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Spiral Progression Approach in Teaching Science

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Abstract:
This study determined the teacher's perceptions on the implementation of the Spiral Progression Approach in teaching Science in selected secondary schools in the 2nd District of Sorsogon, S.Y. 2018–2019. It also determined the perceptions along vertical and horizontal articulation, the strategies and instructional materials used and the difficulties encountered in big and small schools along strategies and instructional materials. The descriptive-survey method was used to determine the teacher's perception, the strategies and instructional materials used and the difficulties encountered. Questionnaire checklist and unstructured interview were used in gathering the needed data which was provided by 141 Junior High School teachers respondents composed of 110 from big schools and 31 from small schools. The data gathered were analyzed and interpreted using appropriate statistical tools and measures. The results revealed that in vertical articulation, most of the teachers perceived that the topics discussed in the previous grade level are pre-requisites in the present grade level. In terms of horizontal articulation, teachers believed that the concepts and skills in life science, chemistry, physics and earth science are presented with increasing levels of complexity from one grade level to another. There are different strategies used by the teachers in implementation of Spiral Progression Approach along vertical and horizontal under direct, indirect, interactive experimental instruction and independent study. Meanwhile, teachers utilized different instructional materials along the said approach. However, science teachers encountered several difficulties in the implementation of spiral progression approach along teaching strategy and instructional materials.

Keywords: Spiral Progression Approach (SPA), Horizontal and Vertical Articulation, Instructional Materials, Strategies, Difficulties.

I. INTRODUCTION

Quality education is an important tool in order to achieve a more sustainable world. Education that aims for sustainable development should focus on the development of the knowledge, skills, understanding and values of all educational and learning dimensions. Improvement of the quality of life for people without compromising the natural environment is our shared goal in education. The United Nations Educational, Scientific and Cultural Organization (UNESCO) is an organization that sought to build and provide peace internationally with cooperation in education, science and culture. It also focused to provide leadership in education within regional and global. Through these, it strengthens educational systems worldwide and responds to current global challenges through education. Furthermore, UNESCO believes that education is a human right for all throughout life and that access must be matched by quality. This organization is the only United Nations agency authorized to cover all aspects of education. One which has been entrusted to them is to lead the Global Education 2030 Agenda through Sustainable Development Goal 4. The way to achieve this is the Education 2030 Framework for Action (FFA). The Sustainable Development Goals (SDGs) have set for the international community which has a target of: all young people by 2030 should be completing secondary school of good quality. But the challenge is a disheartening one since in 2010–2015, there are only average of 45% of young people were completing secondary school thus, more and better financing will be an important part of any strategy to achieve the goal (UNESCO, 2019)[1]. On the other hand, the National Achievement Test (NAT) is a Philippine-made standardized test designed to determine pupils/students' achievement level in the five key curricular subject areas which includes, Science, Math, English, Araling Panlipunan and Filipino. It aims to determine the rate of improvement in basic education. Based on the statistical data available, overall NAT MPS for Science is 59.64 which fall below standard range set by the Department of Education which is 75.00. In the Division of Sorsogon, MPS for Science is 49.52, that is still below national MPS. The result shows that there is an improvement as compared to previous NAT MPS that indicates the DepEd's collective effort in improving quality of basic education. Still, there is a need to put more resources on equipping the DepEd's workforce – teachers and administrators, with a more effective and efficient intervention programs aimed at improving key performance indicators. In the response for the quest for the quality education, the Philippine government itself work together in enhancing and uplifting the basic education. Every government worked hard in the revisions of the educational curriculum to make it suitable in giving quality education for everyone. This educational system underwent several developmental stages before it reached the current educational system today. Recently, the Philippines implemented a new curriculum which was started in the school year 2012-2013. This is the shift from the Basic Education Curriculum to the New K to 12 Curriculum. The said innovation in Philippine education has been made legal by the Republic Act No. 10533, otherwise known as "Enhanced Basic Education Act of 2013". There are many innovations introduced to the curriculum such as the extension of years spent in school. From the old 10-year scheme, Grade 1 to 10, it has been modified to 12 years. Among the different subjects or disciplines, Science is one of the subjects which undergone major revisions. As stated in Section 5 Curriculum Development, of Republic Act No. 10533[2] g) the curriculum shall use the spiral progression approach to ensure

mastery of knowledge and skills after each grade level. Enclosure No.1 in DepEd Order No. 31, series 2012 is the Policy Guidelines on the Implementing Guidelines of Grades 1 to 10 Enhanced Basic Education Curriculum[3], states that, "the overall design of Grade 1 to Grade 10 curriculum follows the spiral progression approach across subjects by building on the same concepts developed in increasing complexity and sophistication starting from grade school. Teachers are expected to use Spiral Progression Approach in teaching competencies." Furthermore, the spiral progression of topics in the said subject reveals how lessons are intertwined in every year level. The new science program has many improvements. These include the decongestion of the competencies as well as the arrangement in terms of spiral progression manner. In RBEC curriculum, it is discipline based. Every year has its specific discipline that is being offered such as General Science for first year, Biology for the second year, Chemistry for the third year and the seniors will take Physics. However, in the new science program, the different disciplines have been incorporated in every grade level. Likewise, in terms of the teaching strategies, there is a shifts from traditional methods to a more innovative exploration that emphasizes more in the development critical thinking and scientific skills of the students. The K to 12 science curriculum is learner-centered and inquiry-based, emphasizing the use of evidence in constructing explanations. The topics, concepts and skills in different science disciplines (Biology, Physics, Chemistry, and Earth Sciences) are presented with increasing manner with complexity from one grade level to another (spiral progression), thus learners experienced deeper understanding of key concepts (SEAMEO INNOTECH, 2012)[4]. This curriculum explains that progression of concepts taught does not only continuously progress vertically but also horizontally. It is aligned with Bruner's theory of discovery learning which claims that learning is an active and dynamic process, where students learn best by building on their schema or prior learning. Currently, all the grade levels now already following the seamless approach of spiral progression as stipulated on all the curriculum guides in all disciplines as issued by the Department of Education, yet, teachers still experienced cases and issues. Aside from that, teachers find it difficult to teach subjects who are not their major field of specialization, knowing that the new curriculum is not disciplined based, thus they need to restudy the lessons before presenting it to their learners (Casil, et al. 2018)[5]. With these, the researcher wants to discover teachers' perception on the spiral progression approach of the K to 12 Science Curriculum, the strategies that teachers incorporate to ensure the seamless transfer to the teaching learning process, the instructional materials used, the challenges and difficulties encountered by teachers and their coping mechanisms that plays a very vital role in the realization of what is the expected outcome of the said Curriculum.

II. FRAMEWORK

This study used the Input-Process-Output (IPO) model. The IPO model helps to structure the review findings in a useful way. The input variable includes the teacher's perception on the implementation of Spiral Progression Approach, strategies and instructional material used and the difficulties encountered in teaching science. The process includes the survey questionnaires with unstructured interview. The output of this study is an action plan that proposes suggestions and measures to strengthen teachers' in-depth knowledge in the implementation of the Spiral Progression Approach in teaching science. The action plan was conceptualized based on the results and findings of the study. The feedback refers to the reflective nature of the output and also the interrelationships of the variables in the study.

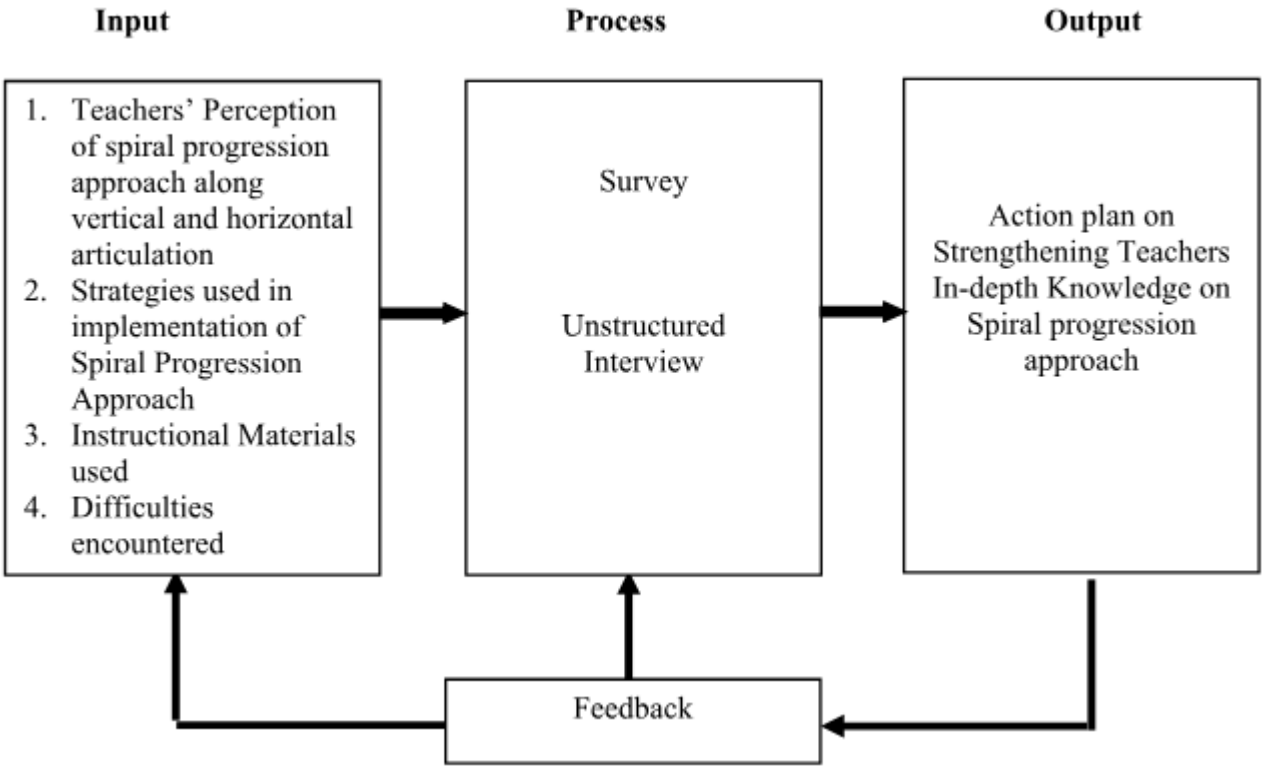

Figure.1. Conceptual Paradigm

III. OBJECTIVES OF THE STUDY

The main purpose of the study is to determine the teacher's perceptions on the implementation of the Spiral Progression Approach (SPA) in teaching Science in selected secondary schools in the 2nd District of Sorsogon, S.Y. 2018 – 2019.Specifically, this study sought to determinethe:1) teacher's perceptions on the spiral progression approach in teaching science along vertical articulation and horizontal articulation; 2) the strategies used in the implementation of the spiral progression approach along the identified variables; 3) the instructional materials used in the implementation of spiral progression approach along the identified variables; and 4) the difficulties encountered by the teachers from the big and small schools in the implementation of spiral progression approach along strategies and instructional materials.

MATERIALS AND METHODS

Research Design

This study aimed to determine the teacher's perceptions on the implementation of the Spiral Progression Approach in teaching Science in selected secondary schools in the 2nd District of Sorsogon, SY 2018 – 2019. In this study, descriptive survey method of research was utilized. The respondents are the secondary teachers teaching science in Junior High School in selected secondary schools in 2nd District of Sorsogon. Questionnaire checklist is the instrument use to gather data from the respondents. The data gathered were classified, analyzed and interpreted using an appropriate statistical tool.

Research Site

The study was conducted in 2nd District of Sorsogon. There are 16 secondary schools identified which were purposively selected as the source of respondents. It consists of 8 big schools and 8 small schools.

Participants

The researcher conducted this study among the science teachers in 16 selected secondary schools in the 2nd District of Sorsogon. The municipalities where the secondary schools are located includes Bulusan, Barcelona, Gubat, Juban, Irosin, Bulan, Matnog and Sta. Magdalena. It consists of 8 big schools and 8 small schools. A total enumeration of all 141 Junior High School teachers teaching science in all the selected schools were the respondents, which includes - 110 Junior High School science teachers from big schools and 31 from small schools.

Instrumentation

The instrument used in this study is survey questionnaire checklist which was constructed by the researcher and validated by some experts. The questionnaire is composed of three parts. Part I consists of the respondent's profile to provide the researcher basic information of the Junior High School teachers. Part II consists of perception on the spiral progression approach along vertical and horizontal articulation. It also consists of the statements which deal on how they perceived the features of the spiral progression approach and it is in a checklist form. Meanwhile, Part III consists of the various strategies in the implementations of Spiral Progression Approach in teaching science. It was based from DepEd Order No. 42, series 2016, while Part IV includes the instructional materials used in Spiral Progression Approach. Finally, Part V includes the difficulties encountered in the implementation of Spiral Progression Approach along strategies and instructional materials.

Validation of Instrument

The survey questionnaire checklist was validated to 10 science teachers of Casiguran Technical Vocational School on December 1, 2018. The questionnaire was then revised based on the responses and comments / suggestions of the respondents in the dry-run. After the revision and preparation of the questionnaire, it was submitted to the researcher's adviser and consultant for further corrections. Suggestions and necessary corrections were made until it was finalized for approval by the members of the panel.

Data Collection

A letter request seeking permission to administer the questionnaire was sent to the Schools Division Superintendent to allow the researcher to gather the needed information. The letter was duly noted by the Dean of Sorsogon State College, Schools of Graduate Studies. After it was approved, a letter request was also made and sent to the principals / school heads of selected secondary schools for approval. After the approval has been sought, the researcher personally went to the selected schools one at a time.

The researcher requested assistance from the head teacher and science teacher of each school for the distribution of the questionnaires. The researcher also explained the details and objectives of the study before the respondents answered the questionnaire for clarity of the contents. Enough time was provided to the respondents to answer the said instrument. The informal interview was also done to further validate the consistency of the responses. This was conducted on December 05 to 14, 2018. The researcher retrieved the questionnaire after the respondents have answered them. Ninety-eight 98% of the questionnaires were retrieved; the other 2% were not due to unavailability of the teachers since it was almost Christmas break during the retrieval of the instrument. Tabulation, analysis and interpretation of data came next. The tabulation and summary of the data collected was done in the school.

Data Analysis

The data collected from the respondents were statistically treated, analyzed and interpreted. The appropriate statistical measures used in the interpretation of data were the frequency count, percentage and rank. Frequency count was used to determine the number of times a particular answer was chosen by the respondents determining the perception, teaching strategies and instructional materials used along vertical and horizontal articulation and difficulties encountered in the implementation. On the other hand, rank was used to identify the most and the least frequent factors.

IV. RESULTS AND DISCUSSION

Table.1. Vertical Articulation of the Spiral Progression Approach in Teaching Science

Perceptions	f	rank
1. There is continuity of lessons in the same concept of science in all grade levels.	106	3
2. The topics discussed in the previous years are needed in the present year.	127	1
3. The progressions of learning competencies of science are discussed in all grade levels.	81	4
4. The lessons are easy to understand since the same topics are offered in all grade levels at varying level of complexities.	65	5
5. The topics are reviewed from the previous grade level before introducing new topics.	114	2

Table 1 shows the teachers' perception of the Spiral Progression Approach along vertical articulation. It is implied in the results that teachers acknowledged the need for the mastery of the pre-requisites concepts and skills in each grade level since there is a continuity of the lessons of the same concept. Teachers should have equipped themselves with the in-depth knowledge of the subject in varying difficulties so as to teach the students the basic skills and ideas and build on these to obtain the advanced levels of knowledge. Fundamental concepts are needed that linked and reinforced the present lessons. On the other side, teachers are usually not able to discuss all the learning competencies due to the continuity of the concepts that they have to establish during instruction. To do this, the teachers have to review of the past lessons. The findings are in consonance with the study of Samala (2017)[6] who concluded that Spiral Progression Approach helped the students improve their retention in science first by revisiting their previous lessons in their lower grade levels and through the review done by their teachers. Review played an important role in the retention process of the students and at the same time stated as one of the difficulties experienced by them and was considered as time consuming. She also stressed that review is indeed a tool to help the students remember what they learned in the previous years. It helped the students to have retention of the subject matter.

Table. 2. Horizontal Articulation of the Spiral Progression Approach in Teaching Science

Perceptions	f	rank
1. The concepts and skills in Life Science, Chemistry, Physics and Earth Science are presented with increasing levels of complexity from one grade level to another.	124	1
2. There is more integration of various concepts on each topic encountered.	81	5
3. The lessons are extended in more elaborate and comprehensive teaching style.	83	4
4. There is an integration of knowledge and skills across different disciplines.	110	2
5. The presentations of the lessons are broadened and deepen each time a concept is revisited.	100	3

Table 2 shows the teachers' perception of the Spiral Progression Approach along horizontal articulation. It means that most of the science teachers perceived that the concepts and skills in all science subjects are presented in such a way that lessons have increasing levels of complexity as student progress from one grade level to another. Teachers also perceived that there is an

integration of knowledge and skills across different disciplines. This is also called interdisciplinary approach in which the lessons learned are incorporated in other areas or field. Through these, students can experience to apply what they have learned and see its value. Moreover, teachers understand that in spiral progression approach, presentation of the lesson must be more broadened and deepen each time a concept is revisited. Though the concepts are the same each grade level, teachers may have utilized varied teaching strategies because of the increasing difficulties as each grade level progresses. Teachers must design lessons that would enhance and deepen their pre-conceived insights from the same lesson they have in their previous year. Tan (2012)[7] lends support in this study since according to him, spiral progression means developing the same concepts from one grade level to the next in increasing complexity and sophistication. Revisiting the topics and concepts at each grade level with increasing depth. Through this, it builds learners prior knowledge and skills and it allow mastery from one grade level to the next. This also agrees with Harden and Stampera (1999)[8] that spiral curriculum is not simply the repetition of a topic taught, it requires also the deepening of it, with each successive encounter building on the previous one. The topics visited are addressed in successive levels of difficulty. Each return visit has added objectives and presents fresh learning opportunities leading to the final over-all objectives. Each visit can bring new knowledge or skills relating to the theme or topics and more advanced applications of areas previously covered.

Table. 3. Strategies used by the Teachers on the Vertical Articulation of the Spiral Progression Approach

STRATEGIES	F	Rank
A. DIRECT INSTRUCTION		
1. Compare and contrast	99	1
2. Demonstrations	87	3.5
3. Drills and Practice	86	5
4. Listening & Viewing	87	3.5
5. Lecture	96	2
B. INDIRECT INSTRUCTION		
1. Case Study	23	6
2. Cloze Procedure	38	5
3. Concept Formation	84	2
4. Inquiry Based	101	1
5. Problem Solving	77	3
6. Reflective discussion	57	4
C. INTERACTIVE INSTRUCTION		
1. Brainstorming	90	2
2. Debates	31	6
3. Cooperative Learning	87	3.5
4. Interviewing	42	5
5. Small Group Discussion	100	1
6. Whole Class Discussion	87	3.5
D. EXPERIENTIAL INSTRUCTION		
1. Games	91	2
2. Experiments	101	1
3. Field Trips	22	6
4. Model Building	50	5
5. Role Play	68	4
6. Simulations	83	3
E. INDEPENDENT STUDY		
1. Essays	62	3
2. Reports	74	2
3. Homework	87	1
4. Research Projects	51	4

Table 3 shows the teaching strategies used in Spiral Progression Approach along vertical articulation.Based on the results presented, majority of the teachers utilize compare and contrast as form of direct instruction teaching strategies. Some also preferred to use lecture method or the traditional methods of teaching. Demonstration and Listening and viewing as teaching strategies are seldom used while drills and practice as the least likely used teaching strategies under direct instruction.The data also revealed that under indirect instruction, teachers preferred to use inquiry-based and concept formation in their lessons. This is in congruence with the provisions in the K to 12 Curriculum for science subjects to use inquiry-based approach in teaching. Arthur (2005)[9] supported that inquiry-based science experiences positively affected students' attitudes in science and their

participation. In addition, students worked collaboratively, made connections to other experiences, and demonstrated confidence in their ability to ask and answer their own questions through inquiry-based experiences. For interactive instructions, all teachers prefer to conduct their lessons using small group discussions and less likely to use interviewing and debates. Along with experiential instructions, teachers usually execute lessons through experiments, games and simulations. Meanwhile, the strategy least used by the teachers under experiential instruction is the field trips since it is costly and expensive. Braund (2009)[10] provides support on experiments as a strategy in Science. His findings revealed that pupils enjoy science laboratory and much practical science at primary school, value it as a method of learning science and look forward to doing more of it with much better apparatus and equipment when they arrive at secondary school. Furthermore, teachers gave homework and reports to students as form of independent study.

Table. 4. Strategies used by the Teachers on the Horizontal Articulation of the Spiral Progression Approach

STRATEGIES	f	Rank
A. DIRECT INSTRUCTION		
1. Compare and contrast	63	5
2. Demonstrations	95	1
3. Drills and Practice	81	3
4. Listening & Viewing	76	4
5. Lecture	83	2
B. INDIRECT INSTRUCTION		
1. Case Study	58	5
2. Cloze Procedure	51	6
3. Concept Formation	65	4
4. Inquiry Based	86	2
5. Problem Solving	97	1
6. Reflective discussion	78	3
C. INTERACTIVE INSTRUCTION		
1. Brainstorming	79	3
2. Debates	59	6
3. Cooperative Learning	89	1
4. Interviewing	71	5
5. Small Group Discussion	80	2
6. Whole Class Discussion	77	4
D. EXPERIENTIAL INSTRUCTION		
1. Games	76	4
2. Experiments	88	2
3. Field Trips	53	6
4. Model Building	70	5
5. Role Play	80	3
6. Simulations	89	1
E. INDEPENDENT STUDY		
1. Essays	69	3
2. Reports	68	4
3. Homework	85	1
4. Research Projects	82	2

Table 4 shows the teaching strategies used in Spiral Progression Approach along horizontal articulation. The table shows that most of the teachers preferred demonstrations and lecture as the most used direct instruction teaching strategies under horizontal articulation since these method is very common and useful. Another strategy under direct instruction is drill and practice. This approach is very familiar since most of the science teachers utilize this in their classroom. The result agrees with the findings of Mohan (2018)[11]. In his study, he found out that the students who use the drill and practice method shows higher performance achievement and understanding compare to the group who use conventional way of learning Under indirect instructions, teachers teaching science utilizes problem solving and inquiry based as most used teaching strategies. Most teachers implement cooperative learning in conducting their interactive instruction. Herreid (2016)[12] lends support in this study regarding team learning as a special method of cooperative learning. It has been used to different disciplines with great success, but ideally suited for the sciences. Along experiential instruction, simulations, experiments and role play are used mostly by the teachers. Meanwhile, it can be gleaned that teachers preferred to used homeworks and research projects as strategies along independent study in both vertical and horizontal. Homework is a school work given at school to do at home. It strengthens learning and

promotes longer retention of the concepts. Similarly, research project has a similarity with homework may also be an expansion on the past work that develop further knowledge on a particular topic.

Table. 5. Instructional Materials used by the Teachers on the Vertical Articulation of the Spiral Progression Approach

Instructional Materials	f	rank
1. Multimedia (Videos, Power Point, Prezi, Movies)	93	5
2. Laboratory Equipment	103	3
3. Learners Module / Reference Books	115	1
4. Interactive Games	64	6
5. Models / Picture / Illustrations / Drawing	111	2
6. Concept Map / Flow Chart / Mind Map	101	4
7. Strategic Intervention Materials (SIM)	43	7
8. Electronic Science Apps	29	8

Table 5 shows the instructional materials used by the teachers along vertical articulation. This implies that teachers mainly rely on learners' module/reference books as their main instructional materials. It is still one of the most important teaching materials despite the presence of the technology which is being used by most of the students nowadays. There is a need to augment teachers' need in a more advanced instructional material to cater the millennial learners. De dios (2012)[13] stressed that in high school, the spiral curriculum not only requires good teachers who could handle multiple disciplines, but also a different type of textbook. Another instructional materials being used by the teachers is the models / pictures / illustration / drawing. Using these, it enhances the imagination of the students in order to understand better concepts in science and enable real world application.

In addition, models are one of the very powerful instructional materials bridges and make unfamiliar phenomena seem more relevant in science education and it is necessary to argue the degree of their usefulness rather than whether they are right or wrong. Models are powerful teaching and learning tools.

Table. 6. Instructional Materials used by the Teachers on the Horizontal Articulation of the Spiral Progression Approach

Instructional Materials	f	rank
1. Multimedia (Videos, Power Point, Prezi, Movies)	107	1
2. Laboratory Equipment	84	4.5
3. Learners Module / Reference Books	84	4.5
4. Interactive Games	70	8
5. Models / Picture / Illustrations / Drawing	88	2
6. Concept Map / Flow Chart / Mind Map	87	3
7. Strategic Intervention Materials (SIM)	63	6.5
8. Electronic Science Apps	63	6.5

Table 6 shows the instructional materials used by the teachers along horizontal articulation. As shown in the table, majority of the teachers make use of multimedia (videos, power point, prezi, movies) as their instructional materials. Model/picture/ illustrations/drawing and Concept map are also preferred over Learners module/reference books. SIM and e-science apps are often used by some of the teachers in schools.This implies that teachers are aware of the importance of the use of ICT as an aid in the learning process. Teachers must keep up with the trends that the learners are up to their advantage. Keeping abreast with the maximum use of available technology as instructional materials motivates all types of learners.

The study is in lined by the study of Sahin (2006)[14] that focused on multimedia as instructional materials. Results showed that computers may play important roles in the classroom and laboratory science instruction in either the classroom or distance. They can be used with instructive or constructive pedagogy. Computer simulations give students the chance and opportunity to observe a real world experience and interact with it.

Table.7. Difficulties encountered by the Teachers on the Implementation of the Spiral Progression Approach along Strategies

Problems	Small School		Big School	
	f	Rank	f	Rank
1. Knowledge on the use of strategies is inadequate.	7	7	35	6.5
2. There is difficult in choosing the appropriate strategy/ies to the level of understanding of students.	18	4.5	48	5
3. Selecting appropriate strategy/ies to be used in the topic to be discussed is difficult.	10	6	35	6.5
4. Time allotment in the use of some teaching strategies is not enough to cover the topic.	23	2.5	93	1
5. There is time constraint in the use of differentiated instruction for evaluation.	23	2.5	81	2
6. Preparation of interactive activities that will not cater all types of learners.	24	1	76	3
7. Varied and appropriate rubrics for differentiated instruction is difficult to prepare.	18	4.5	61	4

Table 7 shows the difficulties encountered by the teachers on the implementation of the Spiral Progression Approach along strategies. As revealed in the table, teachers in the small and big group of schools have encountered the following three difficulties - time allotment in the use of some teaching strategies to cover the topics; time constraint in the use of differentiated instructions for evaluation and preparation of interactive activities that will cater all types of learners. Most of them agreed that enough time should be allotted so that they can effectively use strategies to finish the science concepts and to give appropriate evaluation of learning outcomes. They also have difficulties in preparation of interactive activities that is best suited to all types of learners. This implies that there is a need for the teachers to reinforce and update their knowledge in the different teaching strategies that is in lined with the learning competencies set by the K-12 curriculum. Strengthening their know-how on the use of teaching strategies through the LAC Sessions is a way of helping teachers cope up with the difficulties they encountered in spiral progression. Snider (2004)[15] provide support with regards to the difficulties encountered, he stated that the problem with the spiral design is that the rate for introducing new concepts is often either too fast or too slow. All concepts are allottedequal amount of time whether they are easy or difficult to master. Units are approximately the same length, and each topic within a unit is 1 day's lesson thus there will be not be enough time to introduce.

Table .8. Difficulties Encountered by the Teachers on the Implementation of the Spiral Progression Approach along Instructional Materials

Problems	Small School		Big School	
	f	Rank	f	Rank
1. Inadequate/ Lack of Instructional Materials in the subjects.	18	4	70	2
2. There is limited number of Learner's Module and Teacher's Guide.	13	5	66	4
3. There are limited laboratory materials, equipment and chemicals for student's and teacher's use.	24	1	69	3
4. Laboratory Rooms for the conduct of experiments are inadequate.	22	2	73	1
5. Preparations of Learning Materials are time consuming.	12	6.5	59	5
6. There is difficulty in using the available Learning Materials due to inadequate knowledge/lack of training.	12	6.5	38	7
7. The relevance of Instructional Materials used for contextualization are confusing.	4	8	31	8
8. There are no available internet connections to serve as other source of knowledge for my lessons.	20	3	49	6
9. Financial Constraint	0	9.5	1	9.5
10. Lack of support from the School	0	9.5	1	9.5

Table 8 shows the difficulties encountered by the Teachers on the implementation of the Spiral Progression Approach along instructional materials. As revealed in the table, teachers in the small and big group of schools have encountered the following

three difficulties – inadequate laboratory rooms for the conduct of experiments; limited laboratory materials, equipment and chemicals for students and teachers use and inadequate / lack of instructional materials in the subjects. These findings mean that teachers in big schools have difficulty in implementing the spiral progression approach mainly due to inadequacy of laboratory rooms for conducting science experiments. There are limited laboratory materials, equipment and chemicals for students and teachers' use. In addition, teachers also face challenges due to inadequate / unavailability of instructional materials needed for the teaching-learning process. The perceived difficulties encountered by small schools are somewhat different. While both groups struggle in the inadequacy of laboratory rooms and science laboratory equipment/chemicals, small schools perceived the unavailability of internet connection as difficulty encountered in teaching science concepts.

V. CONCLUSION

It was concluded in this study that in vertical articulation, most of the teachers perceived that the topics discussed in the previous grade level are pre-requisites in the present grade level. In terms of horizontal articulation, teachers believed that the concepts and skills in life science, chemistry, physics and earth science are presented with increasing levels of complexity from one grade level to another.There are different strategies used by the teachers in in implementation of Spiral Progression Approach along vertical and horizontal under direct, indirect, interactive experimental instruction and independent study. Meanwhile, teachers utilized different instructional materials along the said approach. However, science teachers encountered several difficulties in the implementation of spiral progression approach along teaching strategy and instructional materials.

TRANSLATIONAL RESEARCH

Findings of the study can be translated to the teachers in each grade level that should have collaborate with one another so that progression of learning competencies with varying level of complexities are thoroughly discussed in all grade level. There is a need to deepen teachers' insights on the appropriate teaching strategies that can be utilized in both vertical and horizontal articulation of the spiral progression approach. The DepEd and school administrators should prioritize the allocation and utilization of MOOE respectively on the instructional materials needed in the curricula and in assigning teaching loads to teachers, the school heads should consider teacher's major or specialization because they have a good grasp of the strategies and instructional materials appropriate and relevant to the subject.

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