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Performance of Senior High School Students in Spiral Progression Approach of the K to 12 Science Curriculums

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Abstract: *This study aimed to determine the level of performance in terms of scientific understanding and science process skills of Grade 12 senior high school students in the spiral progression approach of the K to 12 Science Curriculum. This utilized the quantitative – qualitative descriptive research, in which questionnaires and focused group discussion were used to gather the needed data. The study shows that the senior high school students have "high" level of scientific understanding as to the content of their science subjects and results showed that among the five science process skills, only the observation skills were found to be "very high" while experimentation, measurement, communication and inference skills measured "high level" as being possessed by the students.The study also found out that student has difficulty in the transition of topics as they move to a higher grade level since some of the topics are not being covered in their lower grades because of the limited time allocated for each topic. This study implied the current situation on the newly implemented curriculum in the educational sector of the Philippines and the revisions that the science subject undergoes.*

Key words: *Spiral progression approach, scientific understanding, science process skills, experiences on spiral progression approach, performance of senior high school students*

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I. Introduction

To realize learning goals, effective learning needs to occur and educational theories, tested empirically in the 20th century and evidenced in the literature, show that effective adult learning takes place when there is a cycle of experience, reflection, thinking and planning, where there is deep learning for understanding, rather than surface learning for assessment and what learners already know is assimilated into new learning. From these pedagogical perspectives, the spiral curriculum evolved, with horizontal and vertical integration of topics (Coelho, 2015).

The Department of Educations' K to 12 Program goes with the spiral progression approach where in a major part of the implementation is the transition stage, which is crucial for the success of the reform. It is therefore necessary to pay close attention to the transition process as this stage can easily lead to failure if not implemented correctly. (Adanza et.al, 2015)

Ramon T. Diaz National High School in Gandara, Samar is one of the big schools in the Samar Division composing of approximately 2, 200 enrollees coming from different barangays of the said municipality. With the large number of enrollees, Ramon T. Diaz National High School will serve as a representative school for the whole Division of Samar as sample of this study. The researcher herself was a former teacher of the school handling junior and senior high school students and is familiar on how the school functions, thus the researcher chose to conduct the study in Ramon T. Diaz National High School.

The implementation of the new science curriculum brought changes to the part of the school administrators, teachers and especially to the students. On how spiral approach applied in science create confusion to the students particularly on the transition of topics every grade level, which is the main problem of the students of Ramon T. Diaz National High School.

The said case above is quite apprehensive and it was in this regard that the researcher was encouraged to conduct this research to determine the performance of senior high school students under spiral progression approach of the K to 12 science curriculum.

General Objective

This study aimed to determine the level of performance under spiral progression approach in the K to 12 Science Curriculum of the Grade 12 senior high school students of Ramon T. Diaz National High School, school year 2017-2018.

Specific Objectives

1. To determine the profile of the student-respondents in terms of the following profile variates:

1.1age and sex;

1.2track or specialization;

1.3 mid-term grade in science of second semester; and

1.4 average family monthly income

2. To determine the level of performance of grade 12 senior high school students under the spiral progression approach of the K to 12 Science Curriculum to the student-respondents in terms of developing:

2.1 scientific understanding; and

2.2 science process skills

3. What arethe experiences of the senior high school students in the K to 12 Science Curriculum?

4. Is there a significant relationship between student-respondents' profile and level of performance under spiral progression approach in the K to 12 Science Curriculum in terms of developing:

a. scientific understanding; and

b. science process skills?

5. Is there a significant difference between male and female respondents in terms of:

5.1 scientific understanding; and

5.2 science process skills?

II. Research Methods

This study utilized a qualitative – quantitative descriptive research to know the level of performance of senior high school students in terms of developing scientific understanding and acquiring science process skills and their experiences under spiral progression approach in the K to 12 Science Curriculum and the profile variates of student-respondents.

Descriptive and inferential statistical tools were used in the analysis of data such as frequency count, percentage mean, weighted mean, pearson product moment correlation, standard deviation and z-test for independent sample. The respondents of this study were the grade 12 senior high school students of Ramon T. Diaz National High School, Gandara Samar.

The researcher used stratified random sampling technique in obtaining the necessary information from the respondent. It utilized a fifty-item multiple choice test questions, survey questionnaire and Focused Group Discussion as the main data gathering instrument in obtaining all the needed information in coming up with the most accurate findings with the level of performance of senior high school students under spiral progression approach.

The fifty-item multiple choice test questions was constructed by the researcher and it was passed through validations. The questionnaire was drafted and submitted to the members of the panel for comments and suggestions. All comments and suggestions of the members of the panel were considered and incorporated which was subjected to expert validation.

To ascertain the reliability of the fifty-item multiple choice, it was subjected to pilot testing using the test-retest method through a group of senior high school students from Ramon T. Diaz National High School who were not samples of this study, wherein the coefficient reliability was computed using Cronbach's alpha formula. The computed value denoted the reliability coefficient that determined the strength of the fifty-item multiple choice test. Interpretation of the reliability was based on the information below:

Reliability Coefficient	Degree of Reliability
0.90	Excellent
0.80 - 0.90	Good
0.70 - 0.80	Respectable
0.65 - 0.70	Minimally Acceptable
0.60 - 0.65	Undesirable
0.60 below	Unacceptable

The computed reliability coefficient was 0.84 which was denoted that the questionnaire possessed good reliability suggesting that the questionnaire was adequate for individual measurement, particularly on the level of scientific understanding of the grade 12 senior high school students under spiral progression approach of the K to 12 Science Curriculum.

Whereas, the science process skills questionnaire was adapted from the study of Omiko Akani (2015); and the researcher constructed a Focused Group Discussion Tool in conducting the interview to the respondents.

III. Results and Discussion

This section presents the results of the study and its discussion.

Profile of Student – Respondents

The profile of the student-respondents such as age, sex, track or specialization, first quarter grades in science in the second semester and average family monthly income are presented below.

Age and Sex. Table 2 shows the distribution of student – respondents according to their age and sex.

Table 2
Age and Sex Distribution of Student-Respondents

Age (years)	Sex				Total	%
	Male	%	Female	%		
17	6	6.00	16	16.00	22	11.00
18	37	37.00	37	37.00	74	37.00
19	33	33.00	28	28.00	61	30.50
20	8	8.00	10	10.00	18	9.00
21	5	5.00	7	7.00	12	6.00
22	8	8.00	2	2.00	10	5.00
23	2	2.00	0	0.00	2	1.00
28	1	1.00	0	0.00	1	0.50
Total	**100**	**100.00**	**100**	**100.00**	**200**	**100**
Percentage	**50.0**		**50.0**		**-**	**-**
Mean	**19.10**		**18.61**		**18.86**	**-**
SD	**1.66**		**1.20**		**1.46**	**-**

About 74 or 37.00 percent of the student – respondents' are 18 years old composed of 37 males and 37 females. This is followed by 61 or 30.50 percent composed of 33 males and 28 females whose ages are 19 years old. The oldest is about one or 0.50 percent who is a male whose age is 28 years old.

The mean age of the student – respondents is 18.86 years old with a standard deviation of 1.46 years. It appears that females are younger than males as supported by the mean age of 19.10 year for the male group and 18.61 year for the female group. This means that with the additional two years in Basic Education of the K to 12 curriculum, student's finishes senior high school at higher age but the eagerness to acquire new knowledge is still the same. According to Clack et al. (2015), in their study "Age-Related Differences in the Ability to Learn of Students", they found out that young and older adults generally demonstrate a similar ability to learn new things. The study also concluded that the ability to acquire knowledge is largely unaffected by cognitive aging.

Track or Specialization. Table 3 shows the distribution of student – respondents according to their chosen track or specialization.

Table 3
Track or Specialization Distribution of Student – Respondents

Tracks	f	%
Accountancy, Business and Management (ABM)	13	6.5
TVL- Information, Communication and Technology(ICT)	41	20.5
Humanities and Social Sciences (HUMSS)	15	7.5
TVL- Cookery	37	18.5
TVL- Dressmaking	6	3
TVL- Electrical, Installation and Maintenance(EIM)	42	21
General Academic Strand (GA)	46	23
Total	**200**	**100**

As reflected in Table 3, 46 or 23.5 percent of the student – respondents are from the General Academic Strand. This is followed by the Technical Vocational Livelihood – Information Communication Technology composing of 41 or 20.3 percent and the lowest participants in the study were from the Technical Vocational Livelihood with specialization in dressmaking with 6 or 3 percent.

First Quarter Grades for the Second Semester. Table 4 is the distribution of the student – respondents' first quarter grades in physical sciences for the second semester.

Table 4

Mid-term Grades in Physical Science of 2nd Semester

Grade	f	%	Interpretation
90 - 100	38	19.00	Outstanding
85 - 89	98	49.00	Very Satisfactory
80 - 84	63	31.50	Satisfactory
75 - 79	1	0.50	Fairly Satisfactory
below 75	0	0.00	Did not meet expectation
Total	**200**	**100**	**-**
Mean	**86.32**	**-**	**Very Satisfactory**
SD	**3.81**	**-**	**-**

The table shows that 98 or 49.0 percent of the student – respondents has grades ranges from 85 – 89 indicating that grade 12 student has a very satisfactory performance in physical science. Thirty-eight or 19.0 percent have grades ranges from 90 – 100 which shows that students has an outstanding performance in physical science for the first quarter of the second semester. This is followed by 63 or 31.50 percent whose grades in Physical Sciences ranges from 80 – 84 indicating a satisfactory performance. One or 0.50 percent of the student – respondents has grades ranging from 75 – 79 which is fairly satisfactory.

The mean grade of the student – respondents is 86.32 which is very satisfactory. This implies that in the spiral progression approach, students are performing well in science as evidenced by the computed mean value; and as students tends to get a higher grades they become even more motivated to learn (Stan, 2012).

Average Family Income. In Table 5 shows the average monthly family income of student – respondents.

Table 5
Average Family Monthly Income Distribution of Student-Respondents

Income	f	%
1,000 - 5,999	127	63.5
6,000 - 10,999	66	33
11,000 - 15,999	4	2
16,000 - 20,999	2	1
21,000 - 25,999	0	0
26,000 - 30,999	1	0.5
Total	**200**	**100**
Mean	**Php. 5,205.00**	**-**
SD	**Php. 3,228.79**	**-**

As can be seen from the table, 127 or 63.5 percent of the student – respondents have average family income ranging from P1, 000 – 5,999. This is followed by 66 or 33 percent from P6, 000 – 10,999, 4 or 2 percent from 11,000 – 15,999. The lowest number is one or 0.5 percent whose family income ranging from P26, 000 – 30,999.00. The computed mean income value is P5, 205.00 with standard deviation of P3, 228.79. Comparing these values with the poverty threshold as per survey of Philippine Statistics Authority (2017), this indicates that the family income shows that their families can't afford to provide the basic needs of their family.

Student – Respondents' Level of Scientific Understanding in Physical Science under Spiral Progression Approach

Table 6 reflects the level of understanding in physical science under spiral progression approach.

Table 6
Student-Respondents' Level of Scientific Understanding

Scores	Level of Scientific Understanding	f	%
37 - 48	High	115	57.50
25 - 36	Moderate	76	38.00
13 - 24	Low	9	4.50
Total	**-**	**200**	**100.00**
Mean	**-**	**36.70**	**-**
SD	**-**	**5.20**	**-**

Out of 200 student – respondents' 115 or 57.50 percent have "high" level scientific understanding corresponding to a percentage score 37.48. Seventy-six or 38.00 percent have "moderate" level scientific understanding with percentage scores 25.36 and 9 or 4.50 percent have "low" level of scientific understanding at percentage scores between 13 – 24.

The overall level of scientific understanding of senior high school student – respondents' in physical science under spiral progression approach is "high" as supported by mean percentage score of 36.70 with standard deviation of 5.20. With the results above, it coincides with the approach of spiral progression in science - spiral progression design are presented repeatedly throughout the curriculum, but with deepening layers of complexity and after a mastery of the initial topic, the student spirals upwards as the new knowledge is introduced, enabling the student to reinforce what is already learned. In the end, a rich breadth and depth of knowledge is achieved (Dee, 2014).

Student – Respondents' Level of Science Process Skills in Physical Science under Spiral Progression Approach

The weighted means of the twenty-eight statements used to determine the level of science process skills under spiral progression approach of the student-respondents are presented below.

Table 7
Mean and Standard Deviation Results based on Observation Skills

Statements	VH (4)	H (3)	L (2)	VL (1)	X_w	SD	Interpretation
1. Ability to use senses to identify characteristics of properties.	150	48	2	-	3.74	0.46	VH
2. Ability to identify similarities and differences between objects based on features/ properties.	124	75	1	-	3.62	0.38	VH
3. Ability to identify qualitative changes in conditions.	121	70	9	-	3.56	0.49	VH
4. Ability to use observable properties to classify object or parts of organism.	93	105	2	-	3.46	0.50	H
5. Ability to observe quantitative changes in formation of products.	95	97	8	-	3.44	0.55	H
6. Ability to identify differences between substances before and after chemical reaction.	96	99	5	-	3.46	0.54	H
Grand Mean	**-**	**-**	**-**	**-**	**3.54**	**0.49**	**VH**

Legend: VH – Very High H – High L – Low VL – Very Low

Based on the results in table 7, statements one, two and three had mean values that falls in the very high level while statements 4, 5 and 6 had mean values that falls in high level. The grand mean of 3.54 with standard deviation of 0.49 is also within very high level indicating that senior high school students are observant with different things in their environment.

Table 8
Mean and Standard Deviation Results based on Experimentation

Statements	VH (4)	H (3)	L (2)	VL (1)	X_w	SD	Interpretation
7. Ability to identify instruments for carrying out an experiment.	71	108	21		3.25	0.68	H
8. Ability to set up instruments for experiments.	55	99	42	4	3.03	0.84	H
9. Ability to follow steps or procedures in experiment.	50	98	46	6	2.96	0.83	H
10. Ability to observe precautionary measures when carrying out an experiment.	37	100	50	13	2.81	0.90	H
11. Ability to identify and carry out necessary repetition of steps in experiments.	26	129	28	17	2.82	0.88	H
12, Ability to work independently.	38	119	25	18	2.89	0.99	H
Grand Mean	**-**	**-**	**-**	**-**	**2.96**	**0.85**	**H**

Legend: VH – Very High H – High L – Low VL – Very Low

Table 8 shows that in experimentation skills, the mean value for each item is within the high level of the skills of the student-respondents' senior high school students under spiral progression approach. The grand mean of 2.96 with standard deviation of 0.86 is also within the range of high level skills in experimentation. This indicates that students have the ability to conduct experiments following the necessary precautions and procedures.

Table 9
Mean and Standard Deviation Results based on Measurement Skills

Statements	VH (4)	H (3)	L (2)	VL (1)	X_w	SD	Interpretation
13. Ability to determine appropriate values using average value of measures.	75	113	12	0	3.32	0.62	H
14. Ability to identify appropriate device for measuring quantities.	64	126	10	0	3.27	0.49	H
15. Ability to use measuring instruments correctly.	79	106	10	5	3.30	0.79	H
16. Ability to repeat measurement to obtain more appropriate value.	87	92	19	2	3.32	0.61	H
17. Ability to specify units of measurements using the correct S.I units (metric system)	95	88	15	2	3.38	0.48	H
18. Ability to estimate quantity using the spatula.	58	116	22	4	3.14	0.63	H
Grand Mean	-	-	-	-	**3.29**	**0.60**	**H**

Legend: VH – Very High H – High L – Low VL – Very Low

In the above table, the values for each of the item were found to be in the high level. The grand mean value of 3.29 with standard deviation of 0.60 is also within the high level skills in the experimentation. This indicates that with the use of spiral progression approach students can measure or estimate a particular dimensions or objects.

Table 10
Mean and Standard Deviation Results based on Communication Skills

Statements	VH (4)	H (3)	L (2)	VL (1)	X_w	SD	Interpretation
19. Ability to express observation in quantitative description.	88	90	20	2	3.42	0.80	H
20. Ability to use written reports to transmit information.	93	99	8	0	3.47	0.56	H
21. Ability to express observations in appropriate quantitative description.	85	107	8		3.43	0.56	H
22. Ability to report event procedurally.	77	112	9	2	3.37	0.62	H
23. Ability to use appropriate reporting format for the type of observation or event.	102	87	11	0	3.51	0.54	VH
Grand Mean	-	-	-	-	**3.44**	**0.62**	**H**

Legend: VH – Very High H – High L – Low VL – Very Low

As reflected in table 10, only statement 23 had mean value that falls into very high level in terms of the communication skills acquired by the grade 12 students, while statement 19, 20, 21 and 22 falls into high level of communication skills. The grand mean of 3.44 with standard deviation of 0.62 also falls in high level skills of communication. This means that in the K to 12 science curriculum applying the spiral progression approach the students gained the ability in expressing observations into a particular condition in science-related topics.

Table 11
Mean and Standard Deviation Results based on Inference Skills

Statements	VH (4)	H (3)	L (2)	VL (1)	X_w	SD	Interpretation
24. Ability to make assumptions based on observations	120	78	2	0	3.59	0.48	VH
25. Ability to relate the observed characteristics and experimental results	94	95	11	0	3.42	0.61	H
26. Ability to draw reasonable conclusions bases on results.	77	105	12	6	3.27	0.77	H
27. Ability to relate initial assumptions with experimental results.	88	98	14	0	3.37	0.51	H
28. Ability to specify relevant conclusion at each stage of experimentation.	77	104	13	6	3.26	0.79	H
Grand Mean	-	-	-	-	**3.38**	**0.63**	**H**

Legend: VH – Very High H – High L – Low VL – Very Low

In the above table, statement 24 had mean value that falls into very high level of inference skills acquired by the students while statement 25, 26, 27 and 28 falls into high level skills of inference. The grand mean of 3.38 with standard deviation of 0.63 falls into high level skills. This indicates that in the spiral progression approach students can figure out things based on their observations and can determine what is observed and what is already known.

Relationship Between Student-Respondents' Scientific Understanding in Physical Science and Profile Variates

Table 12 below provides the coefficients of correlation and p-values between student-respondents 'scientific understanding and their profile variates.

Table 12
Correlation Between Student-Respondents' Scientific Understanding in Physical Science and Profile Variates

Profile Variates	r_{xy}	p-value	Decision	Evaluation
Age	0.053	0.457	Accept Ho	NS
Grades in Science	0.393	0.000	Reject Ho	**S**
Average Monthly Family Income	0.033	0.644	Reject Ho	**S**
Track or specialization	0.203	0.004	Accept Ho	NS

Correlation is significant at the 0.05 level (2-tailed).

The following correlation coefficients and p-values were obtained between student-respondents' scientific understanding under spiral progression approach and profile variates: 0.393 and 0.000 for grades in physical science and 0.033 and 0.644 with average monthly family income. The accompanying p- values are lower than the 0.05 significance level which means significant relation between variables. Therefore, the hypotheses "there is no significant relationship between scientific understanding in the spiral progression approach and grades in science and average monthly family income" is rejected. This implies that in the spiral progression approach, grades and average family monthly income are significantly related to each other, this means that as the students' level of scientific understanding gets higher the grades of the students will also become higher since they will be able to perform well in their science subject.

In contrast, the following coefficients of correlation and p-values were obtained from the remaining profile variates: 0.053 and 0.457 with age and 0.203 and 0.004 for track or specialization. The p-values are higher than the 0.05 significance level implying no significant relationship between variables. The hypotheses "there is no significant relationship between student-respondents' scientific understanding under spiral progression approach and age and track or specialization" is accepted. This indicates that age and track or specializations are not significantly related to the students' level of scientific understanding. This means that whatever track or specialization the student may choose in the senior high school program and regardless of age it does not affect the level of scientific understanding of the student.

Relationship Between Student-Respondents' Science Process Skills in Physical Science and Profile Variates

Table 13 shows the correlation between the different profile variates and level of science process skills of the grade 12 senior high school students in their subject physical science under spiral progression approach in the K to 12 science curriculum.

Table 13

Correlation Between Student-Respondents' Science Process Skills in Physical Science and Profile Variates

Level of Science Process Skills		Age	Grade in Science	Average Monthly Family Income	Track
Observation Skills	r_{xy}	0.154	0.032	0.003	0.345
	p-value	0.030	.652	.963	5.5E-07
	Evaluation	**S**	NS	NS	**S**
Experimentation	r_{xy}	0.208	-0.124	-0.084	-0.405
	p-value	0.003	0.079	0.237	2.7E-09
	Evaluation	**S**	NS	NS	**S**

Measurement Skills	r_{xy}	0.080	0.062	0.071	0.388
	p-value	0.258	0.384	0.318	1.4E-08
	Evaluation	NS	NS	NS	**S**
Communication Skills	r_{xy}	0.024	0.139	-0.132	0.236
	p-value	0.734	0.049	0.063	0.00075
	Evaluation	NS	**S**	NS	**S**
Inference Skills	r_{xy}	-0.044	0.003	0.036	0.411
	p-value	0.533	0.969	0.613	1.5E-09
	Evaluation	NS	NS	NS	**S**

As depicted in the table, in the level of science process skills of the student-respondents', the observation and experimentation skills have significant relationship with their age and the track they have chosen as evidenced in the computed p-values thus rejecting the hypothesis. Hence, the levels of science process skills in observation have significant relationship with their age and track or specialization. This means that as the higher the age of the students' they tend to be more observant and has the ability to conduct experiments procedurally and their level of science process skills in observing differ in the track or specialization they have chosen. Their grades in science and average monthly income were found to have no significant relationship as evidenced in the p-values with their level of science process skills in observation thus accepting the hypothesis.

In the measurement skills of the student-respondents' only the track or specialization have significant relationship with the level of science process skills in measurement while their age, grades and average family monthly income were found to have no significant relationship with their level of science process skills in measurement thus accepting the hypothesis. Hence, there is no significant relationship with the student-respondents' age, grades, and average family monthly income to their level of science process skill in measurement; in the communication and inference skills, their age grades and track have significant relationship with their communication skills as evidenced by the p-values, thus rejecting the hypothesis. This means that as the student-respondents' gets a higher grades in physical sciences they are more confident in expressing their ideas on a particular conditions in science-related topics; and in the inference skills , only the track were found to be significant to their inference level of science process skills.

Difference in Scientific Understanding in the Spiral Progression Approach Between Male and Female

Table 14
Comparison of Scientific Understanding Between Male and Female in the Spiral Progression Approach

Level of Scientific Understanding	Sex	Mean	SD	z - value		Evaluation
				Computed	Critical	
scores	Male	37.110	5.140	1.596	1.96	Accept H_o/ NS
	Female	36.280	5.259			

Reject H_o /computed z / ≥ critical, z = 1.96
Accept H_o /computed z / ≤critical, z = 1.96

Table 14 shows the mean values of males and females on their level of scientific understanding. The males had mean value of 37.110 with standard deviation of 5.140 while the females had mean value of 36.280. The analysis indicates a z-critical value of less than 1.96, showing that there is no significant difference between male and female on their level of scientific understanding thus accepting the hypotheses. Hence, the level of scientific understanding of the student-respondents' has no significant difference as to male or female. This indicates that the students can acquire the level of scientific understanding in the spiral progression approach regardless of gender.

Difference in Science Process Skills in Spiral Progression Approach Between Male and Female

Table 13
Comparison of Science Process Skills Between Male and Female in the Spiral Progression Approach

Level of Science Process Skills	Sex	Mean	SD	z - value		Evaluation
				Computed	Critical	
Observation Skills	Male	3.600	0.238	1.661	1.96	Accept H_o/ NS
	Female	3.487	0.295			

Experimentation	Male Female	2.979 2.937	0.493 0.519	0.824	1.96	Accept H_o/ NS
Measurement Skills	Male Female	3.327 3.245	0.389 0.370	2.158	1.96	**Reject H_o / S**
Communication Skills	Male Female	3.400 3.362	0.329 0.365	1.086	1.96	Accept H_o/ NS
Inference Skills	Male Female	3.382 3.378	0.443 0.390	0.096	1.96	Accept H_o/ NS

Reject H_o /computed z / $\geq$ critical, z = 1.96
Accept H_o /computed z / $\leq$critical, z = 1.96

As shown in the above table, among the five skills of science processes only the measurement skills have showed a significant difference between male and female. With the computed mean value of 3.327 for male and 3.245 for females, analysis shows that there is a significant difference as to the measurement skills of male and female. From the computed mean values, it implies that male respondents are likely to be more precise in terms of measurements rather than female in different conditions such as the ability to determine appropriate values using values of measurement; and the other science process skills like experimentation, observation, communication and inference skills were found to have no significant difference as to male or female. This further meant that the mentioned science process skills of grade 12 student-respondents' does not vary significantly in male and female in the spiral progression approach of the K to 12 science curriculum.

Experiences of Student-Respondents in Spiral Progression Approach of the K to 12 Science Curriculums

Table 16 below summarizes the responses of the student-respondents on their experiences of going through spiral progression approach in the new science curriculum design of the K to 12 Program.

Fifteen or 100 percent of the student-respondents agreed that they are aware with the new changes in science curriculum - the spiral progression approach and the integration of the four areas of science all in one grade level. All the respondents in the focused group discussion responded that spiral progression approach is a step by step process which starts from the very basic up the complex one. Nine or 60 percent responded that spiral progression is a connection of topics in every grade level and the remaining six or 40 percent agreed that in the spiral progression approach, as the learning progresses, more details are being introduced.

Table 16

Responses of the Students on their experiences of Spiral Progression Approach

Responses of the Students	f	%
1. We are aware with the changes in the science curriculum, such as the integration of the four areas in science in one grade level.	15	100
2. I defined spiral progression as the step by step process which starts from the very basic up to complex.	15	100
3. There is a connection of topics in every grade level.	9	60
In a spiral progression approach as the learning progresses, more and more details are being introduced.	6	40
4. I acquired the scientific knowledge and understanding through various activities in our science subject.	15	100
5. We are bombarded with knowledge in every grade level since it becomes difficult as we go to a higher grade level.		
The lesson is being cut or stop after the allocated time hence students cannot fully understand a specific topic in science.	15	100
Our school lacks learning materials and facilities in science.	15	100
Our science teacher uses limited strategies in teaching us in science.	13	86
6. We are in favor of spiral progression approach in science, it is in fact advantageous to us because the content of the science subjects are already advanced and activities are interesting and new to us.	15	100

According also to the fifteen student-respondents, it is through various activities in science they can acquire scientific knowledge and understanding. The student-respondents' also mention that they also encountered problems in a spiral progression approach like they are being bombarded with knowledge every grade level and the transition of topics every grade level is somewhat not evident because the time allocated for

each is limited. The student-respondents also raised on the lack of learning materials in science, the same with the equipment's and facilities. They also point out the strategies used by some of the science teachers; most of the teachers use limited strategies in teaching science.

As a whole, the student-respondents disclosed that in the science content and processes of the K to 12 curriculum are intertwined, organized, arouse student's curiosity and motivate them to learn and appreciate science as relevant and useful subject; and through hands-on and minds-on activities it used to develop student's interest and become active learners.

IV. Conclusions

The following are the conclusions derived from the findings of the study:

1. Majority of the student-respondents are 19 years old, most of them are enrolled in General Academic Strand, and parents earning on average monthly family income at P1, 000 – 5,999. This indicates that the parents of the student-respondents based from the poverty threshold set by PSA (2017) belong to the poor family.
2. Overall, the student-respondents have high level scientific understanding based on the scores from the multiple choice test, indicating that students has better understanding on the content of the new design curriculum in science.
3. Student-respondents' scientific understanding under spiral progression approach was significantly related with average family monthly income and grades in physical science but not with age and tack or specialization. This indicates that as student' level of understanding gets higher students will also get good grades since they are able to perform well in science classes.
4. There was no significant difference on the scientific understanding between male and female under spiral progression approach indicating that the students can acquire the level of scientific understanding in the spiral progression approach regardless of gender.
5. As a whole, the student-respondents' rated "high" on the level of science process skills acquired by the respondents, that only means that varied activities in the science curriculum of the k to 12 program are effective.
6. In the level of science process skills of the student-respondents, observation and experimentation skills is significantly related to age and track or specialization but not with their grades in physical science and average family monthly income. This means that as the higher the age of the students' they tend to be more observant and has the ability to conduct experiments procedurally and their level of science process skills in observing differ in the track or specialization they have chosen; measurement skills is significantly related to their track but not with their age, grades in physical science and average family monthly income; communication skills is significantly related to their grades in science and track or specialization but not with age and average family monthly income; and inference skills is significantly related to their track or specialization but not with age, grades in science and average family monthly income.
7. Among the five science process skills, only the measurement skills has significant difference between male and female while the other science process skills has no difference significantly. This implies that male are likely to be precise in terms of measurements rather than female in different conditions such as the ability to determine appropriate values using values of measurement.
8. From the responses of fifteen students interviewed they agreed that they are aware with the new changes in science curriculum - the spiral progression approach and the integration of the four areas of science all in one grade level. They had defined spiral progression approach as a step by step process which starts from the very basic to difficult. The student-respondents also added that it is through various activities in science they can acquire scientific knowledge and understanding. The student-respondents' also enumerated problems they encountered in spiral progression approach like they are being bombarded with knowledge every grade level and the transition of topics every grade level is not evident because the time allocated is limited.

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