AN EVALUATION OF A RURAL SCHOOL'S GRADE 10 STUDENTS' PERFORMANCE IN K-12 BIOLOGY

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ABSTRACT

Biology is taught in the second year of the old Secondary Science curriculum; however currently, it is taught every year in the Enhanced Basic Education Curriculum in a Spiral progression approach. With this, the researcher determined the performance of Grade 10 students in Biology at a rural school in the K–12 spiral progression. A total of 76 students were given an Achievement Test that covered Biology competencies from Grades 7 – 9 before the beginning of the third quarter (Biology). Their performance level was determined through a Quarterly Exam and Performance Tasks specified in the learners' modules. The Performance Tasks were assigned during the third quarter (Biology), and the Quarterly Exam was administered at the end of the quarter. The researcher utilized the Statistical Package for the Social Sciences (SPSS) Program to analyze the data. Procedures and techniques of descriptive statistics such as mean and standard deviation were utilized to determine the performance level of the students in the Achievement Test and the Quarterly Exam and Performance Tasks. Inferential statistics such as Pearson r was used to determine the relationship between students' Achievement Test results and their performance level in Quarterly Exam and Performance Tasks. According to the study's findings, students at a rural high school performed poorly on the Achievement Test. Their performance on the Quarterly Exam demonstrated that they did not fulfill their goals in terms of acquiring Biology competencies. They achieved the minimum competencies in completing tasks in Biology based on their performance in the Performance Tasks. The result of the Achievement Test has a significant relationship with the level of performance on the Quarterly Exam and Performance Tasks. Biology is not taught effectively in the Science Spiral Curriculum in K-12 education. The subject's complexities increase with each passing year, but its fundamental foundation has yet to be constructed and comprehended, making it easier for students to understand.

Keywords: Spiral Progression, Biology, Rural School, Achievement Test, Quarterly Exam, Performance Tasks, Philippines

INTRODUCTION

The Spiral Progression Approach believes that the simple concepts must be learned first by the learners before moving on to more complicated ones. As students develop in their learning, more and more details are taught to them, while at the same time, the basics are reemphasized or rediscovered several times for connection and mastery. This approach was founded on Jerome Bruner's cognitive theory in 1960. Bruner (1960) takes an approach, believing that any child (of any age) can comprehend complex information: *"We begin with the hypothesis that any subject can be taught in some intellectually honest form to any child at any stage of development."* To put it another way, even the most challenging content may be grasped by very young children provided it is correctly structured and presented. Learning should be structured in a spiral to draw on what

they have learned previously. Bruner (1960) explained how the spiral curriculum paradigm allowed for this. This meant structuring data in such a way that complex topics could be taught at a basic level first, then explored at a higher level afterwards.

There are learning theories strongly linked to the spiral progression approach (Corpuz & Salandanan, 2015; Pawilen, 2015; Resurreccion & Adanza, 2015). Learners gain new knowledge through the processes of assimilation and accommodation, according to Jean Piaget's cognitive development theory (Corpuz et al., 2015). The teacher plays a significant role in supporting the learners by arranging material in a manner that meets their present level of development, according to socio-cultural theories of development, such as more knowledgeable other (MKO). The spiral curriculum is also based on David Paul Ausubel's theory of meaningful verbal learning and the principle of progressive differentiation, which provides notions on the hierarchical organization of knowledge – general ideas of a topic should be taught first, followed by more specific concepts (Corpuz et al., 2015).

In the Philippines, as specified in Republic Act 10533, the Spiral Progression Approach is one of the standard concepts in the Philippines' Enhanced Basic Education Curriculum (K to 12). The general grades 1 to 10 design follows a spiraling flow of contents through subjects, according to the Department of Education's policy guidance (DepEd Order No. 31, s 2012). It implies that learners acquire concepts at an early age and then repeat them at a higher level of difficulty as they progress through the grades. The spiral progression approach aims to introduce students to a broad range of ideas, subjects, and disciplines until they have mastered them by learning them repeatedly but with increasing levels of complexity. After understanding the first topic, the student "spirals upwards," as fresh knowledge is provided in the next lesson, allowing them to reinforce what they've already learned. Finally, a broad range and scale of proficiency are attained. This method double-checks the previously known meaning, ensuring that it is remembered.

Integrated Science was taught in the first year of the previous secondary Science curriculum, followed by Biology in the second year, Chemistry in the third year, and Physics in the fourth year. In the current secondary science curriculum, these four disciplines of science are taught at the same time. Each year, students follow a spiral development technique in which the four areas are taught one at a time. Integrated Science was also renamed Earth Science. Students can better understand the core concepts and learning competencies needed in Grade 10 by progressing through the grade levels. They are expected to show their academic competencies objectively and creatively in real-life situations by the end of Grade 10. The content's breadth and chronology are designed such that topics and skills are explored in greater depth at each grade level. The understanding of each subject matter expands in breadth and depth as additional facts and principles are encountered, producing a metaphorical spiral.

As mentioned, Biology is one of the essential domains of Science. In general, it is the study of living organisms' structure, function, development, origin, evolution, and distribution. From Grade 3 to Grade 10, Biology is taught in conjunction with the other science disciplines at each grade level. It is offered in the second quarter in Grade 3 up to Grade 7, the first quarter in Grade 8, the fourth quarter in Grade 9, and the third quarter in Grade 10. It ensures that instruction starts with the fundamentals and that, as students' progress through the grades, these fundamentals become more nuanced in their care. This method allows teachers to return to basic concepts at each grade level yet teach them with complexity as they progress through the grades (Corpuz and Salandaan, 2015).

Many researches have been completed and published on the spiral progression approach in K-12 Science (Decano et al., 2021; Garcia, 2021; Dunton & Co, 2019; Maing, 2019; Orbe et al., 2018; De Ramos-Samala, 2018; Resurrection & Adanza, 2016). However, none of these studies have thoroughly investigated students' performance, particularly in a rural school and specifically in the biology domain.

Thus, the students at a rural high school in the Schools Division of Puerto Princesa City, Palawan, Philippines, were assessed on their success in the most recent Spiral progression curriculum in science, mainly in Life Science or

Biology. These students were enrolled in the school year 2017-2018, which means they experienced spiral progression since they were in Grade 7. The goal of this study was to examine if there was a link between their Achievement Test results, which included Biology competencies from Grades 7 to 9, and their performance level based on the Quarterly Exam and Performance Tasks, which covered Grade 10 Biology competencies.

OBJECTIVES OF THE STUDY

The study ascertained the performance of Grade 10 students in a rural school in K–12 Spiral progression in Biology subject. It sought to: (1) determine the results of the Achievement Test, which covered the Grades 7 – 9 Biology competencies, (2) determine the level of performance in the Quarterly Exam and Performance Tasks which covered the Grade 10 Biology competencies, and (3) determine whether there is a significant relationship between the results of the Achievement Test and the level of performance in the Quarterly Exam and Performance Tasks.

METHODOLOGY

This study used a quantitative, nonexperimental research design. Quantitative research collects and analyzes numerical data to describe, explain, forecast, or regulate variables and phenomena of interest (Gay, Mills, & Airasian, 2009). A nonexperimental research design is a set of approaches for doing quantitative research in which no variables in the study are manipulated (Creswell, 2013). Specifically, to see if there was a significant relationship between the variables in this study, the descriptive-correlational analysis was utilized. In the School Year 2017-2018, there were 76 enrolled Grade 10 students at a rural high school in the Schools Division of Puerto Princesa City that took part in this study.

The researcher wrote a letter requesting permission to perform the study. After receiving approval from the authority, the Achievement Test that covered Biology competencies from Grades 7 – 9 was developed and validated. It looked at all of the Biology competencies from Grades 7 through 9 to assess how students fared in the new Enhanced Basic Education Curriculum's spiral progression approach. The Achievement Test was given before the beginning of the third quarter (Biology). On the other hand, the students' performance level was determined by a Quarterly Exam and Performance Tasks specified in the learners' modules. The Performance Tasks were given during the third quarter (Biology), while the Quarterly Exam was given at the end of the said quarter.

To process the data, the researcher used the Statistical Package for the Social Sciences Program. Procedures and techniques of descriptive statistics were utilized to gain information on the performance level of the students. The mean and standard deviation were used to describe the students' performance in the Achievement Test and the level of performance in Quarterly Exam and Performance Tasks. Additionally, inferential statistics like Correlation was employed to determine the relationship of variables. Specifically, Pearson r was used to determine the relationship between students' Achievement Test results and their performance level in Quarterly Exams and Performance Tasks.

RESULTS AND DISCUSSION

This section presents, interprets, and discusses the results obtained in this study.

1. The Achievement Test Performance of Grade 10 Students in Biology

The table below shows the achievement test performance of the Grade 10 students in Biology at a rural high school.

As revealed in Table 1, Grade 10 students gained a percentage mean of 34.75 with a transmuted mean of 68 based on the Department of Education Order 08 series of 2015. It shows that the Grade 10 students at a rural school scored poorly in their Achievement Test in Biology, which covered competencies for Grade 7 up to Grade 9. It indicates that they did not meet the expectations for them based on the descriptors stated in the Department of Education Order 08 series of 2015.

Table 1
The Achievement Test Performance of Grade 10 Students in Biology (n=76)

	PM	TM	SD	V.I.
Achievement Test	34.75	68	9.72	Did Not Meet Expectations

It indicates that they did not meet the expectations for them based on the descriptors stated in the Department of Education Order 08 series of 2015.

2. The Performance Level of Grade 10 Students in Quarterly Exam and Performance Tasks

The table below shows the performance level in Quarterly Exam and Performance Task of Grade 10 students in Biology at a rural high school.

Table 2
The Performance Level of Grade 10 Students in Quarterly Exam and Performance Tasks (n=76)

	PM	TM	SD	V.I.
Quarterly Exam	49.68	72	18.60	Did Not Meet Expectations
Performance Tasks	62.39	76	24.80	Fairly Satisfactory

The performance level was measured through a Quarterly Exam, and Performance Tasks found in the learners' module. Using the descriptors stated in the Department of Education Order 08 series of 2015, the mean percentage scores were transmuted and interpreted. Results show that the transmuted mean percentage score of 72 in the Quarterly Exam signifies that the students did not meet the expectations in the K-12 curriculum. It means that the respondents have not gained enough knowledge, competencies, and skills in Biology that will allow them to understand and use concepts and principles of Biology. Neither have they attained the competencies from Grade 7 to 9. The Performance Tasks of the respondents, on the other hand, yielded a transmuted mean percentage of 76, which is interpreted as "fairly satisfactory." It implies that the respondents were able to attain the minimum competencies in performing tasks in Biology.

The results of the Quarterly Exam, as well as the Performance Tasks in Biology 10, showed that the objectives of the spiral progression approach, which is supposed to promote mastery among the students stated on the Curriculum Guide for Science, were not attained.

3. The Relationship Between Achievement Test Result and Level of Performance

Table 3 presents the relationship between the result of the Achievement Test of the Grade 10 students and their level of performance in Biology 10 in terms of Quarterly Exam and Performance Tasks.

Table 3
The Relationship Between Achievement Test Result and Level of Performance

Performance Level	Achievement Test
Quarterly Exam	
Pearson Correlation	.676**
Sig. (2-tailed)	.000
Interpretation	*Strong and Significant Positive Relationship*
Performance Tasks	
Pearson Correlation	.465**
Sig. (2-tailed)	.000
Interpretation	*Strong and Significant Positive Relationship*

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

These relationships were yielded through Pearson r statistical analysis, which resulted in the following correlation coefficients and interpretations.

It can be gleaned from the table above that the Pearson correlation between the Achievement Test and the Performance Level in Quarterly Exam is .676 significant at the 0.01 level. Also, the Pearson correlation between the Achievement Test and the Performance Level in Performance Tasks is .465, which is also significant at the 0.01 level. It implies a strong and significant positive

relationship between the Achievement Test results and the level of performance both in Quarterly Exam and Performance Tasks.

CONCLUSIONS

Based on the results of this study, the following conclusions were made:

1. Grade 10 students at a rural high school did not perform well in the Achievement Test, covering Biology competencies from Grades 7 through 10. Accordingly, Science Spiral Curriculum of K-12 education is ineffective in teaching Biology. The complexities of the subject matter increase every year level, but their basic foundation has not previously been established and mastered to make it for the students to understand.
2. The level of performance of the Grade 10 students at a rural high school in the Quarterly Exam revealed that they did not meet the expectations for them in the attainment of Biology competencies. In terms of their level of performance in the Performance Tasks, they attained the minimum competencies in performing tasks in Biology.
3. There is a significant relationship between the Achievement Test result and the level of performance in Quarterly Exam and Performance Task. Students perform poorly in the Achievement Test, which covers the Grades 7 – 9 Biology competencies, and the Quarterly Exam and Performance Task in Grade 10 Biology.

RECOMMENDATIONS

Based on the preceding conclusions, the following recommendations are offered:

1. It is recommended to share the findings of this study with the Science teachers, especially those teaching Biology, to let them know that in spiral progression in Biology, the basic competencies have not previously been established and mastered by the students.
2. Further evaluation of the existing curriculum is encouraged and recommended as it could help in establishing its effectiveness and quality. The study's findings could further support the Department of Education in implementing the K-12 Basic Education Curriculum, specifically in Science Instruction. It could enlighten other concerns regarding the curriculum and instruction of Biology.
3. For future researchers, it is suggested to investigate other factors that could affect the performance level of the students. The same study can also be done in other domains of science and the other subject areas that capture the focus of the K-12 Basic Education Curriculum.

REFERENCES

Bruner, J. S. (1960). *The process of education*. edci770.pbworks.com/w/file/fetch/45494576/Bruner_Processes_of_Education.pdf

Corpuz, B.B. & Lucas, M.D., Borabo, H.L. & Lucido, P.I. (2015). *Child and adolescent development: Looking at learners at different life stages*. Lorimar Publishing, Inc.

Corpuz, B.B. & Salandanan, G.G. (2015). *Principles of teaching 1* (4th ed.). Lorimar Publishing,

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Research Design | SAGE Publications Inc

DepEd Order 8, S. 2015 – Policy guidelines on classroom assessment for the K to 12 basic education programs. Department of Education. https://www.deped.gov.ph/2015/04/01/do-8-s-2015-policy-guidelines-on-classroom-assessment-for-the-k-to-12-basic-education-program/

DepEd Order 31, S. 2012 – Policy guidelines on the implementation of grades 1 to 10 of the K to 12 basic education curriculum (BEC) effective school year 2012-2013. Department of Education. https://www.deped.gov.ph/2012/04/17/do-31-s-2012-policy-guidelines-on-the-implementation-of-grades-1-to-10-of-the-k-to-12-basic-education-curriculum-bec-effective-school-year-2012-2013/

De Ramos-Samala, H. (2018). Spiral progression approach in teaching science: A case study. *KnE Social Sciences*, *3*(6), 555. https://doi.org/10.18502/kss.v3i6.2404

Decano, R. S., Paring, I. R., & Cereno, A. C. (2021). Determining factors to students' science achievement in the implementation of K to 12 spiral progression approach: A mixed method. *International Journal of Educational Research Review*, 46-54. https://doi.org/10.24331/ijere.815698

Dunton, J. B., & Co, W. S. (2019). "Spiral progression approach in teaching science and the performance of learners in district I, Capiz". *Journal of Physics: Conference Series*, *1254*, 012045. https://doi.org/10.1088/1742-6596/1254/1/012045

Garcia, R. E. (2021). Factors that influence students' learning progress in the science spiral progression curriculum. *Journal of Curriculum Studies Research*. https://doi.org/10.46303/jcsr.2020.5

Gay, L. R., Mills, G. E., & Airasian, P. W. (2009). *Educational research: Competencies for analysis* Inc. https://yuli-elearning.com/pluginfile.php/4831/mod_resource/content/1/Gay-E Book Educational Research-2012.pdf

Maing, E. M., Mangadang, A. T., Salic-Hairulla, M. A., Canalita, E. E., Sequente, F. R., & Yuenyong, C. (2019). Assessment of science teacher competence in teaching secondary science with spiral progression approach. *Journal of Physics: Conference Series*, *1340*, 012059. https://doi.org/10.1088/1742-6596/1340/1/012059

Orbe, J., Espinosa, A., & Datukan, J. (2018). Teaching chemistry in a spiral progression approach: Lessons from science teachers in the Philippines. *Australian Journal of Teacher Education*, *43*(4), 17-30. https://doi.org/10.14221/ajte.2018v43n4.2

Pawilen, G.T. (2015). *Curriculum development: A guide for teachers and students*. Rex Book Store, Inc.

Resurreccion, J. A., & Adanza, J. (2016). Spiral progression approach in teaching science in selected private and public schools in Cavite. *International Conference on Research in Social Sciences, Humanities and Education (SSHE-2016) May 20-21, 2016 Cebu (Philippines)*. https://doi.org/10.17758/uruae.uh0516148

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Jaybie S. Arzaga was a science teacher at Bahile National High School in the Schools Division of Puerto Princesa City from 2015-2019. He graduated with his bachelor's degree in Secondary Education major in Biological Sciences at Palawan State University, Puerto Princesa City, Philippines, in 2014, as a government and an *Erasmus Mundus* scholar. He took his Master of Arts in Teaching major in Biology Education at the same university where he graduated in 2018. In the same university, he is also currently teaching college and graduate students. This 27-year-old bachelor is presently doing his dissertation for his Doctor of Education (EdD) major in Educational Management degree.

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