"Spiral Progression Approach in Teaching Science and the Performance of Learners in District I, Capiz"

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Abstract. This study was conducted to determine the relationship of the implementation of the spiral progression approach (SPA) in teaching science and the students’ performance. Results reveal that respondents are 21-30 years old, females, specializing in integrated science, with Bachelor’s Degree, 1-10 years service, and holding Teacher I positions; their SPA implementation in teaching science is ‘fair’; no difference existed in their SPA implementation by dimensions; the students’ performance from grades 7, 8, 9, and 10 in the different schools is very satisfactory; differences existed in the students’ performance from grades 7, 9, and 10 in different schools; but none in Grade 8; no relationship existed on the SPA implementation and different grade levels, and in different schools; the top five (5) problems in the SPA implementation included teaching guides and learning modules as have not yet been massively distributed; the SPA implementation is not well-planned; lack of qualified teachers; incompetency of teachers; and time spent for teachers’ training is not enough; and a Training Program is proposed to better prepare and equip the teachers in the SPA implementation in teaching Science.

1. Introduction

Republic Act 10533 of the Philippines, otherwise known as the “Act Enhancing the Philippine Basic Education System”, not only adds two years to basic education and reiterates universal kindergarten, but also prescribes the standards and guidelines the Department of Education must follow in developing a curriculum. One item under this prescription is: "The curriculum shall use the spiral progression approach to ensure mastery of knowledge and skills after each level."

The purpose of this study was to determine the extent of implementation of teachers of the Spiral Progression Approach in Teaching Science and the Academic Performance of students in Science in the District 1, Capiz, Philippines.

Specifically, it sought answers to the following questions:
1. What is the extent of implementation of the Spiral Progression Approach (SPA) in teaching science in terms of; Technical support (Monitoring, Mentoring, Motivation); School Facilities; Level of Readiness (Extent of Knowledge, and Extent of Trainings)?
2. Is there a significant difference in the extent of implementation of the SPA in teaching Science in terms of Monitoring, Mentoring, and Motivation?
3. What is the Academic performance of the students in Science from grades 7,8,9, and 10 in the different schools?
4. Is there a significant difference in the academic performance of the Students in Science from grades 7, 8, 9, and 10 in the different schools?
5. Is there a significant relationship on the extent of implementation of the SPA and the Different grade levels, and Different schools?
6. What are the problems encountered by the teachers in the implementation of the SPA in teaching Science?
7. What IP is proposed to improve the implementation of the SPA in teaching Science and the academic performance of the students?

2. Literature Review

Spiral Progression Approach in curriculum is derived from Bruner’s Spiral curriculum model. Bruner stressed that teaching should always lead boosting cognitive development [1-2]. The idea in spiral progression approach is to expose the learners into a wide variety of concepts/topics and disciplines, until they mastered it by studying it over and over again but with different deepening of complexity. In relation to secondary Science curriculum, [3] explained that, science is composed of four areas, namely Integrated Science, Biology, Chemistry and Physics. In old curriculum, Integrated Science was taught in first year, second year was Biology, third year was Chemistry and Fourth year was Physics. However, in new secondary science curriculum implemented last 2012, the concept of those four major areas are being taught all at the same time. Each year students are exposed to spiral progression approach, wherein the four areas are being taught per grading period. Aside from that, integrated science was changed into Earth Science [4].

Spiral progression approach follows a progressive type of curriculum. Progressive curriculum anchored to Dewey is defined as the total learning experiences of the individual. Given these descriptions, the spiral curriculum can be understood as a design, a written plan, list of subjects and expected outcomes of the students in which one concept are presented repeatedly throughout the curriculum, but with deepening layers of complexity [5-6].

Spiral curriculum is a design framework which will help science teachers construct lessons, activities or projects that target the development of thinking skills and dispositions which do not stop at identification. It involves progression and continuity in learning science. Progression describes pupils’ personal journeys through education and ways, in which they acquire, apply and develop their skills, knowledge, and understanding in increasingly challenging situations. Continuity is concerned with the ways in which the education system structures experience and provides sufficient challenge and progress for learners in a recognizable curricular landscape. Therefore, a spiral progression approach is an approach or a way on how to implement the spiral curriculum.

Based on the studies above, most countries which are also implementing the spiral progression approach in their educational system, say that the said approach is not applicable to the needs of their learners. However, in Philippine setting, DepEd sees the spiral progression approach as a solution to our education problem. The potential outcomes of this study are the views and voice of science teachers regarding the spiral progression approach from public secondary schools. It is very important to hear their insights and views about the approach because teachers are the prime movers of the curriculum. If teachers are not knowledgeable of the said curriculum they will not be able to implement it correctly and properly in their teaching.

Earlier in 2010, the DepEd Discussion Paper on the Enhanced K to 12 Basic Education Program stated that the need to enhance the quality of Basic Education Program is urgent and critical. Thus, the agency came up with the proposal to enhance the country’s basic education program in a manner that is least
disruptive to the current curriculum, is most affordable to government and families, and is aligned with international practice.

The Philippine basic education curriculum is congested. The curriculum designed for completion in twelve years has been cramped in 10 years, resulting to gaps in critical skills of the graduates, whereas the lack of emotional maturity, which is highly fundamental in the workplace results to the mismatch of industry demand and supply. Through the implementation of the aforementioned reform, congestion will be addressed through the additional two years in the curriculum while enriching the students’ emotional faculties through the natural development and help them to be globally competitive.

The regrettable fact is that the Philippines is the only Southeast Asian nation that has the 10-year basic education program while Brunie, Cambodia, and Thailand have the same for 12 years. This revised curriculum under the K to 12 has been implemented since SY 2011-2012. The components of K to 12 are one-year kindergarten, six years of elementary school, four years of Junior High School and two years of Senior High School. The twelve years of basic education is prerequisite for entry into tertiary education.

With the challenges encountered in the implementation of the new curriculum, some of the Secondary Science Teachers are experiencing stress in the workplace which affect their performance. The National Science Teachers Association (2014) shows educators as professionals engaged in reflective analysis of their beliefs about and experiences with teaching children or adolescent’s science. With their ideas about instruction and learning strategies, these educators become more aware of the circumstances today's teachers face. Their honest accounts reveal that through teaching children and adolescents, teacher educators can also renew themselves and expand their identities as well as their understanding of themselves in the profession and in relation to others.

Similarly, recent developments in the teaching of science have shown the importance of early (kindergarten) exposure to science, and the changed ways of making them learn. These are not evident in the K to 12 curriculums. Examples are reported by the Nobel laureate Carl Wieman, by Science editor and former president of the US National Academy of Sciences Bruce Alberts, and by Columbia physics professor Brian Greene. They have been involved in research on science education, whose innovative results have been tested or are undergoing pilot tests.

Based on the results of their studies, they have suggested a better way to improve basic education: (a) put only the right people in charge; (b) program components should be based on tested studies abroad and properly published studies of local problems; (c) undergo trial runs or verifications at selected schools before nationwide implementation.

UNESCO (2010 ) EFA Monitoring Report, the next most valiant step the founder’s take is to think of educational reform initiatives such as the K to 12 curricula. Furthermore, students do not acquire sufficient mastery of basic skills and concepts as evidenced by the need for improvement of student achievement as reflected in their poor performance on national achievement tests. The Philippines also landed at the lowest part of the roster when it participated in the 2008 TIMSS (Trends in International Mathematics and Science Study).

3. Research Method
This study employed a survey-correlation research design. A descriptive research describes the nature of the situation as it exists at the time of the study and explore as the causes of a particular phenomenon. Thus, it involves the collection of data in order to test hypothesis or to answer questions concerning the current status of the subject and their study. Descriptive research typically describes what appears to be happening and what the important variables seem to be.

The schematic diagram presents the essential components of the study’s Independent variable which is made up of the Spiral Progression Approach in teaching Science in terms of 1. Technical support (1.1. Monitoring, 1.2. Mentoring, and 1.3 Motivating); 2. School Facilities; 3. Level of Readiness in terms of 3.1. The extent of knowledge, and 3.2. The extent of Training.
The dependents variable of the study composed of the following; Proposed intervention program to improve the implementation of the spiral progression approach and increase the academic performance of students in Science.

Research Environment

The study was conducted in District 1, Capiz, Philippines. Capiz is composed of 16 municipalities, one chartered city (Roxas City) and 472 barangays. Its capital, Roxas City, is the seat of the provincial and city governments and center of trade. Capiz' topography varies from rolling lands and hills to mountain peaks and ranges. Capiz is located in the Western Visayas Region, at the northeastern portion of the Panay Island, bordering Aklan and Antique to the west, and Iloilo to the south. Capiz faces the Sibuyan Sea to the north. Entrancing Capiz is divided into two (2) districts: The 1st District is composed of Roxas City, Panay, Panitan, Pontevedra, Pres. Roxas, Pilar, and Maayon;

Respondents

The respondents of the study were Secondary teachers in District 1, Province of Capiz who implemented the spiral progression approach in teaching Science. Stratified Proportionate Random sampling was used in the identification and selection of the respondents. The selection of the respondents was done using the lottery technique. Slips of paper with corresponding numbers were placed in separate boxes and the required sample/s were picked from each box.

Data Gathering Instrument

The research instrument was retrieved and adopted from the TIMSS science teacher survey questionnaire which was used to measure the perceptions of the secondary teachers on the extent of implementation of a spiral progression approach in teaching science. Part I solicited information on the Profile of the secondary school teachers and Part II gathered the data on the perceptions of teachers in terms of Technical Support, Facilities, Extent of Knowledge, Extent of Training, and Problems Encountered.

The items indicate the degree of agreement or disagreement of the responses with the following descriptions and numerical weights.

| Weight | Description                 |
|--------|----------------------------|
| 5      | Strongly Agree             |
| 4      | Agree                      |
| 3      | Neither Agree nor Disagree |
| 2      | Disagree                   |
| 1      | Strongly Disagree          |

To interpret the result on the perceptions of the teacher-respondents, on the implementation of the SPA approach, the following scale and description were used:

| Scale     | Description      |
|-----------|------------------|
| 4.21 - 5.00 | Outstanding     |
| 3.41 – 4.20 | Very Satisfactory |
| 2.61 – 3.40 | Satisfactory     |
| 1.81 – 2.60 | Fair            |
| 1.00 – 1.80 | Poor            |

On the other hand, the scale for interpretation below was used to describe the performance of the students.

| Scale     | Description      |
|-----------|------------------|
| 90 –100   | Outstanding      |
Data Gathering Procedure
The researcher asked permission from the Schools Division Superintendent to conduct the questionnaire-survey among all the secondary school teachers handling science subjects in spiral progression in the 1st District of Capiz. The researcher then asked the permission from the school principal and personally distributed the questionnaires, explaining the items/questions therein very clearly to the respondents. The accomplished questionnaires were retrieved, and the scores were analyzed and interpreted using the Statistical Package for Social Sciences (SPSS).

Statistical tools.
The statistical tools used to analyze the data were frequency, percentage, mean, t-test, ANOVA, and Spearman Rho. For the descriptive statistics, frequency, percentage, mean, t-test, and multiple regressions are used to analyze data. The frequency and percentage were used to describe the profile of the respondents (science teachers) while the mean was utilized to determine the Perceptions of Science teachers on the extent of implementation of the Spiral Progression Approach in teaching Science. All data were processed using the Statistical Package for Social Sciences (SPSS). Hypotheses were tested at 5% level of significance.

Conclusion.
The following conclusions were drawn based on the findings of the study:
1. The teachers’ extent of implementation of the spiral progression approach in teaching science is ‘fair’; however, in terms of technical support as to monitoring, mentoring, and motivating, the implementation is “poor”; while in terms of school facilities and level of readiness as to extent of knowledge and trainings, the implementation is “fair”.
2. There is no significant difference in the teachers’ extent of implementation of the spiral approach when grouped by dimensions.
3. The Academic Performance of the Students in Science from grades 7, 8, 9, and 10 in the different schools is, in general, very satisfactory.
4. There are significant differences in the academic performance of the students in Science from grades 7, 9, and 10 in the different schools; but none in Grade 8.
5. There is no significant relationship on the extent of implementation of the Spiral Progression Approach in teaching Science and the different grade levels.
6. There is no significant relationship on the extent of implementation of the Spiral Progression Approach in teaching Science in terms of monitoring, mentoring, and motivating and the different schools.
7. The top five (5) problems that surfaced in the implementation of the Spiral Progression Approach in teaching Science, include: teaching guide and learning modules have not yet been massively distributed to teachers; the implementation of the said program is not well-planned; the lack of qualified teachers; incompetency of teachers due to the lack of academic conferences and seminar-workshops; and time spent for teachers’ training is not enough.
8. A Training Program is proposed to better prepare and equip the teachers in the implementation of the Spiral Progression Approach in teaching Science that would improve the teaching of science and the academic performance of the students.
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