Spirally-Progressed Mathematics 6: Difficulties And Coping Mechanisms

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***Abstract*— Abstract—The study determined the difficulties and coping mechanisms in the spirallyprogressed Mathematics of Grade 6 pupils and teachers in the District of San Miguel South of the School Year 2017-2018. Using the mixed methods of research with 29 teachers and 235 pupils as respondents of the study, findings showed that: Majority of the teacher respondents were enrolled in the masteral and doctorate degrees. Majority of these teachers have been teaching Mathematics from 6 years and below and have attended in-service training from 12 to 23 days. Teachers and pupils encountered "less difficulty" in the spirally-progressed Mathematics in terms of content and skills and processes. They encountered "no difficulty" in the spirally-progressed Mathematics in terms of values and attitudes, and tools. The coping mechanisms of teachers and pupils with the difficulties on the spirally-progressed Mathematics 6 is the internet. They used internet to search for more exercises, sample problems, and tools for the lessons. The teachers believed that spirally-progressed curriculum improved the grades of those pupils who were inclined in Mathematics. Based on the findings of the study, the following conclusions were drawn: There is a significant relationship between the teachers' background and the difficulties encountered by the teacher in the spirally-progressed Mathematics 6. There is no significant difference between the difficulties encountered by the teacher-respondents and the pupil-respondents on the spirally-progressed Mathematics 6.**

Keywords—spirally-progressed, difficulties, coping mechanism, attitudes, content, processes

Introduction

Curriculum designs for all disciplines are important components of the learning process. These designs determine the usefulness or effectiveness of other components in the teaching process. One of the curriculum designs is the spiral curriculum. This aims success for all pupils, yet it seems to be a fact of life that while a few prosper in the various disciplines, mathematics included, a much greater number find mathematics difficult. Many elementary pupils do not master the basic math facts. Thus it is that, however successful a course may appear to be, there are pupils who begin to struggle and who need appropriate help to be able to pursue mathematics further.

DepEd Order No. 31 s. 2012 – Policy Guidelines on the Implementation of Grades 1 to 10 of the K to 12 Basic Education Curriculum Effective School Year 2012- 2013, states that the overall design of Grades 1 to 10 should follow the spiral approach across subjects by building on the same concepts developed in increasing complexity and sophistication starting from the grade school.

In the K to 12 Curriculum, basic principles are introduced in the first grade and are rediscovered in succeeding grades in more complex forms. Concepts are introduced at an early age and re-taught in succeeding years in an increasingly sophisticated fashion (Corpuz, 2014).

According to the University of Chicago School Mathematics Project (2012), spiraling leads to better long-term mastery of facts, skills, and concepts. Spiraling is effective with all learners, including struggling learners. Learning difficulties can be identified when skills and concepts are encountered in the early phases of the spiral and interventions can be implemented when those skills and concepts are encountered again later in the spiral.

Spiraling the curriculum provides opportunities for learners to deal with content developmentally over time. Concepts can be built upon and related to previous learning throughout the curriculum as students become more proficient and experienced in mathematics. However, it is critical that the same content not be taught year after year, in almost the same manner of delivery. Students who do not "get it" the first time are not likely to "get it" the next several times if it is taught in the usual manner. Moreover, underachieving students are frequently assigned repetitious and uninteresting skill-and drill work each year in order to teach them "the basics." This type of work often represents a narrow view of mathematical foundations and a low level of expectation of students' abilities. It limits opportunities to reason and problem solve (Sherman, et al., 2014).

According to Stendall (2009), the abilities to give good concentration, to make meaningful perceptions, to think logically and to use memory effectively are important factors in learning skills. In addition, these

skills could be learned and trained. If teachers understand the students' difficulties, they could make a change towards creating a meaningful learning based on students' intellectual needs.

Corpuz (2014) in her study said that the spiral approach has advantages: (1) mastery of the concepts because one keeps moving upward but keeps returning to the fundamentals; (2) improved retention because the teacher reinforces what is already learned; concepts are revisited; one learns best through the repeated experiences of a concept; (3) rich breadth and depth of knowledge achieved and (4) continuum, meaning there is a vertical and horizontal articulation. Montebon (2014) in his study said that the students are seeing the program helpful to them in a general sense.

On the other hand, the biggest disadvantage of a spiral curriculum is the lack of opportunity to cover a variety of topics within one discipline in a year. Each discipline requires steps and prerequisites (Kronthal, 2012).

According to de Dios (2012), the "spiral curriculum" requires that progress is indeed achieved in each year. Otherwise, it becomes circular. Combined with "learnercentered", the "spiral curriculum" can indeed become circular with the students learning the same thing over and over each year. This happens when an individual student fails to grasp or master the material in the first pass. As a result, in the following year, the teacher will have to cover the same material. Remedial intervention does not occur easily when topics are presented to students in a mixed fashion. The spiral nature pushes the students into various topics without giving enough time to master each one. In elementary schools, this is not yet a serious issue since the material to be learned is usually appropriate for the age of the children. Mathematics and Science are very general in nature at this stage. However, there are still skills that need to be mastered, which could only be accomplished by drills and a given amount of emphasis that a spiral curriculum sometimes does not provide. Adding, subtracting, multiplying and dividing are essential, and these constitute one of the foundations of mathematics education. Only a layered curriculum, one which recognizes that there are discreet steps in learning, allows for mastery of the skills and concepts necessary to advance to the next level.

In support, Hasna (2012) said that use of time in teaching the lessons is also a disadvantage in the spiral curriculum. When subjects are taught in such manner, the tendency is that there maybe too many repetitions that would reduce teaching and learning time. Learners may be also find the design a bore or may not stimulate their interest in the subject since it was taught to them the previous grade. Another disadvantage of the design is that when students are taught to master specific concepts or skills, it can also reduce topics that can be covered. There would be lesser topics to be discussed and sometimes at a superficial level only. The spiral design can also develop in students lesser adaptability and coping skills in discussions for higher and complicated learning. Another disadvantage of the design is the means of reviewing lessons. It would be disadvantageous if students would review lessons taken at a certain grade level and relearn them in the next level. The time allotted for reviewing can also be disadvantageous for learners. Finally, an important disadvantage is its sensitivity to cultures and backgrounds. Considering that students have different backgrounds, sometimes the teachers tend to neglect the fact that not all students come from the same background, and therefore do not build up to the student's specific background appropriately.

This research was conceived to further assess the difficulties and coping mechanisms of pupils and teachers with regard to the spirally-progressed Mathematics 6.

Statement of the Problem

Generally, this study aimed to determine the difficulties and coping mechanisms in the spirally-progressed contents in Mathematics of Grade 6 pupils and teachers in the District of San Miguel South of the School Year 2017-2018.

Specifically, the study sought answers to the following questions:

1. How may the Grade 6 Mathematics teachers' background be described in terms of:

    1.1 Highest Educational Attainment;

    1.2 Number of Years in Teaching Mathematics; and

    1.3 In-service Trainings Attended?

2. What are the difficulties encountered by the teacher respondents in the spirallyprogressed Mathematics in terms of:

    2.1 content;

    2.2 skills and processes;

    2.3 values and attitudes; and

    2.4 tools?

3. Is there a relationship between the teachers' background and the difficulties they encounter in teaching spirally-progressed Mathematics 6?

4. What are the difficulties encountered by the pupil respondents on the spirallyprogressed Mathematics in terms of:

4.1 content;

4.2 skills and processes;

4.3 values and attitudes; and

4.4 tools?

5. Is there a significant difference between the difficulties encountered by the teacher respondents and the pupil respondents on the spirally-progressed Mathematics 6?

6. What are the coping mechanisms of teachers and pupils to the difficulties on the spirally-progressed Mathematics 6?

7. Does the application of spirally-progressed Mathematics 6 in teaching significantly affect the performance of pupils in Mathematics?

Hypotheses

The study was guided by these hypotheses:

1. There is no significant relationship between the teachers' background and the difficulties encountered by the teacher in the spirally-progressed Mathematics 6.

2. There is no significant difference between the difficulties encountered by the teacher-respondents and the pupil-respondents on the spirally-progressed Mathematics 6.

Conceptual Framework

One of the subjects that many people fear and complain to be, too difficult to learn is Mathematics. The truth, however, is that everyone is capable of learning Mathematics. One should simply know the proper method of learning it.

According to K to 12 Curriculum Guide, Mathematics is one subject that pervades life at any age and in any circumstance. Thus, its value goes beyond the classroom and the school. Mathematics as a subject, therefore, must be learned comprehensively and with much depth. The twin goals of mathematics in the basic education levels, K-10, are Critical Thinking and Problem Solving. These two goals are to be achieved with an organized and rigorous curriculum content, a well-defined set of high-level skills and processes, desirable values and attitudes, and appropriate tools, taking into account the different contexts of Filipino learners. There are five content areas in the curriculum namely: Numbers and Number Sense, Measurement, Geometry, Patterns and Algebra, and Probability and Statistics. The specific skills and processes to be developed are: knowing and understanding; estimating, computing and solving; visualizing and modelling; representing and communicating; conjecturing, reasoning, proving and decision-making; and applying and connecting. The following values and attitudes are to be honed as well: accuracy, creativity, objectivity, perseverance, and productivity. The use of appropriate tools is necessary in teaching mathematics. These include: manipulative objects, measuring devices, calculators and computers, smart phones and tablet PCs, and the Internet. Context are defined, as a locale, situation, or set of conditions of Filipino learners that may influence their study and use of mathematics to develop critical thinking and problem solving skills. Contexts refer to beliefs, environment, language and culture that include traditions and practices, as well as the learners' prior knowledge and experiences.

Gatdula (2016) stated that one feature of the K to 12 Program that proved to be a real challenge for many educators, especially the Science and Mathematics teachers was the spiral progression approach. This approach means the basic principles are introduced in the first grade and are rediscovered in succeeding grades in more complex forms. With this approach concepts are introduced at an early age and re-taught in succeeding years in an increasingly sophisticated fashion. The teacher starts with the most basic and simple concepts. These same concepts are developed from one grade level to the next, in increasing level of complexity and sophistication.

The main philosophies behind spiral progression approach are constructivism, progressivism and behaviorism. Jerome Bruner was the main proponent of spiral curriculum and was also the proponent of constructivism (Haeusler, 2013.) A major theme in the theory of Bruner is that learning is an active and dynamic process in which learners construct new ideas based upon their current/past knowledge. Constructivism is often explained in terms of the social construction of knowledge. This "construction" of knowledge concept makes a distinction between memorization of facts and formulas and how people actually learn things. This philosophy is similar to the spirally-progressed Mathematics where learners take responsibility for their own learning. They set goals and can self-regulate their progress toward the goal. Learners collaboratively work either with peers and even with the teacher as a co-learner. Sometimes the learner becomes the teacher.

Behaviorism is another philosophy under the spiral approach. According to him, it is a theory of learning based upon the idea that all behaviors are acquired through conditioning. Conditioning occurs through interaction with the environment. Behaviorists believe that responses to environmental stimuli shape behaviors. In the spirally-progressed Mathematics incorporating behaviorism into the classroom allows

educators to assist their students in excelling both academically and personally.

Another philosophy under the said approach is progressivism. It is based on the idea of progress, which asserts that advancements in education, science, technology, economic development, and social organization which are vital to the improvement of the human condition. In spirally-progressed Mathematics, pupils are actively learning. The students interact with one another and develop social qualities such as cooperation. In addition, pupils solve problems in the classroom similar to those they encounter in their everyday lives.

Spiral progression can also be anchored to discovery-based learning. This type of learning requires longer hours and fails without sufficient guidance. The discovery-based learning method is also called inquiry method or problem solving method. Corpuz (2011) explained that the teacher guides the students as they explore and discover. As stated by a science teacher, “We will never be able to help children learn if we tell them everything they need to know. Rather, we must provide them with opportunities to explore, inquire and discover new leanings. Houtz (2010), emphasized inquiry method as all hands-on activities, no textbooks, and few or no directions from the teacher. The students are responsible for their own learning. Students may decide what to do.

In the article of McLeod (2012), he cited that the purpose of education for Bruner is not to impart knowledge but instead to facilitate a child’s thinking and problem solving skills which can be transferred to a range of situations. The role of the teacher should not only to be teach information but instead to facilitate the learning process. To do this, a teacher must give students the information they need but without organizing for them.

The use of the spiral approach can aid the process of discovery learning. Likewise, in the article published by General Teaching Council in England (2006), Bruner argued that for transfer of learning to happen, students needed to learn and to make connections between different experiences in learning rather than just master facts. To achieve this, he advocated learning through inquiry, with the teacher providing guidance to accelerate children’s thinking. He recommended that the early teaching of any subject should emphasize grasping basic ideas intuitively. After that, he believed that the curriculum should revisit these basic ideas, building upon them incrementally until the student understands the spiral approach clearly.

According to The University of Chicago School Mathematics Project (2012), in a spiral curriculum, learning is spread out over time rather than being concentrated in shorter periods. In a spiral curriculum, material is revisited repeatedly over months and across grades. Certain prerequisite knowledge and skills must be first mastered which in turn provides linkages between each lesson as the students “spiral upwards” in a course of study. One should always remember that one keeps moving upward, but keeps returning to the fundamentals through reviews but adding more (McLeod, 2012).

According to Snider (2007), spiral progression approach avoids disjunctions between stages of schooling, it allows learners to learn topics and skills appropriate to their developmental/cognitive stages, and it strengthens retention and mastery of topics and skills as they are revisited and consolidated. But, the problem with the spiral design is that the rate for introducing new concepts is often either too fast or too slow. All concepts are allotted the same amount of time whether they are easy or difficult to master. Units are approximately the same length, and each topic within a unit is a day’s lesson, as there might not be enough time to introduce the concept. The fact that an entire class period must be devoted to a single concept makes it difficult to sequence instruction to ensure that students acquire necessary pre-skills before introducing a difficult skill.

Resurreccion (2015) added that, in a spiral curriculum many topics are covered but only briefly. 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.

Davis (2007) said that the effectiveness of the curriculum relies on the teacher’s knowledge about the curriculum, his/her teaching strategies and mastery of the subject matter. Teachers must be constantly updated on the latest information related to their subject and the trends in pedagogy. Moreover, they should also be sharing and applying what they are learning with their pupils and colleagues. The K to 12 program is studentcentered. Thus, teachers must be able to adopt various learning styles and needs of the learners. They must also be flexible enough to ensure that learning takes place all the time using alternative modes. Teachers are the key to achieving the vision of the program. With this high demand for teachers, DepEd gave consideration and appropriate support to ensure that teachers will be able to fulfill their significant roles (Novera, 2015).

Participation of teachers in the orientations and in-service trainings must be done in order for them to perform their job better. The training may also build the teachers’ confidence because of a stronger understanding of the subject and the responsibilities of their job. This confidence may push them to perform even better and think of new ideas that help them

excel. One should understand and appreciate the crucial role of teachers in education reform.

Enlightened by the concepts mentioned above, the researcher intellectualized a paradigm with the Dependent Variables and Independent Variables to illustrate the relationships of the variables used in the study.

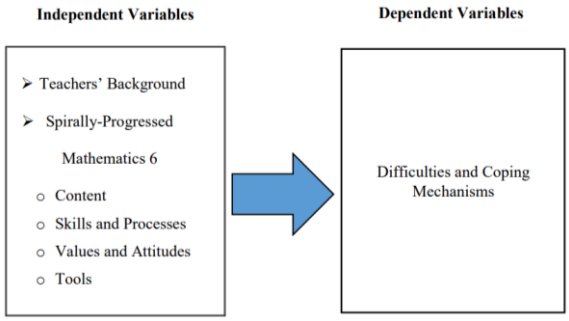

Figure 1. Paradigm of the Study

Figure 1 exhibits the paradigm of the study which describes the flow of this study. The first frame, the independent variable refers to the Teachers' Background and spirally-progressed Mathematics 6 which includes the content, skills and processes, values and attitudes and tools in Mathematics. The second frame is the dependent variable which refers to the difficulties and coping mechanisms among selected Grade 6 Mathematics teachers and pupils in District of San Miguel South.

Significance of the Study

The findings of the study are significant to the following:

Curriculum Planners and Developers. This outcome may serve as guide to the curriculum planners and developers in the revision and improvement of the content of the learner's modules and other learning resources based on the actual needs of the students. The result may also be an assessment for them to expose the teacher's in-depth training to facilitate learning and learning process effectively.

School Administrators. The findings of this study may serve as basis of the administrators in the provision of teaching materials, math equipment and conduct of trainings and seminars for teachers in order to carry out the goals of the K to 12 program.

Teachers. The results of this may be utilized by teachers to determine areas for improvement to maximize the impact of the new K to 12 program. This may also help them enhance the materials they will use in teaching and introduce new ways of presenting lessons especially in Mathematics 6.

Pupils. This research may be of great help for the students to understand the importance of the content of the K to 12 Spiral Approach in Mathematics curriculum, how it is being implemented, and how it affects their lives.

Parents. Awareness of the findings of the study will enable parents to be more observant in guiding and supervising their children to the program of the school. This may also lead to improve the communication between parents and teachers with regard to the children's development.

Future Researchers. Future researchers may use the findings of this research as reference especially for those who have the same interest in the topic of concern.

Scope and Limitation of the Study

The study focused on the difficulties and coping mechanisms in the spirallyprogressed Mathematics of Grade 6 teachers and pupils in the 25 schools in the District of San Miguel South of the School Year 2017-2018.

Data were limited to Grade 6 Mathematics teachers' background, the difficulties encountered by the teacher and pupil in the spirally-progressed Mathematics and their coping mechanism to the difficulties. This study was conducted in the School Year 2017- 2018. The researcher also provided interview guides for the Grade 6 teachers and pupils to justify the responses of teacher and pupil-respondents.

Location of the Study

The study was conducted among the 25 schools in the District of San Miguel South, San Miguel, Bulacan particularly in public elementary schools of Bagong PagAsa, Bagong Silang, Balaong, Balite, Batasan, Biak na Bato, Biclat, Don Felix Deleon, Doña Narcisa, Juan Pascual, Labne, Magmarale, Mandile, Masalipit, Pacalag, Paliwasan, Pangarayuman, Pulong Bayabas, Salacot, San Jose, San Juan, San Miguel, San Vicente, Sta. Rita, and Tibagan Elementary School.

The location of these schools is reflected in the map that follows. The history of these schools may be traced back in 1901.

According to Provincial Government of Bulacan (2007), the dawn of formal education began in 1901 when Fred Tullus Lawrence, an American teacher, pioneered the free public education in San Miguel. Through the end of 1901, Filipino teachers trained and supervised by the American instructor were assigned to the barrio schools and taught primary course in full. The children then, had to attend the intermediate course in the town's central school in Poblacion. Intermediate instruction did not rest in Poblacion and

its adjacent barrios but gradually spread over in the most distant areas of the town.

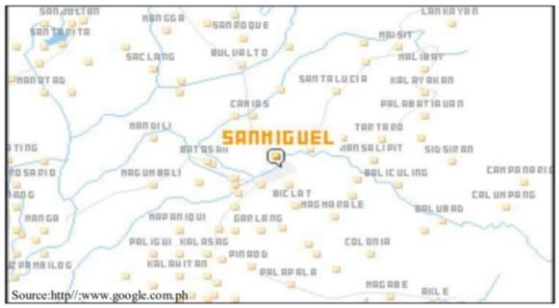

Figure 2. Location of the Map of the Study

In 1947, the first complete elementary instruction in the barrio was finally offered in Sibul. Years after, other schools followed offering first to sixth grade in Salacot, Camias, Bulualto, San Agustin, Batasan, Pinambaran, Tartaro, Buliran, Bantog, Kng. Kabayo, Buga, Bardias, Lambakin, Partida, Sta. Ines, Sta. Lucia, San Jose, Balaong, Salangan and Biclat. The growth and development of public schools, teachers and pupils that required effective supervision had split the lone educational district of the town into two- North and South which begun in School Year 1969-1970.

Definition of Terms

To understand this study better, the researcher used the following operational definitions:

Attitudes. This pertains to how the pupils and teachers think and feel about the difficulties and coping mechanisms of the spirally-progressed Mathematics 6.

Content. This refers to the scope and sequence of topics and skills covered in each quarter.

Coping Mechanism. This refers to how the pupils and teachers deal with the difficulties of the spirally-progressed Mathematics 6.

Curriculum. This is the specific learning program that collectively describes the teaching, learning and assessment materials available for a given course of study.

K to 12. This is a program where learners should begin studying from Kindergarten and to continue the 12 years of basic education: six years of primary education, four years of Junior High School, and two years of Senior High School.

Learning. This term refers to how the pupils acquire knowledge from their teachers.

Mathematics. This refers to the study of relationships among numbers, quantities and logical operations that makes use of signs and symbols.

Mixed Method. This refers to the combination of quantitative and qualitative methods used by the research in the study.

Processes. This pertains to the different procedures done in Mathematics.

Pupil-respondents. This refers to the randomly selected Grade 6 pupils as respondents in the study.

Skills. It refers to the ability of pupils and teachers in Mathematics.

Spirally-progressed Content. This refers to the teaching technique where in Mathematics areas are taught in increasing levels of complexity from one level, thus paving the way for deeper understanding of key concepts.

Teacher-respondents. This refers to Mathematics teachers/coordinators teaching Grade 6 who served as respondents in the study.

Tools. It refers to the materials being used in teaching and learning Mathematics.

Values. This term refers to how the pupils and teachers think.

CHAPTER II

METHODOLOGY

This chapter presents the research design, the data gathering techniques that were applied, the sampling procedures and the data analysis scheme. Research Design The researcher utilized a mixed method approach in the study in order to develop and test a psychometric instrument that improves on existing measures. The use qualitative data is to augment a quantitative outcome study. Within this type of an outcome study, the researcher collected and analyzed both quantitative and qualitative data. This is a methodology for conducting research that involves collecting, analyzing and integrating quantitative and qualitative research and data in a single study or a longitudinal program of inquiry.

Quantitative research is more logical and data-led approach which provided a measure of what people think from a statistical and numerical point of view. It gathered a large amount of data that can be easily organized and manipulated into reports for analysis. It also used instrument such as questionnaires with set questions and answers that respondents ticked from a pre-defined selection.

In this research, the researcher used the quantitative analysis in order to determine the Grade 6 Mathematics teachers' background and the difficulties encountered on the spirally-progressed Mathematics of the pupil and teacher respondents.

Qualitative research on the other hand, is largely led with discussion around certain concepts or ideas with open questioning. Respondents were encouraged to explain or describe their reason for having certain responses which can reveal underlying motivations, associations and behavioural triggers.

Qualitatively, the researcher provided an interview guide for Grade 6 Mathematics teachers and pupils. The Creswell Sequential Model (2007) was used. This was done by using the open-ended questions as interview instrument. Thus, giving a more vivid explanation of the quantitative data.

Data Gathering Techniques

The study was conducted in District of San Miguel South, San Miguel, Bulacan, the current teaching site of the researcher. She sought permission from the Schools Division Superintendent of Bulacan. The office of Schools Division Superintendent forwarded the permission letter to the District Supervisor of San Miguel South. Immediately after receiving the permission letter from both offices, the researcher sent another letter of request that was addressed to the principal of each school for the conduct of the study.

The instrument that was used in gathering the needed data for the study was questionnaire and interview. The adapted and modified questionnaires from Novera (2015) was used. The questionnaire was adopted to deal on the teachers' background in the profession, and was administered to the Grade 6 Mathematics teachers/coordinators. This included the profile of Grade 6 Mathematics teachers in terms of highest educational attainment, number of years in teaching Mathematics and Mathematics aligned in-service trainings attended.

On the other hand, the difficulties in the content, skills and processes, values and attitudes and tools of the following Mathematics Learning Competency in the Learner's Material and Teaching Guide were evaluated by the teacher respondents and pupil respondents through questionnaire. For the content, topics presented in the Mathematics Grade 6 Curriculum Guide (as of August 2016) was used. In terms of the skills and processes, the adapted and modified questionnaires from Southall (2015) was used; for the values and attitudes, the adapted and modified questionnaires from Brookstein (2011); and for the tools, used was the adopted and modified questionnaire from Novera (2015).

The coping mechanism of spirally-progressed in Mathematics was determined using the interview guide. Guide questions were asked to the teacher respondents and pupil respondents in order to reveal their own ideas without directing their responses.

Sampling Procedures

The District of San Miguel South consists of 25 complete schools which includes public elementary schools of Bagong Pag-Asa, Bagong Silang, Balaong, Balite, Batasan, Biak na Bato, Biclat, Don Felix De Leon, Doña Narcisa, Juan Pascual, Labne, Magmarale, Mandile, Masalipit, Pacalag, Paliwasan, Pangarayuman, Pulong Bayabas, Salacot, San Jose, San Juan, San Miguel, San Vicente, Sta. Rita and Tibagan Elementary School.

Table 1. Distribution of Respondents

Name of School	Total Number of Teachers/ Coordinators Teaching Mathematics 6	Total Number of Sections in Grade 6	Total Number of Pupils in Grade 6	Selected Pupils in Grade 6 Using Raosoft Sample Size
1. Bagong Pag-Asa Elementary School	1	1	26	5
2. Bagong Silang Elementary School	1	1	34	5
3. Balaong Elementary School	1	1	54	7
4. Balite Elementary School	1	1	28	5
5. Batasan Elementary School	2	3	114	15
6. Biak na Bato Elementary School	1	1	42	6
7. Biclat Elementary School	1	1	34	5
8. Don Felix Deleon Memorial School	2	2	88	13
9. Doña Narcisa Elementary School	1	1	28	5
10. Dr. Juan Pascual Memorial School	1	2	106	15
11. Labne Elementary School	1	1	25	5
12. Magmarale Elementary School	1	1	41	6
13. Mandile Elementary School	1	1	57	8
14. Masalipit Elementary School	1	1	58	8
15. Pacalag Elementary School	1	1	32	5
16. Paliwasan Elementary School	1	2	73	7
17. Pangarayuman Elementary School	1	1	9	3
18. Pulong Bayabas Elementary School	1	1	46	7
19. Salacot Elementary School	1	3	128	17
20. San Jose Elementary School	1	3	112	13
21. San Juan Elementary School	1	1	50	7
22. San Miguel Elementary School	3	8	373	41
23. San Vicente Elementary School	1	1	46	7
24. Sta. Rita Elementary School	1	1	51	7
25. Tibagan Elementary School	1	2	90	13
TOTAL	**29**	**42**	**1 745**	**235**

Table 1 presents the distribution of respondents in the research. These were the 25 complete schools in the District of San Miguel South. All Grade 6 Mathematics Teachers/Coordinators of the said district served as sample for the survey because they were the forefront of the education system and policies. The sampling method for this research in selecting the pupil-respondents was random sampling, where every pupil in San Miguel South had an equal chance of being selected as a subject.

It is composed of 25 complete schools where the researcher conducted the survey and interview. For the teacher respondents, all Grade 6 Mathematics teachers/coordinators answered for the survey and interview questions. For the pupil respondents, the researcher used the Raosoft sample size calculator with a margin error of 5%, confidence level of 95%, population size of 1745, response distribution of 50% which resulted in the recommended sample size of 235 pupils that were used for the questionnaire. Draw lots was used to select the sample size. On the other hand, only one pupil per school was used for the interview; draw lots was also done.

Data Analysis Scheme

The results of this study were tabulated, organized, analyzed, interpreted and presented in textual and tabular forms. To solve the problems of the study and the hypotheses, the following statistical techniques were used to ensure accuracy and reliability in the analysis and interpretation of data.

To describe the profile of Grade 6 Mathematics teachers in terms of highest educational attainment, number of years in teaching Mathematics and Mathematics aligned in-service trainings attended, frequency distribution, percentage and weighted mean and standard deviation were used.

To describe the difficulties in the content, skills and processes, values and attitudes and tools encountered by the Mathematics 6 teachers/coordinators and pupils on spirally-progressed Mathematics 6, a Likert Scale to interpret their responses was used.

According to McLeod 2008, various kinds of rating scales have been developed to measure attitudes directly. The most widely used is the Likert Scale.

Likert (1932) developed the principle of measuring attitudes by asking people to respond to a series of statement about a topic, in terms of the extent to which they agree with them, and so tapping into the cognitive and affective components of attitudes.

Each of five responses with a numerical value was used to measure the attitude under investigation, as:

Scale	Verbal Interpretation
5	Very Difficult
4	Difficult
3	Moderately Difficult
2	Less Difficult
1	Not Difficult

Correlation analyses were employed to determine the significant relationship between the teachers' background and the difficulties encountered in the spirallyprogressed Mathematics 6. T-test analysis was used to determine the significant differences between the difficulties encountered by the teacher respondents and the pupil respondents on the spirally-progressed Mathematics 6.

To determine the coping mechanisms of Grade 6 Mathematics teachers and pupils with the difficulties encountered on the spirally-progressed Mathematics 6, interview questions were asked to the respondents. Qualitative data and results were consolidated and placed after the quantitative data so that more in-depth analysis and support focus on individual perspectives could be clearly seen.

CHAPTER III

RESULTS AND DISCUSSIONS

This chapter deals with the presentation, analysis and interpretation of the data collected and the results of the statistical treatment employed in the study with the purpose of determining the pupils' and teachers' difficulties and coping mechanisms in the spirally-progressed Mathematics of Grade 6.

The Grade 6 Mathematics Teachers' Background

Background is the basic information about the Grade 6 teacher respondents. In this study it refers to the teachers' highest educational attainment, number of years in teaching Mathematics and in-service trainings related to Mathematics teachings (in terms of number of days). Highest Educational Attainment Educational attainment is a term commonly used to refer to the highest degree of education a teacher has completed. Educational attainment is a powerful predictor of well-being. Table 2 presents the distribution of the teacher respondents when they were grouped according to their highest degree of educational attainment.

Table 2. The Grade 6 Mathematics Teachers' Background in terms of Highest Educational Attainment

Educational Attainment	F	%
Doctorate Degree	0	0.00
Finished the Academic Requirements in Doctorate Degree	0	0.00
With units in Doctorate Degree	1	3.45
Masteral Degree	11	37.93
Finished the Academic Requirements in Masteral Degree	3	10.34
With units in Masteral Degree	8	27.59
Bachelor Degree	6	20.69
Total	29	100.00

It can be noted from Table 2 that more than one-third or 37.93 percent of the master's teacher respondents have already finished their masteral degree. Meanwhile, more than one-fourth or 27.59 percent have already earned some units in master's degree. On the other hand, 20.69 percent of the respondents did not pursue graduate studies and had their bachelor's degree only. A closer look at the table shows that another 10.34 percent of the respondents already finished the academic requirements in master's degree and the remaining 3.45 percent earned some units in doctorate degree.

These results imply that most of the teacher respondents spent some of their vacant time for professional development by taking graduate degree courses such as master's and doctorate degrees. This is of extreme importance because education does not need to end with the conclusion of a bachelor's degree. Further, these imply that those who finished

graduate degree courses could be more competent in the field of their study. It will actually help them gain understanding and build knowledge even more. As one acquires knowledge at a higher level, he/she is expected to develop the necessary skills in his/her field of work.

This was supported by the article written by Dedicatoria (2017) that a graduate degree course enhances critical and analytical thinking, the ability to work well with others, and maturity in challenging environments.

Number of Years in Teaching Mathematics

Teaching experience matters with regard to mathematics instruction. Mathematics teachers' experience in the classroom is a strong measure of the range of skills that a teacher brings to creating lesson plans, building in flexibility to the curriculum, explaining and clarifying the material, and enhancing student understanding of mathematics.

Table 3. The Grade 6 Teachers' Background in terms of Number of Years in Teaching Mathematics

Number of Year	F	%
16 – 18	1	3.45
13 – 15	2	6.90
10 – 12	3	10.34
7 – 9	4	13.79
4 – 6	12	41.38
3 and below	7	24.14
Total	29	100.00
Range	2 – 17	
Mean	6.34	
Standard Deviation	3.99	

Table 3 exhibits the distribution of the Grade 6 teacher respondents when they are grouped according to number of years in teaching Mathematics.

It can be gleaned from the table that more than two-fifths of the teacher respondents or 41.38 percent have been teaching Mathematics from 4 to 6 years. Meanwhile, almost one-fourth or 24.14 percent have been teaching Mathematics for 3.

years and below. A closer examination of the table shows that: 13.79 percent have been teaching Mathematics from 7 to 9 years; 10.34 percent have been teaching from 10 to 12 years; 6.90 percent have been teaching Mathematics from 13 to 15 years; and the remaining 3.45 percent have been teaching Mathematics from 16 to 18 years. Further analysis of the same table reveals that the Mathematics teaching experience of the respondents ranged from 2 to 17 years. Meanwhile, the mean was registered at 6.34 while the standard deviation which measures the spread of the respondents' years of experience from the mean was recorded at 3.99.

These findings imply that most of the teacher respondents were just new in teaching Mathematics. Less experienced teachers tend to be less effective than more experienced teachers as a whole. The idea is that experience, gained over time, enhances the knowledge and skills of teachers. These findings supported the results of the study conducted by Vukovic et al., (2013). In their study they found that majority of teacher respondents' experience in teaching Mathematics ranged from 2 to 5 years. It was also supported by the study of Rice (2010) who said that teachers' years of experience is a relevant factor in teaching Mathematics. The teacher's academic training and preparation program of old teachers outweigh those who are new in the field.

In-service Trainings Attended

An in-service program is a professional training or staff development effort, where professionals are trained and discuss their work with others in their peer group. It is a key component of continuing Mathematics education for teachers who handle the said subject.

Table 4. The Grade 6 Mathematics Teachers' Background in terms of In-Service Trainings Attended

Number of Days	F	%
30 – 35	2	6.90
24 – 29	5	17.24
18 – 23	9	31.03
12 – 17	6	20.69
6 – 11	3	10.34
5 and below	4	13.79
Total	29	100.00
Range	3 – 33	
Mean	17.28	
Standard Deviation	8.66	

Table 4 displays the distribution of the Grade 6 teachers when they were grouped according to the number of days in in-service training in teaching Mathematics.

It can be gleaned from the table that almost one-third or 31.03 percent of the teacher respondents attended in-service training in Mathematics from 18 to 23 days. Meanwhile, more than one-fifth or 20.69 percent attended in-service training from 12 to 17 days. On the other hand, 17.24 percent attended in-service training from 24 to 29 days; 13.79 percent attended from 5 days and below; 10.34 percent attended from 6 to 11 days; and the remaining 6.90 percent attended in-service training in Mathematics from 30 to 35 days.

Further perusal of the same table reveals that the number of days of in-service training attended by the respondents ranged from 3 to 33 days. The mean and standard deviation were computed at 17.28 and 8.66, respectively.

These results imply that DepEd officials provided adequate in-service training in Mathematics to Grade 6 teachers. This is big help for the teachers to gain expertise in the field of Mathematics because in-

service trainings give intensive exposure to lessons through presentations and discussions led by experts. In return, pupils learn more from their teachers and become more equipped of the skills they need in Mathematics. Further, they become updated on the new techniques in learning Mathematics.

Accordingly, Steinberg et al., (2010) reported that Mathematics teachers attended various seminars, workshops and in-service training to make them well-equipped in teaching Mathematics. Further, this made the teachers up-to-date on the latest trends and techniques in teaching Mathematics.

The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed

Mathematics In a spiral curriculum, learning is spread out over time rather than being concentrated in shorter periods. In a spiral curriculum, material is revisited repeatedly over months and across grades. Spiraling is effective with all learners, including struggling learners. Learning difficulties can be identified when skills and concepts are encountered in the early phases of the spiral and interventions can be implemented when those skills and concepts are encountered again later in the spiral.

The teacher and pupil respondents' perceptions as regards the level of difficulties they encountered in spirally-progressed Mathematics in terms of content, skills and processes, values and attitudes and tools are presented in Tables 5 to 12.

Content

Elementary school teachers are generalists. Their content knowledge is less than what a specialist would have so they don't understand Mathematics in the broadest sense.

Numbers and Number Sense (First Grading)

Numbers and Number Sense as a strand includes concepts of numbers, properties, operations, estimation and their applications.

Table 5. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Content - Numbers and Number Sense (First Grading)

Item Statement *I find it difficult to teach my pupils on…* *I find it difficult to learn about…*	Teacher (N=29)		Pupil (n=235)	
	Mean	Verbal Description	Mean	Verbal Description
1. adding and subtracting fractions	2.68	MD	2.72	MD
2. multiplying fractions	1.72	ND	1.69	ND
3. dividing fractions	2.59	LD	2.59	LD
4. adding and subtracting decimals	1.41	ND	1.27	ND
5. multiplying decimals	1.97	LD	1.76	ND
6. dividing decimals	1.59	ND	1.61	ND
Overall Mean	1.99	LD	1.94	LD

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 5 presents the level of difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of content – numbers and number sense (First Grading Lesson).

It can be noted from the table that both groups of respondents gave their highest computed weighted mean to item "adding and subtracting fractions" which was verbally described as "moderately difficult". On the other hand, these respondents gave their lowest computed weighted mean to item "adding and subtracting decimals" which was verbally interpreted as "not difficult". The overall mean of 1.99 was computed for the teacher respondents which is a little bit higher than the computed overall mean of 1.94 for the pupil respondents with a verbal description of "less difficult".

These results imply that teacher and pupil respondents encountered moderate difficulties in adding and subtracting fractions. This is a common knowledge that pupils find it so hard to add or subtract fractions especially when the denominators are not the same. Also, these imply that as teachers encounter difficulty in teaching, the pupils also encounter difficulty in learning.

Pupils and teachers have less difficulty on dividing fractions due to the fact that it is just the same as multiplying fractions, they simply need to get the reciprocal of the second fraction and multiply the numerators and denominators.

In the same vein, Askew and Ebbutt (2008) said that fractions are one of the basic but poorly understood concepts in mathematics in elementary school curriculum. Students can understand simple issues whereas they have difficulty in learning more abstract concepts in fractions.

Numbers and Number Sense (Second Grading)

Number sense is defined as an intuitive feel for numbers and a common sense approach to using them. It is a comfort with what numbers represent, coming from investigating their characteristics and using them in diverse situations. It involves an understanding of how different types of numbers, such as fractions and decimals, are related to each other, and how they can best be used to describe a particular situation. Number sense is an attribute of all successful users of mathematics.

Table 6. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Content - Numbers and Number Sense (Second Grading)

Item Statement *I find it difficult to teach my pupils on…* *I find it difficult to learn about…*	Teacher (N=29)		Pupil (n=235)	
	Mean	Verbal Description	Mean	Verbal Description
1. the concept of ratio	1.90	LD	1.68	ND
2. the concept of proportion	1.83	LD	1.61	ND
3. types of proportion	2.21	LD	2.23	LD
4. fractions, decimals and percent	2.21	LD	2.09	LD
5. percentage, rate and base	2.38	LD	2.43	LD
6. percent of change	2.17	LD	2.15	LD
7. applications of percent	2.31	LD	2.34	LD
8. the set of integers and the number line	1.86	LD	1.81	LD
9. adding integers	1.55	ND	1.45	ND
10. subtracting integers	1.69	ND	1.60	ND
11. multiplying and dividing integers	2.10	LD	2.02	LD
12. exponents and exponential notation	2.14	LD	2.05	LD
13. order of operations involving integers	2.41	LD	2.12	LD
Overall Mean	2.06	LD	1.98	LD

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 6 shows the level of difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of content – numbers and number sense (Second Grading Lesson).

It can be noticed from the table that teacher respondents had their highest computed weighted mean of 2.41 on item “order of operation”. Meanwhile pupil respondents had their highest weighted mean of 2.43 on item “percentage, rate and base”. On the other hand, teacher and pupil respondents gave their lowest computed weighted mean to item “adding integers”. The computed overall mean of 2.06 was registered for the teacher respondents which is a little bit higher than the computed overall mean of 1.98 for the pupil respondents.

These findings indicate that teacher and pupil respondents encounter less difficulties on the different topics in spirally-progressed Mathematics under the second grading period. Further, these indicate that the teaching and learning process under the content Numbers and Number Sense which include concepts of numbers, properties, operations, estimation, and their applications was not tough. These imply that the pupils were well-equipped with the basic concepts in Mathematics.

It was supported by the study of Burns (2007) which stated that pupils found it easy to learn Number and Number Sense because they have sense of what numbers mean, understand their relationship to one another, are able to perform mental Mathematics, understand symbolic representations, and can use those numbers in real world situations.

In contrary to the present findings, Alsopp et al., (2008) observed that students experienced difficulties in applying percentage, rate and base to word problems which is part of the second grading period. Further, they added that students had difficulties in determining which was the base, percent and rate in a given word problem.

Geometry, Patterns and Algebra and Measurement (Third Grading)

In the third grading period under the Spirally-Progressed Mathematics, the lessons that were needed to be discussed were the basic topics in Geometry, Patterns and Algebra and Measurement.

Geometry as a strand includes properties of two- and three-dimensional figures and their relationships, spatial visualization, reasoning and geometric modeling and proofs.

Patterns and Algebra as a strand studies patterns, relationships and changes among shapes and quantities and includes the use of algebraic notations and symbols, equations and most importantly, functions, to represent and analyze relationships.

Measurement as a strand includes the use of numbers and measures to describe, understand and compare mathematical and concrete objects. It focuses on attributes such as length, mass and weight, capacity, time, money and temperature among others, as well as applications involving perimeter, area, surface area, volume and angle measure.

Table 7. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Content – Geometry Patterns and Algebra & Measurement (Third Grading)

Item Statement *I find it difficult to teach my pupils on…* *I find it difficult to learn about…*	Teacher (N=29)		Pupil (n=235)	
	Mean	Verbal Description	Mean	Verbal Description
1. solid figures	2.00	LD	1.85	LD
2. nets of solid figures	2.17	LD	2.01	LD
3. writing rules for sequences	2.24	LD	2.22	LD
4. algebraic expressions	2.31	LD	2.40	LD
5. algebraic equations	2.28	LD	2.40	LD
6. solving equations	2.38	LD	2.43	LD
7. speed, distance and time	2.31	LD	2.35	LD
8. area of composite figures	2.20	LD	2.23	LD
9. surface area	2.45	LD	2.60	LD
Overall Mean	2.26	LD	2.28	LD

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 7 reveals the level of difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of Content – Geometry Patterns and Algebra & Measurement (Third Grading).

It can be gleaned from the table that both groups of respondents gave their highest computed weighted mean to item “surface area”. Meanwhile, these respondents gave their lowest computed weighted mean to item “solid figures”. The computed overall mean of 2.28 was computed for the pupil respondents which is almost equal to the computed overall mean of 2.26 for the teacher respondents.

These findings imply that teacher and pupil respondents encountered less difficulties on the

different topics in spirally-progressed Mathematics under the third grading period. Further, results indicate that the teaching and learning process under the content Patterns and Algebra and Measurement became easier for the respondents to comprehend which imply that they are good in analysis.

Opposite to the present findings, Shahrill (2014) pointed out that when students solve problems in surface area and volume under the third grading period, they had a hard time distinguishing them because in their earlier study of two dimensions, they thought of an area as what's "inside" the figure, with perimeter being the measure of the "outside." In three dimensions, the volume is the "inside" and the surface area is a measure of the "outside."

Measurement and Statistics and Probability (Fourth Grading)

In the fourth grading period, the topics discussed under spirally-progressed Mathematics were Measurement and Statistics and Probability.

Statistics and Probability as a strand is all about developing skills in collecting and organizing data using charts, tables and graphs, understanding, analyzing and interpreting data, dealing with uncertainty and making predictions and outcomes.

Table 8. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Content – Measurement and Statistics and Probability (Fourth Grading)

Item Statement *I find it difficult to teach my pupils on…* *I find it difficult to learn about…*	Teacher (N=29)		Pupil (n=235)	
	Mean	VD	Mean	VD
1. volume of solid figures	2.07	LD	2.07	LD
2. meter readings	2.03	LD	2.06	LD
3. data collection	2.00	LD	1.99	LD
4. pie graph	1.97	LD	1.98	LD
5. probability	2.24	LD	2.23	LD
6. prediction and outcomes	2.10	LD	2.19	LD
Overall Mean	2.07	LD	2.09	LD

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 8 presents the level of difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of Content – Measurement and Statistics and Probability.

It can be noted from the table that teacher and pupil respondents gave their highest and lowest weighted mean to items “probability” and “pie graph” respectively. Meanwhile, the computed overall mean of 2.09 was registered for the pupil respondents which is almost equal to the computed overall mean of 2.07 for the teacher respondents.

These findings imply that teacher and pupil respondents had the same experience in so far as teaching (for the teacher) and learning (for the pupils) measurement and statistics and probability are concerned. Further, these imply that skills in collecting and organizing data using charts, tables, and graphs; understanding, analyzing and interpreting data; dealing with uncertainty; and making predictions about outcomes were developed to the pupils by their teachers.

On the contrary, Lamb (2010) asserted that probability and statistics is hard over and above any mathematical difficulty because it involves philosophy: how scientists and other users of statistics ought to analyze data. Moreover, he said that all intuitions are wrong, and one has to let statistics do the thinking. Statistics is hated by many people.

In the conducted interview with the teacher respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “content”. Most of the respondents replied that they utilized various teaching strategies to make teaching easy for them. Further, they said that teaching strategies made their pupils more attentive and motivated to learn all the lessons that they discussed and they believed that this strategy is very effective.

In the conducted interview with the pupil respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “content”. There were some respondents who replied that whenever they encountered difficulties with their lessons, they asked help from their friends, classmates, teachers and family. On the other hand, there were some pupils who said that they search at the internet and look for some exercises with answers. They study the techniques and the styles in the computations of Mathematical problems. Further, they said that they found their strategies effective.

Skills and Processes

The process standards describe ways in which pupils are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that pupils may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course.

Table 9. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Skills and Processes

Item Statement *I find it difficult to…*	Teacher (N=29)		Pupil (n=235)	
	Mean	VD	Mean	VD
1. understand the meaning of the problem and look for entry points to its solution	2.07	LD	2.13	LD
2. communicate and defend mathematical reasoning	2.07	LD	2.00	LD
3. represent abstract situations symbolically and understand the meaning of quantities	2.10	LD	2.07	LD
4. flexibly use properties of operations	2.28	LD	2.26	LD
5. recognize the significance in concepts and models and use the patterns or structure for solving related problems	2.17	LD	2.09	LD
6. notice repeated calculations and look for general methods and shortcuts	2.21	LD	2.11	LD
7. apply prior knowledge to solve real world problems	2.04	LD	2.07	LD
8. make assumptions and approximations to make a problem simpler	2.21	LD	2.19	LD
9. state the meaning of symbols, carefully specifying units of measure, and providing accurate labels	2.02	LD	2.00	LD
10. label accurately when measuring and graphing	2.14	LD	2.13	LD
Overall Mean	2.13	LD	2.11	LD

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 9 shows the level of difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of skills and processes

It can be seen from the table that item “flexibly use properties of operations” got the highest computed weighted mean from the teacher and pupil respondents. Meanwhile, item “state the meaning of symbols, carefully specifying units of measure, and providing accurate labels” received the lowest computed weighted mean from the same groups of respondents. An overall mean of 2.13 was computed for the teacher respondents which is almost equal to the computed overall mean of 2.11 for the pupil respondents.

These findings imply that teacher and pupil respondents had the same perceptions as to level of difficulties in teaching (for the teacher) and learning (for the pupils) skills and processes. This meant that they had developed the specific skills and processes needed such as knowing and understanding; estimating, computing and solving; representing and communicating; reasoning, proving and decision-making; and applying and connecting.

Contradictory to these findings, Khalid (2009) asserted that students typically have a difficult time deciding which operation a word problem requires. The process of "choosing the operation" involves the skill in applying which mathematical operation (addition, subtraction, multiplication, or division) or combination of operations will be useful in solving a word problem.

In the conducted interview with the teacher respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “skills and processes”. These respondents replied that they provided more exercises in order for their pupils to be familiar with the procedures in solving worded problems. Moreover, they utilized peer teaching to help those pupils who encountered difficulties in problem solving to catch up with the lessons.

In the conducted interview with the pupil respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “skills and processes”. Pupil respondents answered that the best strategy is that they always do self-practice. They look for problems in some books and tried to answer them by themselves. Sometimes, they had group study which they found very effective to increase their knowledge in solving problems in Mathematics.

Values and Attitudes

Attitude is a predisposition or a tendency to respond positively or negatively towards a certain idea, object, person, or situation. Attitude influences an individual's choice of action, and responses to challenges.

Teachers’ values, attitudes, and personal beliefs about Mathematics affect how they teach. The values, attitudes and beliefs that teachers hold about the teaching and learning of Mathematics influence the instructional strategies they select and enact.

Table 10. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Values and Attitudes

Item Statement *I find it difficult to …*	Teacher (N=29)	Verbal Description	Pupil (n=235)	Verbal Description
1. teach Math/ learn Math	1.41	ND	1.28	ND
2. see Math as important in life	1.31	ND	1.21	ND
3. lead pupils in group activities/ Participate in group activities	1.55	ND	1.57	ND
4. encourage pupils to participate in discussion that involves Mathematics/ participate in discussion that involves Mathematics	1.62	ND	1.54	ND
5. have pupils get good grades on Math tests and quizzes/ get good grades on Math tests and quizzes	1.79	ND	1.75	ND
6. encourage pupils to go to the board or share their answers in Math Class/ go to the board or share my answers in Math class	1.72	ND	1.73	ND
7. push pupils to learn Math on their own/ learn Math on my own	1.62	ND	1.50	ND
8. encourage pupils to trust in their abilities to solve Math problems/ trust my abilities to solve Math problems	1.66	ND	1.60	ND
9. encourage pupils to listen to the thoughts and ideas of their peers in Math class/ listen to the thoughts and ideas of my peers in Math class	1.66	ND	1.71	ND
10. calm my pupils during Math class, instead they feel nervous/ stay calm during Math class, instead I feel nervous	1.79	ND	1.73	ND
Overall Mean	1.61	ND	1.56	ND

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 10 displays the perceptions of the teacher and pupil respondents as regards to their values and attitudes toward teaching spirally-progressed Mathematics.

It can be noticed from the table that items “I find it difficult to have pupils get good grades on Math tests and quizzes” and “I find it difficult to calm my pupils during Math class, instead they feel nervous” got the highest computed weighted mean of 1.79 for the teacher respondents. Meanwhile, the item “I find it difficult to get good grades on Math tests and quizzes” got the highest computed weighted mean of 1.75 for the pupil respondents. On the other hand, the item “I find it difficult to see Math as important in life obtained the lowest computed weighted mean of 1.61 for the teacher respondents and 1.56 for the pupil respondents. A closer look at the table shows that all items indicated therein including the computed overall mean garnered the lowest verbal description of “not difficult” for both respondents.

These findings imply that teacher and pupil respondents had positive values and attitudes toward Mathematics.

Accordingly, Wilkins (2008) posited that Mathematics teachers’ values, attitudes and beliefs reflect personal theories about the nature of mathematics and mathematics teaching and learning that influence their decision-making and choice of instructional practices. Specifically, “Mathematics teachers’ values, attitudes and beliefs have an impact on their classroom practice, on the ways they perceive teaching, learning, and assessment, and on the ways they perceive students’ potential, abilities, dispositions, and capabilities.”

Accordingly, Köğce et al., (2009) affirmed that attitudes are seen as more or less positive and encompass emotions, beliefs, values and behavior and hence affect individual way of thinking, acting and behaving which has a lot of implications to teaching and learning. They have a strong effect on behavior which helps in understanding and predicting peoples’ behavior in a wide range of contexts. Attitudes though not directly observable are inferred from observable responses and behaviours which reflect a pattern of beliefs and emotions. They are elicited by certain stimuli and gradually get established into a consistency or a tendency.

In the conducted interview with the teacher respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “values and attitudes”. These respondents answered that they provided their pupils some activities that help develop positive attitudes toward Mathematics.

In the conducted interview with the pupil respondents, they were asked about the strategies that they find helpful in dealing with difficulties on “values and attitudes”. A few respondents replied that in order for them to like Mathematics they watched the history of great mathematician in the You Tube. The lives of the mathematicians served as their inspiration to study more mathematics. Moreover, there were some pupils who answered that they play Math puzzles that enhanced their skills. These strategies were found effective by the pupil respondents.

Tools

“Teaching tools" is a generic term used to describe the resources teachers use to deliver instruction. Teaching tools can support pupils’ learning and improve their success. Ideally, the teaching tools are tailored to the content in which they're being used, to the pupils to whose class they are being used, and the teacher. Teaching tools come in many shapes and sizes, but they all have in common the ability to support pupil learning.

Table 11. The Difficulties Encountered by the Teacher and Pupil Respondents in the Spirally-Progressed Mathematics in terms of Tools

Item Statement *I find it difficult to teach Math using…* *I find it difficult to learn Math using…*	Teacher (N=29)		Pupil (n=235)	
	Mean	VD	Mean	VD
1. visual displays (bulletin boards, charts, graph, magnetic board, realia or real objects, pictures and posters)	1.45	ND	1.44	ND
2. projected and instructional aids (projectors, computers, sound or tape recorders, slides and film strips, video recorded and laser video disc players)	1.40	ND	1.36	ND
3. instructional television	1.41	ND	1.43	ND
4. printed materials (learners’ module, teachers’ guide, workbooks, pamphlets, magazines, brochures, newspapers, periodicals and duplicated materials)	1.42	ND	1.38	ND
5. computer and computer programs (computer aided instruction)	1.55	ND	1.47	ND
6. improvisation of materials	1.59	ND	1.42	ND
7. group activities	1.69	ND	1.58	ND
8. community as a resource material	1.83	LD	1.74	ND
9. math equipment	1.72	ND	1.67	ND
Overall Mean	1.56	ND	1.50	ND

Legend:

Rating Scale	Verbal Description
4.21 – 5.00	Very Difficult (VD)
3.41 – 4.20	Difficult (D)
2.61 – 3.40	Moderately Difficult (MD)
1.81 – 2.60	Less Difficult (LD)
1.00 – 1.80	Not Difficult (ND)

Table 11 presents the perceptions of the teacher and pupil respondents with regard to the difficulties encountered by the teacher and pupil respondents in the spirally-progressed Mathematics in terms of tools.

It can be seen from the table that item “I find it difficult to teach Math using/I find it difficult to learn Math using community as a resource material” got the highest computed weighted mean of 1.83 for the teachers and 1.74 for the pupils. On the other hand, item “I find it difficult to teach Mathematics using/I find it difficult to learn Math projected and instructional aids (projectors, computers, sound or tape recorders, slides and film strips, video recorded and laser video disc players)” got the lowest computed weighted mean of 1.40 for the teachers and 1.36 for the pupils. The computed overall mean of 1.56 was registered for the teacher respondents which is a little bit higher than the computed overall mean of 1.50 for the pupil respondents.

These results imply that teacher respondents had no difficulties as far as tools in teaching Mathematics are concerned. This is due to the fact that tools in teaching Mathematics are all available in the internet

which can be downloaded and used by the teachers in their respective classes. Moreover, the DepEd provided some materials which can be used for effective Mathematics teaching. In the same vein, pupil respondents did not consider the use of tools as a difficulty.

In support to the present findings, Kennon (2010) agreed that getting teachers' hands on valuable teaching materials is not nearly as difficult as it seems at first. The internet has many resources for teachers, most of them are free, and can significantly increase the contents of teachers' teaching toolbox. Teachers can also make their own materials. Every learning material the teachers develop is an asset for them when they next teach a similar unit. An investment of time or money in good teaching materials is an investment in good teaching.

In the conducted interview with the teacher respondents, they were asked about the strategies that they find helpful in dealing with difficulties on "tools". Teacher respondents replied that if there were difficulties with materials and tools in teaching the spirally-progressed Mathematics 6, they improvised the needed tools or sometimes they search for it in the internet. Moreover, there are some teachers who said that they asked their pupils to provide the tools that they would use in their lessons.

In the conducted interview with the pupil respondents, they were asked about the strategies that they find helpful in dealing with difficulties on "tools". Most of them stated that they searched in the internet for the needed tools that would help them improve their knowledge in Mathematics.

The Relationship between Teachers' Background and the Difficulties Encountered by the Teacher in the Spirally-Progressed Mathematics 6

In this part of the study the relationships between the teachers' background and the difficulties encountered by the teacher in the spirally-progressed Mathematics 6 were determined.

Table 12. Correlation Analysis on the Relationship between Teachers' Background and the Difficulties Encountered by the Teacher in the Spirally-Progressed Mathematics 6

Difficulties	Teachers' Background		
	Highest Educational Attainment	Number of Years in Teaching Mathematics	In-service Trainings Attended
Content	-0.515** (0.004)	-0.898** (0.000)	-0.861** (0.000)
Skills and Processes	-0.320ns (0.091)	-0.671** (0.000)	-0.639** (0.000)
Values and Attitudes	-0.292 (0.524)	-0.586** (0.001)	-0.569** (0.001)
Tools	-0.058ns (0.763)	-0.603** (0.001)	-0.581** (0.001)

Legend numbers enclosed in parenthesis are probability values numbers in the upper entry are correlation values (r-values)
** = highly significant ($p \leq 0.01$) * = significant ($p \leq 0.05$) ns = not significant ($p>0.05$)

Table 12 presents the results of the correlation analyses which were performed to determine if significant relationship existed between teachers' background and the difficulties encountered by the teacher in the spirally-progressed Mathematics 6.

Findings showed that highly significant correlation was found between teachers' highest educational attainment and the level of difficulties that they encountered in the spirally-progressed Mathematics 6. This highly significant correlation was brought about by the fact that the computed probability value of 0.004 is less than the 0.01 significance level. Further, inverse correlation existed between the aforementioned variables as implied by the negative sign of the computed correlation value (-0.515).

These imply that as the teachers advanced their professional levels, their knowledge and capabilities to teach the subject is also enhanced.

Further analysis of the same table reveals that highly significant relationships were found between teachers' number of years in teaching Mathematics and the level of difficulties that they encountered in the spirally-progressed Mathematics 6 in terms of content (p=0.000), skills and processes (p=0.000), values and attitudes (p=0.001) and tools (p=0.001). A closer examination of the table shows that inverse correlations were found between these variables as manifested by the negative sign of the computed correlation values that ranged from -0.898 to -0.586.

These findings imply that as the teacher respondents' number of years in teaching Mathematics increases, the level of difficulties that they encountered in the spirallyprogressed Mathematics 6 decreases.

A closer examination of the tabulated results shows that highly significant correlations were found between teacher respondents' in-service trainings attended and the level of difficulties that they encountered in the spirally-progressed Mathematics 6 in terms of content (p=0.000), skills and processes (p=0.000), values and attitudes (p=0.001) and tools (p=0.001). Moreover, the table disclosed that inverse correlations were found among the aforementioned variables as indicated by the negative sign of the correlation values that ranged from -0.861 to -0.569.

These findings imply that the more trainings they obtain, the better teacher they become.

In accordance to the above findings, Grehan et al., (2010) opined that teachers do better as they gain experience. As teachers gain more experience in teaching profession, they improve their effectiveness. Furthermore, they reported that the need for training and workshop for teachers are important to improve the quality of education. Teachers are crucial in implementing educational reforms. The success of a school curriculum depends on the teachers'

effectiveness. Teachers have to be personally aware of the school curriculum, improve and enhance their skills to interpret the concept of changes accurately and to implement the modified curriculum according to its requirements, aims and objectives.

The Difference between the Difficulties Encountered by the Teacher and Pupil Respondents on the Spirally-Progressed Mathematics 6

In this part of the study, the perceptions of the teacher and pupil respondents with regard to the level of difficulties that they encountered on the Spirally-Progressed Mathematics 6.

Table 13. t-test Analysis on the Difference between the Difficulties Encountered by the Teacher and Pupil Respondents on the Spirally-Progressed Mathematics 6

Difficulties	Mean		Mean Diff.	t-value	p-value
	Teacher	Pupil			
Content					
Numbers and Number Sense (First Grading)	1.99	1.94	0.05	0.166ns	0.871
Numbers and Number Sense (Second Grading)	2.06	1.98	0.08	0.800ns	0.432
Geometry, Patterns and Algebra & Measurement (Third Grading)	2.26	2.28	-0.02	-0.189ns	0.852
Measurement & Statistics and Probability (Fourth Grading)	2.07	2.09	-0.02	-0.319ns	0.673
Skills and Processes	2.13	2.11	0.02	0.705ns	0.490
Values and Attitudes	1.61	1.56	0.05	0.659ns	0.518
Tools	1.56	1.50	0.06	0.923ns	0.370

Legend numbers enclosed in parenthesis are probability values numbers in the upper entry are correlation values (r-values)
** = highly significant ($p \leq 0.01$) * = significant ($p \leq 0.05$) ns = not significant ($p>0.05$)

It can be noted from Table 13, that no significant difference was found between the perceptions of the teacher and pupil respondents as regards the level of difficulties that they encountered on the spirally-progressed Mathematics 6. This no significant difference was due to the fact that the computed probability values that ranged from 0.370 to 0.871 are greater than the 0.05 level of significance.

These results indicate that the perceptions of the teacher and the pupil respondents with regard to the level of difficulties that they encountered on the spirally-progressed Mathematics 6 are the same. Further, the difficulties experienced by the teachers in the said subject were the same with the pupils.

These imply that as the teacher encountered difficulty in teaching the topic specifically “fractions” it follows that the pupils find it difficult to understand.

Accordingly, Schuck and Grootenboer (2009) also found the same results with the present study. They gathered the opinion of the teachers and pupils with regard to spirally-progressed curriculum. They utilized a self-made questionnaire which they administered personally. After applying the appropriate statistics, they found that the assessments of the teachers and students were the same.

In the conducted interview with the teacher respondents they were asked about the challenges that they encounter in the implementation of the spirally-progressed Mathematics 6. Most of the respondents replied that they needed to study the content of their lessons because the topic changed every grading period. The challenge that they encountered was that they needed to study all branches of Mathematics.

On the follow-up question with the teacher respondents, they were asked if they believed that spirally-progressed Mathematics 6 improve performance of pupils. These respondents answered that based on their observations, those pupils who are inclined with numbers did better in spirally-progressed Mathematics 6. These pupils improved their academic performance in the subject because they already had the baseline knowledge from their previous Mathematics subjects in lower grades. However, these respondents added that for those pupils who had poor foundations in Mathematics, they found it so hard to improve their performance in the subject.

These respondents were also asked about the skills that they need to become competent in teaching Mathematics. Some of them answered that the best skill that will make them competent in Math is computational skills. They wanted to develop this skill which they think will make them more competent in Mathematics.

On the last question, they were asked about the hindrances in the application of spirally-progressed Mathematics in teaching. These respondents replied that mastery of the subject matter is the hindrance in spirally-progressed Mathematics teaching. Because of the constant change of the topic every grading period, they were not able to master all the branches of Mathematics which are consolidated in one subject.

CHAPTER IV

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary of the major findings, the conclusions arrived at based on the findings, and the recommendations given in accordance with the conclusions.

Findings

The study determined the difficulties and coping mechanisms in the spirallyprogressed Mathematics of Grade 6 pupils and teachers in the District of San Miguel South during the School Year 2017-2018.

Using the procedures described in the preceding chapter, the answers to the problems raised in this study were ascertained and summarized as follows: Majority of the teacher respondents were enrolled in

the graduate degree courses such as master's and doctorate degrees. Further, majority of these teacher respondents have been teaching Mathematics from six years and below and attended in-service training from 12 to 23 days. Teachers and pupils encountered "less difficulty" in the spirally-progressed Mathematics in terms of content and skills and processes. On the contrary, they encountered "no difficulty" in the spirally-progressed Mathematics in terms of values and attitudes, and tools.

Highly significant correlation was found between teachers' highest educational attainment and the level of difficulties that they encountered in the spirally-progressed Mathematics 6.

Highly significant relationships were found between teachers' number of years in teaching Mathematics and the level of difficulties that they encountered in the spirally-progressed Mathematics 6 in terms of content, skills and processes, values and attitudes and tools.

Highly significant correlations were found between teacher respondents' inservice trainings attended and the level of difficulties that they encountered in the spirally-progressed Mathematics 6 in terms of content, skills and processes, values and attitudes and tools.

The perceptions of the teacher and the pupil respondents with regard to the level of difficulties that they encountered on the spirally-progressed Mathematics 6 were the same.

The coping mechanisms of teachers and pupils with the difficulties on the spirally-progressed Mathematics 6 is the use of the internet. They used internet to search for more exercises, sample problems, and tools for the lessons. Furthermore, teachers utilized various teaching techniques and strategies to make their lessons more interesting to their pupils.

Teacher respondents firmly believed that the spirally-progressed curriculum improved the grades of those pupils who were inclined in Mathematics (see appendix I). On the contrary, this curriculum negatively affects the performance of those pupils who are poor in Mathematics.

Conclusions

Based on the findings of the study, the following conclusions were drawn: There is a significant relationship between the teachers' background and the difficulties encountered by the teacher in the spirally-progressed Mathematics 6.

There is no significant difference between the difficulties encountered by the teacher-respondents and the pupil-respondents on the spirally-progressed Mathematics 6.

Recommendations

In light of the findings and conclusions of the study, the following recommendations were drawn:

1. DepEd Officials should conduct annual evaluation on the K to 12 program for them to see the common problems encountered by the teachers in the implementation of the said program. Awareness of those problems is very significant for the success of the K to 12 program.

2. Teachers could be required to produce at least one research in a year with focus on factors affecting pupils' performance in Mathematics. In this way, they could find ways and means to improve the academic performance of elementary pupils in the said subject.

3. Various teaching strategies must be utilized by teachers to make the lessons more interesting to the pupils.

4. Further study about spirally-progressed Mathematics could be conducted. A pure qualitative method could be employed to deeply understand the problems and interests of the teachers and pupils in spirally-progressed Mathematics.

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