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Stories of Students toward Spiral Progression Approach in Science: A Phenomenological Study

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Abstract—*The spiral progression approach in Science aims to expose the learners into a variety of concepts repeatedly with deepening complexity until the learners show mastery. This qualitative study described and understood the lived experiences and relayed the stories of the learners. A phenomenological method was used to explore the views and insights of the students toward the implementation of the Spiral Progression Approach in learning the Science subject. Through a series of interviews with the students, the central question, "What story can you tell about the current science curriculum?" was addressed in this study. The responses of the participants gave focus and bearing to this study which provided a profound perception of this phenomenological study. After a thorough analysis and coding, three (3) themes emerged and categories were identified from the interview of the students: the attributes of the spiral progression approach in Science, the challenges the learners experience in the spiral progression approach and the adaptations of the learners to overcome the challenges. In light of these findings, the researchers have developed the Induced-Fit Learning Model that describes the experiences of students mainly the challenges they have faced, adjustments they have made, and the perceived attributes of the K 12 Science curriculum. The lived experiences of the students in the spiral progression approach reshaped and reformed them to become learners who successfully faced the challenges in their academics. Furthermore, the experiences developed the learners to become graduates of a curriculum that promotes progressive, learner-centered, integrated, advanced, enhanced and inquiry-based learning*

Keywords— *Spiral progression approach, Science Education, Curriculum, phenomological study.*

I. INTRODUCTION

In the year 2012, the K – 12 curriculum was implemented in the Philippines beginning with grade 1 and grade 7 learners. The curriculum was introduced in succeeding grade levels as the learners get promoted to the next level. Subsequently, Republic Act 10533 otherwise known as the "Enhanced Basic Education Act of 2013" made the implementation of the K-12 in the country official (The Official Gazette, 2013). One of the features of the K-12 Enhanced Basic Education Program is the spiral progression approach which aims to strengthen Science and Math education. According to RA 10533, as supported by DepEd Order 31 s. 2012, the enhanced basic education curriculum should follow the spiral progression approach across subjects. It is designed by building on the same concepts in each grade level and developed in increasing complexity from Kinder to Grade 10. Likewise, teachers should adapt the spiral progression approach in teaching competencies. This reveals how the topics in the K 12 Science curriculum should be developing and integrated as the grade level progresses.

The spiral progression approach is grounded on the adaptive learning theory as proposed by Jerome Bruner (1960), "We begin with the hypothesis that any subject can be taught in some intellectually honest form to any child at any stage of development." In other words, even the most complex material can be understood by very young children regardless of age, if it is properly structured and presented with the guidance of an adult or a skilled partner (Vygotsky, 1978). According to Bruner (1960), "A curriculum as it develops should revisit these basic ideas repeatedly, building upon them until the student has grasped the full formal apparatus that goes with them." Key features of the spiral curriculum based on Bruner's work are: (1) student revisits a topic, theme or subject several times throughout their school career; (2) complexity of the topic or theme increases with each revisit; and (3) new learning has a relationship with old learning and is put in context with the old information. The benefits attributed to the spiral curriculum by its advocates are: (1) information is reinforced and solidified each time the student revisits the subject matter; (2) spiral curriculum also allows a logical progression from simplistic ideas to complicated ideas; and (3) students are encouraged to apply the early knowledge to later course objectives (Johnston, 2012).

The spiral curriculum is based on the concept that information is introduced to children at a young age and continually reintroduced, reinforced and built upon throughout their learning. Children perform an active role in the learning process and interact with the world around them. As they continually interact with the world around them, they acquire new knowledge, build upon existing knowledge, and adapt to previous knowledge to accommodate new learning (Piaget, 1962). Consequently, Bruner (1960) believed that even complex topics can be introduced to young learners if they are presented in a way that would make sense to them.

Spiral progression approach follows the progressive type of curriculum anchored to John Dewey's theory on the total learning experiences of an individual. Dewey's concept of education puts importance on meaningful activity in learning and participation in classroom democracy. According to him, students must be invested in what they were learning, and that curriculum should be relevant to students' lives. Learning by doing and development of practical life skills are crucial to children's education.

Martin (2008) described progression as pupils' personal journeys through education and ways, in which they acquire, apply, develop their skills, knowledge and understanding in increasingly challenging situations. He further explained that the 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. Hence, it involves progression as well as continuity in learning science. Continuity is concerned with ways in which the education system structures experience and provides enough challenge and progress for learners in a recognizable curricular landscape. Martin (2008) concluded that 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 is presented repeatedly throughout the curriculum, but with deepening layers of complexity. Therefore, spiral progression approach is an approach or a way on how to implement the spiral curriculum (Resurreccion and Adanza, 2015).

In the spiral progression approach, learners are exposed into a wide variety of concepts/topics and disciplines, until they mastered it by studying it repeatedly but with different deepening of complexity. Before the implementation of the K-12 curriculum, Science is taught into four areas: Integrated Science, Biology, Chemistry and Physics and are taught in first year, second year, third year and fourth year high school, respectively. However, with the implementation of the K-12 curriculum, all four major areas are being taught in each grade level. Every year, students are exposed to spiral progression approach, wherein the four areas are being taught per grading period, with increasing complexity each year. Aside from that, Integrated Science was changed into Earth Science (The Official Gazette, 2013).

In the spiral progression approach, when a student mastered the initial topic or skill, he/she "spirals upwards" as new knowledge is introduced in the next lesson, enabling him/her to reinforce or strengthen what is already learned (Cabansag, 2014). With this repeating procedure, the previously learned concept is reviewed thus improving its retention and mastery of topics and skills. (Resurreccion and Adanza, 2015; Quijano Technical Working Group on Curriculum, 2012). In the end, a rich breadth and depth of knowledge is achieved. Hence, the topic may be progressively elaborated when it is reintroduced leading to a broadened understanding and transfer (Mantiza, 2013).

Cabansag (2014) mentioned that the implementation of the K-12 curriculum have brought different reactions from students as well as teachers in the public sector. The provision of learning activities, the use of technology in the delivery of instruction and the increasing difficulty of lessons has garnered opposing reactions to students and teachers. She further added that these features of the K – 12 curriculum have brought pressure to teachers who should follow these new practices with great accuracy. However, the presence of prepared modules and instructional materials for use both by the teachers and the students lessen the vulnerability of teachers to become unmotivated in the implementation.

Stating the Science Framework for Philippine Basic Education (Department of Science and Technology - Science Education Institute, 2011),

"The Philippines' Grades 1-10 Science Curriculum envisions the development of scientifically, technologically, and environmentally literate and productive members of society. They must possess effective communication and interpersonal and lifelong learning skills as well as scientific values and attitudes. These skills will be acquired through a curriculum that focuses on knowledge relevant to real world and encompasses methods of inquiry. These will be implemented in a learning environment that promotes the construction of ideas and instils respect for others. "

Furthermore, the guiding principles of the science curriculum framework for the Philippine Basic Education states that: (1) science is for everyone; (2) science is both a content and process; (3) school science should emphasize depth rather than breadth, coherence rather than fragmentation, and use of evidence in constructing explanation; (4) school science should be relevant and useful; (5) school science should nurture interest in learning; (5) school science should demonstrate a commitment to the development of a culture of science; (6) school science should promote the strong link between science and technology, including indigenous technology; and (7) school science should recognize that science and technology reflect, influence, and shape our culture. Moreover, these guiding principles are summed up in the conceptual framework of the Science Education Curriculum: As a whole, the K to 12 science curriculum is learner-centered and inquiry-based, emphasizing the use of evidence in constructing explanations. Concepts and skills in Life Sciences, Physics, Chemistry, and Earth Sciences 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. The integration across science topics and other disciplines will lead to a meaningful understanding of concepts and its application to real-life situations. Thus, each graduate of the Basic Education Curriculum must possess these skills and attributes as envisioned by this framework.

Learning is the acquisition of knowledge and skills. It is influenced by social interactions, interpersonal relations and communications with others. It starts the moment we are born, with each of us learning in different ways and paces. It is acquired through practice and the varied experiences of an individual. There is no one-size-fits-all learning style. Since each learner has a different personality, influenced by family background, environment and status of the learner, learners have different ways of learning, coping, surviving and applying what they have learned. Bustos (2005) as stated by Resurreccion and Adanza (2015), furthered explained that the process of learning, memory and understanding are directly related to behavior. It is a product of the experiences an individual has achieved. Hence, models are used to describe how individuals learn.

A model describes a concept, a thought, and their connections with one another. It is also regarded as an attempt to explain or visualize an abstract idea or theory. A model is an analogy and a representative of variables that are included in the theory. In addition, a teaching and learning model is a tool to help the designer to understand the framework of theories and to implement the theories to create effective and efficient activities for teaching and learning. (Winataputra, 2001). A teacher who is a designer, instructor, supervisor, and facilitator of learning must realize that choosing appropriate model of teaching and learning depending on specific situation, setting and set of learners is critical. Since learners have different personalities and learning styles, learning models are just guides or references in which learning environments and instruction can be created, developed, delivered and implemented to achieve the learning goals.

Learning models provide teachers with a guide on a systematic procedure in creating appropriate learning environment and in planning and delivering or implementing instructional activities. Learning models describe what the teacher and student do, the learning environment, the nature of the procedures, materials, and the instructional tasks and how these all affect one another. In this study, the researchers have designed a learning model that describes the experiences, adjustments, challenges and attributes of students in the spiral progression approach in Science in the Philippine setting.

Studies have shown that giving students a role as active partners for restructuring schools as well as being radical agents of school reforms has lead to positive effects on the teaching and learning process (SooHoo, 1993; Fielding, 2001, 2004, 2007; Cook-Sather, 2002, 2006). Likewise, empowering students by hearing their voices and consulting with them regarding school issues and matters concerning their learning have made significant effects (Mitra, 2001; MacBeath, Demetriou, Rudduck and Myers, 2003; Flutter and Rudduck, 2004; Rudduck and McIntyre, 2007). Soo Hoo (1993) stressed that students who were given responsibilities and shared authority could actively investigate what is effective for them as learners. She even mentioned that students sharing their experiences and stories show a sense of confidence and group solidarity. Pedder (2009) wrote that when pupils are consulted, data reveal that pupils have sophisticated and serious things to say about classroom teaching and learning and how their classroom experiences might be enhanced. Thus, getting stories and insightful ideas from students about their experiences in the spiral progression approach in the current Science curriculum can be helpful in evaluating it. This supports the view that giving attention and opportunity to students to share their learning experiences in the teaching and learning process would improve the school performance and eventually student achievement (Nieto, 1994).

Learners' insights, perceptions and stories are very important in assessing students' learning journey. Through this way, teachers can have the ability to adapt changes and make adjustments on the different approaches to give to their learners. The rapid changes and increased complexity of today's economy present new challenges that set new demands on our education system. As educators seek ways to improve and meet the demands on these changes, it may be helpful to recognize students' voice about the current educational system. After five years of its implementation with the vision in producing graduates equipped with these scientific knowledge and skills, the researchers want to discover the insights and impacts of this spiral progression to the learners in studying the science subject.

The purpose of this qualitative study is to describe and understand the lived experiences and relay the stories of the learners of the Junior High School level, specifically Grade 10, of Colegio de San Juan de Letran regarding the Spiral Progression Approach. This phenomenological investigation explored the views and insights of the students in relation to the implementation of the Spiral Progression Approach in learning the Science subject. The research question, "What story can you (student) tell about the current science curriculum?" was addressed in this study.

II. Materials and Methods

This section includes the research design, the sample and the research instruments that were used in the conduct of the study. The sources of data, methods and procedure of data gathering and statistical treatment of data are also part of the discussion.

2.1 Design

Focusing on the experiences of the learners from the Junior High School of Colegio de San Juan de Letran – Manila, the phenomenological design of qualitative research approach was utilized to develop an understanding on the insights of the students regarding the spiral progression in the science curriculum. Phenomenology was the research design used because according to Creswell (2009 as cited in Padilla-Diaz, 2015), phenomenology is used when a study aims to understand thoroughly the subjective human experiences that was common among a group of people. Along with this statement, this study aimed to understand the lived experiences of the students in studying the Science subject using the spiral progression approach.

The role of the researchers in this qualitative research is to attempt to access the thoughts and feelings of the participants without personal bias, assumptions and/or subjectivity. The researchers are full-time faculty members of the Junior High School Level of Colegio de San Juan de Letran – Manila. One of the researchers is the Science Coordinator of the Basic Education Department of the Colegio and has been teaching Science for 17 years. The other researcher has been teaching Science for eight and a half years, while the other for six years.

Recognizing the need to be open to different thoughts and opinions and setting aside personal biases that may shape the way they view the data collected, the researchers' exerted efforts such as triangulation and focus-group discussions that will ensure the objectivity of the study (Krueger, 2009 as mentioned in Mangali and David, 2017).

2.2 Research Sampling

The participants were purposely selected since they are the batch of students who experienced the K12 program longest in the department. The researchers identified students who belong to the top rank and those who belong to the lowest rank. A letter of consent was given to the participants to inform the parents regarding the study. The letter of consent includes the signature of the parents that means they are allowing their son/ daughter in participating with the study, as well as the assurance of the confidentiality of the data that will be gathered. In addition, the date, time, and venue of the focus group discussions were stated in the consent letter. Prior to the interview proper, the researchers asked the participants to accomplish a demographic form of relevant background data and to sign a consent form regarding their involvement in the study.

There were sixteen (16) participants in this study, two batches of focus group discussions were conducted on October 25, 2018 and November 8, 2018 in the Research Productivity Room of Colegio de San Juan de Letran. All of the participants have studied in the Basic Education Department of Colegio de San Juan de Letran – Manila for the past four (4) years. Ten (10) out of sixteen (16) or 63 % of the participants belong to the top 10% of the batch while six (6) out of sixteen (16) or 37% belongs to the bottom 10% of the batch. There were three (3) girls or 19 % and thirteen (13) boys or 81 % who participated in the study. Seven (7) participants or 43 % were athletes while seven (7) or 43 % hold major positions in the student government or interest clubs.

2.3 Instrumentation and Data Collection Procedures

The researchers employed qualitative interviewing as the data collection approach. A two-part research instrument was prepared in this study to gather relevant information. The first part is getting the baseline data about the participants' information or "robotfoto". The second part is the semi-structured interview guide that serves as the prime source of data. An "aide memoire" was used during the interview to serve as guide to the participants. (de Guzman and Tan, 2007; Mangali & David, 2017).

A consent letter was given to the parents of the intended participants and are obtained later to certify that the parents allow their children to be included in the study. Students who were allowed by their parents to participate in the study were subjected to interview through focus group discussions. Since there were students who were not around on the first focus group discussion, researchers scheduled another discussion with the remaining participants. The researchers used a non-directive style of interviewing using open-ended questions thereby allowing the participants the freedom to control pacing and draw out clarity on the subject matter being discussed. In addition, a more directive style of questioning was employed to clarify some information from the participants. The researchers, video and audio recorded the participants' responses, as well as hand-written some notes during the interview (McLafferty, 2004). More probing questions were used to elicit confirmatory answers.

The acceptability of questionnaire was determined by asking experts' feelings on how they found answering it. The central question is, "What story can you tell about the current science curriculum?" While the subquestions and specific questions are: 1. "How do you perceive the science subject as it is taught?" 2. "What makes the science subject easy for you?" 3. "What makes the science subject difficult for you?" 4. "What challenges do you experience in the current science curriculum?" 5. "What difficulties do you find in dealing with the subject?" 6. "What are your adjustments on the subject matter in every quarter?" 7. "In a scale of 1 to 10, 10 being the highest and 1 being the lowest rating, describe: 8. your adjustment on the complexity of the topics; 9. your learning experiences in understanding the science concepts; and 10. how you retain previous knowledge/concepts in science".

2.4 Strategies in Analyzing and Validating the Findings

The recorded interviews from the focus group discussions were transcribed. Statements and phrases which are significant and clearly describe the learning experiences of students in the K12 Science curriculum were extracted from the transcripts. Varied meanings were constructed from the identified statements and phrases. The meanings were organized and categorized into themes, and these themes evolved into theme clusters, and eventually into theme categories. A color coded system as used to highlight specific themes / categories to perform a preliminary analysis (Creswell & Miller, 2000)

2.5 Ethical Considerations

To ensure that the study complied with ethical standards, the principles on ethical standards on qualitative research are followed. Ethics approval for the research was granted from the Basic Education Department of Colegio de San Juan de Letran. The participants of the study were given information about the nature of the research study and the procedures of gathering data. To preserve the confidentiality, any personal information was not asked to the following respondents. The following principles of ethical behaviour, as indicated by American Counselling Association (2014), were practiced throughout the study: autonomy (freedom of the participants), fidelity commitment and trust, nonmaleficence (causing no harm), and veracity (truthfulness). These principles were applied to protect the rights of the participants. The participants were also informed that they have the discretion not to answer the questions whenever they feel them intrusive (de Guzman & Tan, 2007). Participants were also informed that they will be audio and video recorded during the interview. In order to maintain the anonymity of the participants, their real names were not used in this paper.

III. Results and Discussion

The aim of this study was to give an avenue to share the stories of students in their journey in the K 12 Science curriculum. The study was intended to explore the varied experiences of the participants regarding their insights and perceptions of the spiral progression approach in Science. The responses of the participants gave focus and bearing to this study which provided a profound perception of this

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phenomenological study. Each participant in this study expressed their ideas attributed to the spiral progression approach in Science, the challenges they have faced, and the adaptations they were taking to cope up with the challenges and reap the benefits of the curriculum. In light of these findings, the researchers have developed the Induced-Fit Learning Model that describes the experiences of students mainly the challenges they have faced, adjustments they have made and the perceived attributes of the K 12 Science curriculum.

After a thorough analysis and coding, three (3) themes emerged and categories were identified from the interview of the students.

Theme 1: Attributes of the Spiral Progression Approach in Science

In this study, the attributes of the spiral progression approach in Science refers to the qualities or characteristics of the K 12 science curriculum as perceived by the students. It covers the features and how the students describe the curriculum. The attributes of the spiral progression approach in Science were coded as progressive, promotes advanced and enhanced learning, integrated, learner-centered and inquiry-based.

The Science Framework of the Philippine Basic Education encourages a developmental and integrated approach to curriculum planning, teaching and learning. The framework addresses the need to develop students' content knowledge and their applications to real life situations (Joong, Mangali, Raganit, Swan, 2019). It enables students to progress smoothly from one grade level to another.

Progressive education is a counterpoint to the traditional or didactic education of the schools of the 20th century. This school of thought was advocated by many philosophers including John Dewey. According to Dewey, the philosophy of teaching and learning had to be grounded in the practical conditions of everyday human life, and that human knowledge should be linked to practical social experience. Furthermore, teaching in the progressive school of thought is focused on the child as the learner. Hence, teachers promoting progressivism considers the learners' interests, skills and capabilities. In the K 12 Science curriculum, learning is developmental and progressive since it considers the nature of the individual learners, their learning pace, styles and capabilities in designing, distinguishing and evaluating each student's learning.

As Rina shares, "*We like more the spiral curriculum because as we mature, our mind is well progressed and there is no overload of information.*"

Morrie says, "*We like the way we learn different things in every quarter while there is no difficulty in understanding the lessons.*"

As Ernie conveys, " *I have a passion for science especially biology since I wanted to become a doctor, so that's what pushes me to really study and become very dedicated in every lessons*." He added, *"I'm planning to take up medicine in college and I think memorizing different terms in biology is a big advantage for us."*

Cabansag (2014) emphasized that students learn the subject matter at their own phase. They have to master or develop mastery of the subject matter first before they can proceed to the next level. Some students master these concepts when they are taught repeatedly (Gamoran, 2001). Since the spiral progression approach in Science is learner-centered, teachers employ varied teaching strategies that would cater to different learning abilities, capabilities, interests, and nature of students.

As Kris points out, "*The teacher utilizes different medium of instructions like videos, they show us different video presentations for us to really understand the lesson.*"

This shows that the current science curriculum is progressive and is learner-centered as perceived by the participants of the study. The spiral progression approach is focused on the learners' development, their learning capabilities and progress, as well as the enhancement of their skills.

From the traditional methods of teaching, the change in the Science curriculum in the K 12 program resulted to a more innovative exploration that emphasizes the enhancement of the students' critical thinking and scientific skills. Spiral progression seems to lead to a more advanced, sophisticated content through the involvement of varied teaching strategies (Orbe, Espinosa, and Datukan, 2018). Montebon (20140 supported their study that K-12 curriculum utilises learner-centered approaches such as the inquiry-based learning pedagogy – concepts and skills are taught by providing pedagogy which enable students to enhance their cognitive, affective, and psychomotor domains. This is supported by how the participants of this present study perceived the science curriculum.

As Shanny imparts, *"it is more challenging in such a way that we learn many things in advance".*

Lany mentions that, "*it's not like one school year you are focused on one branch of science only, in the end it is tiring*."

As the participants of the study attest, the spiral progression approach in science in the K 12 curriculum promotes advanced and enhanced learning, evident by in-depth content, variety of lessons, techniques, and methods of teaching as well as teachers effort to teach beyond the curriculum.

In this study, the participants have identified that the spiral progression approach in Science is integrative in nature and in the same manner, inquiry-based because of the incorporating concepts within the Science subjects, across other disciplines, and by making students apply what they have learned through assessments that cater to real-world issues and scenarios. Resurreccion and Adanza (2015) mentioned that the spiral progression approach uses authentic assessment instead of

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traditional classroom assessment. The tasks that the students have to perform are similar to tasks that they might have in the real world. They are also commonly seen through laboratory experiments and other forms of assessments in which learners apply what they have learned by doing real-life learning activities. Thus, the spiral progression approach does not only expose the students to current issues but also prepares them for the challenges in the future.

Leo narrates, *"During the transitions of K-12 there is an implementation of Performance tasks. In our experience, there are a lot of performance tasks and activities done for us to really understand the lessons especially in laboratory experiments, it stimulates our mind and make us more interactive in the lesson.* " He adds, "*Science should be about exploring and applying that means you are not just to learn but you have to explore and you need to apply it."*

As Jonny says, "*The teacher made the subject mysterious. They really want us students to look for an answer. They will make us curious on things that will push us to really learn on it.*"

Morrie attests, "*It is relatable into real life applications its because science is everywhere. Everyplace we go there is an explanation in science. It is the way it is being taught*."

Theme 2: Challenges in the Spiral Progression Approach in Science

With the view to produce scientifically, environmentally, and technologically literate graduates with 21st century skills, the government passed the Republic Act 10533 otherwise known as the "Enhanced Basic Education Act of 2013". In order to strengthen Science education in the country, the spiral progression approach was implemented for the subject. Along with the decongestion of the Science curriculum and the introduction of various strategies, techniques and forms of assessments, there are challenges that came up during the implementation. Based on the participants' interview, the challenges they experienced in the spiral progression approach in Science are: learners' characteristics, teachers' qualities, assessment, school culture, and classroom atmosphere.

Since the K 12 Science curriculum is learner-centered and is focused on the development of individual learners, considering their varied personalities which stemmed from their differing learning styles, diverse family and cultural backgrounds, and coping mechanisms, learners' characteristics pose a challenge in the implementation of the curriculum.

Morrie reveals, "*Since I am an athlete, I don't have enough time at home to read and review our lessons. The only way we do to learn is thru listening to our teachers in the classroom*." He adds, "*The things that you have learned in your grade 9, you need to recall for you to be able to understand the lesson in grade 10. Just like me, I'm having difficulty in remembering some of the lessons because I try to focus on what is being taught in the present*."

Ernie says, "*There are areas in sciences which I do not like, like physics and chemistry because I like biology most. So like for example in first quarter is physics, I am still focused in studying biology for the third quarter*."

Leo says, "*One of the difficult experience is time also if example some students are slow learners wherein they can't really intake lesson or absorb them and some are really fast pace so sometimes lesson for the day where not completely covered until tomorrow. So there is an adjustment of time for us. For example during our grade 8, it's chemistry and our topic is electronic configuration, we have just a brief introduction on that topic and were done already because the following day we already had our exams*."

Learner characteristics can be identified as personal, academic, social/emotional, and /or cognitive in nature (Drachster and Kirschner, 2012). In the K 12 Science curriculum, teachers who perform the main role of implementers should consider the learners' individual abilities, anxieties and aspirations.

Teachers' motivation also plays a role in waking up and sustaining the interest of the learners. As what the participants share, "*If the teacher is good, the students are motivated to study well.* " (Morrie); "*Let's face the fact that science is a hard subject and what make the subject easy are the teachers. For example, I don't want the subject, then I will not listen anymore. But if I like the teacher, it will motivate me as well to listen and to like the subject." (Jonny); "It becomes easier because we have a deeper understanding about a certain terms and equations because the teacher taught us in a way that they want us to learn, it benefit us students in sharpening our mind in science subject.*" (Rina); and "*As I mentioned, there are topics that is very hard and boring and here comes the idea that teacher makes it more lively in their approach in teaching for us to understand the lesson well.*" (Leo)

Teachers' competency and preparation are requirements for teachers to become independent and successful in their career. There is also a growing consensus that science teachers must have a strong science background (Ware, 1992). In the K 12 Science curriculum, mastery of the subject is posed to be a challenge. Unlike in the discipline-based approach in Science teaching, teachers in the current Science curriculum in the Junior High School level must teach all disciplines: Biology, Chemistry, Physics and Earth Science regardless of their expertise. Teaching within one's subject specialization ensures full confidence in conveying knowledge to students. However, with the implementation of the K 12 curriculum and the adoption of the spiral progression approach, a Science teacher who is trained and prepared in a discipline or specific content area must teach content areas or topics he is not an expert of. In the study of Samala (2018), the teacher-respondents find it hard to teach areas of science which are not their field of specialization. This means that the teachers might teach based only on their level of understanding. Thus, it is possible that the teachers might not teach the subject accurately or is short-changed, or just choose topics which they find comfortable and convenient to teach.

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Morrie says, "*The teachers make the subject easy. I am not degrading teachers from the other schools but what I can say teachers here in school specifically in the science area shows competency and mastery in their subject area. It's like they are just telling stories that make the subject very practical*."

Rina shares, "*There are different approach in teaching styles of the teachers, there are big adjustment to us students. We are not familiar on how you give your seatworks and quizzes. Like example during our grade 7, when Mr. M, and then on the second quarter mam A will be our teacher. There are different ways on both you. That's why it makes hard for us."*

Jonny tells, "*I think another difficulty is the curriculum. There was a time wherein there will be an exchange of teachers. For example if you we're assigned to teach biology and then another teacher is assigned to teach physics, so there will be a shift in teachers which is hard because as a student, one thing for you need to know is the techniques of the teacher on how they teach, how they create their quizzes, so it's another challenge to us to adapt how the teachers teach in his or her class.*"

Cabansag (2014) mentioned that the implementation of the K-12 curriculum have brought different reactions from students as well as teachers in the public sector. The provision of learning activities, the use of technology in the delivery of instruction and the increasing difficulty of lessons has garnered opposing reactions to students and teachers. She further added that these features of the K – 12 curriculum have brought pressure to teachers who should follow these new practices with great accuracy. Because of these challenges to the teachers, they sometimes resort to limiting the discussion to what they know and how to implement instruction. As revealed in the study of Valin and Janer (2019), teachers in the small and big group of schools have encountered the following three difficulties - time allotment in the use of some teaching strategies to cover the topics; time constraint in the use of differentiated instructions for evaluation and preparation of interactive activities that will cater all types of learners. Hence, school activities other than academics may affect the contact time of teaching (Mangali, Biscocho, Salagubang & Del Castillo, 2019). This is reflected from the responses of the participants in the focus group discussions.

Shanny mentions, "*One challenge is that topics were not finished in a quarter because of the different scheduled activities of the school. That is one of my experiences. The things I need to learn for that quarter is not complete." She adds, "Because of our schedule we tend not to finish the lesson for a particular quarter, but what if it is not be discussed on the next level then the topic will be left out*."

Lany tells, "*I think in the progression today, since we are discussing the topics from the past so I think there will be less time to tackle the new lessons. The time for the new lesson will be lessened because we need to recall the past lesson.*"

In a spiral curriculum, many topics are briefly covered. On the average, teachers devote less than 30 min of instructional time across an entire year to 70% of the topics they cover the result of teaching for exposure is that many students fail to master important concepts. Another disadvantage of the spiral design is that it does not promote sufficient review once units are completed. There may be some review of previously introduced topics within the chapter, but once students move on to the next chapter, previous concepts may not be seen again until they are covered the following year (Resurreccion and Adanza, 2015)

"Out-of-field teaching" typically refers to teachers who are teaching subjects out of their field of training (Ingersoll, 2003). The major concern with out-of-field teaching is decreased teaching effectiveness due to limited content knowledge (Hobbs, 2013; Ingersoll, 2008). Reviews of research on the knowledge of science teachers have repeatedly shown the importance of a teacher's content knowledge (Abell, 2007; van Driel, Berry, & Meirink, 2014). According to Magnusson, et.al (1999), teachers with differentiated and integrated knowledge will have greater ability than those whose knowledge is limited and fragmented, to plan and enact lessons that help students develop deep and integrated understandings. Effective science teachers know how to best design and guide learning experiences, under particular conditions and constraints, to help diverse groups of students develop scientific knowledge and an understanding of the scientific enterprise. These statements about the role of knowledge in teaching is supported by a body of research documenting that science teachers' knowledge and beliefs have a profound effect on all aspects of their teaching (e.g., Carlsen, 1991a 1993; Dobey& Schafer, 1984; Hashweh, 1987; Nespor, 1987; Smith & Neale, 1991), as well as on how and what their students learn (Bellamy, 1990; Magnusson, 1991).

Hence, in this study, students have identified that the mastery of the subject matter, how teachers motivate students, and the methods of teaching are challenges in the effective delivery of instruction.

The spiral progression approach in Science uses authentic assessment instead of traditional classroom assessment of pen-and-paper test. In authentic assessment, students perform tasks which are similar to real-world situations that they might encounter. These authentic assessments measure and evaluate how the learners apply what they have learned by doing real-life learning activities. Teachers must stretch beyond their boundaries and take risks with alternative types of assessments and strategies for reporting them. Teachers must use their creativity and critical thinking skills to create effective alternative exams. To measure those, teachers should come up with a criteria and rubrics to evaluate (Resurreccion and Adanza, 2015). However, in this study, students mentioned that the use of these assessments seem to be a challenge for them. Not being able to rationalize the purpose of these assessments as well as the criteria of grading the outputs, and not to mention the load of work in performing tasks not only in Science but also in the other subjects as well.

As Lany divulges, "*In the performance task it's just more on doing the tasks without understanding it*."

Rina quips, "*We tend to be out of focus because of the investigatory project, of the experience I had. I prioritize more on the investigatory project rather than performance tasks. That's one our lessons.*"

Leo mentions, "*I think one of the challenges in the current curriculum is that it is now more on performance tasks applications.*"

School cultures are the shared orientations, values, norms, and practices that hold an educational unit together, give it a distinctive identity, and vigorously resist change from the outside (Kaplan and Owings, 2013). Since different schools have different cultures, there might be challenges in implementing the school curriculum.

Leo says, "*For me the strongest battle in the curriculum as of now in school is the schedule of activities. Because here in school, there are many events that interrupts classes. So the number of days per quarter is not equally distributed*"

As Miggy shares, "*Things that are not been covered for a quarter will not be discussed anymore for next year since there is an integration on the subject, we need to cope up easily on the spiral curriculum and one challenge here in school are the line up of activities. It's very hard for us that we don't know what unexpected activities will happen*"

Classroom atmosphere also plays a role in the learning process of students. As what most neuroscientists believe, the human brain is constructed socially especially for teens whose brains maybe designed to filter out the stimuli of authority figures and members of the family in favor of their peers. (Eisenberg, cited in Gunn et al, 2007). Hence, the influence of classmates and the classroom atmosphere they create, pose a challenge as well in the implementation of the spiral progression approach. As what Jonny (one of the participants) says, "*It's not always on the teacher, what if the teacher is teaching and the student is not listening so it is not only the teacher but also it needs the students' attention to have a good learning environment.*"

In this study, the participants perceive that the learners' characteristics, teachers' qualities, assessment, school culture, and classroom atmosphere are challenges in implementing the spiral progression approach in the Science curriculum in the Philippine setting.

Theme 3: Learners' Adaptations in the Spiral Progression Approach in Science

In coping with the challenges brought about by the implementation of the spiral progression approach in the K 12 curriculum, learners have adapted ways like resetting the mind, revisiting the topics and evaluating their own learning.

In the spiral progression approach, learners are exposed into a wide variety of topics in each discipline per quarter in each succeeding grade levels with increasing complexity and deepening understanding. Though these disciplines are all under the umbrella of the sciences, varying nature of concepts as well as the needed skills to comprehend them, students reset their minds after each quarter to be ready in the next quarter.

Miggy shares, "*It doesn't necessary for you to adjust from zero level. You just need to fully refreshen your mind in some important details*".

The processing capacity of the conscious mind is limited and taking breaks is biologically restorative (Levitin, 2014). Thus, breaks in between quarters or topic of disciplines can be effective in managing students' burn out and making them ready for the quarter ahead. Since in the spiral progression approach, topics are presented in integrative manner with increasing complexity and deepening understanding, basic and fundamental concepts are linked and reinforced in every lesson. In the study of Samala (2018), she concluded that the spiral progression approach helped the students improve their retention in science first by revisiting their previous lessons in their lower grade levels and through the review facilitated by their teachers. The review plays an important role in the retention process of the students and serves as a tool to help them remember what they have learned in the previous years.
Ben conveys, "Because I have those tendency that if someone mention and told me about a certain topic there is an automatic reaction that I easily recall me on that certain lesson. Example in cardio and circulatory system so since it's my favorite topic, if the atrium is already mention I tend to remember different diseases that incorporate in this topic."

Shanny shares, "*For me, whatever things I have learned for a day I keep to focus on that. So for me adjustment takes time"*

This confirms what Tan (2017), as stated by Valin and Janer (2019), said about how revisiting the topics from one grade level to the next can build learners prior knowledge and skills and allow mastery from one grade level to the next. It also agrees with what Harden and Stamper (1999) mentioned that the spiral curriculum is not simply the repetition of topic but also requires the deepening of it, with every encounter building on the previous one and the revisited topics addressed in successive levels of difficulty. Visiting each topic means additional objectives and presenting fresh learning opportunities leading to the over-all objectives. Certain studies show that students perform better academically when they are given numerous opportunities to review learned material. For example, teachers incorporating a short review of a past lesson into the current lessons, or by giving assignments or activities to expose again the students to previous concepts. (Carpenter et al., 2012; Kang, 2016).

Evaluating one's own learning or self-assessment is a valuable tool and an important part of the assessment process. It makes the students identify their own skill gaps, where their knowledge is weak, see where to focus their attention in learning, set realistic goals, revise their work, track their own progress and decide when to move on to the next level (

Glen R. Mangali, Cathlea Tongco, Kristina Pamela Aguinaldo, and Calvin Joshper Calvadores, "Stories of Students toward Spiral Progression Approach in Science: A Phenomenological Study, *International Journal of Multidisciplinary Research and Publications (IJMRAP)*, Volume 2, Issue 2, pp. 37-48, 2019.

Andrade and Valtcheva, 2009). In this study, the participants mentioned that they do self-evaluation on the topics they find difficult and adjust accordingly. Self-assessment is a way of responding to the challenges the students experience on the spiral progression approach and eventually adapting to the K 12 curriculum. Just like what Demore (2017) found out in his study, there is a clear relationship between self-assessment (tasks) and increased ability to recognize students' own thinking, identifying their own errors, and recognizing areas they were personally struggling in or challenges they were experiencing in mastering the content.

When the participants rated themselves on how they adjust to the complexity of lessons from a scale of one (1) to ten (10) as 10 the highest, they rated seven (7) on the average. They mentioned that because of the complexity of the lessons, they adjust very well by resetting their minds and reviewing the past lessons. In addition, they mentioned that with the teachers' help, they are able to adjust very well with the spiral progression approach in Science.

Likewise, when the participants were asked to rate themselves on their learning experiences in the spiral progression approach in Science, they rated an average of seven (7). They mentioned that they have learned a lot in the Science subject, especially how they were able to understand phenomena and how the Science concepts are applied in real life. They also believed that having spiralling topics in the high school Science curriculum made them prepare better for future endeavours.

However, the participants of the study gave an average rating of six (6) on how they retain their knowledge in Science. Some of them mentioned that they don't retain much of their knowledge because they reset their minds and forget what they have discussed previously.

The Induced-Fit Learning Model

From the themes that came up from the sharing of the participants in this study, the researchers designed the Induced-Fit Learning Model that attempts to describe the attributes, challenges and adaptations of the learners in the spiral progression approach in Science in the Philippine setting.

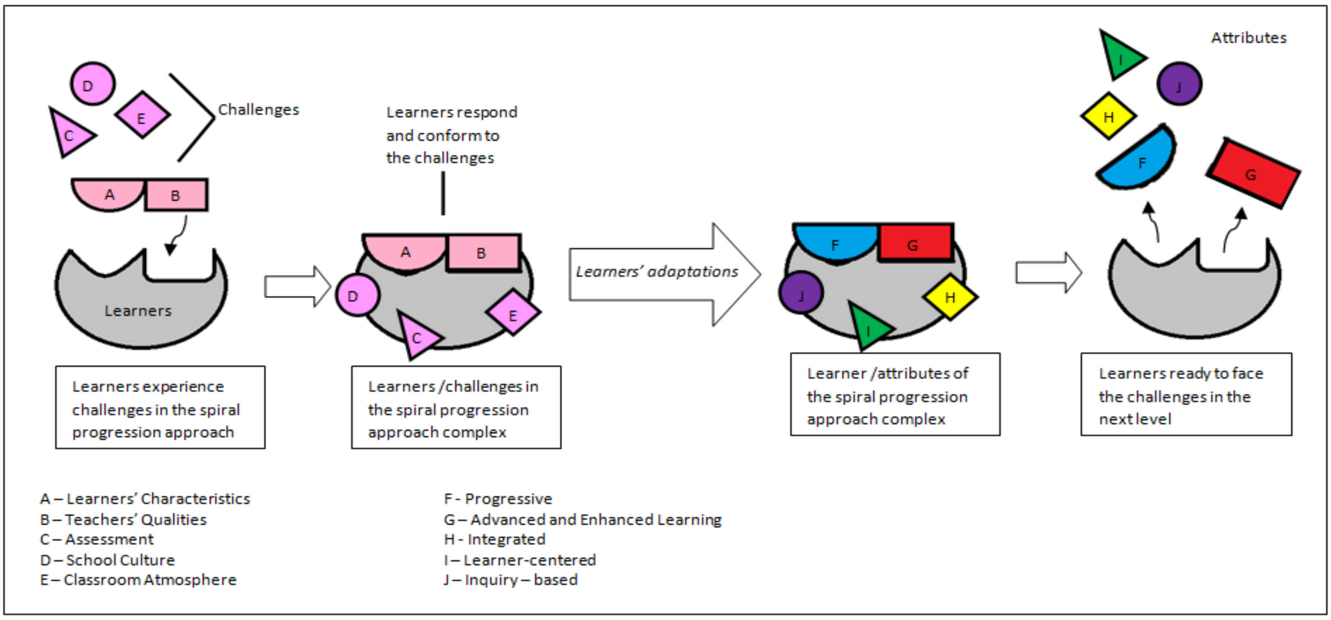

Figure 1. The induced-fit learning model in the spiral progression approach in science

The induced fit learning model describes the learners' experience in the spiral progression approach in the K 12 curriculum in the Philippine setting. With the introduction of the spiral progression approach, learners have experienced challenges in which they conform. It suggests that when learners are faced with challenges, they make certain adjustments and adaptations in order to conform and surmount these. Learners continue to reshape themselves when they interact with these challenges until the time they become well-adjusted. When learners adjusted very well and have adapted with the challenges, learners reap the benefits of the new curriculum. These attributes of the spiral progression approach which result from the successful implementation, delivery and continuous evaluation will then be experienced by other learners. Learners, after completing the curriculum and have reaped its benefits are now ready to face more challenges in the next level of education.

IV. Implication of the Study

The spiral progression approach in Science is aimed towards the development of learners as it is learner-centered and progressive in nature. There are several researches that determine the perceptions and insights of teachers in the adoption of this new curriculum. However, with the view of learner as the center of this curriculum, little attention is given to the lived experiences of students in the spiral progression approach. This phenomenological study provided an avenue on the learners' perceived attributes of the curriculum, the challenges they encounter, and their adaptations to overcome these challenges and eventually reap the benefits of the curriculum. The study describes how the learners adjust as they are exposed with the spiralling concepts, new forms of assessments and deepening complexities of the Philippine K 12 curriculum.

The findings provided essential insights that the Philippine education stakeholders have to consider for the improvement of the implementation of the spiral progression approach in Science. Likewise, the study gives an overview as to what challenges the students and teachers can expect in the approach. Hence, it gives suggestions to both teachers and students as to how to effectively adjust with the spiral progression approach in Science. This research implies that all stakeholders of the educational system of the Philippines should work hand-in-hand in developing learners toward the fulfilment of educational goals. This research also contributes to the literature on how students perceived the spiral progression approach, as well as how learners in the Philippine K 12 curriculum respond to the challenges with the guide of the Induced-Fit Learning Model. Teachers, school administrators, curriculum developers and policy makers should identify and find ways on how to minimize the impact of these challenges by providing more training for teachers, introducing effective strategies and techniques to cater to the individual differences of learners, rationalizing assessments, as well as providing a classroom atmosphere conducive to learning. This will effect into reduced challenges that the learners will experience as they go through their journey in the K 12 curriculum. The study also pinpoints that learners be given opportunities to make them adjust very well. Their stories on the spiral progression approach can be used by teachers to identify methods, techniques and strategies to facilitate learning more effectively. Likewise, schools should provide more opportunities for the students to apply what they have learned in the classroom as well as give support to educational programs. Since learners came from varied backgrounds and have different learning styles, it is important to note that many factors can affect the manner and pace they learn.

The study showed the essential insights and stories of students in the Philippines as they experience the spiral progression approach in Science. Three themes emerged based on the stories of students namely: the attributes, the challenges, and the learners' adaptations in the spiral progression approach. This study revealed that challenges such as learners' characteristics, teachers' qualities, assessment, school culture, and classroom atmosphere abound the implementation and delivery of the spiral progression approach. In response to these challenges, learners have adjusted by resetting their minds, revisiting the topics, and evaluating their own learning.

The lived experiences of the students in the spiral progression approach reshaped and reformed them to become learners who successfully faced the challenges in their academics. Moreover, their experiences developed them to become graduates of a curriculum that promotes progressive, learner-centered, integrated, advanced, enhanced and inquiry-based learning.

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