum since they do not have sufficient knowledge about teaching strategies and when it should be integrated into instruction. This study is a descriptive research employing a survey method using a survey questionnaire and interview in the collection of data. It aims to identify the common and not commonly used strategies by in-service Biology teachers in teaching Biology in terms of content and skill. It is anchored on the K to 12 Basic Education Curriculum substantiated by Outcome-Based Teaching and Learning Theory. The participants were selected through random sampling including 72 in-service public Junior High School Biology teachers in which 29 were teaching Grade 7, 27 in Grade 8, 27 in Grade 9, and 25 in Grade 10. Data were tabulated using frequency count and were analyzed using percentage analysis. Results showed that lecture-discussion is the commonly used strategy in teaching the content yet considered to be the most ineffective strategy based on the interview, while cooperative learning is the commonly used strategy in teaching in terms of skills. Not commonly used strategies in teaching the content include jingle, music creation, poster-making, word puzzle, and think-pair-share while word puzzle for the skills. The result of the study pointed out the need for more training and seminars regarding the use of innovative science teaching strategies which will help improve students' performance in Biology both in content and skills.

Keywords: *Biology education, teaching strategies, in-service teachers, pre-service teachers*

1. Introduction

Teachers are traditionally known to impart knowledge solely, but in today's context, it is not enough for a teacher who is already in-service to teach in a vacuum, confirming on what is conventional. Instead, teachers now look for possible ways on how to deliver their instruction effectively by keeping students motivated and engaged. The teacher as implementer has to choose the right strategies to render effective teaching and instruction to learners (Pambid 2015; Boiser 2000) aside from the fact that there are numerous learning and teaching strategies freely available. Teaching strategies alongside the teacher's knowledge about the curriculum and mastery of the subject matter are one of the determinants in the effectiveness of the curriculum (Kamamia 2014; Duze 2012). It can be deduced that the fundamental importance of teaching strategies is to make teaching instruction efficient and effective by implementing a variety of teaching methods and techniques; hence, having a repertoire of a variety of teaching strategies will help students take more responsibility and enhance their learning as well as to improve the process of teaching for learning. However, large percentage of the pre-service teachers who are expected to be in-service teachers in the future are facing problems in integrating teaching strategies for their instruction during their practicum since they lack the exposure to these strategies (Mangila, 2018).

For an easy integration of strategies to instruction, this research undertaking specifically aimed to: (a) find out the commonly and not commonly used strategies used by selected in-service Public Junior High School Biology teachers in teaching Biology (Living Things and Their Environment) in terms of content and skills and (b) to develop a matrix that will serve as a guide in choosing the strategies in teaching Biology contents and skills.

2. Theoretical Framework

The study is anchored on the K to 12 Basic Education Curriculum, also known as Enhanced Basic Education Curriculum that offers a decongested 12-year program. As the current curriculum used in the Philippine educational system gives students sufficient time to master skills and absorb necessary competencies to provide teaching approaches that could improve the teaching and learning process. In line with this theory is the Outcomes-Based Teaching and

Learning which focuses on student-centered approaches rather than teacher-centered approaches in the delivery of educational programs (Garrett, 2008; Llanes, 2010). As cited in the paper of Magtolis (2013) and Livingstone (2014), it has its roots from the idea of Biggs and Tang (2011) who further called OBTL as constructive alignment because students can construct meaning out of the relevant activities they are exposed. Moreover, Piaget's constructivism is affixed to the curriculum because of the integration of the spiral progression approach where current in-service teachers have a choice on what teaching strategies to use to come up with a meaningful learning experience (Bada, 2015).

Catering diverse intelligences of the students which enables a teacher to choose appropriate methods and strategies to use in instruction is the primary concern of Gardner's multiple intelligences theory. It emphasizes what the learner can bring inside the classroom by providing cues to what strategies the teacher can employ while considering individual characteristics (Bordei, 2016). According to Lewis (2012) as mentioned in the paper of Gorontalo (2018), allowing students to perform specific tasks together as divided into small groups develops critical thinking skills and cooperative learning because they are part of the discussion. Contemporary teaching can be best implemented through learning by design and project-based learning as it contends that building knowledge occurs best through making things that are tangible and sharable (Ralph 2015; Ackerman et al. 2009). It is supported by Wurdinger and Carlson (2010) who stated that students' learning must be facilitated by the instructor for them to apply their knowledge and conceptual understanding of real-world problems or authentic situations. This thought highlights experiential learning where teachers must employ a strategy to help bring about learning by trying to emphasize issues relevant to the learners and the context, they are in.

Indeed, upholding to these theories and approaches helped to assimilate the realization of the core learning area standard that develops scientific, technological and environmental literacy among learners as prescribed by the K to 12 Science curriculum. By integrating them across science topics and other disciplines with the aid of the spiral progression approach result to a meaningful understanding of concepts and direct application to real-life situations.

2.1. Conceptual Framework

The study is directed to answers the identified problems with the use of the schematic diagram shown below.

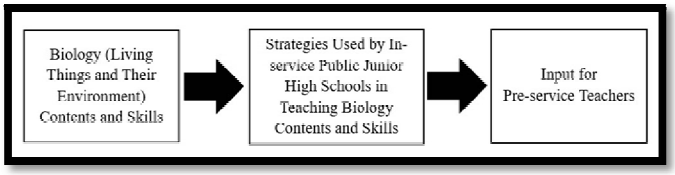

Figure 1: Conceptual Framework of the Study

The figure shows how the study looked into the teaching of Biology (Living Things and Their Environment) contents and skills in the field concerning to the contemporary methods and strategies used by in-service Public Junior High School to bring about the commonly used strategies and develop a matrix containing the possible strategies that can be used in choosing teaching strategies. Collectively, the findings and results will serve as an input to other in-service teachers and to pre-service teachers in becoming an effective teacher by equipping and immersing themselves into a variety of strategies and when to use them. The impact on them would be an additional input to the various educational-related individuals and authorities regarding what to retain, improve, and remove during instruction.

2.2. Review of Related Literature

Science, engineering, and technology has been widespread in every feature of modern life and used as an instrument to conquer humanity's most pressing challenges. The journey to seek an answer to a problem by exhibiting methods and principles in Science is to acquaint with the ever-flourishing technology advancements and to know and understand the challenges faced by the environment. These are the most critical components of the learning process in the 21st century Science teaching which the Committee on Conceptual Framework for New K to 12 Science Education Standards designed the framework comprising the broad set of expectations for students in Science. In the Philippines, this can be reflected in the K to 12 Science curriculum which 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.

Teachers, as one of the determinants of the success of a curriculum, bombarded with vast strategies can use them in today's teaching instruction. It is crucial to remember that not every strategy can or should be applied in every teaching situation. Instructional strategies serve as tools in designing and implementing instruction; hence, these can be used synchronously provided that it serves its purpose which is to support and nurture student learning. Based from the report of Schroeder et al. (2002), the Center for Mathematics and Science Education Project of Texas in A&M University presented descriptions of the identified effective research-based strategies in teaching K to12 Science which includes enhanced context strategies, collaborative grouping strategies, questioning strategies, inquiry strategies, manipulation strategies, assessment strategies, instructional strategies, and enhanced material strategies.

Effective science teachers are those who recognize suitable methods for teaching specific concepts or skills in different situations that provide appropriate instruction and those who have a vast array of instructional strategies and methods available to produce successful learning. Pre-service teachers as future educators play a vital role in the component and integral part of the curriculum (Alsubaie 2016; Mavrogiorgos 2014; Avgitidis 2007;). It is claimed that

many pre-service teachers have considered their pre-service teaching or practicum to be the most significant influence upon learning how to teach (Adoniou 2013; Hastings 2010). However, it was observed that the pre-service teachers do not have sufficient knowledge about teaching strategies, methods, and techniques and that they cannot even distinguish between these concepts (Pambid 2015; Gunes et al. 2011).

In today's setting, if the teacher intends to create more interactive learning environments, he or she has to integrate technology and use innovative strategies applicable into the learning experience because students are more likely interested and abreast. The world today is changing and advancing so teachers especially the pre-service teachers who are to be in-service teachers in the future need to be flexible, innovative and technology savvy. Thus, this calls for the identification of the strategies used by the present in-service teachers and the development of a repertoire of strategies for the immersion of the pre-service teachers to this variety of strategies. So as to create meaningful learning in the process of teaching and learning that requires contextualization by bridging the students' real-life experiences into the content and deliverance.

3. Methodology

3.1. Research Design

The study utilized a descriptive research design employing a survey method in the collection of data where the respondents answer questions administered through survey questionnaires where quantifiable information was used for statistical inference. The data gathered were validated through conducting interviews to further elaborate their answers and to strengthen the reliability of the results.

3.2. Research Locale

The information presented in this study is geographically based in the Tacloban City Division where the participants are currently affiliated. Tacloban City as the regional center of the region of Eastern Visayas and despite being autonomous from the province of Leyte, still many educationally- motivated individuals in nearby municipalities and provinces seek to enroll because of the various public and private institutions that provide an excellent training ground for productive individuals in the future.

3.3. Sampling Procedure

The sampling technique utilized was random sampling wherein the researchers selected the respondents randomly for the pilot testing and during the actual data gathering by getting the list of all schools under the Division of Tacloban City and each school provided the number of teachers teaching Biology. Out of the 88 teachers, 13 teachers were chosen as the participants for pilot testing to achieve feasibility and 72 teachers for the actual data gathering with 95% confidence level and 5% margin of error for the results to establish reliability.

3.4. Data Instrument and Collection

Researchers have sought permission to each of the chosen schools where the study was conducted. The use of a survey questionnaire as an instrument was then distributed to the research respondents where they have to provide their demographic profile and placed a checkmark before the name of the strategy or strategies, they are utilizing in teaching Biology contents and skills. A follow-up interview consisted by eight open-ended questions was conducted to support their answers on the survey questionnaire and holistically develop the matrix for the possible instructional strategies that can be used in teaching Biology (Living Things and Their Environment). The gathered data were tabulated, analyzed and interpreted by using frequency count and percentage analysis as statistical tools. The different strategies used by the respondents in teaching the contents and skills in Biology in each grade level were tallied to derive the frequency of each strategy as well as to determine the value percentage. These enable to identify the common and not commonly used strategies in teaching Biology contents and skills and the matrix to be developed.

3.5. Data Analysis

The gathered data during the pilot testing and actual data collection were coded and tallied for commonalities. Frequency count and percentage analysis were used to analyze the data provided by the respondents to give accurate interpretations and conclusions of the results gathered during the survey conducted. In the form of a table, all the strategies used in teaching Biology contents and skills were summarized to develop the matrix.

4. Results and Discussion

This chapter presented the results of the research study drawn out from the answers of the respondents in the survey questionnaires and interviews with the corresponding interpretation and analysis. They are presented in a manner that they sequentially answer the research questions.

A. Age and Sex

Age	Sex														Total	Percentage
	Male				T	Female				T	DNS				T		
	G7	G8	G9	G10		G7	G8	G9	G10		G7	G8	G9	G10			
21-30	1	1	0	3	**5**	3	9	7	4	**23**	-	-	-	-	**0**	**28**	**30%**
31-40	0	0	1	0	**1**	2	4	4	7	**17**	-	-	-	-	**0**	**18**	**19%**
41-50	0	2	1	0	**3**	1	1	3	2	**7**	-	-	-	-	**0**	**10**	**11%**
51-60	0	0	1	0	**1**	0	4	1	1	**6**	-	-	-	-	**0**	**7**	**8%**
DNS	-	-	-	-	**-**	-	-	-	-	**-**	7	6	9	8	**30**	**30**	**32%**
Total					**10**					**53**					**30**	**93**	**100%**
Percentage					**11%**					**57%**					**32%**	**100%**	

B. Specialization or Major Field

Specialization	*f*				T	%
	G7	G8	G9	G10		
Biological Sciences	15	16	8	6	**45**	**42**
Physical Sciences	3	1	6	13	**23**	**21**
General Sciences	8	7	5	5	**25**	**23**
Others	2	1	3	0	**6**	**6**
DNS	1	2	5	1	**9**	**8**
TOTAL					**108**	**100**

C. Highest Educational Degree

Educational Degree	*f*				T	%
	G7	G8	G9	G10		
Bachelor's Degree	12	12	16	12	**52**	**48**
Master's Degree	10	8	2	7	**27**	**25**
Doctorate Degree	1	1	2	0	**4**	**4**
Supplemental Degree	1	0	0	0	**1**	**1**
DNS	5	6	7	6	**24**	**22**
TOTAL					**108**	**100**

D. Length of Time Spent in Teaching Biology

No. of Years	*f*				T	%
	G7	G8	G9	G10		
1 to 5 years	12	12	16	10	**50**	**46**
6 to 10 years	7	3	3	7	**20**	**19**
11 to 15 years	2	4	3	3	**12**	**11**
Others	6	5	1	2	**14**	**13**
DNS	2	3	4	3	**12**	**11**
TOTAL					**108**	**100**

E. Nature of Appointment

Nature of Appointment	*f*				T	%
	G7	G8	G9	G10		
Teacher 1	4	5	7	7	**23**	**21**
Teacher 2	3	2	1	1	**7**	**6**
Teacher 3	12	9	8	9	**38**	**35**
Others	6	5	2	1	**14**	**13**
DNS	4	6	9	7	**26**	**24**
TOTAL					**108**	**100**

Legend: ***f*** Frequency **%** Percentage **DNS** Did Not Specify **T** Total

Table 1: Profile of the Respondents of the Study

The respondents of the study included seventy-two (72) teachers who are composed mainly of females belonging to the age group between 21-30 years old with Biological Sciences as their major field of specialization and Bachelor's degree for their highest educational degree attained. Most of the teachers have taught Biology in the span of 1 to 5 years due to the ever-changing system of giving loads and preparation to the teachers. However, in terms of their nature of appointment of their service, mostly are Teacher 3 which implies that they are engaged in continued professional development. It is important to take note that the total number respondents reflected in Table 1 may exceed the total number of respondents of the study because some of the teachers teach Biology in other grade levels.

r	Strategy	*f*	%	r	Strategy	*f*	%
1	Lecture-Discussion	461	28.13	18	Boardwork	13	0.79
2	Multimedia Instruction	421	25.69		Pick and Match	13	0.79
3	Brainstorming	98	5.98	19	Direct Instruction	12	0.73
4	Cooperative Learning	77	4.70	20	Situational Analysis	11	0.67
5	Role Playing	48	2.93	21	4 Pics 1 Word	9	0.55
6	Picture Analysis	43	2.62		Video Making	9	0.55
7	Cues and Questioning	41	2.50	22	Simulation	8	0.49
8	In-School Field Experience	38	2.32	23	Gallery Walk	7	0.43
9	Research Review	37	2.26		K-W-H-L	7	0.43
10	Concept Mapping	32	1.95		Poem Making	7	0.43
	Reporting	32	1.95	24	Checklist	5	0.31
11	Laboratory Activity	31	1.89		Memory Game	5	0.31
12	Model Making	30	1.83		Trivia Question	5	0.31
13	Jigsaw	22	1.34	25	Realias	4	0.24
14	Show and Tell	21	1.28	26	Jingle	1	0.06
15	Graphic Organizer	20	1.22		Music Creation	1	0.06
16	Film Showing	19	1.16		Poster Making	1	0.06
17	Consequence Mapping	16	0.98		Think-Pair-Share	1	0.06
	P.O.E.	16	0.98		Word Puzzle	1	0.06
	Venn Diagram	16	0.98	39	TOTAL	1519	100

Continue to the next column

Table 2: Strategies Used Across All Grade Levels in Teaching Biology in Terms of the Content

The results revealed that 39 strategies were utilized by the selected Biology teachers across all grade levels in teaching Biology in terms of the content. Relative to this, lecture-discussion was the commonly used strategy while jingle, music creation, poster making, think-pair-share, and word puzzle were the strategies which are not commonly used. Lecture-discussion is the best teaching method that can be applied in many circumstances and for many students especially for communicating conceptual knowledge (Charlton, 2006) like in teaching the contents in Biology. In 2014, the Center for Instructional Development and Distance Education argued that despite its disadvantages such as providing students with individual feedback, difficult to adapt to learning differences and failure to promote independent learning can be addressed by incorporating into the lecture with other teaching strategies like questioning and problem-solving activities will surely support active learning.

r	Strategy	f	%	r	Strategy	f	%
1	Cooperative Learning	354	12.26	26	Show and Tell	16	0.55
2	Multimedia Instruction	314	10.88	27	Targeted Feedback	15	0.52
3	Laboratory Activity	305	10.56		Tracking One's Meal	15	0.52
4	Brainstorming	217	7.52		Trivia Question	15	0.52
5	Picture Analysis	166	5.75	28	4 Pics 1 Word	14	0.48
6	Boardwork	123	4.26		Music Creation	14	0.48
7	Role Playing	86	2.98		Planning A Healthy Diet	14	0.48
8	P.O.E.	84	2.91	29	Name Game	13	0.45
9	Model Making	77	2.67	30	Debate	12	0.42
10	Comic Strip Making	72	2.49		Gallery Walk	12	0.42
11	Graphic Organizer	68	2.36		Modelling	12	0.42
	In-School Field Experience	68	2.36		Peer Teaching	12	0.42
12	Venn Diagram	64	2.22	31	3-Day Menu	11	0.38
13	Lecture-Discussion	59	2.04		Making Illustrations	11	0.38
14	Simulation	55	1.91		Word Wall	11	0.38
15	Lecture-Demonstration	50	1.73	32	Film Showing	10	0.35
16	Concept Mapping	49	1.70		Instructional Analysis	10	0.35
17	Situational Analysis	46	1.59	33	Memory Game	9	0.31
18	Direct Instruction	39	1.35	34	Journal Making	8	0.28
19	Consequence Mapping	38	1.32		Think-Pair-Share	8	0.28
	Reporting	38	1.32	35	Integration with Other Conter	7	0.24
20	Research Review	27	0.94	36	Survey Activity	6	0.21
21	Collaborative Learning	26	0.90	37	Culminating Activity	5	0.17
	Picture Puzzle	26	0.90		Reaction Papers	5	0.17
22	Classifying Organisms	24	0.83		Realias	5	0.17
23	Reciprocal Teaching	22	0.76	38	Focus Group Discussion	4	0.14
24	Advertisement Making	19	0.66		Video Making	4	0.14
25	Cues and Questionning	18	0.62	39	Poem Making	3	0.10
	Story Making	18	0.62		R.E.P.R.	3	0.10
26	Jigsaw	16	0.55	40	Poster Making	2	0.07
	Playing A Board Game	16	0.55	41	Word Puzzle	1	0.03
	Project-Based Task	16	0.55	**63**	**TOTAL**	**2600**	**100**
Continue to the next column.							

Table 3: Strategies Used Across All Grade Levels In Teaching Biology In Terms Of The Skills

On the other hand, the commonly used strategy by selected Biology teachers in teaching Biology in terms of the skills was cooperative learning and word puzzle as the not commonly used strategy. Cooperative learning is employed by teachers to increase student understanding of content, to build particular transferable skills, or some combination of the two from small group work to capitalize on the impacts of peer-to-peer interaction and discussion (Brame and Biel 2015; Johnson et al. 2008). Promoting students in working together maximize their own and each other's learning is the primary instructional use of small groups. Johnson and Johnson (2015) stressed that cooperative learning has characterized by positive interdependence, where students perceive that better performance by individuals produces better performance by the entire group. They also added that it is one of the most effective teaching approaches to be used to analyze the results of the activities performed.

	Strategy	f	%	r	Strategy	f	%
1	Multimedia Instruction	735	16.60	31	Story Making	18	0.41
2	Lecture-Discussion	520	11.74	32	Playing A Board Game	16	0.36
3	Cooperative Learning	431	9.73		Project-Based Task	16	0.36
4	Laboratory Activity	336	7.59	33	Music Creation	15	0.34
5	Brainstorming	315	7.11		Targeted Feedback	15	0.34
6	Picture Analysis	209	4.72		Tracking One's Meal	15	0.34
7	Boardwork	136	3.07	34	Memory Game	14	0.32
8	Role Playing	134	3.03		Planning A Healthy Diet	14	0.32
9	Model Making	107	2.42	35	Name Game	13	0.29
10	In-School Field Experience	106	2.39		Pick and Match	13	0.29
11	P.O.E.	100	2.26		Video Making	13	0.29
12	Graphic Organizer	88	1.99	36	Debate	12	0.27
13	Concept Mapping	81	1.83		Modelling	12	0.27
14	Venn Diagram	80	1.81		Peer Teaching	12	0.27
15	Comic Strip Making	72	1.63	37	3-Day Menu	11	0.25
16	Reporting	70	1.58		Making Illustrations	11	0.25
17	Research Review	64	1.45		Word Wall	11	0.25
18	Simulation	63	1.42	38	Instructional Analysis	10	0.23
19	Consequence Mapping	54	1.22		Poem Making	10	0.23
20	Direct Instruction	51	1.15	39	Realias	9	0.20
21	Lecture-Demonstration	50	1.13		Think-Pair-Share	9	0.20
22	Jigsaw	38	0.86	40	Journal Making	8	0.18
23	Show and Tell	37	0.84	41	Integration with Other Content A	7	0.16
24	Film Showing	29	0.65		K-W-H-L	7	0.16
25	Collaborative Learning	26	0.59	42	Survey Activity	6	0.14
26	Picture Puzzle	26	0.59	43	Checklist	5	0.11
	Classifying Organisms	24	0.54		Culminating Activity	5	0.11
27	4 Pics 1 Word	23	0.52		Reaction Papers	5	0.11
28	Reciprocal Teaching	22	0.50	44	Focus Group Discussion	4	0.09
29	Trivia Question	20	0.45	45	Poster Making	3	0.07
30	Advertisement Making	19	0.43		R.E.P.R.	3	0.07
	Gallery Walk	19	0.43	46	Word Puzzle	2	0.05
31	Cues and Questionning	18	0.41	47	Jingle	1	0.02
Continue to the next column.				**66**	**TOTAL**	**4103**	**100**

Table 4: Summary of All Teaching Strategies Used by Selected in-Service Public Junior High School Biology Teachers in Teaching Biology Content and Skills across All Grade Levels

Moreover, out of 66 teaching strategies used by in-service Public Junior High School Biology teachers across all grade levels in teaching both the contents and skills in Biology, multimedia instruction is the commonly used strategy while jingle is the not widely used strategy.

The advantages such timeliness and effectiveness are one of the reasons why multimedia instruction is the most commonly used strategy among others because it altered the landscape in the educational arena by providing the students an opportunity to manage cognitive load which increases motivation (Mayer, 2014) and retention (Conrad and Bliemel, 2016) by developing inquisitiveness makes learning experiences purposeful (Ketsman 2014; Allen 2003). It also allows learners to be creative in a way that it will enable them to become active producers of knowledge by reducing the need for memorization through changing "how" by "why" in the classrooms according to Neary and Winn (2009). As revealed during the interview, excerpts are in the text below:

INTVW, Exc. 1
Teacher 11: Multimedia for me is the commonly used strategy especially that the students, the millennials nowadays are much more on multimedia rather than visual aids like

Figure 1

INTVW, Exc. 2
Teacher 10: The most effective teaching strategy is the multimedia presentation by downloading different kinds of video presentation which are related to my topic. It was indeed effective, most effective because students are learning a lot of things rather than chalk talk, like I talk while writing something on the

Figure 2

Despite being a commonly used strategy, problems still confront teachers upon its implementation particularly in the absence of electricity and unforeseen technicalities. However, teachers are said to be problem-solvers, so they provided interventions as cited by the teacher- respondents during the interview.

INTVW, Exc. 3
Teacher 4: As for the technical glitches, I made sure to set up my multimedia equipment ahead of time so as to avoid delay and wastage of time, especially if the laboratory activities and learner's materials are unavailable.

Figure 3

INTVW, Exc. 4
Teacher 10: If there are problems, I encountered in the multimedia, I actually give my PowerPoint presentation through an application for the students to have a copy.

Figure 4

The result indicated that lecture-discussion was the second common strategy and it is not surprising since its widespread use is well documented (Goffe and Kauper 2014; Smith and Valentine, 2012). According to Carnegie Mellon University (2019), it is an excellent strategy for enhancing student motivation, fostering intellectual agility, and provides avenues for exploration and discovery. However, numerous studies have demonstrated that traditional lectures relying on passive learning is not as effective as active, student-centered learning strategies (Lom 2012; Tanner 2009). It noted that lecture-discussion was pointed out by the respondents as least effective during the interview. The responses of the teachers attest this point of view written in the following text.

INTVW, Exc. 5
Teacher 5: The least effective strategy is the lecture-discussion because some of the students are not listening, some were talking to their seatmates and some were not able to understand what the teacher was talking about.

Figure 5

INTVW, Exc. 6
Teacher 11: Spoon feeding the students is not the trend any more for students tend to be bored most of the time. If teacher does the talking and the ideas and information are being spoon-fed by the teacher. It should be then the students, student-centered activities should be catered wherein the teacher will just serve as the facilitator in class.

Figure 6

However, considering this critical claim of the respondents is the answer to why there are contrasting results between the result of the survey and their responses in the interview as stipulated in the statement below

INTVW, Exc. 7

Teacher 13: … teachers can use it anytime as long as you have the mastery of the lesson. As you can notice, teachers nowadays are not only tasked to teach, we also accomplish reports if you are aware of that. We are told to do so many things and we even play roles that are beyond the teaching profession. Sometimes it's painful to think that we cannot prepare that much for our lessons due to these additional roles we play in the school premises. So, when these situations occur, lecture-discussion would be a good alternative to use.

Figure 7

This claim implies that teachers resorted to using lecture- discussion despite its ineffectiveness considering it as suitable in all situations or an answer to any school's urges with their intention of not wasting time or establishing gaps between their lessons. It may be an excuse but the mere fact, it happens in the real scenario. Even the Guyana Ministry of Education (2017) also perceived the same claim that the traditional lecture method of teaching is the only way to be applied in all circumstances.

Upon gathering the necessary data, development of matrix completed the process which comprises all the strategies used by every grade level in-service Public Junior High School Biology teacher in the Division of Tacloban City in teaching Biology contents and skills. As the expected outcome of the study, it primarily intends to provide an input to pre-service teachers in practicing the field of teaching. As shown in the succeeding tables is the developed matrix of the study.

GRADE 7
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
I. Parts and Functions				
1. Microscopy	1. identify parts of the microscope and their functions;	Show and Tell	Activity 1. How to Use the Light Microscope	Laboratory Activity
		Simulation		Cooperative Learning
		Direct Instruction		Film Showing
		Lecture-Discussion		Realias
		Word Puzzle		Collaborative Activity
		Lecture-Discussion		Simulation
		Boardwork	Activity 1.What makes up an organism?	Picture Analysis
	2. focus specimens using the compound microscope;	Laboratory Activity		Cooperative Learning
		Multimedia Instruction		Laboratory Activity
		Simulation		Realias
		Direct Instruction		4 Pics 1 Word
		Lecture-Demonstration		Collaborative Learning
		Lecture-Discussion		Picture Analysis
2. Levels of Biological Organization	3. describe the different levels of biological organization from cell to biosphere;	Multimedia Instruction	Activity 2. Levels of organization in an organism	Graphic Organizer
		Simulation		Brainstorming
		Graphic Organizer		Laboratory Activity
		Lecture-Discussion		Reporting
		Brainstorming		Brainstorming
		Reporting		Collaborative Learning
		Multimedia Instruction		Graphic Organizer
3. Animal and Plant Cells	4. differentiate plant and animal cells according to presence or absence of certain organelles;	Jingle	Activity 1. Comparing plant and animal cells	Venn Diagram
		Think-Pair-Share		Model Making
		Word Puzzle		Cooperative Learning
		Venn Diagram		Laboratory Activity
		Making Models		Collaborative Learning
		Lecture-Discussion		Boardwork
		Direct Instruction	Activity 2. Investigating plant cells	Laboratory Activity
		Multimedia Instruction		Multimedia Instruction
		Show and Tell		Focus Group Discussion
		Brainstorming		Gallery Walk
		Checklist		Lecture-Discussion
	5. explain why the cell is considered the basic structural and functional unit of all organisms;	Multimedia Instruction	Activity 1. Are these also plants?	In-School Field Trips
		Lecture-Discussion		Brainstorming
		Brainstorming		Laboratory Activity
		Laboratory Activity		P.O.E.
		Research Review		Collaborative Activity
		Reporting	Activity 2. What other living things are found in the school grounds?	In-School Field Trips
		Collaborative Learning		Cooperative Learning
4. Fungi, Protists, and Bacteria	6. identify beneficial and harmful microorganisms;	Lecture-Discussion		Multimedia Instruction
		Cooperative Learning		Laboratory Activity
		In-School Field Experience		Collaborative Learning
		Realias		Realias
		Multimedia Instruction	Activity 3. What do these living things look like under the microscope?	Laboratory Activity
		Collaborative Learning		Multimedia Instruction
		Brainstorming		Picture Analysis
		Lecture-Demonstration		Model Making
				Boardwork

Table 5

GRADE 7
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
2. Heredity: Inheritance and Variation				
1. Asexual reproduction 2. Sexual reproduction	7. differentiate asexual from sexual reproduction in terms of: 7. 1 number of individuals involved; 7. 2 similarities of offspring to parents;	Multimedia Instruction		
		Lecture-Discussion	Activity 1. Can you grow new plants from "eyes"?	Laboratory Activity
		Checklist		Multimedia Instruction
		Graphic Organizer		Laboratory Activity
		Research Review		Realias
		Reporting		Lecture-Discussion
		Venn Diagram		Collaborative Learning
		Checklist	Activity 2. Can one become two?	Multimedia Instruction
	8. describe the process of fertilization;	Multimedia Instruction		Cooperative Learning
		Lecture-Discussion		Lecture-Discussion
		Cooperative Learning		Brainstorming
		Laboratory Activity		Boardwork
		Direct Instruction		
		Collaboratie Learning		
III. Ecosystems				
1.Components of an ecosystem 2. Ecological relationships 2.1 Symbiotic relationships	9. differentiate biotic from abiotic components of an ecosystem;	In-School Field Trip		
		Lecture-Discussion		
		Multimedia Instruction	Activity 1. What does it mean to be alive?	Role Playing
		Gallery Walk		Laboratory Activity
		Boardwork		In-School Field Trips
		Lecture-Demonstration		Story Making
		Word Wall		Comic Strip
	10. describe the different ecological relationships found in an ecosystem;	Multimedia Instruction		Lecture-Discussion
		4 Pics 1 Word		Collaborative Learning
		In-School Field Trip	Activity 2. Housemates? Eco mates!	Cooperative Learning
		Lecture-Discussion		Film Showing
		Brainstorming		In-School Field Trips
		Reporting		Laboratory Activity
		Research Review		Collaborative Learning
	11. predict the effect of changes in one population on other populations in the ecosystem; and	Multimedia Instruction	Activity 3. Which eats what?	Brainstorming
		Cues and Questioning		Concept Mapping
		Consequence Mapping		Laboratory Activity
		Picture Analysis		Cooperative Learning
		Focus Group Discussion		Boardwork
		Lecture-Discussion		Picture Analysis
		Picture Analysis	Activity 4. Let's Compare	Using Illustrations
		Simulation		Advertisement Making
	12. predict the effect of changes in abiotic factors on the ecosystem.	Multimedia Instruction		Cooperative Learning
		Lecture-Discussion		Music Creation
		Cues and Questionning		Project-Based Task
		P.O.E.		Laboratory Activity
		Direct Instruction		
		Reporting		
		Research Review		

Table 6

GRADE 8
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
1. Structures and Functions: Focus on the Digestive System				
1.1 Organs of the digestive system and their interaction with organs of the respiratory, circulatory, and excretory systems 1.2 Changes in food as it undergoes physical and chemical digestion 1.3 Diseases resulting from nutrient deficiency and ingestion of harmful substances 1.4 Prevention, detection, and treatment of diseases of the digestive system			Activity 1. Part 1 A. A Gutsy game	Playing A Board Game
				Multimedia Instruction
				Role Playing
				Gallery Walk
			Activity 2. How do enzymes affect digestion?	Laboratory Activity
				Brainstorming
				Cooperative Learning
	1. explain ingestion, absorption, assimilation, and excretion;	Multimedia Instruction		P.O.E.
		Lecture-Discussion		Simulation
		Jigsaw	Activity 3. How does pH affect enzyme activity?	Laboratory Activity
		Role Playing		Multimedia Instruction
		Brainstorming		Consequence Mapping
		Word Puzzle		P.O.E.
				Role Playing
				Cooperative Learning
	2. explain how diseases of the digestive system are prevented, detected, and treated;	Multimedia Instruction		Simulation
		Lecture-Discussion	Activity 4. A journey into the digestive system	Multimedia Instruction
		Research Review		Gallery Walk
		Role Playing		Role Playing
		Cooperative Learning		Modelling
		Direct Instruction		Direct Instruction
		Journal Making		Jigsaw
		Modelling		Laboratory Activity
		Project-based task	Activity 1. Am I eating, right?	Tracking One's Meal
		Showand Tell		Direct Instruction
				Trivia Questions
				Video Making
	3. identify healthful practices that affect the digestive system;	Cooperative Learning		Board Work
		Multimedia Instruction		Cooperative Learning
		Lecture-Discussion		Modelling
		Role Playing		Tracking One's Meal
		4 Pics 1 Word	Activity 2. What happens when nutritional needs are not adequately met?	Consequence Mapping
		Boardwork		Lecture-Discussion
		Brainstorming		Multimedia Instruction
		Cues and Questioning		Role Playing
		Journal Making		Collaborative Learning
		Research Review		Cooperative Learning
		Showand Tell		Cues and Questionning
		Word Puzzle		Journal Making
				Reporting
			Activity 3. Using essential concepts in nutrition to planning a menu	Planning A Healthy Diet
				3-Day Menu
				Journal Making
				Brainstorming
				Cooperative Learning
				Cues and Questionning

Table 7

GRADE 8
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
2. Heredity: Inheritance and Variation of Traits				
2.1 Stages of mitosis 2.2 Stages of meiosis 2.3 Mendelian Genetics			Activity 1. Observing mitosis	Multimedia Instruction Laboratory Activity Graphic Organizer Story Making Cooperative Learning
			Activity 2. Comparing mitosis and meiosis	Venn Diagram Cooperative Learning Brainstorming Laboratory Activity Simulation
	4. compare mitosis and meiosis, and their role in the cell-division cycle;	Lecture-Discussion Multimedia Instruction Show and Tell Brainstorming	Activity 3. Tossing coins and probability	Laboratory Activity Multimedia Instruction Consequence Mapping Cooperative Learning
			Activity 4. Comparing genotypic and phenotypic ratios for a typical Mendelian trait	Boardwork Lecture-Discussion Brainstorming Reporting Laboratory Activity Modular-Based instruction
	5. explain the significance of meiosis in maintaining the chromosome number;	Multimedia Instruction Picture Analysis Music Creation Concept Map Lecture - Demonstration		Think-Pair-Share
			Activity 5. Filling up the Punnett square for a dihybrid cross	Boardwork Collaborative Learning Reciprocal Teaching Brainstorming Boardwork Cooperative Learning Laboratory Activity Simulation
	6. predict phenotypic expressions of traits following simple patterns of inheritance;	Boardwork Multimedia Instruction Lecture-Discussion P.O.E. Reciprocal Teaching Simulation		
			Activity 6. Phenotypes and genotypes in incomplete dominance	Lecture-Discussion Boardwork Cooperative Learning P.O.E. Laboratory Activity Multimedia Instruction
			Activity 7. Inferring genotypes of ABO blood types based on the parental blood types	Boardwork Brainstorming P.O.E. Reciprocal Teaching
3. Biodiversity and Evolution				
3.1 Species diversity 3.2 Hierarchical taxonomic system of classification 3.3 Protection and conservation of endangered and economically important species	7. explain the concept of a species;	Lecture-Discussion Multimedia Instruction Brainstorming Role Playing Direct Instruction Jigsaw Word Wall	Activity 1. What's in a name?	Name Game Memory Game Jigsaw Word Wall Word Puzzle
	8. classify organisms using the hierarchical taxonomic system;	Lecture-Discussion Jigsaw Memory Game Gallery Walk Laboratory Activity	Activity 2. How do bacteria in yogurt look like?	Laboratory Activity Multimedia Instruction Model Making P.O.E.
	9. explain the advantage of high biodiversity in maintaining the stability of an ecosystem;	Lecture-Discussion Brainstorming P.O.E. Journal Making Direct Instruction	Activity 3. What can you do to prevent dengue?	Debate Advertisement Making Role Play Direct Instruction

Table 8

GRADE 8
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
4. Ecosystems				
4.1 Transfer of Energy in Trophic Levels 4.2 Cycling of materials in the ecosystem 4.2.1Water cycle	10. describe the transfer of energy through the trophic levels;	Using Illustrations Lecture-Discussion Cooperative Learning Puzzle Works Lecture -Demonstration	Activity 4. What is the importance of biodiversity to ecosystems?	Multimedia Instruction Cooperative Learning Brainstorming Reaction Papers
	11. analyze the roles of organisms in the cycling of materials;	Reporting Lecture-Discussion Multimedia Instruction Role Playing	Activity 5. I create the future	Role Playing Simulation Brainstorming Consequence Mapping
	12. explain how materials cycle in an ecosystem; and	Picture Analysis Lecture-Discussion Multimedia Instruction P.O.E.	Activity 1. How do you identify the components of a food chain in an ecosystem?	Classifying Organisms Picture Puzzle Reporting Music Creation
	13. suggest ways to minimize human impact on the environment.	Concept Mapping Multimedia Playing Poem Making Role Playing Poster Presentation Consequence Mapping Project-based task Lecture-Discussion Music Creation	Activity 2. Making food web	Making Illustrations Boardwork Concept Mapping Cooperative Learning
			Activity 3. Meat eaters vs. plant eaters	Cooperative Learning Venn Diagram Picture Puzzle Debate

Table 9

GRADE 9
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
1. Structures and Functions: Focus on the Digestive System				
1. Respiratory and Circulatory Systems Working with the other Organ Systems	1. explain how the respiratory and circulatory systems work together to transport nutrients, gases, and other molecules to and from the different parts of the body;	Model Making	Activity 1. What a Bunch of Grapes!	Model Making
		Multimedia Instruction		Multimedia Instruction
		Lecture-Discussion		Modelling
		Role Playing		Cooperative Learning
		Research Review		Brainstorming
		Collaborative Learning		Collaborative Learning
				Laboratory Activity
				Lecture-Discussion
			Activity 2. Bottled Balloons	Cooperative Learning
				Simulation
				P.O.E.
				Collaborative Learning
				Consequence Mapping
				Laboratory Activity
			Activity 3. Just Go with the Flow!	Simulation
				Cooperative Learning
				Multimedia Instruction
				Laboratory Activity
			Activity 4. Let's Organize!	Concept Mapping
				Picture Puzzle
				Cooperative Learning
				Peer Teaching
				Laboratory Activity
				Music Creation
	2. infer how one's lifestyle can affect the functioning of respiratory and circulatory systems;	Cues and Questioning	Activity 5. Pump It!	Simulation
		Multimedia Instruction		Cooperative Learning
		Research Review		P.O.E.
		Role Playing		Reciprocal Teaching
		Brainstorming		Laboratory Activity
		Lecture-Discussion		Multimedia Instruction
				Collaborative Learning
			Activity 6. The Rhythm of my Heart	Music Creation
				R.E.P.R.
				Research Review
				Multimedia Instruction
			Activity 7. Cigarette Smoking Is Dangerous to Your Health	Multimedia Instruction
				Picture Analysis
				Role Playing
				Research Review
				Laboratory Activity
				Lecture-Demonstration
				Lecture-Discussion
				Poster Making
				Reporting

Table 10

GRADE 9
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
1. Respiratory and Circulatory Systems Working with the other Organ Systems			Activity 8. Prevention Is Better Than Cure	Story Making
				Direct Instruction
				Role Playing
				Targeted Feedback
				Multimedia Instruction
				Poster Making
				Simulation
			Activity 9. What's the Word?	4 Pics 1 Word
				Lecture-Discussion
				Multimedia Instruction
				Situational Analysis
				Cooperative Learning
				Direct Instruction
				P.O.E.
2. Heredity: Inheritance and Variation				
1. the information stored in DNA 2. changes in a DNA molecule 3. mutations in sex cells			Activity 1. Phenotypes and Genotypes in Incomplete Dominance	Boardwork
				Trivia Question
				Cooperative Learning
				Jigsaw
				Direct Instruction
				Laboratory Activity
				Lecture-Discussion
			Activity 2. Mystery Bull	Situational Analysis
				Picture Analysis
				P.O.E.
				Brainstorming
				Boardwork
				Cooperative Learning
				Laboratory Activity
	3. describe the location of genes in chromosomes;	Lecture-Demonstration		Lecture-Demonstration
		P.O.E.	Activity 3. What's your blood type?	Situational Analysis
		Brainstorming		Laboratory Activity
		Multimedia Instruction		Brainstorming
				P.O.E.
				Boardwork
	4. explain the different patterns of non-Mendelian inheritance;	Lecture-Discussion	Activity 4. Boy or Girl?	Cooperative Learning
		Multimedia Instruction		Consequence Mapping
		Brainstorming		Laboratory Activity
		Laboratory Activity		Multimedia Instruction
		Cooperative Learning		Boardwork
		Direct Instruction		Targeted Feedback
		Jigsaw	Activity 5. When Gender Matters	Cooperative Learning
		P.O.E.		Boardwork
				Brainstorming
				Targeted Feedback
				Lecture-Discussion
			Activity 6. DNA Modeling	Model Making
				Presentation of Outputs
				Using Illustrations
				Cooperative Learning
				Project-Based Learning

Table 11

GRADE 9
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
3. Biodiversity and Evolution				
1. how evolution through natural selection can result in biodiversity			Activity 1. Index of Diversity	Cooperative Learning
				In-School Field Trips
				Brainstorming
				Peer Teaching
				P.O.E.
			Activity 2. Measuring Population Density	Cooperative Learning
				In-School Field Trips
				Boardwork
	5. relate species extinction to the failure of populations of organisms to adapt to abrupt changes in the environment; and	Multimedia Instruction		P.O.E.
		Brainstorming		Collaborative Learning
		Cooperative Learning		Direct Instruction
		In-School Field Trips		Laboratory Activity
		4 pics 1 word	Activity 3. Endangered but not Extinct...yet	Multimedia Instruction
		Lecture-Discussion		Cooperative Learning
		P.O.E.		Laboratory Activity
		Reporting		P.O.E.
		Trivia Question		Direct Instruction
		Word Puzzle		Multimedia Instruction
				Reporting
				Simulation
			Activity 5. Making Predictions	Picture Analysis
				Brainstorming
				P.O.E.
				Laboratory Activity
				Collaborative Learning
				Lecture-Discussion

Table 12

GRADE 9
Summary of All Strategies Used In Terms of the Content and Skill

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
4. Ecosystems				
4.1 Flow of Energy and Matter in Ecosystems 4.2 Biodiversity and Stability 4.3 Population Growth and Carrying Capacity			Activity 1. What are the structures involved in the food making process in plants?	Multimedia Instruction
				Graphic Organizer
				Cooperative Learning
				Role Playing
				Lecture-Discussion
				Multimedia Instruction
				P.O.E.
			Activity 2. Investigating the Leaf Stomata	Laboratory Activity
				Picture Analysis
				Cooperative Learning
				Music Creation
				Direct Instruction
				Multimedia Instruction
			Activity 3. Evidence of Photosynthesis	Laboratory Activity
				Direct Instruction
				In-School Field Trips
	6. differentiate basic features and importance of photosynthesis and respiration	Multimedia Instruction		Poem Making
		Lecture-Discussion		Brainstorming
		Cooperative Learning		Multimedia Instruction
		Laboratory Activity		P.O.E.
		Picture Analysis		Reporting
		P.O.E.	Activity 4. The Power House	Multimedia Instruction
		Reporting		Cues and Questionning
		Research review		Brainstorming
				Research Review
				Collaborative Learning
				Graphic Organizer
				Multimedia Instruction
			Activity 5. Let Us ReCharge	Multimedia Instruction
				Brainstorming
				Lecture-Demonstration
				Direct Instruction
			Activity 6. Comparing Photosynthesis and Respiration	Concept Mapping
				Venn Diagram
				Graphic Organizer
				Music Creation
				Brainstorming
				Laboratory Activity

Table 13

GRADE 10
Summary of All Strategies Used Both in Content and Skills

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
1. Coordinated Functions of the Reproductive, Endocrine, and Nervous Systems				
1.2 organisms as having feedback mechanisms, which are coordinated by the nervous and endocrine systems 1.3. how these feedback mechanisms help the organism maintain homeostasis to reproduce and survive			Activity 1. Break it Down!	Concept Mapping Multimedia Instruction Graphic Organizer Reporting Boardwork Direct Instruction Laboratory Activity
	1. describe the parts of the reproductive system and their functions;	Multimedia Instruction Brainstorming Lecture-Discussion Reporting	Activity 2. How Fast is Your Reaction?	Cooperative Learning Laboratory Activity Multimedia Instruction Simulation Brainstorming Reciprocal Teaching
	2. explain the role of hormones involved in the female and male reproductive systems;	Lecture-Discussion Pick and Match Concept Mapping Video Making Word Puzzle Concept Mapping	Activity 3. A Nervous Trip	Role Playing Cooperative Learning Simulation Brainstorming Laboratory Activity Multimedia Instruction
	3. describe the feedback mechanisms involved in regulating processes in the female reproductive system (e.g., menstrual cycle);	Multimedia Instruction Lecture-Discussion Brainstorming Consequence Mapping Trivia Question Picture Analysis	Activity 4. Who's in Control?	Multimedia Instruction Role Playing Brainstorming Laboratory Activity Concept Mapping Peer Teaching Picture Analysis Reciprocal Teaching Show and Tell
	4. describe how the nervous system coordinates and regulates these feedback mechanisms to maintain homeostasis;	Multimedia Instruction Reporting Lecture-Discussion Trivia Question Focus Group Discussion Role Playing Brainstorming	Activity 5. What Went Wrong?	Lecture-Demonstration Picture Analysis Multimedia Instruction Laboratory Activity Concept Mapping Journal Making Peer Teaching
			Activity 6. Mark My Calendar!	Laboratory Activity Picture Analysis Cooperative Learning Multimedia Instruction Boardwork Concept Mapping Peer Teaching

Table 14

GRADE 10
Summary of All Strategies Used Both in Content and Skills

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
2. Heredity: Inheritance and Variation				
1. the information stored in DNA 2. changes in a DNA molecule 3. mutations in sex cells			Activity 1. Getting to Know the DNA and RNA Structure	Graphic Organizer Cues and Questioning Laboratory Activity Cooperative Learning
			Activity 2. DNA Makes DNA	Model Making Multimedia Instruction Cooperative Learning Research Review Brainstorming Boardwork Concept Mapping Role Playing Journal Making Laboratory Activity
	5. explain how protein is made using information from DNA;	Multimedia Instruction Lecture-Discussion Cooperative Learning Concept Mapping boardwork Mix and Match	Activity 3. What's the Message	Model Making Simulation Cooperative Learning Boardwork Laboratory Activity Brainstorming Concept Mapping R.E.P.R
	6. explain how mutations may cause changes in the structure and function of a protein;	Multimedia Instruction Lecture-Discussion Pick and Match Research Review Cooperative Learning Concept Mapping brainstorming Trivia Question	Activity 4. Relay the Message	Laboratory Activity Word Wall Reciprocal Teaching Reporting Brainstorming Concept Mapping Cooperative Learning Direct Instruction Model Making Multimedia Instruction
			Activity 5. Trace the Code	Cooperative Learning Multimedia Instruction Concept Mapping Laboratory Activity Peer Teaching
			Activity 6. Chromie Change	Cooperative Learning Integration of Content Areas Laboratory Activity Word Wall Concept Mapping Lecture- Discussion Model Making

Table 15

GRADE 10
Summary of All Strategies Used Both in Content and Skills

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
3. Biodiversity and Evolution				
1. how evolution through natural selection can result in biodiversity			Activity 1A. Where Do I Belong?	Classifying Organisms
				Picture Analysis
				Laboratory Activity
				Cooperative Learning
				Concept Mapping
				Direct Instruction
				Lecture- Discussion
			Activity 1B. What's My Age?	Lecture-Demonstration
				Instructional Analysis
				Laboratory Activity
		Lecture-Discussion		Cooperative Learning
	7. explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution;	Multimedia Instruction	Activity 2. AHA! Analogous! Homologous!	Brainstorming
		Cooperative Learning		Concept Mapping
		Research Review		Laboratory Activity
		Brainstorming		Cooperative Learning
		Concept Mapping		Direct- Instruction
		Picture Analysis		Picture Analysis
		Role Playing	Activity 3. So, who is My Relative?	Brainstorming
		Simulation		Picture Analysis
		Word Puzzle		Cooperative Learning
				Laboratory Activity
		Film Showing	Activity 4. Let's Compare	Graphic Organizer
		Multimedia Instruction		Laboratory Activity
		Lecture-Discussion		Cooperative Learning
	8. explain the occurrence of evolution;	Research Review		Show and Tell
		4 Pics 1 Word		Concept Mapping
		Brainstorming		Reciprocal Teaching
		Concept Mapping	Activity 5. Follow the Track	Brainstorming
		Cooperative Learning		Cooperative Learning
		Model Making		Laboratory Activity
				Picture Analysis
				Concept Mapping
				Direct Instruction
				Show and Tell
				Story Making
			Activity 6. Survivor	Laboratory Activity
				Cooperative Learning
				Multimedia Instruction
				Picture Analysis
				Brainstorming
				Concept Mapping
				Reporting

Table 16

GRADE 10
Summary of All Strategies Used Both in Content and Skills

Content	Learning Competency/ies	Strategies	Acitivity/ies	Strategies
4. Ecosystems				
4.1 Flow of Energy and Matter in Ecosystems 4.2 Biodiversity and Stability 4.3 Population Growth and Carrying Capacity			Activity 1. Classifying the Value of Biodiversity	Cooprative Learning
				Multimedia Instruction
				In-School Field Trips
				Laboratory Activity
				Collaborative Learning
				Concept Mapping
			Activity 2. Dependent or Independent?	Brainstorming
				Lecture-Demonstration
	9. explain how species diversity increases the probability of adaptation and survival of organisms in changing environments;	Situational Analysis		Reporting
		Brainstorming		Laboratory Activity
		Film Showing		Concept Mapping
		K-W-H-L		Situational Analysis
		Concept Mapping	Activity 3. Analyzing Environmental Issues	Situational Analysis
		In-School Field Trips		Role Play
				Laboratory Activity
				Cooperative Learning
	10. explain the relationship between population growth and carrying capacity; and	Situational Analysis		Concept Mapping
		Lecture-discussion		Simulation
		Concept Mapping		Targeted Feedback
		Cooperative Learning	Activity 4. Biodiversity Status in the Community	Research Review
				Cooprative Learning
				Targeted Feedback
		Situational Analysis		Laboratory Activity
		Brainstorming		Brainstorming
	11. suggest ways to minimize human impact on the environment.	Lecture-Discussion		Reporting
		Multimedia Instruction		Survey Activity
		Cooperative Learning	Activity 5. Product Creation	Project-Based Task
		Research Review		Cooperative Learning
		simulation		Culminating Activity
				Laboratory Activity
				Brainstorming
			Activity 6. Showcasing of Products	Project-Based Task
				Cooperative Learning
				Brainstorming
				Laboratory Activity
				Brainstorming

Table 17

5. Conclusions

There is a big gap between the common and not commonly used strategy both in content and skills in terms of its applicability and effectivity. This finding led to a revelation that teacher-respondents are still facing unceasing common problems such as unavailability of laboratory apparatuses and instructional materials which continuously hinders them at present to implement the strategies, they think are said to be effective. As a solution, they resorted to using what they call "traditional" way of teaching despite of knowing its ineffectiveness and impact on the students just for topic completion and convenience. Majority of them suggested adopting strategies that are hands-on and student-centered activities to fulfill the aim of the K to 12 curriculum which is learner-centered and inquiry-based. The matrix developed will be helpful to guide pre-service and in-service teachers in choosing appropriate strategies to be integrated into the instruction. The said matrix comprises the collection of teaching strategies that can be applied explicitly to every competency of the Biology curriculum across all grade levels. Therefore, the result of the study would be a wake-up call to pre-service teachers, in-service teachers, and administrators the need to practice various science teaching strategies as identified in the matrix to improve the performance of students both in Biology contents and skills.

6. Recommendations

Based on the findings and conclusion, the following are recommended: (a) the use of science innovative teaching strategies, technology-based materials and needs-based curriculum enabling teachers to build rapport between students and improve teaching and learning process (b) more trainings and seminars regarding the use of teaching strategies to immerse teachers into a variety of teaching strategies that can be used in teaching Biology (c) to conduct studies to thoroughly evaluate the effectiveness of the strategies as reflected in the matrix developed (d) constant monitoring to eradicate the unceasing problems of teachers which continuously affecting the teachers' vision of rendering effective instruction.

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