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Spiral Progression Approach in Teaching Science in the K-12 Curriculum

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A B S T R A C T

This study determined the use of the spiral progression approach in teaching science during the pandemic in a selected school in the City Schools Division Office of Antipolo. The study specifically determined the teachers' perception of the use of the spiral progression approach in teaching science during the pandemic in the different aspects of the curriculum and the extent of the factors the teachers encountered. The study employed a descriptive-correlational design to establish the relationship between the respondents' profile variables and the way the spiral progression approach is used in the different aspects of the curriculum, and the relationship between the aspects of the curriculum where the spiral progression approach is used and the factors the teacher-respondents encountered in teaching science during the pandemic. The study used an adapted and validated survey questionnaire checklist distributed to forty (40) science teachers of Antipolo National High School during SY 2022-2023 to gather the needed data. The study revealed that the respondents often follow the principles of the spiral progression approach in teaching science during the pandemic. The study also revealed the respondents' strong agreement with the factors related to students, teachers, and school, as factors they encountered in teaching science using the spiral progression approach during the pandemic. In addition, the study revealed that the respondent's age, position title, length of service, and teaching modality during SY 2020-2021 and SY 2021-2022 affected their perception of the use of the spiral progression approach to teaching science during the pandemic in the mentioned aspects of the curriculum in the study. Moreover, only the strategies the respondents employed in teaching science using the spiral progression approach during the pandemic and the student-related factors, the evaluation techniques and the teacher-related factors, and the evaluation techniques and the school-related factors are found to be significantly related. The study suggests that the use of the spiral progression approach in teaching science may be betterimproved by equipping the teachers with the essential knowledge of the subject content and skills set to use to effectively deliver the curriculum. The study further suggests that the learners and the teachers be provided with learning and instructional materials that are aligned with the curriculum.

Keywords: Spiral Progression Approach, aspects of curriculum, learning activity, strategy, instructional material, evaluation technique, student-related factor, teacher-related factor, school-related factor

1. Introduction

The Philippine government continues with its effort to evolve the way education in the country will be managed and implemented. On May 15, 2013, the K-12 curriculum was put in place through the enactment of R.A. 10533 or the "*Enhanced Basic Education Act of 2013*". This education reform established by the Philippine government primarily aimed to strengthen the basic education curriculum in the country by increasing the number of years of basic education from 10 years to 12 years. During these two additional years, students are expected to venture into opportunities that will expose them more to a wide array of knowledge, preparing them to be high school graduates that are responsive to the demand and challenges of society and equipped with skills compliant with the international standard set across the globe.

The law as it was implemented has posed so many changes withthe way the curriculum will be implemented. One of the highlights that the law has inflicted was the approach used in teaching. As per stipulated in section 5 (g) of R.A. 10533, *"The curriculum shall use the spiral progression approach to ensure the mastery of knowledge and skills after each level."* In this scheme, learners are introduced to a wide variety of concepts and disciplines in which ideas are taught at a young age and retaught in the following years in an increasing complexity until the learners master them. In this approach, it is also expected that the competencies will be decongested since they are arranged in terms of a spiral progression manner. In the learning area of science, the differentconceptsand skills in its different areas are said to be incorporated into every grade level with an increasing manner of complexity.

The implementation of the K-12 curriculum during its early years is faced with many challenges. Its effectiveness was questioned numerous times. Thecall for it to be reformed became a yearly concern and turned as anextensive issuein the country when the results of the Programme for International Student Assessment (PISA) 2018 were made public and revealed that among 79 participating countries and economies, the Philippines ranked last in reading and second to last place in science and mathematics. Accordingly, besides the DepEd's National Achievement Test (NAT), PISA is among the system assessments that the DepEd considered in generating the necessary feedback to update the policies and implement reforms. Consequently, the results of PISA 2018 only manifested that the DepEd has failed in the implementation of the K-12 curriculum, whose primary goal is to provide every Filipino learner with a quality education that is globally competitive and based on a curriculum that is compliant with global standards and pedagogically sound.

Meanwhile, in a school-based setting, learners are given classroom assessments regularly as an integral part of the curriculum implementation. As highlighted in the DepEd's DO 8 s.2015 or the *Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program*, the principal purpose of the assessment is to help the students perform well, consistent with the learning standards which includes the content standards, performance standards, and learning competencies that are specified in the curriculum. Between the formative and summative assessments given to the learners, the summative evaluation determines if the students have met the performance and content standards the curriculum has set. Raganit (2021) in his study emphasized that instructional development, assessment modifications, and even school governance all depend on school-based data from assessment results. He added that the Mean Percentage Scores (MPS) might be viewed as factual baseline data for lesson upgrades, the selection of learning resources, and adjustments of school improvement plans. Correspondingly, Collera, Pojeda, and Lauron (2020) have cited Etcobañez (2014) in their research which stated that every school strives to improve academic results, especially in achieving the material standard MPS of 75% for each subject area. Thus, the MPS determines the learner's learning outcomes and the effectiveness of the curriculum and instruction. In the case of Antipolo National High School, the MPS, particularly in science, has never reached the 75% benchmark. Specifically, the MPS obtained during 2019-2020 across all grade levels has an average of 44.98 %. It was 52.91% during 2020-2021 and 47.91% this school year 2021-2022. Looking at these MPS for the last three (3) school years, it could be enough to say that there is a problem with how the K-12 curriculum is implemented beginning from the school level.

Every year, the Department of Education (DepEd) improves the implementation of the K-12 curriculum in the country. However, in 2020, the COVID-19 pandemic arose as a challenge that the department needs to combat. For a while, the operation of the schools in the country and across parts of the globe had stopped. As a response to the challenges caused by the pandemic, the officials of every government across the globe have taken their actions to transform their educational landscape, making it a responsive system to the challenges brought by the COVID-19 pandemic. In the Philippines, the government, through the DepEd, has instituted the operationalization of itsDO 12 s.2020, or the *Policy Adopting the Basic Education Learning Continuity Plan for School Year 2020-2021 in the light of the Covid-19 Public Health Emergency*. The policy primarily introduced the department's Basic Education-Learning Continuity Plan (BE-LCP) or the package of education interventions that the department has developed to respond to the basic education challenges caused by COVID-19. The package include features like the restructuring of the K-12 curriculum into the Most Essential Learning Competenciesin whichlearning competencies in all learning areas from kindergarten to Grade 12were reduced from 14,171 to 5,689; introduction of various learning modalities that schools can adoptas it resume its operations; learning resources in which SLMs both in print and digital format are made available to supplement the available textbooks; and other strategies that would help DepEd in operationalizing its BE-LCP principles.

When the DepEd announced the resumption of school operations in the country, many questioned its implemented programs. Mainly when the school year 2021-2022 is about to begin, Dr. Christopher C. Bernido, an academician from the National Academy of Science and Technology (NAST), a physicist, co-founder of Central Visayan Institute Foundation, and a Ramon Magsaysay awardee in education, suggested that R.A. 10533 be amended, deleting, in particular, the provision in section 5 (g) that states, *"The curriculum shall use the spiral progression approach …"*. He further recommended that, because of the pandemic, schools may be allowed to choose between spiral and disciplinal curricula as an emergency measure. Correspondingly, Fr. Bienvenido F. Niebres, SJ, a mathematician, and a former president of Ateneo de Manila University (AdMU) added that schools should be allowed to focus on the most essential topics. According to Fr. Niebres, the AdMU has shifted already to a disciplinal curriculum as its response to the call of time (Mirasol, 2021).

Relative to the above-cited propositions on the implementation ofK-12 curriculum, specifically during the time of the COVID-19 pandemic, the researcherdecided to embark on the conduct of this study focused on the use of the spiral progression approach in teaching science during the pandemic. This studyparticularly determined the teachers' perception of the use of the spiral progression approach in teaching science in the different aspects of the curriculum,namely; learning activities strategies, instructional materials, and evaluation techniques; theextent of the factors like student-related factors, teacher-related factors, and school-related factors that the teachers encountered in teaching science using the spiral progression approach during the pandemic; the relationship that the teacher's profile have with their perceptionconcerning the use of the spiral progression approach in teaching science during the pandemic with respect to the cited aspects of the curriculum; and the relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching science during the pandemic with respect to the cited aspects of the curriculum and the factors they encountered in teaching science using the spiral progression approach during the pandemic. Moreover, the researcher believed that this study findings would give the people in the academe idea of the status of science teaching that usesthe spiral progression approach and enabling them, particularly teachers, to bridge the gap that most likely affects the learner's learning.

2. Methodology

This study employed a descriptive-correlational research design to explain the relationship between the study's independent and dependent variables. This study using a descriptive-correlational method, established the relationship between the teacher-respondents profile variables and the way the spiral curriculum approach is used in the different aspects of the curriculum and the relationship between the aspects of the curriculum where the spiral curriculum approach is used and the factors the teacher-respondents encountered in teaching science during the pandemic.

The data needed was gathered from theforty (40) science teachers from Antipolo National High School that were purposively selected and described in the study in terms of thevariables which the researcherthinks pivotal in the implementation of the curriculum. Specifically, the data needed was collected using amodified survey questionnaire checklistadapted from the study of Padilla (2020) of Tomas Claudio Colleges, which was subjected to a series of experts' validation before it is disseminated to the respondents.

The data that were collected were subjected to various statistical treatments, which include frequency and percentage distribution, weighted, mean, and Chi-square test, and interpreted following the principles of Likert scaleindicated in the table below below.

Table 1. Likert scale distribution of values and interpretation.

Scale	Range	Verbal Interpretation
4	3.26 – 4.00	Always / Strongly Agree
3	2.51 – 3.25	Often / Agree
2	1.76 – 2.50	Sometimes / Disagree
1	1.0 – 1.75	Never / Strongly Disagree

3. Results and Discussion

Problem No. 1. Profile of the respondents:

Most of the respondents belong to the age group of 31 to 40 years old. Their number of 23 is equal to 57.5% of the total respondents.37 of the 40 respondents, or 92.5% of the total, were female.

Most respondents—30 out of 40, or 75%—only have bachelor's degrees.

Regarding the training attended, 18 or 45% of the respondents have attended seminars/training at the Regional Level.

For the number of seminars/training sessions attended regarding curriculum implementation, 25 of the 40 respondents, or 62.5% of the total respondents, attended only 1 to 5 seminars/training.

Most of the respondents were Teacher I. Their number of 28 is equal to 70% of the total respondents.

Most of the respondents were just new to the service. A total of 15 out of 40 respondents were teaching for 1 to 5 years.

During SY 2020-2021, 33 out of the 40 respondents, or 82.5% of the total, were teaching in a Modular learning scheme.

Meanwhile, 28 out of 40 respondents, or 70% of the total respondents, were teaching in a Modular-Printed learning scheme during the SY 2021-2022.

For the grade level taught, the most significant number of respondents, or 12 out of 40 respondents, equivalent to 30% of the total, were teaching Grade 9 Science.

Problem No. 2. Perception of the respondents concerning the use of the spiral progression approach in teaching science during the pandemic with respect to aspects of the curriculum:

Table 2.1. Perception of the respondent concerning theuse of the spiral progression approach in teaching science during the pandemic with respect tolearning activities

Learning Activities	WM	VI
1. There is more integration of various concepts on each topic encountered.	3.03	O
2. The lessons are extended in a more elaborate and comprehensive teaching style.	2.80	O
3. There is an integration of knowledge and skills across different disciplines.	2.93	O
4. The topics discussed in the previous years are pre-requisite for those topics in the current year. Thus, they are reviewed before a new topic is introduced.	3.25	O
5. There is continuity of lessons in the same science concept in all grade levels.	3.10	O
6. The lessons which cover the same topics in other grade levels are presented at varying levels of complexity.	3.18	O
7. The information the students have acquired about a topic is reinforced and deepened as they revisit the subject matter.	2.98	O
8. The learning experiences exposed the students to a wide variety of concepts/topics, skills, and attitudes deemed of "continual concern of everyone" until they are mastered.	2.70	O
9. Learners learn topics and skills appropriate to their developmental/cognitive stages.	2.80	O
10. Learners are provided with activities or projects that target developing their thinking skills and dispositions, which do not stop at	3.23	O

identification but facilitate implementation of the desired performance.		
Composite Mean	3.00	O

Legend: 4(3.26-4.00) – Always(A), 3(2.51-3.25) – Often (O), 2(1.76-2.50) – Sometimes (S), 1(1.00-1.75) – Never (N)

The learning activities provided and performed by students, as determined by the computed composite mean of 3.0, were often based on the spiral progression approach. The learning activities provided to the students, as evidenced by a weighted mean of 3.25, specifically included topics covered in previous years. However, as evidenced by the weighted mean of 2.70, the student's learning experiences from the learning activities often expose them to concepts/topics, skills, and attitudes they are expected to learn.

The results that table 2.1 has revealed about how science is being taught during the pandemic following the spiral progression approach in the learning activity aspect of the curriculum have highlighted the importance of those topics discussed during the previous year to the current year's topics. This result is consistent with one of the findings that Valin and Janer (2019) have discovered in their study that the topics discussed in the previous years are pre-requisite for those topics in the current year. Thus, they are reviewed before a new topic is introduced to the students. Moreover, the statements in table 2.1, which describe the continuity and complexity of science lessons and learning activities, agree with how Johnston (2012) explained Bruner's (1960) work on the spiral curriculum. Accordingly, the spiral curriculum lets the students return to a topic, theme, or subject on multiple occasions as they progress from one level to another, wherein the topic becomes more complex, letting the learner learn a new concept that is related to their previous knowledge of the subject (Bruner, 1960; Johnston, 2012).

However, the results the table has presented mainly for item number 8, which says that the learning experiences provided to students exposed them to a wide variety of concepts/topics, skills, and attitudes that are deemed of "continual concern of everyone" until they are mastered seemed to be given lesser concern as manifested by the weighted mean of 2.70 and interpreted as often observed by the teachers in teaching science. If we are to recall the reason why the spiral progression approach is adopted as the primary approach in the implementation of the K-12 curriculum in the Philippines, the government, through the passage of R.A. 10533, wanted to ensure that the learners have acquired the necessary knowledge and skills in each level of learning. As Resurreccion and Adanza (2015) have explained in their study, the spiral progression approach is a scheme wherein learners are introduced to various concepts and disciplines until they master them. Pondering the results presented in the table of how the students are provided with learning activities, it could be said that the students learning experiences do not expose them to a wide variety of concepts/topics, skills, and attitudes that are essential to them. Thus, the way Science is taught to students during the pandemic in the aspect of the curriculum relating to the learning activities does not strictly conform with the ideals the law has provided.

Table 2.2. Perception of the respondent concerning theuse of the spiral progression approach in teaching science during the pandemic withrespect to teaching strategies

Strategies	WM	VI
1. I prepare every science lesson and the curriculum with a proper blending of concepts, skills, and values from the natural and physical sciences and appropriately sequenced them from the start upward according to the difficulty level.	3.25	O
2. In preparing the lesson, I always check on what the students have previously learned and reflect on what "prior knowledge" is needed by the students for the new lesson to be presented to them.	3.63	A
3. When presenting a new lesson, I associate them with the basic concepts that were previously discussed and re-emphasized them many times to help the students master them.	3.53	A
4. I present topics and skills appropriate to students' developmental/cognitive stages.	3.40	A
5. As learning progresses, I present topics in a more detailed way wherein topics are progressively elaborated, leading to a broadened understanding and knowledge transfer.	3.45	A
6. I present key concepts repeatedly throughout the curriculum to let the students reinforce what they have previously learned but with deepening levels of complexity.	3.43	A
7. I encouraged the students to apply what they have previously learned to the topics being discussed at present.	3.50	A
8. I provide linkages between each lesson as the students "spirals upwards" in a course study to help them see the connections among the lessons.	3.35	A
9. I expose the students to a wide variety of concepts/topics, skills, and attitudes that are deemed of "continual concern to everyone" until they are mastered.	3.35	A
10. I construct lessons, activities, or projects that target the development of thinking skills and dispositions which do not stop at identification but instead facilitate implementation of the desired performance.	3.48	A
Composite Mean	3.44	A

Legend: 4(3.26-4.00) – Always(A), 3(2.51-3.25) – Often (O), 2(1.76-2.50) – Sometimes (S), 1(1.00-1.75) – Never (N)

The strategies employed by the respondents were always anchored to the principles of the spiral progression approach, and this is evident with the computed composite mean of 3.44. As denoted by the weighted mean of 3.63, the respondents always check what their students had previously learned.

On the other hand, as indicated by the weighted mean of 3.25, the respondents often observed the harmonization of concepts, skills, and values from the different areas of sciences and their appropriate sequencing based on the difficulty level when they prepared their lessons and the curriculum.

The results table 2.2 revealed is consistent with what Bruner (1960) and Johnston (2012) have explained and established about the features of the spiral curriculum wherein the new learning the learner has learned is deemed related to the learner's previous knowledge and is placed in the context of the earlier knowledge the learner has learned. Therefore, there is a need for a teacher to check on what their students have previously learned and consider the prior knowledge of the learner about the lesson to be presented to them. As Bruner (1960) highlighted, learners must attain the most basic understanding of a subject by having a solid understanding of the underlying principle. Because if their knowledge is not structurally organized in terms of principles and ideas, they may find little reward in intellectual excitement and be more likely to forget what they have learned. In the same context, if the learner was introduced to a specific topic or skill without connecting it to core principles in the broader field of knowledge, then they are most likely unable to generalize from what has been learned and apply it in other scenarios (Bruner, 1960; Ireland & Mouthaan, 2021).

On the other hand, the table, as indicated by the weighted mean of 3.25, revealed that the respondents often observed the harmonization of concepts, skills, and values from the different areas of sciences and their appropriate sequencing based on the difficulty level when they prepared their lessons and the curriculum. This is associated with what Resurreccion and Adanza (2015) have quoted in their study, that science teachers are teaching other branches of science that are not in line with their area of specialization. Consequently, they delivered the lesson without an in-depth discussion or harmonization of concepts, skills, and values from the different areas of science. Also, this finding speaks of the reality in the field wherein teachers find alternative ways of rendering the curriculum because of a very limited period in a school year devoted to a particular branch of science. As Kronthal (2012) and Resurreccion & Adanza (2015) have stated, the spiral curriculum is an intensive design of mixing sciences. However, only a quarter of a school year is devoted to each branch of science. This exposes the student to a very minimal topic in each area of science (De Dios, 2013; Resurrecion and Adanza, 2015). As we all know, topics in science are built on top of each other, and a quarter is not enough time to cover the essential knowledge the student needs to embark on another field. This dearth of opportunity to cover various topics in one discipline in a year may be highlighted as the biggest drawback of a spiral curriculum when applied to science.

Table 2.3. Perception of the respondent concerning theuse of the spiral progression approach in teaching science during the pandemic with respect to instructional materials

Instructional Materials	WM	VI
1. I use multimedia materials like videos, PowerPoint, Prezi, and Movies in teaching science lessons.	3.08	O
2. I use laboratory equipment in the conduct of scientific experiments.	2.30	S
3. I use the learner's/self-learner's module as a reference for the lesson and activities.	3.65	A
4. I use interactive games in teaching science lessons.	2.60	O
5. I use models/pictures/illustrations/drawings to deliver science lessons.	3.65	A
6. I use a concept map/flow chart/mind map in presenting and generalizing concepts about the science lessons.	3.55	A
7. I use science manipulatives like DNA and electric circuit models to teach science concepts.	2.48	S
8. I use electronic science applications like a virtual laboratory, a Physics calculator, and those in Khan Academy to teach science lessons.	2.18	S
9. I use strategic intervention materials to help students master competency-based skills they could not develop during the lesson.	3.03	O
10. I use Knowledge Channel to supplement the student's learning while at home.	2.68	O
Composite Mean	2.92	O

Legend: 4(3.26-4.00) – Always(A), 3(2.51-3.25) – Often (O), 2(1.76-2.50) – Sometimes (S), 1(1.00-1.75) – Never (N)

The instructional materials the respondents used to teach science during the pandemic, as validated by the composite mean of 2.92, were often consistent with the principles of the spiral progression approach. Most of the time, as denoted by the weighted mean of 3.65, the respondents used the learner's module as a reference for the lesson and activities given to the students. As indicated by the weighted mean of 2.18, the respondents often used electronic applications like a virtual laboratory, a Physics calculator, and those in the Khan Academy in teaching.

These results are the same as what Valin and Janer (2019) found in their study, that teachers mainly rely on the learner's module as a reference for the lesson and activities given to students. This signifies the importance of a book and other printed materials in the students' learning amid the availability of so much technology today to which most students have access and are very adept. Valin and Janer (2019) also noted that teachers use models, pictures, illustrations, and drawings to aid students' imagination and better understand science concepts.

Consequently, as evidenced by the weighted mean of 2.18, the teachers sometimes used electronic applications like a virtual laboratory, a Physics calculator, and those in the Khan Academy in science lessons. Teachers sometimes use electronic applications to teach science could be because they have problems or difficulties with the way such electronic applications are being used in the delivery of the lesson, or it could be because the resources needed are not available; stipulations that are the same as what Gonzales (2019) contended in his study as some of the difficulties faced by the teachers in implementing the spiral progression curriculum. Samala (2018), in her research, indicated that the utilization of technology in the delivery of the lesson had helped the students to be more motivated in learning, especially in the difficult areas of science and in attaining the goal of the spiral progression approach implemented in science. Thus, teachers must keep abreast of using technology as instructional materials.

Table 2.4. Perception of the respondent concerning the use of the spiral curriculum approach in teaching science during the pandemic with respect to evaluation techniques

Evaluation Techniques	WM	VI
1. I use pencil and paper tests to measure students memorized knowledge and levels of understanding.	3.43	A
2. I use visual displays like photographs, diagrams, tables, charts, and models to assess students' analytical thinking skills and grasp of the lesson presented to the class.	3.50	A
3. I let my students do Science Journal entries like a reflection note allowing them to write down their experiences and thoughts about the lessons discussed.	3.00	O
4. I let my students have a research report presentation to let them express their knowledge and understanding of a topic.	2.55	O
5. I use performance-based assessments like producing a product and performing an activity for them to showcase what they know and can do.	3.33	A
6. I use laboratory experiments to gauge students' conceptual understanding of the theory-practice relationship, their higher-level reasoning skills, and the development of their practical competence in laboratory work.	2.43	S
7. I give my students a group/peer assessment to help them develop skills specific to collaborative efforts, allowing them to tackle more complex problems than they could on their own, delegate roles and responsibilities, and share diverse perspectives about the lesson.	2.95	O
8. I give my students a self-assessment to let them reflect on how their work meets the goals set for learning concepts and skills.	3.28	A
9. I provided my students with checklists and rubrics to help them understand and meet the expectations as they worked on their assigned tasks and assignments.	3.70	A
10. I give my students formative assessments for me to know the concepts the students are struggling to understand, skills they are having difficulty acquiring, or learning standards they have not yet achieved so that adjustments can be made to lessons, instructional techniques, and academic support.	3.58	A
Composite Mean	3.17	O

Legend: 4(3.26-4.00) – Always(A), 3(2.51-3.25) – Often (O), 2(1.76-2.50) – Sometimes (S), 1(1.00-1.75) – Never (N)

The way the respondents evaluated the learner's learning outcomes in science, as expressed by the composite mean of 3.17, was often accordant with what the DepEd had stated on how the student's learning in the K-12 spiral curriculum should be assessed. The respondents, in general, as implied by their responses' weighted mean of 3.70, had provided their students with checklists and rubrics to help them understand and meet the expectations as they worked on their assigned tasks and assignments. This result is in unison with what the DepEd has stated in its policy guidelines for assessment. *"The assessment should inform and enhance classroom procedures and promote learning results. Continuing education during the health crisis should ensure that all learners are assessed and graded fairly. In this regard, assessment strategies should establish clear learning targets and success criteria to inform teaching and promote growth and mastery. Each task must be accompanied by clear directions and appropriate scoring tools like checklists, rubrics, and rating scales to help learners better demonstrate their learning" (pp. 1-2).*

However, as manifested by the weighted mean of 2.43, only sometimes do the responders conduct laboratory experiments to evaluate their students' conceptual comprehension of the theory-practice relationship, their higher-level reasoning abilities, and the growth of their practical competency in laboratory work.Samala (2018) discussed that conducting laboratory experiments develops the students' minds to discover science concepts, think critically, and apply what they have learned from the class. However, as manifested by the weighted mean of 2.43, the respondent of this present study sometimes uses laboratory experiments to gauge their learner's "conceptual understanding of the theory-practice relationship, their higher-level reasoning skills, and the development of their practical competence in laboratory work". This is because of the challenge the pandemic brought, wherein laboratory experiments are being replaced by virtual laboratories and alternative experimentation at home that commonly resorted to improvisation or utilization of household items (Owolabi, 2021).

Table 2.5Summary of the perception of the respondents concerning the use of the spiral progression approach in teaching science during the pandemic.

Perception	WM	VI
1. Learning Activities	3.00	O
2. Strategies	3.44	A
3. Instructional Materials	2.92	O
4. Evaluation Techniques	3.17	O
Composite Mean	3.13	O

Legend: 4(3.26-4.00) – Always(A), 3(2.51-3.25) – Often (O), 2(1.76-2.50) – Sometimes (S), 1(1.00-1.75) – Never (N)

Overall, as indicated by the composite mean of 3.13, the respondents often follow the principles of the spiral progression approach in teaching science during the pandemic. From the four aspects of the curriculum emphasized in this study, the strategies employed by the teachers in teaching science were found always to follow the principles of the spiral curriculum. This is supported by the weighted mean of 3.44 and conforms with what Valin and Janer

(2019) have stated in their study that teachers understand how they prepare and select the instructional techniques and methods they employ in teaching science. Accordingly, the teachers recognized that the lesson's presentation should be in a broadened and deepened approach and interdisciplinary nature where the integration of skills and knowledge across the different disciplines is evident.

The other three aspects, learning activities, instructional materials, and evaluation techniques, often follow the spiral curriculum's principles. These are represented by the computed weighted means of 3.17, 3.00, and 2.92, respectively. The reason why the teachers often followed the principles of the spiral progression approach could be associated with what Quintos et al. (2022) revealed in their study as to the assessment of the spiral progression of teachers' readiness in terms of the extent of knowledge to topics. According to them, the teachers' mastery varied across the different science areas, which could be associated with the teachers' area of specialization during their bachelor's degree. Standards-based science teachers need to be well-versed in the different areas of science since the curriculum design compels the teachers to teach all the other areas of science. Also, if we relate the results in the table with the explanation of Tinapay et al. (2021), which considered the spiral progression approach as an approach that promotes new standpoints on the application of teaching and learning development, it would be enough to say that there is much more needed to be done and to considered by teachers, particularly those relating to various aspects of the curriculum that profoundly impact the success of program implementation. As Valin and Janer (2019) have said, teachers need to properly strengthen their knowledge of how to implement the spiral progression approach in the K-12 curriculum since they are the ones who take part in a significant role in the implementation of the curriculum.

Meanwhile, the computed composite means of 3.13 in the table deemed that the respondents often follow the principles of the spiral progression approach in teaching science during the pandemic. In general, the result table 3 revealed is the same as what Balinario (2021) has talked about the teacher's level of applying the spiral progression in the science curriculum concerning the aspects, namely, objectives, methodology, facilities, learning resources, and assessment. The implementation strength is notable in the teachers' methods. On the other hand, the weak point is related to facilities and instructional materials. The overall result the table has revealed about the respondents' perception concerning the use of the spiral progression approach in teaching science during the pandemic with respect to the aspects of the curriculum only indicates that the attention given by teachers to different aspects of the curriculum is not balanced. Some aspects of the curriculum are consistently anchored to the principles of the spiral progression approach, and some are not. This result indicates how teachers are implementing the ideals of the K-12 curriculum after almost a decade of implementation, where the situation has become more challenging because of the pandemic. Furthermore, this result suggests the need for the teachers' knowledge and pedagogical skills to be improved to raise the instructional quality in the country, which is the primary reason why the government implemented the spiral curriculum.

Problem No. 3. Extent of the factors encountered by the teachers in teaching science using the spiral progression approach during the pandemic:

Table 3. The extent of the factors encountered by the teachers in teaching science using the spiral progression approach during the pandemic.

Student-Related Factors	**WM**	**VI**
1. Student's learning styles	3.75	SA
2. Student's study habits	3.83	SA
3. Student's motivation to learn	3.75	SA
4. Student's nutritional status	3.53	SA
5. Student's support from family	3.78	SA
Composite Mean	3.73	SA
Teacher-Related Factors		
1. Teacher's area of specialization	3.60	SA
2. Teacher's teaching style	3.68	SA
3. Teacher's length of service	2.75	A
4. Teacher's attended seminars and training	3.10	A
5. Teacher's personal-related factors	3.23	A
Composite Mean	3.27	SA
School-Related Factors		
1. Learning materials	3.65	SA
2. Assessment and promotion of students	3.45	SA
3. Teacher's teaching load	3.50	SA
4. Support to teacher training	3.53	SA
5. School facilities	3.75	SA
Composite Mean	3.58	SA
Overall Mean	3.52	SA

Legend: 4(3.26--4.00) – Strongly Agree-(SA), 3(2.51-3.25) – Agree (A), 2(1.76-2.50) – Disagree (D), 1(1.00-1.75) Strongly Disagree (SD)

Overall, as indicated by the composite mean of 3.52, the respondents strongly agreed that the factors related to students, teachers, and school are the factors they encountered in teaching science using the spiral progression approach during the pandemic.In general, the result of the table about the factors met by the teachers teaching science using the spiral progression approach during the pandemic is consistent with what Merza et al. (2018), Garcia (2020), Decano (2021), and Paring et al. (2021) revealed in their studies.

In the student-related factors, students' study habits got the highest weighted mean of 3.83, while students' nutritional status got the lowest weighted mean of 3.53.In the study by Garcia (2020), the teacher-respondents agreed that students' study habits were one of those student-related factors affecting students' growth in the science spiral progression curriculum. However, it only comes next to students' motivation to learn.

In the teacher-related factors, the teacher's teaching style got the highest weighted mean of 3.68, while the teacher's length of service got the lowest weighted mean of 2.75. From the literature reviewed in this current study, many identified teachers' specializations as the main factor affecting their teaching. In the study by Quintos et al. ((2022), it was established that teachers' effectiveness is related to their length of teacher service.

In school-related factors, the item about the school facilities got the highest weighted mean of 3.75, while assessment and promotion have the lowest weighted mean of 3.45. In most of the literature reviewed in this current study, the problem with facilities and instructional materials was highlighted as factors that affect implementing the spiral progression approach in science.

Problem No. 4. Relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching science during the pandemic with respect to the aspects of the curriculum, namely, learning activities, strategies, instructional materials, & evaluation techniques, and their profile variables.

Table 4.1. Relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching scienceduring the pandemic with respect to learning activities and their profile variables.

Profile Variable	Computed Chi-Square Value	p-value	Interpretation	Decision
Age	19.265	0.004	Significant	Reject the Hypothesis
Sex	0.942	0.625	Not Significant	Do not Reject the Hypothesis
Highest Education Obtained	1.944	0.378	Not Significant	Do not Reject the Hypothesis
Highest Level of Seminar/Training Obtained	7.200	0.515	Not Significant	Do not Reject the Hypothesis
Number of Seminars & Training Attended	4.738	0.578	Not Significant	Do not Reject the Hypothesis
Position Title	5.419	0.491	Not Significant	Do not Reject the Hypothesis
Length of Service	18.495	0.018	Significant	Reject the Hypothesis
Modality inSY 2020-2021	0.944	0.624	Not Significant	Do not Reject the Hypothesis
Modality in SY 2021-2022	1.240	0.871	Not Significant	Do not Reject the Hypothesis
Level Taught	10.114	0.120	Not Significant	Do not Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

From the specified profile variables of the respondents, only the age profile and the profile about the length of service have a significant relationship with the respondent's perception of the use of the spiral progression approach in teaching science during the pandemic with respect to the learning activity aspect of the curriculum. The results were supported by the p-values of 0.004 and 0.018, respectively, which are lower than the significance value of 0.05 and indicated the rejection of the null hypotheses for the above-cited profile variables. The results mean that the respondents' age and length of service affect their perception of how the spiral progression approach was used in teaching science during the pandemic, specifically in the learning activity aspect of the curriculum.

The results that table 4.1 revealed about the relationship that exists between respondent's perception of the use of the spiral progression approach in teaching science during the pandemic, specifically in the aspect of the curriculum about learning activities and their age and length of service are supported by the result of the study of Maing et al. (2018) which stated that science teachers' knowledge of the subject matter they teach is related to their age and tenure and years in teaching. The University of Northern Iowa (n.d.) explained in an online article published on its website that teachers' in-depth content knowledge or knowledge of the subject matter is fundamental to teaching students based on today's standards. Similarly, for teachers to teach science concepts following the principles of the spiral curriculum where backtracking of the previously discussed concepts and integration of various ideas and skills are involved, the teachers need to be adept at the science concepts not only of their area of specialization but of those areas of science that comprise the curriculum.

The implementation of the spiral progression approach in the K-12 science curriculum not only affected its content and the transitions between its different areas but made teachers problematic regarding their content or mastery of the subject matter since the spiral progression approach required the specialized-science teachers to teach an area of science that is not in line with their area of specialization (Resurreccion & Adanza, 2015; Gonzalez, 2019).

Table 4.2. Relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching scienceduring the pandemic with respect to strategies and their profile variables.

Profile Variable	ComputedChi-Square Value	p-value	Interpretation	Decision
Age	6.825	0.078	Not Significant	Do not Reject the Hypothesis
Sex	0.478	0.596	Not Significant	Do not Reject the Hypothesis
Highest Education Obtained	0.033	0.855	Not Significant	Do not Reject the Hypothesis
Highest Level of Seminar/Training Obtained	4.845	0.304	Not Significant	Do not Reject the Hypothesis
Number of Seminars & Training Attended	0.274	0.965	Not Significant	Do not Reject the Hypothesis
Position Title	2.86	0.414	Not Significant	Do not Reject the Hypothesis
Length of Service	5.266	0.261	Not Significant	Do not Reject the Hypothesis
Modality in SY 2020-2021	0.073	0.787	Not Significant	Do not Reject the Hypothesis
Modality in SY 2021-2022	3.814	0.149	Not Significant	Do not Reject the Hypothesis
Level Taught	1.136	0.768	Not Significant	Do not Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

None of the specified profile variables of the respondents have a significant relationship with the respondent's perception of the use of the spiral progression approach in teaching science during the pandemic with respect to the strategies aspect of the curriculum. The computed p-values were all higher than the significance value of 0.05 and indicated the acceptance of the null hypotheses for all the specified profile variables. The results mean that the respondents' profiles affect their perception of how the spiral progression approach was used in teaching science during the pandemic, specifically in the strategy aspect of the curriculum.

The results the table has revealed, particularly for the relationship between the respondents' perceptions about the use of the spiral progression approach in teaching science during the pandemic concerning strategies and their profiles about their age, length of service, and highest education obtained, are found not consistent with the findings of Maing et al. (2018) which stated that teachers' age, length of service, rank or position, and highest educational attainment correlate with their teaching strategies and approaches. Moreover, the results do not conform to what Quintos et al. (2022) have emphasized in their study, that teachers' ability to be the most influential person in a classroom is significantly influenced by their age, years of experience, and field of specialization.

Table 4.3. Relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching scienceduring the pandemic with respect to instructional materials and their profile variables.

Profile Variable	Computed Chi-Square Value	p-value	Interpretation	Decision
Age	16.099	0.013	Significant	Reject the Hypothesis
Sex	1.230	0.541	Not Significant	Do not Reject the Hypothesis
Highest Education Obtained	2.703	0.259	Not Significant	Do not Reject the Hypothesis
Highest Level of Seminar/Training Obtained	17.476	0.026	Significant	Reject the Hypothesis
Number of Seminars & Training Attended	8.233	0.222	Not Significant	Do not Reject the Hypothesis
Position Title	6.292	0.391	Not Significant	Do not Reject the Hypothesis
Length of Service	17.796	0.023	Significant	Reject the Hypothesis
Modality inSY 2020-2021	3.218	0.200	Not Significant	Do not Reject the Hypothesis
Modality inSY 2021-2022	4.190	0.381	Not Significant	Do not Reject the Hypothesis
Level Taught	7.922	0.244	Not Significant	Do not Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

From the specified profile variables of the respondents, only the profiles about age, level of seminars/training attended, and length of service have a significant relationship with the respondent's perception of the use of the spiral progression approach in teaching science during the pandemic with respect to the aspect of the curriculum about instructional materials. The results were supported by the p-values of 0.013, 0.026, and 0.023, which are lower than the significance value of 0.05 and indicated the rejection of the null hypotheses for the above-cited profile variables. The results mean that the respondent's age, level of seminars/training attended, and length of service affect their perception of how the spiral progression approach is used in teaching science during the pandemic, specifically in the instructional materials aspect of the curriculum.

The results revealed in table 4.3 is the same as what table 4.1 has transcribed about the respondent's perception concerning the use of the spiral progression approach in teaching science during the pandemic with respect to learning activities. The only difference is in the profile about the level of seminars/training attended, which was not identified in table 4.1 as a variable profile that affects the respondent's perception. Moving forward to other profile variables in table 4.3, the sex profile with a p-value of 0.541, the education profile with a p-value of 0.259, the number of seminars/training attended profile with a p-value of 0.222, the position title profile with a p-value of 0.391, the teaching modality profiles with p-values of 0.200 and 0.381, and the grade level taught profile with a p-value of 0.244, are found to have p-values that are higher than the significance level of 0.05—emphasizing that these profile variables do not affect the respondent's perception of how the spiral progression approach is used in teaching science at the time of the

pandemic, particularly in the aspect of the curriculum related to the instructional materials.
The age and the length of service of a teacher, in general, go hand in hand. The older the age, the longer the length of the service. The results the table has revealed, particularly for the relationship that exists between the respondents' perception concerning the use of the spiral progression approach in teaching science during the pandemic regarding instructional materials and their profile concerning their age and length of service, are in conformance to what Manalo and Yazon (2022) have concluded in their study. According to them, there is no significant difference among teachers' assessments of the spiral progression approach regarding instructional materials according to age. This may be because teachers, regardless of age, have the same perspectives and ideas on implementing the spiral progression approach, especially regarding the instructional materials. Correspondingly, this result could also be associated with the kind of instructional materials used in the curriculum delivery being limited by the modality the teacher is engaged with.

Concerning the seminars and training obtained that are found to be significantly related to respondents' perception of the use of the spiral progression approach in teaching science, especially in the aspect of the curriculum that concerns the instructional materials, this could be associated with what Balinario (2021) has stipulated in his study that the seminars, training, orientations conducted by the DepEd for this spiral curriculum are effective and helps the DepEd to implement its program. Quintos et al. (2022) defined teacher training as an ongoing process that enhances instructors' ability to teach, helps them learn new information and helps them gain better or newer proficiency—all of which contribute to better learning for students. Therefore, it has been shown that providing instructors with ongoing professional development has a good effect on their students' attitudes and academic achievement.

Table 4.4. Relationship between the perception of the respondents concerning the use of the spiral progression approach in teaching science during the pandemic with respect to evaluation techniques and their profile variables.

Profile Variable	Computed Chi-Square Value	p-value	Interpretation	Decision
Age	5.319	0.504	Not Significant	Do not Reject the Hypothesis
Sex	1.946	0.378	Not Significant	Do not Reject the Hypothesis
Highest Education Obtained	1.961	0.375	Not Significant	Do not Reject the Hypothesis
Highest Level of Seminar/Training Obtained	9.392	0.310	Not Significant	Do not Reject the Hypothesis
Number of Seminars & Training Attended	1.737	0.942	Not Significant	Do not Reject the Hypothesis
Position Title	14.165	0.028	Significant	Reject the Hypothesis
Length of Service	10.758	0.216	Not Significant	Do not Reject the Hypothesis
Modality in SY 2020-2021	10.334	0.006	Significant	Reject the Hypothesis
Modality in SY 2021-2022	12.791	0.012	Significant	Reject the Hypothesis
Level Taught	6.875	0.333	Not Significant	Do not Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

From the specified profile variables of the respondents, only the profiles about position title and teaching modality during SY 2020-2021 and SY 2021-2022 have a significant relationship with the respondent's perception of the use of the spiral progression approach in teaching science during the pandemic with respect to the aspect of the curriculum about evaluation techniques. The results were supported by the p-values of 0.028, 0.006, and 0.012, which are lower than the significance value of 0.05 and indicated the rejection of the null hypotheses for the above-cited profile variables. The results mean that the respondents' position title and teaching modality during SY 2020-2021 and SY 2021-2022 affect their perception of how the spiral progression approach is used in teaching science during the pandemic, specifically in the evaluation techniques aspect of the curriculum.

The significant relationships that exist between the respondents' perception of the use of the spiral progression approach in teaching science in the evaluation aspect of the curriculum and the profile variables about modality during SY 2020-2021 and SY 2021-2022 could be related to the effect the pandemic brought to teachers and students, particularly in the context of the assessment of learning. As schools prepare for the continuity of education amidst the threat and unprecedented challenges posed by COVID-19, teachers adopt alternative measures of assessing the learners to ensure that the latter achieves the essential curricular goals. Teachers and students both face difficulties conducting assessments while using distance learning. These restrictions include the necessity to account for various contexts while planning, implementing, and grading assessment assignments. Teachers must consider its flexibility in multiple modalities as they prepare the assessment. In distance learning modalities, teachers create tests based on the assumption that students would take them asynchronously and have open access to a variety of resources. They must also think about how they will explain the assessment's design and grading standards to students and their parents and guardians. Additionally, teachers must set up systems for remotely following and documenting the progress of students in order to provide timely, beneficial, and pertinent feedback and to support remediation for students who require additional support (DO 31 s. 2020).

Table 4.5. Overall relationship between the perception of the respondents concerning the use of the spiral curriculum approach in teaching science during the pandemic with respect to the aspects of the curriculum and their profile variables.

Profile Variable	ComputedChi-Square Value	p-value	Interpretation	Decision
Age	12.435	0.043	Significant	Reject the Hypothesis
Sex	2.435	0.375	Not Significant	Do not Reject the Hypothesis
Highest Education Obtained	1.738	0.356	Not Significant	Do not Reject the Hypothesis
Highest Level of Seminar/Training Obtained	2.46	0.389	Not Significant	Do not Reject the Hypothesis

Number of Seminars & Training Attended	3.645	0.324	Not Significant	Do not Reject the Hypothesis
Position Title	15.342	0.029	Significant	Reject the Hypothesis
Length of Service	14.332	0.028	Significant	Reject the Hypothesis
Modality in SY 2020-2021	13.334	0.032	Significant	Reject the Hypothesis
Modality in SY 2021-2022	16.443	0.027	Significant	Reject the Hypothesis
Level Taught	3.442	0.332	Not Significant	Do not Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

From the specified profile variables of the respondents, only five have a significant relationship with the respondent's perception concerning the use of the spiral progression approach in teaching science during the pandemic with respect to the aspects of the curriculum. The profile variables found to have a significant relationship to the respondents' perceptions were profiles about age, position title, length of the service, and teaching modality during the SY 2020-2021 & SY 2021-2022. These results are attested by the p-values of 0.043, 0.029, 0.028, 0.032, and 0.027, respectively. The results established that respondents' perception of using the spiral progression approach in the different aspects of the curriculum was affected by the profile variables mentioned above.

The results that table 4.5 revealed for the profile variables about age and length of service are supported by the study by Quintos et al. (2022). They claim that the teachers' professional profiles have something to do with their occupation. Teachers' capacity to exert the most effect in a classroom is substantially influenced by their age and tenure. Accordingly, a teacher's level of material understanding, and instruction delivery increases with the number of years they spend in the classroom.

Meanwhile, the result of the table for the profile regarding teacher preparation which includes the teacher's obtained degree and seminars attended does not conform to what was stated by Quintos et al. (2022) in their study. According to them, the efficacy and readiness of teachers in terms of the depth of their subject knowledge are both improved by teacher preparation programs and degrees. Similarly, the number of seminars and training sessions that were designed and required for teachers to attend in line with their needs in the teaching world was crucial in raising their level of readiness and performance.\

Table 5. Relationship between the perception of the respondents concerning the use of the spiral curriculum approach in teaching science during the pandemic with respect to the different aspects of the curriculum and the factors they encountered.

Profile Variable	Computed Chi-Square Value	p-value	Interpretation	Decision
Learning Activities vs. Student-Related Factors	0.032	0.984	Not Significant	Do not Reject the Hypothesis
Learning Activities vs. Teacher-Related Factors	3.101	0.541	Not Significant	Do not Reject the Hypothesis
Learning Activities vs. School-Related Factors	4.211	0.378	Not Significant	Do not Reject the Hypothesis
Strategies vs. Student-Related Factors	7.977	0.006	Significant	Reject the Hypothesis
Strategies vs. Teacher-Related Factors	0.185	0.911	Not Significant	Do not Reject the Hypothesis
Strategies vs. School-Related Factors	3.858	0.145	Not Significant	Do not Reject the Hypothesis
Instructional Materials vs. Student-Related Factors	1.050	0.592	Not Significant	Do not Reject the Hypothesis
Instructional Materials vs. Teacher-Related Factors	2.578	0.631	Not Significant	Do not Reject the Hypothesis
Instructional Materials vs. School-Related Factors	2.579	0.631	Not Significant	Do not Reject the Hypothesis
Evaluation Techniques vs. Student-Related Factors	0.615	0.735	Not Significant	Do not Reject the Hypothesis
Evaluation Techniques vs. Teacher-Related Factors	19.138	0.001	Significant	Reject the Hypothesis
Evaluation Techniques vs. School-Related Factors	10.302	0.036	Significant	Reject the Hypothesis

Note: p-value ≤ 0.05 – significant, p-value > 0.05 – not significant

The relationship between the respondent's perception of using the spiral progression approach in teaching science during the pandemic concerning the cited aspects of the curriculum and the factors they encountered in teaching science varied. The learning activity aspect of the curriculum had no significant relationship to any of the student-related factors, teacher-related factors, and school-related factors. This was evidenced by the p-values of 0.984, 0.541, and 0.378, which were all greater than the 0.05 level of significance. Between the student-related factors, teacher-related factors, and school-related factors, only the student-related factors had a significant relationship with the strategy aspect of the curriculum. This was evidenced by the p-values of 0.006, which is much lower than the 0.005 level of significance. The two other factors, the teacher-related and the school-related factors, had no significant relationship with the strategy aspect of the curriculum, as evidenced by the p-values of 0.911 and 0.145, respectively. The aspect of the curriculum about the instructional materials has no significant relationship to factors related to the student, the teacher, and the school. This was evidenced by the p-values of 0.592, 0.631, and 0.631, which were all greater than the 0.05 level of significance. The aspect of the curriculum about evaluation technique was found to be significantly related to both teacher-related and school-related factors. This was evidenced by the p-values of 0.001 and 0.036, which were both lower than the 0.05 level of significance. On the other hand, the evaluation technique was found not significantly related to student-related factors, as denoted by the p-value of 0.735.

Pondering the relationship between the strategies and the student-related factors, the capacity to think naturally and prior preparation both affect students' ability to learn in a classroom. As a result, teachers should establish first a rapport with students and prepare their mindsets (Jalbani, 2015). In the context of the implemented spiral progression approach, teachers are expected to check on what their students have previously learned and reflect on what "prior knowledge" is needed by the students for the new lesson to be presented to them. Teachers must also make sure that concepts, skills, and principles from the natural and physical sciences are properly combined, and that they are taught in the right order, going from the easiest to the most difficult, throughout the course. However, considering what Quintos et al. (2022) have stated about the science teachers' mastery of science topics, there is already that factor to affect how the teachers strategize their curriculum delivery.

One of the domains in which the K-12 science curriculum was structured is the ideals that students will be able to achieve scientific processes and skills and to establish and exemplify scientific values and attitudes (K-12 Basic Education Curriculum Conceptual Framework in Science, 2016). To evaluate the attainment of these ideals, teachers conduct laboratory experiments. However, as perceived by the various research reviewed in this current study, problems in science laboratories, apparatuses, and equipment are among those problems the teachers faced. These problems cause significant difficulty on the part of the teachers and the school managers to improve the learning of the students. As Lackney (n.d) was quoted by Quintos et al. (2022), science is a field of study that depends on physical resources like laboratories, apparatus, equipment, and other related things to produce knowledge. The facility, which is more than just a place for the educational process to take place, is covered by the rules for engagement in the learning environment. Students, teachers, and community members benefit from a facility's layout and design because it helps them feel more comfortable in their surroundings. Also, because of the pandemic's challenge, laboratory experiments are being replaced by virtual laboratories and alternative experimentation at home that commonly resorted to improvisation or utilization of household items (Owolabi, 2021). The above-cited proposition about the problems encountered in the accessibility of the physical facilities and equipment and the way laboratory experiments were carried out during the time of pandemic is sufficient already to explain the significant relationship the evaluation techniques have with teacher-related factors and school-related factors, which further implies that the way the science teachers' evaluate their students' learning, the school-related factor, particularly the physical facilities and equipment affect significantly how the task will be realized.

Problem No. 6. What program could be proposed based on the results/findings of the study?

The researcher of this current study has devised an action plan to enhance further the implementation of the spiral progression approach in teaching science. The proposed action plan can be found inAppendix A.

4. Conclusions and Recommendations

Conclusions

1. Most respondents are predominantly female and are 31 to 40 years old. Mostly had a bachelor's degree only and usually attended 1 to 5 training about curriculum implementation at the Regional Level. Many are in Teacher I position, with 1 to 5 years of experience. Most are assigned to modular teaching modality during the school years 2020-2021 and 2021-2022, and they come from different grade levels. Not all these variables affect the respondent'sperception of the spiral progression approach in teaching science during the pandemic.
2. In general, the respondents often follow the principles of the spiral progression approach in teaching science during the pandemic. From the four aspects of the curriculum emphasized in this study, it is in the strategy aspect of the curriculum that the respondents always employed the spiral progression approach in teaching science. In contrast, it is often used in activities, instructional materials, and evaluation techniques aspects of the curriculum.
3. The respondents strongly agreed that they encountered the factors related to students, teachers, and schools, in teaching science using the spiral progression approach during the pandemic.
4. The respondent's age, position title, length of service, and teaching modality during the SY 2020-2021 & SY 2021-2022 affect their perception concerning the use of the spiral progression approach in teaching science during the pandemic, particularly in the aspects of the curriculum about learning activities, strategies, instructional materials, & evaluation techniques.
5. Only selected aspects of the curriculum and factors are significantly related. Among the aspects of the curriculum and factors that have a significant relationship are the following: the strategies the respondents employed in teaching science using the spiral progression approach during the pandemic and the student-related factors, the evaluation techniques and the teacher-related factors, and the evaluation techniques and the school-related factors.

Recommendations

Considering the conclusions drawn from the study, the following are hereby recommended:

1. The Department of Education, through its implementing bodies, may formulate integrative plans that would provide its teachers intensive support through training about the implementation of the spiral progression approach in teaching science, giving emphasis, particularly on the content, selection of the appropriate instructional materials to use, and evaluation techniques that gauge students' learning.
2. The school's Division Office, through its supervisor in charge of the science subject, may conduct an inventory of its teacher's profile, highlighting the teacher's bachelor's degree program and the training they attended, and the student's level of achievement in science during the pandemic which may serve as the Division's Office basis for its programs to develop and employ to enhance science teachers' competence better, to identify whom shall be given training on a particular aspect of the curriculum, and bridge the gap on student's learning.

3. The school head may create a plan that will encourage the teachers to pursue graduate studies to improve their knowledge of the different areas of science and the various aspects of the curriculum.
4. Through its learning and development unit, the school may conduct school-based or departmentalized training that will specifically accommodate to the pedagogical needs of the teachers.
5. The school, through the assigned subject coordinator or department head and master teachers, may intensify the conduct of LAC sessions to further equip the teachers with essential knowledge of the subject content, strategies, alternative learning resources, and ways of authentically gauging the learner's learning.
6. The school may conduct an inventory of the competencies and skills expected to be developed in students and the facilities needed to properly develop and practice the skills and achieve the goals outlined in the curriculum that will serve as one of the bases for the next school year's crafting and development of school's implementation plan.
7. The school where this study is conducted may adopt the Action Plan the researcher proposed to improve the implementation of the spiral progression approach in teaching science.
8. Future researchers may conduct a similar study focusing on the science teachers' profile and its effect on the student's attainment of the desired learning skills in science, how the factors specified in this study correlate with the student's performance in science that follows a spiral progression approach and students' level of achievement in the different area of science.

Appendix A. Proposed Action Plan for the Enhancement of the Spiral Progression Approach in Teaching Science

RATIONALE: Section 5 (g) of R.A. 10533, or the "Enhanced Basic Education Act of 2013" specified the use of the spiral progression approach in the delivery of curriculum to ensure the mastery of knowledge and skills after each level. In science, the use of the spiral progression approach in the different aspects of the curriculum is not always observed due to several factors, particularly those related to the student, the teacher, and the school.

This action plan will provide ways to improve better the implementation of the spiral progression approach in teaching science.

AREAS OF CONCERN	OBJECTIVES	STRATEGIES/ ACTIVITIES	TIME FRAME	PERSONS INVOLVED	RESOURCES NEEDED	SUCCESS INDICATOR
Teaching Strategy & Methodology	To conduct intra-visitation to promote best practices in teaching science using the spiral progression approach.	Conduct of class observation.	SY 2023-2024	Science Teachers, Designated Technical Assistance Providers (TAP), Master Teachers, Science Head Teacher	Observation Checklist, Record Notebook	- The designated TAPs, Master Teachers, and Science Head Teacher are able to determine the teacher's strengths and weaknesses in teaching science using the spiral progression approach. - The teachers are able to replicate in their class the observed best practices in teaching science using the spiral progression approach.
Content	To determine the teachers' mastery of the lesson they teach in science.	Inventory of teachers' mastery of lessons in science through a Quiz Bee and other similar contests.	First Quarter, SY 2023-2024	Science Teachers, Science Head Teachers, Division Science Supervisor	Test Bank, which questions are aligned to the science curriculum content, and ICT equipment to be used in the activity.	The poorly mastered topics of the science teachers are being identified.

Content & Pedagogy	To enhance and update the teachers' pedagogical approaches and knowledge of the subject matter.	Intensive training of science teachers with regard to the subject matter and pedagogy.	August 2023 (INSET before the opening of classes), February 2024 (Mid-year INSET)	Science Head Teacher, Principal	ICT equipment and learning/ reading materials, which the program matrix will specify	- Teachers will be enhanced and updated on the current pedagogical approaches used in teaching science. - Teachers will have in-depth knowledge of the science lessons they are teaching.
Instructional Materials	To provide teachers with reading materials about the lessons they teach in science and pedagogical approaches.	Provision of reading materials about the subject matter and pedagogy.	First Quarter, SY 2023-2024	School Librarian/ Learning & Resource Unit Coordinator, Science Head Teacher, Principal	Inventory of the learning resources available.	Teachers are able to acquire in-depth knowledge about the lessons they are teaching and of the approaches they may employ in teaching a particular lesson.
Instructional Materials / Facilities	To provide the learning resources needed in the implementation of the curriculum.	- Conduct a rigid curriculum mapping focus on the inventory of laboratory resources needed to deliver the curriculum effectively. - Procurement of the needed resources.	Second Semester, SY 2022-2023	Science Teachers, Master Teachers, Head Teacher, Supply Officer, Principal	Learner's Module, Inventory/List of available Resources in the laboratory	The learning resources needed in the curriculum delivery are ensured to be available before the opening of the next school year.

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