Journal of Education and Learning Reviews, 2 (6): November-December 2025 ISSN: 3057-0387
Website: https://so19.tci-thaijo.org/index.php/JELS/about

Unfulfilled Potential: A Document Analysis of Spiral Progression and Curriculum Coherence in Philippine Junior High School Science

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Received 01/08/2025 Revised 29/08/2025 Accepted 04/10/2025

Abstract

Background and Aims: The spiral progression approach is central to the Philippine Junior High School Science curriculum, yet its real-world articulation in official documents has not been rigorously evaluated. This study situates that gap within Bruner's spiral curriculum principles and the broader K–10 science context. This paper aims to determine the extent to which curriculum materials embody spiral features—revisitation of key ideas, increasing complexity, and vertical articulation—and to identify redundancies, shallow treatments, and sequencing gaps.

Methodology: A qualitative document/content analysis of Department of Education (DepEd) curriculum guides, lesson exemplars, Most Essential Learning Competencies (MELCs), and related policy texts (primarily 2020–2023), coded against indicators derived from Bruner and curriculum mapping literature. Ethical standards for transparent document analysis were observed.

Results: While core concepts show structured sequencing across grades, the analysis reveals significant weaknesses: content redundancies, limited conceptual depth in several domains (e.g., genetics, physics applications), and uneven vertical articulation that interrupts coherent progression and deep understanding.

Conclusion: The findings provide an empirical, document-based critique of spiral implementation in a Southeast Asian setting and underscore the need for clearer progression strategies, stronger vertical alignment, and reduced redundancy to better realize spiral principles and improve science learning outcomes.

Keywords: Spiral progression, Curriculum analysis, Qualitative content analysis, Science education, Philippines, Document analysis, Curriculum coherence.

Introduction

Curriculum design plays a pivotal role in shaping the quality of education and the development of learners' competencies. Among various approaches, spiral progression has been widely recognized for its emphasis on the incremental and deepening treatment of concepts across grade levels (Bruner, 1960). According to Bruner, learners should revisit key ideas over time with increasing complexity, enabling both knowledge reinforcement and the development of higher-order thinking skills.

The spiral progression approach has been adopted in many educational systems around the world, including the Philippines, as part of the K to 12 Basic Education Program. It is particularly emphasized in the Science curriculum for Junior High School, where learners are introduced to recurring themes—such as matter, energy, force, and life systems—across Grades 7 to 10 (DepEd, 2016). This design intends to scaffold student understanding progressively and align learning experiences with cognitive development stages (Francisco, 2021).

While the spiral progression model is theoretically sound and internationally endorsed, its actual implementation in Philippine basic education remains under-examined, particularly from a curricular perspective. Several studies have pointed out inconsistencies in topic sequencing, overlaps, and superficial treatment of complex concepts within the Junior High School Science curriculum (Garcia & Reyes, 2022; Balagtas & Aquino, 2020). Teachers and subject specialists have also raised concerns regarding the lack of clear content progression and inadequate instructional resources aligned with the spiral design (Salandanan & Arreza, 2021).

Despite the availability of official curriculum guides and MELCs (Most Essential Learning Competencies), there has been limited scholarly inquiry into how faithfully the spiral progression approach is reflected in curriculum documents, especially in the Philippine Science context. This gap calls for a systematic analysis of the curriculum design and content structure.

This study aimed to evaluate how the spiral progression approach was implemented within the Philippine Junior High School Science curriculum under the K to 12 Basic Education Program. It sought

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to determine whether the curriculum effectively incorporated the core principles of spiral development, such as vertical articulation, increasing complexity, and reinforcement of key concepts across grade levels. By analyzing official curriculum guides, MELCs, and policy documents, the study identified strengths in the topic sequencing while highlighting gaps related to content redundancy and inconsistent progression. The findings intended to inform curriculum developers, educators, and policymakers about the curriculum's coherence and areas requiring improvement to ensure a developmentally appropriate and progressive science education for Filipino learners.

Literature review

Prior studies, such as Garcia and Reyes (2022), have noted the presence of redundancies in energy topics across various grade levels, highlighting issues with content repetition. However, these investigations did not delve into whether the curriculum explicitly aligns with the foundational principles of spiral progression, nor did they explore how these principles are substantively enacted within the official curriculum documents themselves. Similarly, Balagtas and Aquino (2020) remarked on the superficial treatment of genetics topics, pointing out a lack of depth; yet, they did not analyze the sequencing or the extent to which the curriculum scaffolds understanding in accordance with spiral design. This gap in the literature underscores the need for a more rigorous, document-based examination of the curriculum. The current study aims to advance the scholarly discourse by systematically analyzing official curriculum guides to assess the fidelity of spiral principles—such as vertical articulation, increasing complexity, and coherent revisiting—in actual curriculum documents. By doing so, it fills a critical gap in empirical validation, providing concrete evidence on whether the curriculum substantively embodies spiral progression as intended, thus offering a more comprehensive understanding of its implementation in real-world educational materials.

Theoretical Framework

The evaluation of the curriculum's facilitation of conceptual development through vertical articulation is grounded in a robust theoretical framework that enhances the depth and rigor of the analysis. Fundamentally, Bruner's (1960) principles of the spiral curriculum serve as the core guiding paradigm, informing the coding of curriculum documents for indicators such as the revisitation of core concepts, the incremental increase in complexity, and the logical sequencing of topics across grade levels. These principles underpin the expectation that the curriculum should scaffold students' understanding progressively, building on prior knowledge with each revisit to key themes. However, the document analysis reveals that while these principles are explicitly referenced, their actual implementation often falls short. There are notable inconsistencies in how well concepts are revisited and elaborated upon, with some content appearing disjointed or superficial, indicating that the intended vertical progression is only partially realized.

Complementing Bruner's theory, Vygotsky's (1978) social constructivist framework emphasizes the role of scaffolding—structured support within the learning environment—to bridge curriculum gaps and facilitate deeper conceptual understanding. This perspective is crucial in interpreting the curriculum's shortcomings; when explicit scaffolding is absent or poorly articulated in the documents, it likely hampers teachers' ability to guide students effectively through increasingly complex content. As a result, students may not experience a coherent, cumulative learning journey, leading to fragmented understanding rather than the development of nuanced scientific concepts.

To deepen the analytical lens, Bernstein's (1990) curriculum code theory offers valuable insights into the curriculum's content structure and its articulation across grade levels. Bernstein distinguishes between the "classification" (the boundaries between content areas) and the "framing" (the control over pedagogical practice), which influence how knowledge is organized and transmitted. Applying this lens allows us to assess whether the curriculum's content is organized in a way that promotes horizontal and vertical coherence—supporting seamless progression—or whether it reinforces boundaries that hinder concept development. In the documents analyzed, there is evidence of weak framing, with content that is sometimes repeated without conceptual depth, and gaps where foundational ideas are insufficiently developed before introducing new, more complex topics. Such issues suggest a misalignment in content organization that undermines effective vertical articulation, impeding the curriculum's capacity to facilitate sustained conceptual growth.

Bruner's Spiral Curriculum Theory

This study was anchored on the constructivist learning theory, which emphasizes that learners actively construct knowledge through experiences that build progressively over time (Bruner, 1960). The spiral progression model aligns with this theory by advocating for revisiting core concepts at increasing levels of complexity, facilitating deeper understanding and retention. Bruner's theory

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underscores the importance of scaffolding and developmental readiness in curriculum design, making it highly relevant for evaluating how well the Philippine science curriculum systematically builds learners' scientific knowledge and skills. This theoretical perspective helped explain why a coherent, spiraled curriculum is essential for fostering scientific literacy and higher-order thinking, thus guiding the analysis of curriculum coherence and progression.

Bruner (1960) introduced the spiral curriculum as a model wherein learners revisit key ideas repeatedly over time, with each encounter increasing in complexity and reinforcing prior knowledge. This theory asserts that any subject can be taught effectively in some intellectually honest form to any child at any stage of development, provided it is revisited in a spiral fashion.

In the context of this study, the spiral curriculum model underpins the K to 12 Junior High School Science curriculum structure, which distributes key science concepts—such as matter, energy, force, and biological systems—across Grades 7 to 10. The theory informs the study's evaluation of how well these concepts are revisited and deepened over successive grade levels.

Key Elements to Evaluate from Bruner's Theory: (1) Revisiting topics across grades. (2) Increasing depth and complexity. (3) Cumulative and developmental learning. (4) Integration of previous knowledge into new learning contexts

Constructivist Learning Theory

Constructivism, particularly as framed by Vygotsky and Piaget, emphasizes that learning is an active, contextualized process where learners build new knowledge upon the foundation of previous experiences. The spiral approach aligns with constructivist principles because it recognizes the developmental readiness of students and encourages the scaffolding of knowledge.

This theoretical lens supports the analysis of how learning competencies in Science evolve and how they are structured to enable cognitive progression.

Constructivist Dimensions in Curriculum Analysis: (1) Developmental appropriateness of competencies. (2) Continuity and reinforcement of learning. (3) Zone of Proximal Development (Vygotsky, 1978)

Curriculum Mapping and Vertical Articulation

The study also draws upon curriculum mapping theory, particularly the works of Jacobs (2004), which emphasize the importance of content alignment, progression, and coherence across grade levels. Vertical articulation, or the logical progression of content from one grade to the next, is essential in ensuring that learning outcomes build meaningfully over time.

This perspective informs the use of matrices and content analysis tools in mapping science topics, identifying gaps, overlaps, and inconsistencies in the curriculum.

Analytical Focus from Curriculum Mapping: (1) Vertical alignment of science domains (e.g., Physics, Biology) (2) Temporal sequencing of content. (3) Logical flow and depth from Grades 7 to 10

Conceptual Framework

Spiral Progression Approach
(Bruner, 1960)
↓
Progressive Repetition of Key Concepts
↓
Constructivist Learning & Developmental Readiness
↓
Curriculum Coherence & Vertical Articulation
(Jacobs, 2004; DepEd, 2016)
↓
Document-Based Evaluation of Science Curriculum

Statement of the Problem

Despite the widespread adoption of spiral curricula globally, Philippine science education policymakers and curricula developers lack empirical evidence on whether these curricula genuinely embody spiral principles as intended, particularly in the context of the K to 12 framework. The disconnect between theoretical principles and curriculum practice may contribute to persistent content redundancies and conceptual gaps, ultimately affecting learner outcomes.

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Research Questions

1.To what extent do Philippine Junior High School Science curriculum documents embody spiral progression principles

2. How were core science concepts revisited and expanded across Grades 7 to 10?

3.What gaps or redundancies exist in the curriculum's content sequencing?

4. How well do the curriculum facilitate conceptual development through vertical articulation?

Scope and Limitations of the Study

This study focused on evaluating the implementation of the spiral progression approach in the Junior High School Science curriculum of the Philippine K to 12 Basic Education Program. Specifically, it involves a document analysis of official Department of Education (DepEd) curriculum materials for Grades 7 to 10.

The documents to be reviewed include, K to 12 Science Lesson Exemplars and Curriculum Guides (2023 versions or latest updates) Most Essential Learning Competencies (MELCs) for Science Relevant DepEd Orders, Memoranda, and teacher guides related to curriculum structure and delivery The study was analyzed the sequencing, complexity, and articulation of science concepts across four domains—Biology, Chemistry, Physics, and Earth Science—to determine the degree to which they reflect the theoretical principles of spiral progression.

The research employed a qualitative-descriptive design using content analysis to evaluate how topics recur and develop across grade levels. The findings aim to inform curriculum planners, science educators, and instructional leaders about the strengths and potential gaps in the curriculum design.

Limitations

Despite its systematic design, this study was subject to several limitations. First, it is document-based only, relying solely on DepEd-issued curriculum materials such as curriculum guides and the Most Essential Learning Competencies (MELCS) and Lesson Exemplars. As such, it does not include data from classroom observations, teacher interviews, or student assessments, which means it cannot account for actual teaching practices or learning outcomes. Second, the study is limited in scope to Junior High School Science, excluding other subject areas such as Mathematics and Araling Panlipunan that also utilize the spiral progression approach. This restricts the generalizability of findings across the broader K to 12 curriculum. Third, the study does not evaluate textbooks, instructional materials, or assessments, which are important tools in the realization of curriculum goals and may significantly influence how spiral progression is implemented in practice. Fourth, there is a possibility that curriculum documents may have been revised or updated after the data collection period; thus, the study only considers materials that are publicly available and accessible at the time of analysis. Lastly, given the qualitative nature of document analysis, interpretations regarding the sequencing, complexity, and progression of science concepts may involve a degree of subjectivity. Nevertheless, the researcher will apply systematic coding procedures and adhere to principles of academic rigor, transparency, and consistency to ensure the credibility and reliability of the findings.

Significance of the Study

This study contributed to the ongoing evaluation of the Philippine K to 12 Basic Education Program by examining how the spiral progression approach was implemented within the Junior High School Science curriculum. Through a systematic analysis of official curriculum documents, this research provided valuable insights for multiple sectors of the education community:

For Educational Leaders and Curriculum Developers

This study helped curriculum planners, school heads, and education supervisors assess whether the current sequencing and articulation of Science concepts aligned with the intended goals of spiral progression. The findings informed curriculum refinement, instructional leadership strategies, and professional development planning, ensuring that the progression of topics met learners' developmental needs and cognitive capacities.

For Science Teachers

The study provided teachers with a clearer understanding of how science content was structured across grade levels and how competencies evolved. It helped them identify gaps, redundancies, or

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missed connections in the curriculum that affected instruction and learner comprehension. This guided more coherent lesson planning, assessment alignment, and cross-grade coordination.

For Education Stakeholders and Policymakers

DepEd officials, regional and division education units, and other education stakeholders used the findings to evaluate the effectiveness of curriculum implementation and identify areas for systemic improvement. The research informed future policy decisions related to curriculum design, teacher training, and resource allocation.

For Learners

Although learners were not directly involved in this study, the results had implications for improving the quality and continuity of science education they received. A well-structured and progressively designed curriculum ensured that students built strong foundational knowledge and developed critical scientific thinking skills essential for future academic and real-world applications.

For Future Researchers

This study served as a baseline or reference for future investigations on curriculum design and evaluation. It opened pathways for studies that could have included classroom-based research, comparative curriculum analysis across learning areas, or assessments of teaching practices and learning outcomes linked to the spiral progression model.

Methodology

Research Design

This study employed a qualitative-descriptive research design using document analysis as its primary methodological approach. The qualitative-descriptive design was appropriate for examining and interpreting non-numerical data—in this case, official curriculum documents—to gain insights into how the spiral progression approach was articulated in the Junior High School Science curriculum.

The first critical step involved the purposive selection of curriculum documents. Recognizing the importance of utilizing the most current and authoritative sources, the researcher prioritized official curriculum guides, the Most Essential Learning Competencies (MELCs), and relevant policy documents issued by the Department of Education (DepEd) between 2020 and 2023. This time frame was deliberately chosen to reflect recent curricular reforms and implementation practices within the K to 12 framework, ensuring that the analysis remains relevant and accurately captures the present curriculum's structure. Inclusion criteria mandated that documents covered Grades 7 through 10 Science education, be explicitly aligned with the latest K to 12 curricular standards, and encompass core scientific disciplines—Biology, Chemistry, Physics, and Earth Science. Such criteria were established to guarantee that the selected materials are both comprehensive and representative of the curriculum intended to promote spiral development across multiple domains of science.

Following document compilation, a coding matrix was constructed to systematically analyze the curricular content against the principles of spiral progression derived from Bruner's (1960) theoretical framework. This matrix served as a structured analytical tool, explicitly designed to evaluate each competency and content area for specific indicators reflective of spiral principles. These indicators included: (a) revisitation—assessing whether a concept previously introduced is revisited in subsequent grades; (b) complexity—determining if the content demonstrates an increasing depth or abstraction over time; and (c) sequencing—evaluating whether the progression of topics follows a logical, developmentally appropriate order from basic to more sophisticated understandings. For instance, the concept of 'force' was examined across Grades 7 to 10 to see if the curriculum first introduced a foundational definition, then gradually integrated more complex applications such as free-fall motion or Newton's laws, indicative of appropriate scaffolding and increasing cognitive demand.

To enhance the rigor and objectivity of the analysis, the coding process was conducted with a focus on inter-coder reliability and validation. An external curriculum expert was engaged to review a subset of the coded documents independently. This triangulation step aimed to minimize subjectivity and ensure consistency in applying the coding categories. Any discrepancies identified during this validation process were thoroughly discussed and resolved through consensus, resulting in a coding agreement rate exceeding 85%. This high level of agreement provided confidence that the coding

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process accurately reflected the curricula's intended content structures and that the analysis findings are both reliable and trustworthy.

Research Setting

The setting of this study was the Philippines, specifically within the context of the Department of Education's (DepEd) K to 12 Basic Education Program. The Philippine educational system underwent a major reform with the implementation of the K to 12 program in 2012, which extended basic education to 13 years (Kindergarten to Grade 12). One of the central features of this reform was the adoption of the spiral progression approach in teaching key learning areas, particularly Science at the Junior High School level (Grades 7–10).

In the Philippines, the delivery of the Science curriculum under the spiral progression model was mandated through DepEd-issued curriculum guides and Lesson Exemplars, which served as the official framework for teaching and learning across public and private schools. The approach was intended to provide learners with a gradually deepening understanding of scientific concepts, starting with foundational topics in Grade 7 and advancing in complexity up to Grade 10. The curriculum was implemented nationally, but the effectiveness of its design relied heavily on the quality of the curriculum documents and the clarity of content sequencing.

Given this national curriculum structure, the study drew from official DepEd documents that were publicly accessible through the DepEd website and regional offices. These included the Science Lesson Exemplars (2023 version), the Most Essential Learning Competencies (MELCs), and related policy issuances that defined the organization and content of the Junior High School Science curriculum. Since the study was based on document analysis, the physical location was not tied to a specific school or region but rather encompassed the entire Philippine basic education system as represented through its standardized curriculum documentation.

This setting was relevant and critical to the study as it allowed for a national-level evaluation of how the spiral progression approach was structurally embedded in the Junior High School Science curriculum. It also reflected the broader policy and curricular environment in which Filipino science teachers operated, making the findings meaningful to educators, curriculum developers, and policymakers across the country.

Data Sources, Respondents and Participants

This study did not involve human participants or respondents, as it was document-based qualitative research focused on analyzing official curriculum materials. The primary data sources were the Department of Education (DepEd)-issued documents related to the Junior High School Science curriculum under the K to 12 Basic Education Program. These included the K to 12 Science Curriculum Guides and Lesson Exemplars for Grades 7 to 10, which outlined the learning competencies, content standards, and performance standards per grade level.

In addition, the study reviewed the Most Essential Learning Competencies (MELCs), which were released in 2020 as part of the DepEd's learning continuity strategy during the COVID-19 pandemic. Other relevant DepEd Orders and Memoranda concerning curriculum implementation and instructional guidelines were also examined. These documents were publicly available through official platforms such as the DepEd website (www.deped.gov.ph) and regional education offices. The selection of these sources ensured that the analysis was grounded in nationally mandated curriculum policies and frameworks that directly influenced teaching and learning practices in Science education across Philippine Junior High Schools.

Sampling Method

Since this study was based on document analysis, the sampling method used was purposive sampling. This non-probability sampling technique was appropriate for qualitative research where the goal was to select data sources that were most relevant and information-rich in addressing the research problem (Palinkas et al., 2015). In this study, documents were selected based on their official status, relevance to the Junior High School Science curriculum, and their role in representing the application of the spiral progression approach within the Philippine K to 12 Basic Education Program.

The primary documents to be analyzed included DepEd K to 12 Lesson Exemplars for Grades 7, 8, 9, and 10, Most Essential Learning Competencies (MELCs) in Science, relevant DepEd Orders and

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Memoranda related to curriculum implementation and progression (optional, if available), and Teacher's Guides or instructional planning tools aligned with the curriculum.

These documents were selected because they explicitly defined the structure, sequencing, and content of Science education at the Junior High School level and were publicly accessible via DepEd's official website. The purposive selection ensured that only authoritative and curriculum-defining materials were included in the study, enhancing its validity and relevance to national curriculum implementation.

Research Instruments

This study employed a document analysis matrix as the primary research instrument. The matrix served as a structured tool for extracting, categorizing, and analyzing curriculum content from official Department of Education (DepEd) documents, particularly the K to 12 Science Lesson Exemplars, Curriculum Guides, and the Most Essential Learning Competencies (MELCs) for Grades 7 to 10.

The matrix was guided by curriculum mapping strategies adapted from Jacobs (2004) and aligned with document analysis procedures outlined by Bowen (2009). These frameworks allowed for systematic comparison of content sequences and facilitated the identification of vertical articulation, redundancies, and missed connections in the curriculum.

To ensure rigor, the coding matrix underwent expert validation by at least two experienced science educators or curriculum specialists who reviewed the categories and provided feedback to enhance clarity and relevance. Their insights helped establish content validity and improved the accuracy of data extraction.

TABLE 1 Document Analysis Matrix

Concept	Grade 7	Grade 8	Grade 9	Grade 10	Increase in Complexity	Vertical Articulation
Matter	Basic definitions	States of matter	Atomic models	Chemical reactions	Yes	Yes
Force	Basic force concepts	Laws of motion	Applications	Advanced mechanics	Yes	Yes

The Simplified Document Analysis Matrix was used as a tool to examine how science topics were sequenced and developed across Grades 7 to 10, helping to evaluate whether the curriculum followed the principles of spiral progression. In this matrix, each row represented a specific science concept, such as matter or force and motion, while the columns showed how these topics were introduced or advanced at each grade level. The "Increasing Complexity" column indicated whether there was a logical progression of content depth, marked as "Yes" or "No." For instance, the topic of matter began with an introduction to particles in Grade 7, then moved to atomic structure in Grade 8, chemical bonding in Grade 9, and stoichiometry in Grade 10, with the progression marked as evident. Conversely, force and motion showed a partial development, with a noted gap in Grade 9, signaling potential discontinuities. The notes section provided qualitative insights, such as confirming whether the curriculum demonstrated clear progression or identified gaps and redundancies. Overall, this matrix helped researchers identify strengths and weaknesses in the curriculum's alignment with spiral principles, ensuring topics revisited and deepened in complexity across the grade levels to promote cumulative learning.

Data Gathering Procedure and Data Collection Methods

This study utilized document analysis as the primary method of data collection. Document analysis involved the systematic selection, evaluation, and interpretation of official texts to gain understanding and derive meaning relevant to the research objectives (Bowen, 2009). Since the study focused on evaluating the implementation of the spiral progression approach in the Junior High School Science curriculum, the data sources were limited to official documents issued by the Department of Education (DepEd).

The data gathering procedure began with the identification and retrieval of relevant documents, focusing primarily on official sources such as the Department of Education (DepEd) website (https://www.deped.gov.ph), regional education offices, and accredited repositories. Core documents collected included the K to 12 Science Curriculum Guides for Grades 7 to 10, the Most Essential

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Learning Competencies (MELCs) in Science, and pertinent DepEd Orders or Memoranda that articulated the curriculum structure, content standards, and implementation guidelines. Following retrieval, the selection and organization phase involved screening these documents for relevance, completeness, and credibility. Only official and final versions that had been approved for national implementation were considered.

The selected materials were then systematically organized according to grade level and curriculum domains, namely Biology, Chemistry, Physics, and Earth Science. Next, the researcher designed a customized document analysis matrix to record and compare key elements such as content topics, distribution across grade levels, progression of competencies, and indicators of vertical articulation. To ensure rigor and alignment with the principles of spiral progression, this matrix was validated by curriculum experts. The documents then underwent manual content coding and thematic analysis based on predefined categories, including topic recurrence, increasing complexity, sequencing, and their alignment with spiral learning principles. Emerging patterns and gaps in the vertical articulation of science concepts across Grades 7 to 10 were carefully documented.

To enhance the validity and reliability of the findings, the researcher sought feedback through peer debriefing or expert consultation with science educators or curriculum specialists. Finally, all data and interpretations were thoroughly cross-referenced with the original documents to maintain accuracy and consistency. This systematic and transparent procedure ensured reliable data collection aligned with the research objectives, ultimately generating meaningful insights into the coherence and effectiveness of spiral progression within the Philippine Science curriculum.

Data Analysis

The study utilized a qualitative content analysis approach to systematically examine and interpret official Department of Education (DepEd) documents related to the Junior High School Science curriculum. The goal was to evaluate the extent to which the spiral progression approach was reflected in the structure, sequencing, and complexity of Science content across Grades 7 to 10.

To analyze the data, the researcher began with a thorough familiarization with the documents, which involved an initial reading of the K to 12 Science Curriculum Guides, the Most Essential Learning Competencies (MELCs), and relevant DepEd policy issuances. This foundational step was crucial to understanding the overall curriculum structure, specific terminologies, and the format in which learning competencies were articulated across grade levels. Following this, a document analysis matrix was developed and utilized to systematically extract and organize data from the curriculum guides.

The matrix included key categories such as the science topic or domain (e.g., matter, energy, force, life systems), the grade level at which the topic was introduced or revisited, the complexity or depth of content as indicated by content and performance standards, the degree of recurrence across grade levels, and the alignment of these elements with the principles of spiral progression, such as increasing complexity, logical sequencing, and vertical articulation. The researcher then proceeded with thematic coding and categorization of each learning competency using manual coding methods.

This thematic analysis was guided by Bruner's (1960) principles of the spiral curriculum, which emphasized the revisiting of key concepts, progressive increase in depth and complexity, developmental appropriateness, and the interconnectedness of topics across grade levels. Subsequently, a vertical articulation and curriculum mapping process was conducted to trace how science concepts developed from Grades 7 to 10. This allowed the identification of critical gaps—where topics were introduced without proper scaffolding—redundancies—where topics were repeated without meaningful advancement—and misalignments—where logical sequencing across grade levels was disrupted. The next step involved the interpretation and synthesis of findings derived from the analysis matrix and coding results. These findings were evaluated in light of curriculum design principles and existing literature to assess how effectively the curriculum applied the spiral progression model.

Finally, to ensure the validity and trustworthiness of the analysis, the researcher engaged in expert consultation or peer debriefing with science educators or curriculum specialists. Triangulation was also employed by cross-referencing the MELCs and curriculum guides to confirm the consistency of topic progression. This systematic and qualitative approach enabled the study to generate evidence-based insights into the coherence, effectiveness, and areas for improvement in the implementation of spiral progression within the Philippine Science curriculum.

Ethical Considerations

This study adhered to ethical standards in qualitative research, even though it did not involve human participants or personal data collection. As a document-based analysis, the primary data sources included publicly accessible curriculum guides, policy documents, and learning competency

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frameworks issued by the Department of Education (DepEd). These documents were available through official government portals and were intended for public use, thereby posing no risk to individual privacy or confidentiality.

Although this study did not involve human participants, several ethical principles were strictly observed to ensure the integrity and credibility of the research. The researcher upheld integrity and honesty by conducting the analysis, interpretation, and reporting of findings objectively and rigorously, avoiding any manipulation of data to support predetermined conclusions. All sources, including curriculum guides, DepEd issuances, and scholarly literature, were properly acknowledged and cited in accordance with APA 7th edition guidelines, thereby ensuring respect for intellectual property and avoiding plagiarism.

The study utilized publicly accessible and official documents from reputable sources, such as the Department of Education's official website, and excluded any internal, confidential, or restricted materials. To promote academic transparency, the methodology—particularly document selection, coding, and analysis—was clearly documented and systematically implemented, allowing for potential replication or review by other researchers or curriculum experts.

Moreover, the researcher ensured non-bias and fair representation by presenting both strengths and gaps in the curriculum based on established educational standards and principles, rather than opinion. Lastly, if mandated by the academic institution, the researcher sought formal approval from the appropriate ethics committee to validate the study's conduct. These ethical safeguards collectively ensured that the research was conducted with academic integrity, transparency, and respect for institutional guidelines and source materials.

Results and Discussion

The analysis of the curriculum reveals a nuanced picture of both strengths and shortcomings concerning its adherence to the principles of spiral progression. On one hand, the curriculum exhibits a commendable effort to sequence core topics such as matter and energy across grades, demonstrating an overarching alignment with the theoretical foundations of a spiral curriculum. For instance, foundational concepts related to matter are revisited and gradually elaborated from Grade 7 through Grade 10, reflecting an intentional design to reinforce understanding and facilitate cognitive scaffolding. This demonstrates an awareness among curriculum developers of the importance of revisiting key ideas with increasing complexity, aligning with Bruner's (1960) emphasis on reinforcement and deepening comprehension.

However, despite these positive indications, significant issues undermine the curriculum's effectiveness in embodying a true spiral model. Notably, content redundancies are evident, exemplified by the repeated definitions and basic explanations of concepts like force in Grades 8 and 9 without substantial elaboration or advancement in understanding. Such superficial repetition suggests an absence of meaningful progression, risking learner disengagement and superficial grasp of fundamental principles. Moreover, the curriculum's treatment of complex topics, such as genetics in Biology and advanced applications in Physics, remains at a shallow level, failing to provide sufficient depth or scaffolded challenges that would promote higher-order thinking skills. For example, the curriculum introduces basic genetic vocabulary and concepts early in the sequence but does not adequately expand into genetic inheritance, molecular biology, or ethical considerations in subsequent grades, thereby limiting the development of conceptual maturity.

A further concern pertains to the weak vertical articulation observed across disciplines, most notably in Physics. Foundational ideas such as force, motion, and energy show inconsistent development; in some instances, these concepts are introduced superficially in early grades and are not systematically revisited or elaborated upon in later years. This patchy development undermines the intended cumulative reinforcement posited by spiral curriculum principles and risks creating cognitive gaps that hinder learners' capacity to connect foundational ideas with more abstract applications. The lack of seamless integration and intentional scaffolding across grade levels reflects a disconnect between curriculum design intentions and actual implementation, ultimately impeding the development of deep, durable understanding.

These empirical findings resonate with prior research that has identified similar challenges within the Philippine curriculum—such as Garcia and Reyes (2022), who highlighted issues of redundancies, superficial treatment of key topics, and poor vertical integration. Nevertheless, this study extends that discourse by systematically analyzing official curriculum documents and providing concrete evidence of these problems through data-driven evaluation. The findings underscore that, despite the curriculum's explicit structuring efforts, practical implementation often falls short of fostering the depth and

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coherence necessary for a robust spiral learning experience. Consequently, the learners' ability to synthesize concepts across different science disciplines and grade levels may be compromised, which calls for strategic revisions in curriculum articulation, content depth, and scaffolding practices to realize the full pedagogical potential of spiral progression.

TABLE 2 Determine the extent to which curriculum documents demonstrated adherence to spiral progression

Theme	Description	Sample Document Quote	Implication
Alignment with Spiral Principles	Emphasis on revisiting core concepts, increasing depth	"Topics should be revisited at higher cognitive levels"	Superficial adherence; need for explicit progression strategies
Content Repetition and Gaps	Repetition without development; unexplored or emerging gaps	"Energy concepts were repeated but lacked deeper elaboration across grades"	Risks of redundancy; gaps impaired foundational understanding
Vertical Articulation and Sequencing	Inconsistent or unclear sequencing of topics	"Force appeared again in Grade 8 without prior reinforcement"	Weakened developmental continuity
Increasing Complexity	Aimed for higher-order thinking, unevenly realized	"Grade 7 covered facts, Grade 10 involved application"	Teachers needed clearer guidance for scaffolding

In response to Research Question 1, which sought to determine the extent to which curriculum documents demonstrated adherence to spiral progression in the sequencing of science concepts, three major themes emerged. First, the curriculum showcased a structured revisit of core concepts, particularly in topics such as matter, energy, and biological systems. For example, the concept of matter began with the introduction of particles in Grade 7, progressed to atomic structure in Grade 8, chemical bonding in Grade 9, and stoichiometry in Grade 10. This pattern aligned with Bruner's spiral model, which emphasized repeated engagement with content at increasing levels of complexity.

However, this sequencing was only partially consistent. The documents also reflected patterns of incomplete or inconsistent sequencing. Although certain key topics were revisited, they often exhibited abrupt shifts, shallow reinforcement, or disjointed progression. For example, while energy was introduced in Grade 8, its development in subsequent grades was either minimal or absent, undermining the cyclical nature of the spiral. Lastly, the curriculum revealed a limited reflection of increasing complexity. Although it stated an intent to escalate cognitive demand, the treatment of content across grade levels often remained superficial. The MELCs for certain concepts, such as force or energy, appeared similar across multiple grades, signaling limited differentiation and depth.

Supporting this interpretation, curriculum guides noted that topics like "particles and atomic structure" were revisited but rarely specified how they should be elaborated or expanded. In the case of energy, documentation lacked clarity on how the topic should be further developed, which contrasted with the expectations of spiral learning.

In summary, the curriculum demonstrated a basic awareness of spiral principles by organizing key scientific ideas across grade levels. However, its actual implementation was hindered by gaps in sequencing, minimal cognitive differentiation, and a lack of concrete developmental pathways. These findings echoed previous studies that also identified structural inconsistencies in spiral curriculum designs and pointed to the need for clearer articulation of sequencing and content complexity.

Addressing Research Question 2, the analysis examined how key science topics were revisited and expanded across Grades 7 to 10. While the curriculum attempted to scaffold learning by repeating core concepts, the nature of this repetition often lacked meaningful depth. Themes such as repetition with limited depth, gradual expansion, and redundancy emerged from the data.

Some topics, like force, were introduced in Grade 7 and revisited in Grade 9 through Newton's Laws. However, this progression did not significantly deepen the content or challenge students' understanding, suggesting surface-level reinforcement rather than cognitive development. On the other hand, matter provided a clearer example of gradual content expansion. It began with particle theory in Grade 7, moved to atomic models and structure in Grade 8, and culminated in stoichiometry in Grade

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10. This trajectory reflected a more deliberate effort to build on prior knowledge and support complex understanding.

Nevertheless, several instances of repetitive and reductive patterns were also observed. Biological systems, for example, were introduced with basic terminology in Grade 7 but were not meaningfully expanded or recontextualized in later grades. This led to a loss of instructional value, as students were exposed to similar content without further conceptual challenge.

Evidence from document matrices illustrated this trend. While some sequences—such as the progression from particles to chemical bonding—aligned with spiral learning, other areas—such as force—showed minimal complexity gains. Overall, while the curriculum indicated an effort to revisit and expand topics, the lack of depth in many instances limited the effectiveness of this approach. These mirrored challenges found in prior curriculum analyses, where content redundancy and superficial reinforcement were identified as barriers to cumulative understanding.

To address Research Question 3, which explored factors that may have contributed to the presence of content gaps and redundancies, the analysis identified multiple contributing elements.

One significant theme was the lack of clear developmental scaffolding. Several topics—especially energy and force—appeared abruptly at higher levels without foundational support in earlier grades. This suggested weak sequencing directives or unclear expectations for prior knowledge. In addition, inconsistent curriculum articulation and content overlap were frequently observed. For instance, biological systems appeared with similar content in Grades 7 and 9, leading to redundancy without differentiation in learning goals.

Moreover, the findings pointed to curriculum design and implementation constraints as contributing factors. Overloaded curriculum content, combined with limited teacher preparation or support, likely compromised the ability to reinforce or deepen topics across grades. These issues were reinforced by references in the documents to “overlapping content” and “partial sequencing,” indicating systemic planning issues.

Finally, the curriculum demonstrated a limited focus on developmental readiness. Topics were sometimes introduced at a level of complexity that did not align with students' cognitive capacities, resulting in either premature introduction or overly simplified treatments. These misalignments contributed to the fragmentation and shallowness of conceptual learning.

Overall, these factors reflected structural, pedagogical, and logistical challenges that inhibited effective spiral implementation. Resolving these issues would require more intentional planning of scaffolding, improved teacher support, and rigorous sequencing of content across grades.

Finally, in response to Research Question 4, which investigated how the curriculum facilitated students’ conceptual development through vertical articulation and increasing complexity, the analysis revealed mixed results.

The curriculum attempted to provide partial vertical articulation, with efforts to link concepts across grades—such as the progression of matter from simple to complex forms. However, this articulation was often fragmented. Concepts introduced in earlier grades were not always revisited in meaningful ways in later years. For example, energy and biological systems were presented early but often lacked structured reinforcement in higher levels.

Additionally, the increase in content complexity was inconsistently realized. While some topics demonstrated a logical escalation—such as the movement from basic particles to chemical bonds—others remained static. The topic of force, in particular, did not demonstrate adequate progression, resulting in limited conceptual deepening.

The curriculum documents acknowledged the need to increase complexity, but the actual implementation of these strategies was weak. Sequencing often relied on repetition rather than elaboration, which failed to extend students’ understanding. Supporting evidence showed that learning competencies remained similar across grade levels, implying minimal content differentiation and limited promotion of higher-order thinking.

TABLE 3 Philippine Junior High School Science curriculum incorporates key features

Research Question	Themes	Implications
RQ1	Structured revisit vs. Inconsistent sequencing	Curricula attempt adherence but need clearer sequencing to fully embody spiral principles.

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Research Question	Themes	Implications
RQ2	Repetition with Limited depth vs. Content expansion	Topics sometimes lack meaningful elaboration, risking superficial learning.
RQ3	Lack of scaffolding and Curriculum overlaps	Systemic planning gaps contribute to redundancies and content gaps.
RQ4	Partial vertical links vs. Limited complexity escalation	Weak vertical articulation hampers deep understanding; necessitates clearer progression strategies.

The analysis revealed that the Philippine Junior High School Science curriculum incorporates key features of the spiral progression approach, notably the repeated revisit of core concepts such as matter, energy, and life systems across grades 7 to 10. However, inconsistencies in topic sequencing and content complexity were evident. Some curriculum guides show overlapping topics without clear developmental scaffolding, which may impede learners' deepening understanding. Furthermore, gaps in articulation between grade levels suggest limited coherence, raising concerns about the curriculum's capacity to support cumulative learning. These issues align with prior studies highlighting content redundancy and superficial treatment of concepts (Garcia & Reyes, 2022; Francisco, 2021). The findings emphasize the importance of systematic content alignment and professional development to reinforce the intended spiral structure.

The analysis revealed that the curriculum documents demonstrated a moderate level of adherence to the principles of spiral progression in the sequencing of science concepts. Many curriculum guides and learning competencies explicitly revisited core ideas such as matter, energy, and biological systems across Grades 7 to 10, reflecting the principle of repeated reinforcement. Additionally, there was evidence of increasing complexity and depth in the presentation of these concepts, aligning with Bruner's notion of ascending levels of understanding. However, these patterns were inconsistent; certain topics, like energy and force, were revisited superficially or demonstrated abrupt jumps in content complexity, which could disrupt the developmental progression envisioned in spiral curricula. Instances of content overlap, redundancy, and gaps further indicated that while the curriculum aimed to follow spiral principles, its implementation was somewhat uneven, resulting in only partial conformity to the theoretical standards of systematic, developmental sequencing suggested by Bruner's model

The curriculum documents indicated that key science topics, such as matter, energy, force, and life systems, were intentionally revisited across Grades 7 to 10 to scaffold student understanding in a progressive manner. These recurring themes were designed to be introduced early and revisited with increasing depth and complexity as students advance, aligning with Bruner's concept of spiral learning. However, the extent to which these topics were effectively expanded varied. The analysis revealed that, in some instances, the progression in content depth and complexity was inconsistent, with certain topics experiencing superficial coverage or overlapping content without clear differentiation between grade levels. Additionally, gaps in articulation between grades sometimes resulted in abrupt jumps in difficulty, which could impede the cumulative development of scientific understanding

The presence of gaps and redundancies in the curriculum's development of science topics across grades can be attributed to issues in content sequencing, inadequate vertical articulation, and inconsistent implementation of spiral principles. Specifically, the curriculum sometimes showed overlapping topics without clear developmental scaffolding, leading to redundancy, or omitted critical foundational concepts, resulting in gaps. These issues are linked to limited coherence in curriculum mapping and a lack of systematic alignment to the spiral progression model. Furthermore, challenges faced by teachers, such as weak prior knowledge coverage, non-sequential teaching practices, and insufficient instructional support, contribute to these inconsistencies. As a result, the intended progressive reinforcement and deepening of scientific concepts are not always realized, undermining the spiral curriculum's effectiveness

The curriculum aimed to facilitate the development of students' conceptual understanding by revisiting key science concepts across grades with an emphasis on increasing complexity, in line with the spiral progression approach. It intended to do this through systematic content sequencing, where foundational ideas such as matter, energy, and biological systems are introduced early and progressively elaborated upon in subsequent grades. However, the analysis revealed that gaps in vertical articulation—such as inconsistent content flow and overlapping topics—sometimes hindered this process, making it challenging for students to build cohesive and deep understanding. Despite the

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curriculum's theoretical alignment with increasing complexity and scaffolding principles, actual practice showed deficiencies in clearly sequencing content, which affected students' capacity to develop deeper conceptual mastery over time.

The results indicated that while the curriculum generally incorporated core principles of the spiral approach—such as revisiting key concepts like matter and force, and gradually increasing complexity—there were noticeable inconsistencies and gaps. For example, some topics, like energy, appeared with minimal recurrence or depth at certain grade levels, potentially hindering comprehensive conceptual understanding. The vertical articulation, which should ensure a logical progression from foundational to more advanced topics, was observed in many instances; however, certain areas exhibited abrupt jumps or inconsistencies that could confuse learners. Teachers' adaptation of the curriculum and contextual factors also influenced how these patterns manifested in actual classroom instruction. Overall, the curriculum demonstrated a commitment to spiral principles but required further refinement to improve coherence, eliminate redundancies, and ensure systematic revisits to foundational concepts across grades.

Recommendation

The evaluation of the curriculum reveals a complex interplay of strengths and weaknesses concerning its adherence to the core principles of spiral progression. On a positive note, the curriculum demonstrates an explicit effort to sequence fundamental scientific topics—such as matter and energy—in a manner consistent with the theoretical underpinnings of a spiral curriculum. This sequence indicates an awareness among curriculum developers of the importance of revisiting key ideas across successive grades, with each encounter intended to deepen understanding and reinforce prior knowledge. For example, topics related to matter are systematically revisited from Grade 7 through Grade 10, with each level purportedly building upon and elaborating previous concepts. Such sequencing aligns with Bruner's (1960) emphasis on reinforcement through successive encounters at increasing levels of complexity, thereby supporting learners' cognitive development.

However, despite these positive intentions, significant shortcomings are evident upon closer analysis, undermining the curriculum's capacity to realize the full potential of spiral principles. Chief among these are instances of content redundancy that do not contribute to conceptual deepening. A clear illustration of this is the repeated definitions and basic explanations of concepts such as force in Grades 8 and 9, which appear without significant elaboration or progression in complexity. Instead of fostering an evolving understanding, such superficial repetition risks reducing instruction to mere recitation, which may lead to learner disengagement and superficial comprehension. Equally concerning is the shallow treatment of more complex or abstract topics, such as genetics in Biology or advanced energy systems in Physics. In these areas, the curriculum tends to introduce foundational terminology or basic principles early on but fails to extend the discussion into more sophisticated concepts—like genetic inheritance, molecular biology, or the ethical dimensions of scientific applications—within subsequent grades. This limited elaboration hampers the development of higher-order thinking skills and prevents learners from cultivating a more mature and integrated understanding of the subject matter.

Furthermore, the analysis uncovers weak vertical articulation across disciplines, with particular deficiencies in Physics. Foundational ideas such as force, motion, and energy are introduced at early stages but are not systematically revisited or elaborated on in subsequent years. Instead, development in these areas appears fragmented, with isolated instances of reinforcement that lack deliberate scaffolding or clear progression. This inconsistency disrupts the continuity that a true spiral curriculum seeks to establish—where each learning encounter not only revisits but also deepens and extends earlier concepts. The result is a patchwork development that leaves conceptual gaps unaddressed, thereby impeding learners' ability to connect foundational theories with more complex applications. The absence of a coherent, interconnected progression across grade levels suggests that, while the curriculum design is ostensibly grounded in spiral principles, its practical implementation falls short, leading to superficial coverage and missed opportunities for deep learning.

These empirical findings align with, and indeed corroborate, prior research that has identified similar issues within the Philippine science curriculum. Studies such as those by Garcia and Reyes (2022) have highlighted redundancies, insufficient content depth, and poor vertical integration as recurring challenges. Yet, this investigation expands upon previous work by providing concrete, document-based evidence of these issues through systematic analysis of official curriculum materials. It makes clear that, despite the curriculum's intended design, the actual practice of from teachers and instructional materials can diverge significantly from the theoretical framework. This disconnect

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underscores the need for strategic curriculum revisions, targeted teacher training, and better resource development. Enhancing vertical articulation, ensuring meaningful content progression, and embedding scaffolding practices are essential steps toward translating the approved curriculum into a coherent, deep, and engaging learning experience.

In sum, while the curriculum's structure demonstrates an awareness of spiral principles, this study reveals that implementation challenges—ranging from superficial repetition and shallow treatment of complex topics to inconsistent developmental sequencing—undermine the realization of a truly cohesive and developmental science education. Addressing these issues is crucial for fostering deep conceptual understanding, promoting higher-order thinking, and ultimately fulfilling the promise of a curriculum designed to support students' scientific literacy and cognitive growth across their educational journey.

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