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SPIRAL PROGRESSION APPROACH IN TEACHING SCIENCE: IMPLEMENTATION, CHALLENGES, AND COPING STRATEGIES AS BASES FOR PROGRAM ENHANCEMENT

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ABSTRACT

The descriptive research study aimed to find out the teachers' level of implementation, challenges encountered, and coping strategies on the spiral progression approach in teaching science as bases for program enhancement. The respondents of the study were the 30 junior high school science teachers purposively selected in public secondary schools in the District of Tigbauan, Iloilo. Findings of the study revealed that spiral progression approach was "highly implemented" by the junior high school science teachers. There was no significant difference in the level of implementation when the teachers were classified as to highest educational attainment, grade level taught, field of specialization, and length of teaching experience. Science teachers encountered challenges such as insufficient learning materials, time constraint, poor retention of basic concepts of learners and mastery of content across areas of specialization. It is recommended that this research may be replicated in other district for wider generalizations

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and to adequately establish the level of teachers' implementation of the spiral progression approach in teaching junior high school science.

Keywords: *Spiral Progression Approach, Implementation, Challenges, Coping Strategies, Program Enhancement*

INTRODUCTION

Science is a complex, dynamic and rapidly changing field that covers extra ordinary interesting subjects to study and teach. The teaching science is as important as the subject itself because the learners' learning capacity is influenced by the way the concepts of the lessons are taught by the teachers. Teachers have great potential to affect learners' educational outcomes. How teachers teach is one of the key determinants of learners' success or failure most especially with the changing science curriculum and approach to teaching in the country that aims to improve and develop scientific literacy among learners in order for them to be globally competitive.

In an effort to improve science education in the Philippines, the science curriculum was redesigned and disseminated. The enhanced curriculum boasts a spiral approach to its design, where the same concepts are built on increasing sophistication and complexity from Grade 1 to

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Grade 12. The spiral progression approach is a technique often used in teaching where the basic facts of a subject are first learned, without worrying about details. Then as learning progresses, more and more details are introduced, while at the same time they are related to the basics which are reemphasized many times to help them enter long-term memory.

The basic idea behind spiral progression approach is to expose the learners to a wide variety of concepts or topics, skills and attitudes that are deemed of "continual concern of everyone "until they are mastered. A spiral curriculum design is one in which "key concepts are presented repeatedly throughout the curriculum, but with deepening layers of complexity." After a mastery of the initial topic, the students "spirals upwards" as the new knowledge is introduced in next lessons, enabling him/her to reinforce what is already learned. In Science, concepts and skills in Earth Sciences, Life Sciences, Chemistry and Physics are presented with increasing levels of complexity from one grade level to another in spiral progression, thus paving the way to a deeper understanding of core concepts.

In connection with the redesigned science curriculum, it is obvious that its implementation depends heavily on teachers. The new curriculum assigns teachers' new tasks, responsibilities and roles. In order for teachers to realize the roles mentioned and to implement the curriculum successfully, they must be-well prepared about the structure changes, and implementation of the new curriculum. To evaluate the outcomes and level of implementation of high school science curriculum in real school settings, it is appropriate to take the viewpoints of teachers.

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Recommendations, ideas, and criticisms are very important for the improvement and development of the new curriculum.

It has been observed that many teachers in the School District of Tigbauan specifically at Bagacay National High School, Cordova National High School, Parara National High School, Barroc National High School, Barosong National High School, Binaliuan National High School, Napnapan National High School, and Tigbauan National High School, who were teaching science were trained on specific science discipline such as general science, biology, chemistry or physics and were not science generalists. This orientation did not prepare them to handle the implementation of spiral progression approach in teaching science, hence the study.

MATERIALS AND METHODS

Research Methodology

Descriptive – survey method of research was used in the study in determining the teachers' level of implementation, problems encountered, and coping strategies on spiral progression approach in teaching junior high school science. The primary purpose of descriptive research is to describe the nature of the situation as it exists at the time of the study and to explore the causes of particular phenomenon (McMillan, 2005).

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Research Design

The study utilized a mixed research design incorporating both quantitative and qualitative research design.

A descriptive research design was used in assessing the relationships between the profile and the science teachers' perception as to the level of implementation in terms of grade level taught, field of specialization, highest educational attainment and length of teaching experience. A qualitative or thematic approach was used to describe the challenges and coping strategies of the science teachers have in the spiral progression approach. Thematic analysis is a systematic process for coding data in which specific statements are analyzed and categorized into themes that represent the phenomenon of interest (Creswell, 2014)

Respondents of the Study

The respondents of the study were the thirty (30) junior high school science teachers at the Schools District of Tigbauan specifically at Tigbauan National High School, Bagacay National High School, Cordova National High School, Parara National High School, Barroc National High School, Barosong National High School, Binaliuan National High School, Napnapan National High School and during school year 2022-2023.

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Table 1

Distribution of Respondents When Taken as a Whole and When Classified as to School

Name of School	n	%
Tigbauan National High School	10	33.33
Bagacay National High School	2	6.67
Cordova National High School	3	10.00
Parara National High School	2	6.67
Barroc National High School	4	13.33
Barosong National High School	3	10.00
Binaliuan National High School	4	13.33
Napnapan National High School	2	6.67
Total	30	100.00

As reflected in Table 1, considering Tigbauan National High School, there were ten (10) or 33.33% teachers teaching junior high school science. For the Barroc National National High School and Binaliuan National High School, there were four (4) or 13.33% teachers teaching science. As to Cordova National High School and Barosong National High School, there were three (3) or 10.00% teachers teaching science. For the rest of the schools namely: Bagacay National

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High School, Parara National High School, and Napnapan National High School, each school had only two (2) science teachers and each was represented with 6.67%.

Table 2

Distribution of the Respondents According to Variables

Variables	Frequency	Percentage (%)
A. As a Whole	30	100
B. Grade Level Taught		
7	10	33.33
8	7	23.33
9	5	16.67
10	8	26.67
C. Field of Specialization		
General Science	9	30.00
Biology	11	36.67
Chemistry	4	13.33
Physics	4	13.33
Mathematics	2	6.67
D. Highest Educational Attainment		
Bachelor's Degree	15	50.00
Master's Degree	15	50.00
E. Length of Teaching Experience in Science		
10 years & below	16	53.33
11 to 20 years	9	30.00
21 years & above	5	16.67
Total	30	100.00

As shown in Table 2, of 30 science teachers 10 or 33.33% were teaching Grade 7; 7 or 23.33% were teaching Grade 8; 5 or 16.67% were teaching Grade 9 and 8 or 26.67% were teaching Grade 10.

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Considering field of specialization, 9 or 30.00% were general science major, 11 or 36.67% were biology, 4 or 13.33% were chemistry and physics major and 2 or 6.67% were not a science major but handling science subjects.

For the highest educational attainment, there were 15 or 50.00% were in bachelor's degree and 15 also or 50.00% were with master's degree.

As to length of teaching experience in science, there were 16 or 53.33% belonged to 10 years and below, 9 or 30.00% belonged to 11 to 20 years and finally, there were 5 or 16.67% were in 21 years and above.

Sampling Design

Purposive sampling design was used in the study. A purposive sample is a non-probability sample that is selected based on characteristics of a population and the objective of the study. Purposive sampling is also known as judgmental, selective, or subjective sampling.

The respondents of the study were the thirty – (30) purposively selected junior high school science teachers in the schools District of Tigbauan, Iloilo.

All junior high school science teachers were given a checklist-questionnaire to be filled up.

Research Instrument

The main instrument that the researcher used in gathering the data needed in this study was the duly validated researcher-made checklist-questionnaire. This consisted of four parts.

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Part I solicited data about profile of the respondents.

Part II was designed to measure the teachers' level of implementation of spiral progression approach in teaching science. This instrument consisted of 22 items for grade 7, 30 items for grade 8, 33 items for grade 9 and 17 items for grade 10 teachers, with four-point response format ranging from one (1) Not Implemented at all, (2) Somewhat Implemented, (3) Implemented, and (4) Highly Implemented.

The overall rating obtained was interpreted using the following scale:

Scale	Rating	Descriptions
4	3.26 – 4.00	Highly Implemented
3	2.51 – 3.25	Implemented
2	1.76 – 2.50	Somewhat Implemented
1	1.00 – 1.75	Not Implemented at All

Part III contained descriptive questions that determined the challenges encountered and coping strategies of the junior high school science teachers in the implementation of the spiral progression approach in teaching science. This part of the instrument required the respondents to answer the open-ended questions.

Validity of the Research Instrument

To ensure the validity of the research instruments, the researcher submitted the checklist-questionnaire to the four jurors who are knowledgeable and experts in the field of teaching

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Science (general science, biology, chemistry and physics), English grammar, and educational technology experts. This was to ensure its appropriateness, suitability, relevance, clarity of the language used, and other criteria for validating using the Good and Scates eight-point criteria for validation of the questionnaire. Comments, corrections, and suggestions from the panel of validators regarding the items on the checklist-questionnaire were incorporated in the preparation of the final draft of the instrument before reliability testing.

Reliability of the Research Instrument

After the checklist-questionnaire was found valid, the questionnaire was tested for reliability it among 30 secondary school science teachers in the District of Guimbal, Iloilo. These thirty respondents in the reliability testing were no longer involved in the final administration of the questionnaire.

Reliability refers to the consistency of scores or answers from one administration of an instrument to another, and from one set of items to another. It also refers to the consistency of scores given by the individual to whom the instrument was administered (Fraenkel & Wallen, 2007)

In order to ascertain the reliability coefficient of the checklists, the researcher used the split half procedure. To determine the first half and the second half, the researcher listed the 30 respondents from 1 to 30. All respondents with assigned odd numbers (1, 3, 5, 7 etc.) and were

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grouped as the first half while those with assigned even numbers (2, 4, 6, 8 etc.) were grouped as the second half.

The scores of the respondents in the first half were tallied in the first column and the scores of the second half were tallied in the second column.

The scores for every half were ranked and the difference of every ranked was computed.

It was found out that the reliability of the whole questionnaire was 0.95. According to Fraenkel and Wallen (2007), for research purposes, a useful rule of thumb is that reliability should be at least 0.70 and preferably higher. Since the result was 0.95, being higher than 0.70, the questionnaire was found reliable.

Data Gathering Procedures

During the conduct of the study, all ethical guidelines applicable to treatment of human subjects in research were observed. The retrieval of the questionnaires was done personally by the researcher after this was completely accomplished by the respondents. The researcher assured the respondents about the confidentiality of their answers in the questionnaires.

Before the questionnaires were fielded, permission to conduct the study was secured from the Office of the Schools Division Superintendent, Department of Education (DepEd) of the Division of Iloilo, La Paz, Iloilo City.

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Likewise, the researcher requested permission from the Office of the school principals/head teachers of each of the national secondary schools where the respondents are teaching.

After the permits were granted, the researcher personally distributed and collected politely the questionnaires from the respondents. Letter of request likewise were given to the respondents asking for their cooperation for the success of the study. After the respondents have answered the questionnaires, this was collected, computed and interpreted statistically.

Data Analyses

The research instrument was reproduced according to the number of the respondents in the study.

The overall rating obtained were interpreted using the following scale:

Scale	Rating	Descriptions
4	3.26 – 4.00	Highly Implemented
3	2.51 – 3.25	Implemented
2	1.76 – 2.50	Somewhat Implemented
1	1.00 – 1.75	Not Implemented at All

After the retrieval of the accomplished checklist – questionnaire from the purposively selected respondents, data were organized, computed and tabulated.

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Other computations, analysis, and interpretations were undertaken with the Statistical Package for the Social Sciences (SPSS) Software.

The qualitative data gathered were analyzed using the thematic approach. Emergent themes were identified and discussed comprehensively.

Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data (Braun & Clarke, 2006). The goal of a thematic analysis is to identify themes, i.e. patterns in the data that are important or interesting, and use these themes to address the research or say something about an issue. This is much more than simply summarizing the data; a good thematic analysis interprets and makes sense of it (Clarke & Braun, 2013).

Statistical Tools

The data generated by the researcher were treated using the following statistical tests:

To determine the number of respondents belonging to each category of variables, frequency was used. Percentage was utilized to determine the proportion of the respondents belonging to each category of variables.

Mean was used to determine the level of implementation of teachers in teaching science when taken as a whole, and when classified as to grade level taught, field of specialization, highest educational attainment and length of teaching experience in science.

In determining the homogeneity and heterogeneity of data, standard deviation was utilized. In ascertaining the significant difference in the level of implementation, t-test was used.

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One–Way Analysis of Variance (ANOVA) was employed in ascertaining the level of implementation of teachers in teaching high school science using spiral progression approach when they were categorized as to grade level taught, field of specialization, and length of teaching experience in science.

Since the study partake social research, all significance level for all inferential tests were set at 0.05 alpha level of significance. Data analyses were done using the Statistical Package for the Social Sciences (SPSS) software version 22.0.

RESULTS AND DISCUSSIONS

Summary

The purpose of the study was to find out teachers' level of implementation, challenges encountered, and coping strategies on using the spiral progression approach as bases for program enhancement in the District of Tigbauan, Iloilo for the school year 2022-2023.

The study was conducted in March to June 2023. The respondents were the 30 junior high school science teachers purposively selected from Grade 7 to Grade 10 in public secondary schools in the District of Tigbauan, Iloilo, Division of Iloilo. Respondents' categorization includes grade level taught, field of specialization, highest educational attainment, and length of teaching experience in science.

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Data were gathered using the duly validated researcher-made questionnaire. An accompanying information sheet was used to gather data of the high school science teachers' personal characteristics.

Frequency, percentage, mean and standard deviation, were employed as descriptive statistic while t-test and One-Way Analysis of Variance as inferential statistic. Data analyses were done using the Statistical Package for the Social Sciences (SPSS) software version 22.0.

And to analyze the responses for the statement of the problem 3 and 4, the researcher used the thematic analysis. Relevant themes were selected and coded.

The study came up with the following findings, vis-à-vis the study specific questions:

The teachers' level of implementation of spiral progression approach in teaching junior high school science was "highly implemented" when they were taken as a whole and when they were classified as to grade level taught, field of specialization, and length of teaching experience in science, and highest educational attainment.

There is no significant difference was found in the teachers' level of implementation of spiral progression approach in teaching junior high school science when they were classified as to grade level taught, field of specialization, and length of teaching experience and as well as to highest educational attainment in teaching science.

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Science teachers encountered many challenges in the implementation of the spiral progression approach such as insufficient learning materials, time constraint, poor retention of basic concepts of learners and mastery of content across areas of specialization.

The science teachers are using various coping strategies in attaining implementation in teaching junior high school science using spiral progression approach which include the ICT integration, interactive teaching, attending graduate studies, seminars and trainings and resourcefulness and asking technical assistance from their colleagues just to improve their teaching performance under the new science curriculum.

Insights

In view of the foregoing findings, the following insights were drawn by the researcher:

The study shows the crucial role of the science teachers in implementing the spiral progression approach. In order for spiral progression approach be effective, it should start on enhancing of teacher's knowledge on science curriculum and pedagogy and ensuring students' mastery of learning. Teachers should carefully study the progression of knowledge and skills, and the delivery of the content must be closely monitored. To promote the effectiveness of spiral progression approach teachers must be equipped with deep content and pedagogical knowledge.

In addition, teachers should be compassionate and innovative in dealing with struggling learners. Teachers must contextualize learning tools due to insufficient learning materials, conduct remedial classes to learners having poor retention of basic concepts of the lessons and

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due to insufficient time in delivering a lesson. Digital learning should be integrated for the provision of interactive and experiential activities.

There should be enough professional trainings, seminars and development program for teachers to clarify misconceptions, to be acquainted with the latest trends in education, and to widen knowledge on the content and effective instructional strategies.

Lastly, to enable all mechanisms of education by encouraging full support from the Department of Education towards programs and activities, the implementation of spiral progression approach can create remarkable impact towards the teaching-learning process.

RECOMMENDATIONS

In view of the results of the study, the researcher advances the following recommendations:

Strategies to simplify the teaching of science in secondary schools can be improved by recommending the curriculum planners to conduct assessment of the effectiveness of the implementation of the new approach in teaching science in order to come up with new one.

Furthermore, it is recommended that the division science program supervisor should formulate instructional enhancement program for teachers based on the result of the study, to improve teachers' teaching skills and content knowledge.

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It is also recommended that the Department of Education (DepEd) and the school administrators should collaborate with the Division of Iloilo in order to initiate professional development programs aimed at improving teachers' implementation of spiral progression approach in teaching junior high school science. This can be done through conducting an instructional enhancement program among high school science teachers in the said division. Likewise, school administrators should continually provide teachers with opportunities to develop their teaching potentials by sending them in various trainings and seminars related to teaching science using the spiral progression approach.

Lastly, the public secondary schools in the Division of Iloilo should support the provision of instructional materials development such as textbooks/learning modules, three dimensional teaching/learning materials and multi-media aided materials, enhance the scheduling of teachers and subjects, integration of LAC sessions/group meetings to enhance the effectiveness of their teachers in teaching junior high school science.

To further validate the findings of this study, this research may be replicated among high school science teachers in other district to draw wider generalizations and to adequately establish the level of teachers' implementation in teaching junior high school science using the spiral progression approach.

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