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The Implementation of Spiral Progression Approach in Mathematics Education in the Second District of Ilocos Sur

John Ray S. Sanchez

Master of Science in Education Student, Graduate School, Ilocos Sur Polytechnic State College, Philippines

Abstract

The Philippine's K to 12 Basic Education led the change of approach into spiral progression; teaching the curriculum from simple to complex. Assessing the status of implementation is crucial in identifying its strengths and weaknesses to further improve or sustain the approach. However, there are limited researches on factors related to its implementation among teachers. The aim of the study was to describe the implementation status and its relationship to teacher's performance. Descriptive-correlational design used to examine the profile and the status of implementation among 83 mathematics teachers in the Second District of Ilocos Sur, along with its relationship to their performance based on Classroom Observation Tool (COT) ratings. Data were gathered through a validated and reliable survey-questionnaire and Pearson's r correlation is used at 0.05 level of significance. The study found varied teacher profiles, with most being young female Teacher IIIs with master's units, and found a high overall implementation of the Spiral Progression Approach, with significant links only between educational attainment and implementation, and teaching strategies and performance. The findings suggest that while the Spiral Progression Approach is highly implemented, enhancing teachers' educational attainment and focusing on teaching strategies may further improve instructional quality and teacher performance.

Keywords: spiral progression. implementation, teacher performance

1. Introduction

1.1 Background of the Study

The Philippine educational system has adopted the Spiral Progression Approach, as outlined in the Department of Education's curriculum guidelines (DepEd Order No. 31, s. 2012). According to cognitive theorist Jerome Bruner, the spiral curriculum involves the iterative presentation of fundamental concepts, each time at a more complex level, thereby reinforcing prior learning and facilitating deeper understanding. Thus, it is a form of learning that encourages the revisiting of topics and key concepts, building on previous course material in a cyclical and spiraling manner. By revisiting these topics repeatedly, students gain a greater understanding of the underlying principles and can apply this knowledge more effectively in practical or real-world situations. The spiral curriculum approach can be particularly effective when attempting to teach complex or abstract concepts, such as mathematical formulae or scientific theories (Structural Learning, 2022). Furthermore, spiral curriculum is often present in mathematics because mathematical skills are applied constantly from simple to complex. It can occur

at any time over the course of a single academic year or several years (Hausman, 2022). While in science, learners will deal with several areas in science to maintain their interest high, much as gaining credit to the advantages of returning to the subject (Bookshark, 2020). Being familiar with the basic principles explored is an advantageous process that adds retention therefore becomes an instrument in elaborating a variety of uncommon phenomena (Prezeau, 2012). Although there is no study that shows the total impact of the spiral curriculum to learners, its characteristics tell us that it contributes to the development of learning outcomes. In addition, many research-based approaches have been incorporated by the spiral curriculum from cognitive science to increase the learner's performance as well (Education Partnerships INC., 2014). While the spiral method is adequate for teaching forms, time, and other concepts, it can be challenging for teaching numerical facts. Young children tend to lose their math information extremely rapidly if they don't receive ongoing practice. The youngster takes a break from the math facts and begins to forget them when the spiral moves on to the next topic (identifying shapes, for example). Vacations from school, especially summer break, offer additional chances to relapse. Some math textbooks and curriculum offer some practice for upkeep, but many don't offer enough (http://www.leaningpinesoftware.com/spiral.shtml, 2015).

Snider (2004) suggests that the spiral progression approach may contribute to a decline in students' interest in mathematics during middle and high school years. It is hypothesized that the structure of traditional mathematics textbooks, the foundation of mathematics education, makes it hard for learners to improve the basic abilities needed in the attainment of advance mathematics, which results in low math performance. Many topics are covered, but none are in-depth, in traditional mathematics textbooks' spiral organization. The strand design is an alternative to the spiral structure, which is exclusive to direct instruction programs. Textbooks with strand designs concentrate on a select few themes over a protracted period of time. As concepts are grasped, they are incorporated into new strands that reflect mathematical ideas that are getting more complicated. Faye (2020) analyzed the content selection and articulation in lower-grade mathematics textbooks from Senegal, Japan, and Singapore, focusing on the Spiral Progression Approach (SPA) and the Concrete, Pictorial, Abstract (CPA) approach. The study found that while all three countries employ a spiral progression in their textbooks, variations exist in lesson structure and instructional materials. What is certain is that Singaporean and Japanese textbooks place a high priority on teaching a minimal number of topics in-depth using a variety of tools and techniques. Meanwhile, Senegalese textbooks focus greater emphasis on breadth than on in-depth instruction, with some topics being overemphasized and others—like the addition of three numbers—not being covered in the first two grades.

Research in the Philippines has explored the implementation of the Spiral Progression Approach. For instance, Igcasama (2021) examined teachers' and students' perceptions of the K-12 Spiral Progression in secondary mathematics, finding general support for its implementation. In a study conducted by Fowles (2021), that aims to explore the influence of a spiral instructional approach on middle school students' mathematical understanding and their perceptions of learning, findings suggest that a spiral approach to teaching mathematics supports academic growth. Additionally, the findings suggest that more students had a positive outlook on their learning when the content spirals and this also showed in a similar study conducted by Jawatan (2021).

Amarilla (2019) identified that a significant challenge in implementing the spiral progression approach in mathematics is the students' lack of mastery of concepts. Meanwhile, Rico and Baluyos (2021), in their study that aims to explore the level of implementation of the Spiral Progression Approach in relation to

performance in Algebra of students in Tangub City National High School revealed that the teachers highly implemented the Spiral Progression Approach, but the students' performance in Algebra was very poor. The use of a Spiral Progression Approach in teaching was significantly related to the students' performance in Algebra. Discussion is a common strategy for teachers in teaching the Spiral Progression Approach. Furthermore, Camara (2020), found out in his paper that in 361 respondents, the majority believed that Spiral Progression did not help them to master the content of Science and Math contrary to Manalo and Yazon (2020) findings that there is a significant relationship between the implementation of spiral progression in content standard and student's performance in Science and Mathematics in senior high school which they could have used in learning Science and Math in college better. In addition, Bueno (2018) found no relationship between academic performance and the factors affecting the implementation of Spiral Approach, which is also attested by Merza, et. al (2018) in a study conducted to 74 public and private secondary mathematics teachers.

Batidor and Casinillo (2021) in their study that aims to evaluate SPA in teaching Science and Mathematics students using the modified post-test only design, results showed a significant impact in Biology and Chemistry but not in Integrated Science and Physics. There was also a significant impact in Trigonometry and Statistics but not in Elementary Algebra, Intermediate Algebra, and Plane Geometry. However, the student's academic performance remained below satisfactory in Biology, Chemistry, Trigonometry, and Statistics. Hence, teachers must be experts in their respective fields and undergo rigorous training to improve their strategies. Orale and Uy (2018) study revealed that the expected benefit of the spiral progression approach could never be attained in the current promotion and retention practices of teachers. Teachers' qualifications, resources, and training inadequacy to name a few are factors identified by them that prevent them from producing favorable outcomes.

The findings of the of study Bartolome (2023) show that teachers moderately understood spiral progression approach. The extent of the implementation of SPA exceeded the expectations which results in a positive outcome of the feature of the curriculum. Findings revealed that there is a significant relationship between teachers understanding and the implementation of Spiral Progression Approach and Project ETISPA (Enhanced Teachers Implementation of Spiral Progression Approach) to be proposed as an extension project. Enhancing this study entails promoting advocacy for the sustainability and effectiveness of the spiral progression approach, providing additional orientation on the roles and responsibilities of teachers and school heads, incorporating enrichment activities such as benchmarking and brainstorming, ensuring wide dissemination, and facilitating the implementation of proposed programs.

Manalo and Yazon (2020) suggest discussing topics for LAC sessions that address challenges in implementing the spiral progression approach and encourage teachers to create and implement project proposals aimed at enhancing student academic performance in ENSCIMA (English, Science, and Math). The difficulty of subjects like Statistics and Probability leads to high dropout rates but teaching methods like the Spiral Progression Approach (SPA) aim to improve this. SPA revisits concepts cyclically, reinforcing learning and promoting deeper understanding, potentially increasing student retention, though its impact on Statistics and Probability hasn't been extensively studied (Catapan, et. Al., 2023).

In their study on the spiral progression approach, Perez et. al. (2020) finds that: 1) learner-centered teaching methods are used, 2) both teachers and students have mixed feelings about its effectiveness, leaning towards skepticism, and 3) while spiral curricula usually yield positive outcomes, there are some

exceptions. They suggest enhancing teacher training and instructional methods to improve implementation and mastery learning in the classroom.

Using descriptive phenomenology, the study of Lazao (2023) that explored how teachers and students perceive and experience the spiral progression approach (SPA) in teaching math at junior high schools in Tuguegarao City, findings revealed diverse opinions on SPA's effectiveness: some saw its benefits, while others had doubts and noted challenges. Both teachers and students faced difficulties influenced by curriculum, teachers, students, and school factors. A supportive school culture was crucial for successful SPA integration and improved learning outcomes. These findings offer valuable insights for educators and policymakers to optimize SPA use in math education (Lazao, 2023).

In a study by Gonzales (2019) on Science education, most experienced teachers were unhappy with the spiral progression approach, citing issues like lack of resources, limited lab equipment, and challenges integrating ICT. However, two teachers, one with a General Science background and one without, were enthusiastic. The experienced teachers suggested that administrators provide relevant training, procure necessary resources, and understand their perspectives to help them adapt to the approach more easily.

With this, there have been some contradictory findings in the research on Spiral Progression Approach. To address the gaps between the studies conducted with regard to Spiral Progression, it is essential to assess the status of the Implementation and its relationship to the Performance of Mathematics Teachers based on COT (Classroom Observation Tool) for 2023-2024.

1.2 Framework of the Study

The cognitive paradigm put forth by Jerome Bruner in 1960, according to which "any subject can be taught in some intellectually honest form to any child at any stage of development," is the foundation of the spiral curriculum. In other words, even the most complicated information may be grasped by very young infants if it is presented and structured appropriately. Constructivism is widely considered an important model of effective teaching practice, and Bruner's ideas underlie many contemporary approaches and practices, such as thinking skills and assessment for learning. Bruner organized his ideas in The Process of Education into four key themes: the role of structure in learning and how it may be made central in teaching readiness for learning intuitive and analytical thinking motives for learning (Center for the Use of Research and Evidence in Education, 2008). While the spiral considers the transformational character of education, it also recognizes that the educational system has “long-lasting effects that are not easily changed” (Lima, 2017). In 1960s, Jerome Bruner put forward a theory of cognitive growth which looked to the influence of environmental and experiential factors in a child’s education, and which suggested that each child’s intellectual ability develops in stages through changes in how the mind is used. Bruner’s position was that young children need to learn the underlying principles of different concepts – the structure of ideas – rather than to simply memorize their related facts and data. He championed learning through inquiry and believed that the teaching and learning of any subject at an early age should have as its goal the child’s intuitive grasping of its basic ideas. As children grow then, Bruner believed, curriculum should revisit earlier learned ideas, expanding upon them until a child reaches a more complete understanding of individual ideas and how they relate to one another. Bruner referred to this as the “spiral curriculum”, wherein ideas are presented in repeated learning opportunities over time, and are organized from the simple to the complex, from the general to the specific, and are examined in relation to one another. Engaging information in a spiral fashion, Bruner wrote, helps children to organize knowledge into a structure that makes it both increasingly accessible and usable in areas beyond the immediate learning situation (n.wikipedia.org/wiki/Jerome_Bruner?).

Bruner's spiral curriculum is an approach to education that involves regularly re-visiting the same educational topics over the course of a student's education. Each time the content is re-visited, the student gains deeper knowledge of the topic. It has the benefits of reinforcing information over time and using prior knowledge to inform future learning. (Drew, 2023) https://helpfulprofessor.com/spiral-curriculum/. In mathematics, we often return to the same content repeatedly but add complexity each time. (Drew, 2023) https://helpfulprofessor.com/spiral-curriculum/.

Jerome Bruner's Theory of Development assumes that we learn best when we go from concrete to abstract in a three-step process: First comes hands-on "Action", then learning with "Images" and finally students transform what they've learned into "Language". Throughout the experience, we constantly revisit previously learned topics while teachers provide carefully structured guidance along the way (https://www.uky.edu/~gmswan3/544/Bruner_1964_CoCG.pdf?).

In the 1980s, the Singaporean government decided to stop importing foreign textbooks and, instead, build the world's best math curriculum from scratch. Since that time, Singaporeans study fewer concepts with greater detail, following Bruner's guideline. Singapore's fourth and eighth graders are the world's best in both mathematics and science, and Singapore's math curriculum is copied by educators from around the world (Qosimov, 2023).

Bruner, therefore, advocated for the use of a spiral curriculum with continuous repetition of the same fundamental ideas. The curriculum is comprised of three characteristics: students revisit the same topic at regular intervals, the complexity of the topic increases with each revisit, the new learning has a relationship with previous learning (Koblin 2021) https://sproutsschools.com/bruners-spiral-curriculum/.

The 2013 Enhanced Basic Education Act, commonly referred to as Republic Act No. 10533, was signed into law on May 15. RA 11053 expanded the purpose of high school education to include college preparation, vocational and technical career prospects, as well as creative arts, sports, and entrepreneurial employment. Senior High School (SHS) was added for two additional years. By using suitable teaching and learning tools, such as mother language, it also makes education learner-centered and responsive to community requirements as well as cognitive and cognitive needs. One of the policy statements as prescribed by R. A. 10533 is that the curriculum must make use of constructivist, inquiry-based, reflective, collaborative, differentiated, and integrative pedagogical techniques. According to constructivism, students actively create meaningful knowledge. Questioning, looking into, verifying, probing, explaining, forecasting, and building connections between the evidence are highly valued in inquiry-based learning. Reflective learning gives students the chance to think about what they need to learn, why they need to learn it, and how to go about doing it. To guarantee that students have mastered the material after each level, the curriculum will employ a spiral development strategy. The pedagogical feature adheres to the notion that ideas are presented at a young age and developed over time (DepEd, 2013).

In the Philippine Mathematics Framework, the important principles of numbers, measurement, geometry, probability, data analysis, patterns, functions, and algebra must all be understood by learners. They must be capable of using computers, solving problems, expressing ideas and concepts, and making connections between mathematics and other aspects of life. Learners must learn how to compute using a range of techniques and devices, such as paper and pencil, mental calculations, estimating, calculators, and computers. The use of technology and other practical resources must be a fundamental component of math education. However, not all pedagogies, particularly those that have been shown to be successful in improving students' mathematics knowledge, problem-solving skills, and computing ability, should be replaced by technology alone. The essential principles of numbers, measurement, geometry, probability,

data analysis, patterns, functions, and algebra must all be understood by learners. They must be skilled in using computers, solving problems, expressing ideas and concepts, and making connections between mathematics and other aspects of life. Students must learn how to compute using a range of techniques and devices, such as paper and pencil, mental calculations, estimating, calculators, and computers. The utilization of technology and other practical resources must be a fundamental component of math education. But not all pedagogies, particularly those that have been shown to be successful in improving students' mathematics knowledge, problem-solving skills, and computing ability, should be replaced by technology alone. The goal of mathematics education is to develop a mathematically empowered citizenry. For Filipino students, the goal of Mathematical Empowerment focuses on developing critical and analytical thinking skills among all Filipino students. Critical and analytical thinking encompass the following skills as well: Problem Solving, Communicating Mathematically, Reasoning and Making Mathematical Connections. The vision is to achieve the focus goal through the teaching of a solid mathematical content, the development of strong cognitive skills and the promotion of desirable cognitive values to all Filipino students no matter their background or circumstance (SEI-DOST & MATHTED, (2011).

The Singapore mathematics curriculum comprises a set of syllabi spanning 12 years, from primary to pre-university education. As mathematics is a hierarchical subject, higher concepts and skills are built upon foundational ones and must be learned in sequence. The curriculum is designed in a spiral manner where concepts and skills in each content strand (e.g., Numbers and Algebra, Geometry and Measurement) are revisited and built upon at each level to achieve greater depth and understanding. Exhibit 3 presents a summary of the concepts and skills to be learned by the end of Grade 8 (Secondary 2). Teachers help their students learn these concepts and skills by adopting age- and grade-appropriate pedagogical approaches. Central to these pedagogical approaches at the primary and lower secondary levels is the Concrete-Pictorial-Abstract (C-P-A) approach, whereby teachers lead students through activities that help build an understanding of abstract mathematical concepts from everyday experiences and meaningful contexts, using concrete and pictorial representations (Mullis, Martin, Goh, and Cotter, (2016).

1.3 Statement of the Problem

This study aimed to assess the status of the Implementation of Spiral Progression Approach in Mathematics Education and its relationship to the performance of Mathematics Teachers of the Second District of Ilocos Sur based on COT rating 2022-2023. Mainly, answered the following:

1. What is the socio-demographic profile of Mathematics Teachers in terms of:

a. Age
b. Sex
c. Civil Status
d. Educational Attainment
e. Length of Teaching
f. Position

2. What is the status of Implementation of Spiral Progression Approach in terms of:

a. Teaching Strategies.
b. Instructional Materials and Resources.
c. Curriculum Integration
d. Capacity Training
e. Assessment Strategies

3. What is the Performance of Mathematics Teachers based on their Class Observation Tool (COT) for 2023-2024.
4. Is there a significant relationship between the socio-demographic profile and the status of Implementation of Spiral Progression Approach in Mathematics Education?
5. Is there a significant relationship between the Status of Implementation of Spiral Progression Approach in Mathematics Education and the Performance of public-school teachers based on the Classroom Observation Tool (COT) for 2023-2024?

1.4 Review of Literature

The terminology "spiral curriculum," commonly attributed to Jerome Bruner, is characterized as a curriculum framework in which fundamental concepts are continually covered with increasing levels of complexity or in a variety of contexts. Such an approach enables the earlier introduction of concepts typically saved for later, more specialized courses in the curriculum, after students have mastered some fundamental principles. These principles are frequently very theoretical and are likely to deter students who are eager to apply the concepts they are learning to real-world applications. (https://engsci.udmercy.edu/academics/engineering/electrical-computer/spiral-curriculum.php). Simply, the spiral development approach covers the introduction of fundamental ideas in the beginning, which are then recalled in later years in increasingly complex forms. With this, concepts are first given at a young age and then reinforced in later years in a more sophisticated way (Gatdula, 2016). The pupils continue to learn more about the subject with each revisit. This approach uses existing knowledge to reinforce new information for subsequent learning. It is important to note that the "forgetting curve" conundrum is resolved by Bruner's Spiral Curriculum. Regularly going over the same material forces the student to retain what he has learned, which is essential for subsequent learning. The human mind is like a sponge, soaking up information, but if it is not applied on a regular basis, it will quickly deteriorate. Therefore, whenever a pupil learns a new concept, they must retain it for as long as possible, and repetition helps with this. However, if a student learns something and then moves on without possibly using it again, he will quickly lose sight of what he just learned (Borkala 2022). It is done when the teacher starts with the most basic and simple concepts. These same concepts are developed from one grade level to the next, in increasing level of complexity and sophistication. For the record, this is not an entirely new approach. Elementary teachers have been using this approach for ages, and learners and their parents are not even aware of it (Gatdula, 2016).

There are 4 Key Principles of Spiral Curriculum according to (Borkala, 2020) based on which education is achieved are repetition, progressive increase in difficulty, improve prior knowledge, and competence assessment. Cyclic manner, age-based learning, logic-based, and impermeability are the pros while time-consuming, prior knowledge dependence, student find it difficult, crowded curriculum, and unfit for short courses are the cons.

In short courses, it is possible to return to the topic in a single lesson but this will not help in the long-term retention of the knowledge. The short time frame of the short course will not allow long-term reinforcement which needs a longer time frame (https://collegemarker.com/blogs/spiral-curriculum-pros-and-cons/).

The K–12 Curriculum is created basically to address the current complex educational problem. The Spiral Progression Approach, which is based on John Dewey's progressive education and asserts that "students must be involved in what they are learning," is one of its most pronounced features. The spiral curriculum

framework developed by Jerome Bruner has also had an impact on this approach. A spiral curriculum, according to Erfe (2021), helps students to create a firm foundation of the skills they will need for future activities. For Gatdula (2016), one feature of the K to 12 Program that proved to be a real challenge for many educators, especially the science and math teachers was the Spiral Progression Approach. With the Spiral Progression Approach of the K to 12, teaching is now more integrative and multi-disciplinary. It enables students to connect disciplines and ensures vertical integration and seamless progression of competencies (Borkala, 2022).

Following each level, DO 31 s.2013 ensures knowledge and skills have been mastered. As mentioned, "the overall design of Grades 1 to 10 curriculum follows the spiral approach across subjects by building on the same concepts developed in increasing complexity and sophistication starting from grade school." This means that competences may now be "vertically articulated" or "seamlessly progressed," as well as "horizontally articulated." It helps to build skills and information, which are reinforced as the study progresses. While horizontal articulation integrates the skills (Jabonillo, 2022).

Several studies were conducted regarding the Spiral Progression Approach. In the study of Abad (2020), that determines the influence of the spiral progression approach in teaching junior high school mathematics, findings revealed that learners have low performance in Mathematics in the National Achievement Test (NAT) and were only in the Beginning level of achievement when it comes to their critical thinking and problem solving in the five areas in Mathematics namely Numbers and Number Sense, Measurement, Patterns in Algebra, Geometry and Probability and Statistics. Moreover, there was no significant relationship between the performance of students in Mathematics on NAT and their level of understanding in critical and problem-solving skills in the five areas in Mathematics. Results also revealed that teachers had encountered problems in using a spiral progression approach in teaching Mathematics.

According to the study of Alegre (2019), that determine the level of impact of spiral progression approach in mathematics to the academic performance of the grade 10 students in Ampayon National High School, it was concluded that the extent of students' participation in peer collaboration, and problem-solving activities did not merely influence the students' academic performance. However, there is a significant correlation between the extent of student participation in spiral progression approach in mathematics and the academic performance of the student in the discussion. This means that students were motivated to learn when the teacher presents the process well and they were interested in participating during the discussion. Hence, the students' participation had influenced their academic performance. Based on this conclusion, this study suggested that the teacher should employ techniques and strategies that are appropriate to the leaners' needs and abilities, and the students should also be attentive and participating during discussion to acquire effective learning.

Moreover, in the paper of Perez, et. al. (2020), that aims to provide a comprehensive view of the spiral progression approach, i.e., teaching strategies and methods employed, teachers' and students' perceptions, empirical educational outcomes, and recommendations in improving its implementation. Using Arksey and O'Malley's (2005) scoping review framework, results indicate that 1) learner-centered teaching strategies and methods are employed, 2) teachers and students both have positive and negative perceptions towards its implementation, though they too have more pessimistic views, and 3) a spiral curriculum generally produce positive results, though there are noted exceptions. The implementation can be improved through the enhanced curriculum and pedagogical knowledge of teachers and improve the various instructional procedures taking place inside the classroom for mastery learning.

To sum it up, a curriculum design known as the spiral curriculum, which Jerome Bruner is credited with creating, repeats essential principles with varying degrees of intricacy or application. It enables the early presentation of ideas normally saved for later courses, once students have mastered foundational ideas. The strategy includes practice, increasing difficulty, drawing on existing knowledge, and evaluating competence. Improved retention, age-appropriate learning, logical scope and order, and reinforcement of key ideas are benefits of spiral curriculum. Cons include time commitment, reliance on existing knowledge, student challenges, crowded curricula, and unsuitability for short courses, among others.

The spiral progression method, which was influenced by Bruner's idea, is included into the K–12 Curriculum to build a solid foundation of abilities for subsequent activities. It encourages integrative and multidisciplinary instruction, enabling students to integrate academic fields and guarantee vertical and smooth competency advancement. The program adopts a spiral structure, horizontally integrating skills and vertically articulating concepts. Regarding the spiral progression approach's influence, studies have produced a range of findings. While some discovered poor math performance and implementation issues, others discovered a strong relationship between student engagement and academic performance. To improve the implementation of spiral curriculum, it is advised that teachers complete teacher training programs, make improvements to their lesson plans, and increase their curriculum and pedagogical understanding.

2. METHODOLOGY

2.1 Research Design

This study utilized a descriptive-correlational methodology. This describes the socio-demographic variables like age, sex, civil status, educational attainment, length of teaching, and position. It also describes the status of Implementation of spiral progression approach in terms of teaching strategies, instructional materials, capacity training, curriculum integration, and assessment strategies as well as the relationship between the status of Implementation and Performance of Mathematics teachers based on Classroom Observation Tool (COT) rating 2023-2024.

2.2 Population and Locale of the Study

The population of the study was consisted of 83 public-school mathematics teachers of the Second District of Ilocos Sur.

2.3 Research Instrument

The survey-questionnaire in terms of teaching strategies, assessment strategies and curriculum integration was adopted from the study of Reynoso (2024) entitled, Assessing Teacher Engagement and Effectiveness in Implementing Spiral Progression within Mathematics Curriculum: A Philippine Perspective, while in terms of capacity training and instructional materials, it has been constructed and validated by 5 experts. The reliability of the questionnaire was done through pilot testing to 25 mathematics teachers of the first district of Ilocos Sur who participated in the seminar on HOTS (Higher Order Thinking Skills) with 0.76 reliability score which indicates that the survey-questionnaire is acceptable while the performance of Mathematics Teachers was determined based on COT for 2023-2024 with 0.76 score which is acceptable.

2.4 Treatment of data

There were several statistical techniques used to analyze the data of this study. The reliability of the instrument was determined by Cronbach‘s Alpha Coefficient. The data gathered which include the socio-demographic profile like age, sex, educational attainment, civil status, years in teaching and position was analyzed using descriptive statistics such as frequency count, percentage. Mean was used to describe the

status of Implementation. The Pearsons r correlation for paired samples was used to determine the significant relationship between socio-demographic profile and the status of Implementation as well as the performance and Implementation. Hypotheses was tested at 0.05 level of significance.

3. RESULTS AND DISCUSSIONS

Table 1 The Status of Implementation of Spiral Progression Approach in Terms of Teaching Strategies

TEACHING STRATEGIES	Mean	Descriptive Rating
1. I prepare every Math lesson and the curriculum with a proper blending of concepts, skills, and values and appropriately sequenced them from the start upward according to the difficulty level.	4.30	Very Highly Implemented
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.	4.33	Very Highly Implemented
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.	4.59	Very Highly Implemented
4. I present topics and skills appropriate to students' developmental/cognitive stages.	4.39	Very Highly Implemented
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.	4.40	Very Highly Implemented
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.	4.25	Very Highly Implemented
7. I encouraged the students to apply what they have previously learned to the topics being discussed at present.	4.41	Very Highly Implemented
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.	4.28	Very Highly Implemented
9. 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.	4.33	Very Highly Implemented
10. 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.	4.14	Highly Implemented
Overall mean	**4.35**	**Very High**

Teaching Strategies. Most of the indicators under teaching strategies has a mean score that falls under the very highly implemented descriptive rating except item number 10. Item number 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 has the highest mean score of 4.59 with a descriptive rating of very highly implemented. This implies that this strategy is a key instructional practice. However,

it has found out that item 4-exposing the students to a wide variety of concepts/topics, skills, and attitudes that are deemed of ―continual concern to everyone until they are mastered has the lowest mean of 4.14 which describes it to be highly implemented. This suggests a potential need to enhance the balance between deep reinforcement of prior knowledge and the broad exploration of various topics to support comprehensive learning.

Nevertheless, the overall descriptive rating is Very Highly Implemented with a 4.35 overall mean which suggests that on average, the status of implementation of spiral progression approach in terms of teaching strategies is Very High.

The finding is supported by the result of the study conducted by Reynoso (2024) that teachers always implement spiral progression approach in their teaching strategies. Similarly, Bueno (2023) found out that math teachers prefer learner-centered teaching strategies in junior high school as it caters a spiral progression.

Table 2. The Status of Implementation of Spiral Progression Approach in Terms of Instructional Materials and Resources

INSTRUCTIONAL MATERIALS AND RESOURCES	Mean	Descriptive Rating
1. Multimedia tools (e.g., videos, presentations) are utilized regularly to enhance learning in my classroom.	4.25	Very Highly Implemented
2. Math equipment (e.g., manipulatives, measuring tools) are readily available and effectively support learners' understanding of mathematical concepts.	3.99	Highly Implemented
3. Learners' modules are well-integrated into daily lessons and useful in meeting learning objectives.	4.28	Very Highly Implemented
4. Interactive games are incorporated into lessons to engage learners and reinforce mathematical concepts.	3.90	Highly Implemented
5. Models, pictures, illustrations, and drawings are used effectively to visualize complex topics and improve learners' comprehension.	4.16	Highly Implemented
6. Concept maps, flow charts, and mind maps are implemented regularly to help learners organize and construct their understanding of the mathematical concepts.	3.99	Highly Implemented
7. Strategic Intervention Materials (SIM) are utilized to fill and address learning gaps and support struggling learners.	3.84	Highly Implemented
8. Electronic Math Application are incorporated in the lessons to provide interactive and personalized teaching-learning experiences for learners.	3.57	Highly Implemented
9. Internet resources are used regularly in lessons to provide timely and relevant information to enhance the teaching and learning experience.	3.78	Highly Implemented
10. Reference materials (e.g., textbooks, journals) are sufficient and used regularly as reliable learning resource.	4.12	Highly Implemented
Overall Mean	**3.99**	**High**

Instructional Materials and Resources. The table shows that item 3 - Learners' modules are well-integrated into daily lessons and useful in meeting learning objectives has the highest mean score of 4.28

of very highly descriptive rating. This implies that learners' modules play a crucial role in daily instruction indicating their strong integration and effectiveness in achieving learning objectives. On the other hand, the item 8 - Electronic Math Application are incorporated in the lessons to provide interactive and personalized teaching-learning experiences for learners receives the lowest mean of 3.57. This suggests that the use of technology for interactive and personalized learning experiences is less emphasized and may indicate a need for greater integration of digital tools to enhance engagement and provide more dynamic learning opportunities for students. In conclusion. The status of implementation in terms of Instructional materials is High with 3.99 as the overall mean score.

To have a good academic performance, learners need instructional materials otherwise they perform poorly especially in schools with no adequate instructional materials. Lack of school libraries, lack of sufficient textbooks, and lack of reliable internet connections are some of the challenges schools are facing (Tety, 2016). On Deped's annual audit report in august, 2022, the Commission on Audit (COA) said 1.188 billion pesos worth of science and math equipment were already procured and delivered in the central office but still undistributed to schools (https://www.philstar.com/headlines/2023/12/16/2319252/deped-starts-hauling-math-science-items-logistics-firm).

Table 3. The Status of Implementation of Spiral Progression Approach in Terms of Curriculum Integration

Curriculum Integration	Mean	Descriptive Rating
1. There is more integration of various concepts on each topic encountered.	4.12	Highly Implemented
2. The lessons are extended in a more elaborate and comprehensive teaching style.	4.22	Very Highly Implemented
3. There is an integration of knowledge and skills across different disciplines.	4.34	Very Highly Implemented
4. The topics discussed in the previous years are prerequisite for those topics in the current year. Thus, they are reviewed before a new topic is introduced.	4.30	Very Highly Implemented
5. There is continuity of lessons in the same Math concept in all grade levels.	4.13	Highly Implemented
6. The lessons which cover the same topics in other grade levels are presented at varying levels of complexity.	4.17	Highly Implemented
7. The information the students have acquired about a topic is reinforced and deepened as they revisit the subject matter.	4.11	Highly Implemented
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.	4.07	Highly Implemented
9. Learners learn topics and skills appropriate to their developmental/cognitive stages.	4.08	Highly Implemented
10. Learners are provided with activities or projects developing their thinking skills and dispositions, which do not stop at identification but facilitate implementation of the desired performance.	4.17	Highly Implemented

Overall Mean	**4.17**	**High**

Curriculum Integration. The table indicates that the item with the highest mean score of 4.34 is item 3- there is an integration of knowledge and skills across different disciplines which falls under the Very Highly Implemented descriptive rating. This implies that this approach is a well-established practice in teaching and learning. This interdisciplinary integration likely enhances students' ability to connect concepts across subjects, promoting deeper learning. Item 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 has the lowest mean of 4.07. This implies that while breadth in learning is addressed, it may not be as strongly emphasized as interdisciplinary connections. This highlights a potential need to further enhance diverse learning experiences to ensure a well-rounded education. On average, the status of Implementation is High with an overall mean score of 4.17.

Reynoso (2024) pointed out that learning activities provided to learners are always based on the principles of the spiral progression approach. There is still a need of further research to investigate its impacts on student learning. Ideas behind curriculum integration, especially for young adolescents is challenging, relevant, exploratory, and integrative (Wall and Leckie, 2017).

Table 4. The Status of Implementation of Spiral Progression Approach in Terms of Capacity Training

Capacity Training	**Mean**	**Descriptive Rating**
1. In the seminars I participated, the objectives of the capacity training/workshops are clearly communicated to all participants.	4.19	Highly Implemented
2. The trainings/workshops provide content relevant and aligned with the current needs of teachers.	4.25	Very Highly Implemented
3. Learning facilitators and resource speakers of the seminars/workshops are knowledgeable and effective in delivering the content.	4.25	Very Highly Implemented
4. The capacity training/workshops in school/district/division are conducted regularly and as planned.	4.06	Highly Implemented
5. The training materials provided during the seminars/workshops are comprehensive and useful in teaching-learning process.	4.11	Highly Implemented
6. Teachers are given adequate opportunities to participate in forums, discussions, and practical exercises during the seminars.	4.14	Highly Implemented
7. The capacity training seminars and workshops helped me improve my teaching strategies and ability to implement the curriculum effectively.	4.29	Very Highly Implemented
8. Follow-up support is available after the seminar/workshop to assist teachers in the implementation of the learned teaching strategies.	3.99	Highly Implemented
9. The capacity training seminar/workshops address the specific challenges I encounter in my teaching practice.	4.10	Highly Implemented
10. The overall organization and logistics of the training seminars/workshops are efficient and well-coordinated.	4.17	Highly Implemented
Overall Mean	**4.16**	**High**

Capacity Training. Results shows that item 7- the capacity training seminars and workshops helped me improve my teaching strategies and ability to implement the curriculum effectively gained the highest mean score of 4.29 and a descriptive rating of very highly implemented which suggests that professional development opportunities are well-received and play a crucial role in improving teaching effectiveness Item 8-Follow-up support is available after the seminar/workshop to assist teachers in the implementation of the learned teaching strategies has the lowest mean of 3.99. This implies that post-training assistance may not be as strongly emphasized which indicates a potential need to strengthen follow-up support systems to ensure sustained application and reinforcement of newly learned teaching strategies.

On average, the status of implementation in terms of capacity training is high with its overall mean score of 4.16.

It is important to train and re-train teachers for determining learners' success. Constant capacity building should be provided for teachers to boost their confidence and molding them to be effective and efficient. It should be catered to all teachers and budgetary allowance must be improved (Suleiman, Hanafi, Thanslikan, and Abdulrasheed, 2017). Buan, et. al. (2021) added, that teachers received many benefits from the training that they are able to apply in their teaching. They learn how to effectively use concrete materials and manipulatives to explore important mathematics, emphasizing the benefit of allowing learners to express their ideas.

Table 5. The Status of Implementation of Spiral Progression Approach in Terms of Assessment Strategies

Assessment Strategies	Mean	Descriptive Rating
1. I use pencil and paper tests to measure students memorized knowledge and levels of understanding.	4.47	Very Highly Implemented
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.	4.17	Very Highly Implemented
3. I let my students do reflection note allowing them to write down their experiences, learnings, difficulties and thoughts about the lessons discussed.	3.78	Very Highly Implemented
4. I let my students have a simple research report presentation to let them apply their knowledge and understanding of a topic.	3.55	Highly Implemented
5. I use performance-based assessments like producing a product and performing an activity for them to showcase what they know and can do.	4.00	Highly Implemented
6. I use problem-solving activities to gauge students' conceptual understanding of the theory-practice relationship, their higher-level reasoning skills, and the development of their practical competence in solving problems.	4.24	Highly Implemented
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.	4.23	Very Highly Implemented
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.	4.05	Highly Implemented

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.	3.87	Highly Implemented
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.	4.33	Highly Implemented
Overall Mean	**4.07**	**High**

Assessment Strategies. Item number 1- I use pencil and paper tests to measure students memorized knowledge and levels of understanding has the highest mean score of 4.47 which falls under the very highly implemented descriptive rating which implies that traditional assessment methods are the most commonly used evaluation tools. Similar to the findings conducted by Reynoso (2024), that teachers always use paper and pencil as an assessment practice to evaluate learner understanding.

On the other hand, item 4- I let my students have a simple research report presentation to let them apply their knowledge and understanding of a topic gained the lowest mean score of 3.55 which implies a potential need to incorporate more alternative assessment strategies that promote critical thinking, creativity, and real-world application of learning.

Overall, the status of implementation is High in terms of assessment strategies with 4.07 as the overall mean score.

DepEd No.8, s. 2015 highlights that the purpose of assessment is to monitor students' progress, promote self-reflection and accountability, and provide bases for profiling student performance on the learning competencies and standards of the curriculum.

On average, the status of implementation of spiral progression approach in terms of these five indicators is high with the mean score of 4.15.

Table 6. Performance of Teachers Based on their Class Observation Tool (COT) for 2023-2024

Range of Scores	f	Percentage	Descriptive Equivalent	Rating
4.21 – 5.00	67	80.73	Outstanding	Very High
3.41 – 4.20	11	13.25	Very Satisfactory	High
2.61 – 3.40	3	3.61	Satisfactory	Moderate
1.81 – 2.60	2	2.41	Unsatisfactory	Low
TOTAL	**83**	**100%**		

There are 67 or 80.73% whose rating falls from 4.21-5.00, with a descriptive equivalent of Outstanding which implies that the respondents rating is very high while, 2 or 2.41% performs unsatisfactorily given its rating from 1.81-2.60. This implies that most of the teacher-respondents are performing outstandingly during their classroom observation.

Reynoso (2024) found out in his study that almost all teachers have an outstanding rating in the IPCRF but the performance of teachers in terms of the basic tenets of spiral progression falls mainly in the moderate level of achievement.

Table 7. Significant Relationship between the Socio-demographic profile and the Status of Implementation of Spiral Progression Approach in Mathematics Education

Profile	Status of Implementation (computed "r")				
	Teaching Strategies	Instructional Materials & Resources	Curriculum Integration	Capacity Training	Assessment Strategies
Age	-.042	.109	.008	.060	.000
Sex	-.118	.048	-.050	-.085	-.105
Civil Status	-.002	-.004	-.046	-.083	-.065
Educational Attainment	.363**	.316**	.336**	.222*	.383**
Length of Teaching	.116	.168	.148	.106	.040
Position	.244*	.207	.188	.127	.112

. Correlation is significant at the 0.01 level (2-tailed).

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

First, the correlation between the age and the status of implementation. In terms of curriculum integration, instructional materials and resources, curriculum integration, capacity training, and assessment strategies the computed "r" value is -.042, .109, .008, .060, .000 respectively. The r values implies that there is a negligible association between the age and the status of implementation therefore, the relationship is not significant.

Second, the correlation between the sex and status of Implementation. In terms of curriculum integration, instructional materials and resources, curriculum integration, capacity training, and assessment strategies the computed "r" value are -.118, .048, -.050, -.085, -.105 respectively. The r values of each factor show that there is a negligible association between the age and the status of implementation. This implies that the correlation is not significant.

Third is the correlation between civil status and status of implementation. The computed r value is -.002, -.004, -.046, -.083, -.065 in terms of curriculum integration, instructional materials and resources, curriculum integration, capacity training, and assessment strategies respectively. Similar to age and sex, the relationship is not significant. There is a negative correlation between civil status and to all the factors and the association is negligible.

Fourth, the correlation between the educational attainment and status of implementation. Results show that there is a significant relationship between educational attainment and the status of implementation in terms of teaching strategies, instructional materials and resources, curriculum integration, and assessment strategies at 0.01 level of significance. The computed r value of .363, .316, -336, and .383 implies that the correlation is positive but the association is weak. On the other hand, there is a positive correlation between the educational attainment and capacity training is significant at 0.05 level of significance with .222 computed r value.

Fifth, the correlation between length of teaching and the status of implementation. The computed r values are .116, .168, .148, .106, .040 in terms of teaching strategies, instructional materials and resources, curriculum integration, capacity training, and assessment strategies respectively. It implies a positive correlation but of negligible association and therefore the relationship is not significant.

Lastly, the correlation between the status on implementation in terms of teaching strategies and position is significant at 0.05 level with .244 computed r value. Meanwhile, in terms of instructional materials and resources, curriculum integration, capacity training, and assessment strategies to the position, there is a positive correlation but of negligible association with .207, .188, .127, .112 computed r value respectively. This implies that the relationship is not significant.

In the study of Goldhaber and Brewer (1996), it was found out that years of teaching experience has no significant relationship in any subject area nor is it significant if the teacher is a master's degree holder. It does not guarantee that teachers with higher education are more effective than those who do not have.

Table 8. Significant Relationship between the Status of Implementation of Spiral Progression Approach in Mathematics Education and the Performance of Public-School Teachers based on the Classroom Observation Tool (COT)

Profile	**Status of Implementation (computed "r")**				
	Teaching Strategies	Instructional Materials & Resources	Curriculum Integration	Capacity Training	Assessment Strategies
Performance of Public-School Teachers	.442**	.207	.213	.237	.195

. Correlation is significant at the 0.01 level (2-tailed).

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

The table shows that the correlation coefficient between the status of implementation in terms of teaching strategies and the performance of public-school teachers based on classroom observation tool is significant at 0.01 level. The computed r value of .442 implies that there is a weak association between the two. Moreover, in terms of instructional materials and resources, curriculum integration, capacity training, and assessment strategies, the computed r value are .207, .213, .237, .195 respectively. There is a positive correlation but of negligible association. It means that the association might be due to chance and there is no enough evidence to conclude the relationship between the performance and the status of implementation in terms of instructional materials and resources, curriculum integration, capacity training, and assessment strategies.

In the study conducted by Tapanan, Antig, Tapanan Jr. (2021), it was found that Mathematics teachers have very low ability in terms of instruction in Mathematics using spiral progression approach.

4. Conclusions

The socio-demographic profile of the teacher-respondents as to age, sex, civil status, educational attainment, years in teaching and position varies with each other. More than half of the teacher-respondents belong to younger to mid-career age group and a significant number of females. Meanwhile, single teachers dominate and more than half of the teachers have earned their master's degree units. Furthermore, teachers holding teacher III positions indicating that there is advancement or career progression but little opportunities to master teacher positions. The status of Implementation of Spiral progression approach is

Very High in terms of teaching strategies while in terms of Instructional Materials, Curriculum Integration, Capacity Training and Assessment Strategies is High. Furthermore, majority of the teachers perform outstandingly and isolated number of teachers perform moderately to low based on COT rating for 2023-2024. There is no significant relationship between the socio-demographic profile and the status of Implementation except in terms of educational attainment. In addition, no significant relationship found between the status of implementation and performance of teachers except in terms of teaching strategies. The overall remark of the status of implementation of spiral progression approach is HIGH.

5. Recommendations

Teachers should be given equal opportunity for career progression; finishing their post graduates studies giving more opportunities for a higher teaching position, and develop policies to ensure teachers development regardless to their socio-demographic profile. Moreover, it is essential to Sustain the high status of Implementation of Spiral Progression. Teachers with low to moderate to high performance should benchmark best practices of teachers with a very high rating performance. Mentoring, coaching and intervention programs like LAC sessions can be an avenue for feedbacks and suggestions. The agency on education should find more way to strengthen reinforcement strategies catering diverse teachers to further improve the implementation. Further study by future researchers is encouraged to justify the relationship between the status of implementation of spiral progression approach and the performance of teachers. Identifying other ways and best practices may help sustain the high status of implementation of spiral progression approach in mathematics education and serve as a basis to develop a sustainability plan.

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