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Assessment of Junior High School Mathematics Curriculum Materials

Dave Carlos A. Calixto
Philippine Normal University

ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS

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APPROVAL SHEET

This thesis entitled **"ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS"** prepared and submitted by **DAVE CARLOS A. CALIXTO** in partial fulfillment of the requirements for the degree of **Master of Arts in Education with specialization in Mathematics Education**, is hereby recommended for approval and acceptance.

ERMINDA C. FORTES, Ph.D.
Adviser

Approved in partial fulfillment of the requirements for the degree **Master of Arts in Education** by the Oral Examination Committee.

ADONIS P. DAVID, Ph.D.
Chairperson

RENE R. BELECINA, Ph. D.
Member

ALLAN S. REYES, Ph.D.
Member

ARLYNE C. MARASIGAN, Ph.D.
Member

Accepted in partial fulfillment of the requirements for the degree of **Master of Arts in Education.**

_____
Date

RONALD ALLAN S. MABUNGA, Ph. D.
Dean,
College of Graduate Studies and
Teacher Education Research

This fruit of hard work is for all mathematics teachers

who work tirelessly,

going above and beyond what others believe teachers do,

to provide the best possible learning opportunities for students.

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This study does not end with a period of finality, but with a question mark of future explorations. There is so much more to come from all the learning I gained from this journey.

D. C. A. C.

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ABSTRACT

Name:	**DAVE CARLOS A. CALIXTO**
Title of Study:	**ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS**
Degree:	**Master of Arts in Education**
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Adviser:	**ERMINDA C. FORTES, Ph.D.**
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Curriculum materials are major resource for teachers' planning and practice. Teachers, as curriculum implementers, should engage and show initiative in assessing the strengths and weaknesses of these materials. The present study used a participant-oriented approach that considered teachers' views and attempted to assess the discipline-oriented, learner-oriented, and resource-oriented dimensions of the Junior High School Mathematics curriculum materials. Ninety mathematics teachers from Junior High School during the School Year 2017 – 2018 participated in the study. They were asked to analyze and assess the content of the curriculum materials using the questionnaire developed by the researcher and validated by a group of five experts in Curriculum and Mathematics Education. Then, semi-structured interview was conducted to validate answers and gain breadth in the responses. Results revealed the strengths of the K to 12 Junior High School Mathematics curriculum materials: It has clear objectives; is comprehensive and accurate; gives depth in

mathematical inquiry and reasoning; and is balanced. Moreover, its content is engaging, timely and is supporting students' diversity, and utilizes assessment appropriate for the 21st century. Furthermore, it reflects an efficient pedagogy, needs flexible, indigenized, localized, and varied resources, and requires professional development for teachers. However, the weaknesses of the curriculum materials appeared to be on the presence of errors and the content topics across other grade levels which were not well-arranged. Based on the assessment results, it is recommended to use the findings in improving the curriculum materials whenever and wherever plausible.

Chapter 1

THE PROBLEM AND LITERATURE REVIEW

Background of the Study

Curriculum can be described as the most significant component of a country's education system. It is dynamic and responsive to the demands and needs of the society. Consequently, curriculum assessment has to be given adequate attention. Considerations like whether the curriculum meets the expectation of stakeholders, or objectives through this curriculum are attainable, what is the actual situation in the classroom in which the curriculum is being carried out, or how effective the curriculum materials are in terms of delivering the content topics are some that need to be dealt with.

Curriculum plays a vital role in education; the quality and ideals of curriculum upholds the quality of education. Countries organize their education programs according to contemporary necessities of time. In the Philippine context, the K to 12 Basic Education Program was launched in government's eager desire of producing holistically developed Filipinos who are ready to face the challenges of life and work in the 21st century. This demonstrates the Department of Education's (DepEd) commitment in providing every learner with quality education; and that, education still remains as the top priority and concern of the government.

The learners of the 21st century essentially have to be highly competent since industries nowadays require them to probe questions, solve problems, and think creatively and critically. Moreover, many of today's jobs demand for workers who could think outside

of the box and solve problems from different perspectives and who are always prepared to theorize and demonstrate an innovative way of thinking.

According to Department of Education (2013), the Philippine K to 12 Basic Education Curriculum is supported by philosophical bases. The framework is supported by the following underlying learning principles and theories: Experiential and Situated Learning, Reflective Learning, Constructivism, Cooperative Learning and Discovery and Inquiry-based Learning (Department of Education, 2013). Since the mathematics curriculum is grounded on these theories, it is projected that students' learning will be improved and that the goal of producing holistically developed learners will be realized.

A key feature of the K to 12 Basic Education Curriculum is the spiraling design of the content topics. It means developing the same concepts from one grade level to the next in increasing level of sophistication. Education Partnership, Inc. (2012) explained that features of a spiral curriculum had been associated to improved learning outcomes even though there is no clear empirical evidence yet of its effect on student learning. Once the skills and concepts are met in the first stages of the spiral, learning problems of the students could be identified. Interventions can be implemented when those skills and concepts are encountered again later in the spiral.

On the other hand, there are problems that challenge the K to 12 Program. For instance, some conceptual/typographical errors can be found on the curriculum materials as identified by a number of Mathematics teachers. Consequently, these can hamper students' effective learning. Also, many topics are covered but only briefly. Although the intent is to treat each concept with increasing complexity at succeeding grade levels, the actual result is

that students acquire a shallow understanding of math concepts – and this is actually what happens in the field.

Casual conversations among Mathematics teachers, mainly in the National Capital Region (NCR), revealed that students have low mastery of several topics indicated in the Junior High School Mathematics curriculum materials. Mathematics teachers devote a significant proportion of time on review each year that only limited progress can be made with the new lesson. Moreover, teaching students has been so challenging because a number of students, particularly low and even average achievers, cannot recall even the basic concepts and principles when a lesson demands for prerequisite skills. When students are exposed to too much information, the expected result would be remembering a little of the content. Thus, the spiral progression, in a way, limits student opportunities to master critical mathematical concepts. This may also be attributed to the limited time allotment of certain topics indicated on the curriculum materials and the sequencing of the content topics within and across grade levels.

On the curriculum materials, for instance, uses and importance of statistics, data collection/gathering and different forms of data representation, measures of central tendency, and measures of variability are discussed in Grade 7. Moreover, introductory concepts on Probability are discussed in Grade 8 while concepts of Combinatorics and Probability, and measures of position are discussed in Grade 10. No topic in Statistics and Probability is discussed in Grade 9; consequently creating a two-year gap in the learning process. In a typical classroom setting where students' retention of understanding of lessons may be relatively short, this gap might be dreadful and problematic. Only a few numbers of

students have long retention of topics in Mathematics and they are usually the ones who excel in the subject. Concepts appear and are taught, and then they disappear only to return the following year or after two years. Hence, it is likely to happen that difficulties, specifically lack of prerequisite skills, may arise during class discussions.

In addition to this, there is a strong view on the part of some high school teachers that certain portions of the mathematics curriculum, as embodied on the curriculum materials, e.g., curriculum guides, teaching guides, and learner's materials, are still congested; and that it is quite impossible to cover all the learning competencies in depth as required for sufficient student learning. Hence, due to time constraint, the 'quantity' of learning competencies might be unconsciously prioritized over the 'quality'.

It may be worthwhile to recall that one of the objectives of the K to 12 Program is to produce learners who can think critically and solve problems. On the contrary, exposure on many concepts rather than emphasis on a few key concepts may lead to superficial understanding of mathematical skills. These are very critical for learning higher order math concepts. It seemingly defies the objectives of the program. It may also be pointed out that a curriculum material that deals with many different topics requires too much from any teacher. Moreover, it can be observed that many students are likely to forget basic mathematical concepts and skills because of the gaps in the curriculum. The teaching-learning process is directly influenced by the content and design of the curriculum materials. Thus, it is essential to determine the strategies that teachers are employing in classroom discussions in meeting the demands of the curriculum content and design.

It may be emphasized that there were still no existing researches assessing the content of the K to 12 Junior High School Mathematics curriculum materials. Thus, the researcher was prompted to identify the strengths and weaknesses of the K to 12 Junior High School Mathematics curriculum by assessing the content of the curriculum materials. This research was also an attempt to address the gaps that previously conducted researches revealed about spiraling design of curriculum. Any essential revisions that would make the curriculum materials more efficient and effective could be of great help for the further enhancement of the Philippine education system.

This research study benefits the Department of Education (DepEd) officials, mathematics curriculum designers, public and private school heads, teachers, and students as it lends itself as basis for curriculum improvement. Considering the fact that no assessment study has been made on the K to 12 Junior High School Mathematics curriculum materials, this study is supposed to be an important source of information.

More precisely, this research helps visualize how curriculum developers' decisions are interpreted and practiced by classroom teachers. The present study has a significant value as it supports the gathered statistical data with qualitative data to draw a clear picture of the nuances of the curriculum. The rich information collected through survey questionnaires helps identify the loopholes in the curriculum materials by identifying their weaknesses. Additionally, what does or does not fit to all types of learners in the curriculum could be determined and the reasons for the difficulties encountered in the mathematics curriculum could be recognized through interviews.

To identify the practical problems faced by teachers in delivering the curriculum is a great advantage. When taken into consideration, the results of this study may help teachers manage the gaps in the curriculum contents and develop effective strategies to cope appropriately with the strengths and weaknesses of the curriculum.

Finally, the valuable information that this study provides could help decision makers to develop better-designed curriculum materials and make further progress in the country's education system.

Literature Review

The heart which gives life to any education system is its curriculum. The curriculum serves as the pivotal reference point for teachers where it is encoded in the curriculum guides, teaching guides, and learner's materials, often the sole resource used by teachers. The key implementers of any curriculum are the teachers; their pedagogies, strategies, and practices serve to implement the curriculum.

Köstereliođlu and Özen (2014) suggested that curriculum should always be improved because innovations reflected in the education system are observable to the extent that they are a part of the curriculum. This is why efforts to assess curriculum are most needed and crucial.

Güven and Iscan stated that curriculum is among the most important means of projecting the effects of changes on an educational environment observed in a given education system (as cited in Aksan & Baki, 2017). Özdemir contended that it is not proper if an education system would not be responsive to changes in the educational field in keeping pace with the 21st century (as cited in Aksan & Baki, 2017). These curriculum changes shape

an important part of reform in education. Doğan (2012) stated that education reform change is a structuring that all countries have given priority in the past years. Any country is in need of apprehensive individuals to assess the current status of the curriculum to keep track with the 21st century.

In the study conducted by Coelho and Moles (2015), a survey was conducted to evaluate student thoughts and experiences of a spiral curriculum. Students were asked to rate their thoughts on their understanding, perceived benefit of and confusion with their spiral curriculum at the current time and retrospectively during previous years, and to answer free-text questions on the impact, effects on learning and future suggestions for their spiral curriculum. Results provided insights into students' perceptions of an integrated spiral curriculum, and whilst predominantly positive, there are challenges to enhance the student experience. The spiral curriculum provides an opportunity to revisit and consolidate learning to the apparent benefit of the student.

The Philippine K to 12 Basic Education Program follows a spiral progression and due to the challenges that the program poses on education, teachers have to cope with the demands expected on them with regard to curriculum roles. Accordingly, teachers have a crucial role in the education system; and that, they should not be passive receivers of the curriculum (Mokua, 2010).

During the first conduct of the new K to 12 Mathematics in the Philippines, Capate and Lapinid (2015) sought to determine the performance and the difficulties of the two hundred seventy-nine (279) Grade 8 students of Don Bosco Technical Institute – Makati (DBTI). Students' scores in the formative tests and the mathematics achievement test

measured their mathematics performance while interpretation of their mistakes in the least-mastered contents of the new K to 12 Mathematics identified their difficulties. Results indicated that most of the Grade 8 students were in the beginning level of achievement only. Moreover, half of the tested contents were least-mastered. Incorrectly applying the formulas, properties, theorems, and/or laws and incompletely solving the problem despite correctly doing the initial procedure were their common difficulties. The general recommendation to align the Grade 8 Mathematics Competencies to Instruction and Assessment was to include the missed instructional objectives during the past instruction in the next Curriculum Planning. The recommended strategies to improve instruction included needs assessment, more practice for automation, conduct review classes for mastery and retention, explicit instruction, and peer-assisted mathematics instruction. Results of this study served as basis for enhancing instruction and aligning the Grade 8 Mathematics competencies to Instruction and Assessment.

In the study of Orale and Uy (2018), sixty-six 10th graders from Samar were subjected to a mathematics aptitude test. Interview with 9 teachers in Junior High was also performed to identify factors contributing to the students' performance. A literature review was also undertaken to support the concept of a broken spiral. The study revealed that the expected benefit of the spiral progression approach could never be attained in the current promotion and retention practices of teachers. Teachers' qualifications, resources, and training inadequacy to name a few are factors identified by them that prevent them from producing favorable outcomes. This implies that teachers, as implementers of curriculum,

should continue on developing themselves professionally to attain the expected benefit of curriculum.

Assessment and evaluation are important tools not just for monitoring students' progress but also for finding the current curriculum's strengths and weaknesses. Gibbs (2014) described spiral curriculum as a profound and powerful idea that has been so embedded in how people think about curriculum and pedagogy that it is unexamined and unrecognized.

Asian Development Bank (2014) indicated that teachers and educational institutions capacity should be supporting complex and parallel tasks such as curriculum revision, teacher upgrade, and infrastructure expansion for these are all critical to the successful implementation of the K to 12 Program. It is the responsibility of educators to engage in innovative, research-based curriculum design and development. Luciano (2014) emphasized that educators have to be reflective and open to reform in exploring the best methods to customize the curriculum aligned with the curriculum paradigm that considers the learner, subject matter, and social forces. Teachers, in particular, should engage in research studies that would assess the present curriculum and catalyze necessary modification in the current education system.

Teachers are called the 'front-liners' in education and by utilizing researches and creating new input instruments, teachers can make valuable contributions to curriculum improvement. As curriculum agents, they should show initiative and act as agents of renewal.

Fullan mentioned that teachers are the ones who apply the alterations and approaches that the curriculum supports (as cited in Ng, 2009). A finding by Kurt and Erdoğan (2015) was that many curriculum assessments had been completed mostly with teachers. Teachers are properly qualified and experienced. They have a deep understanding of all facets of the curriculum and of assessment strategies and processes. Stabback (2016) mentioned that teachers are 'at arm's length' from the curriculum, and can report their assessment findings in a professional, valid, and transparent way.

Moreover, Akpinar, Dönder, and Karahan (2013) showed in their theses related to the effectiveness of curriculum applications that they aimed mostly to determine opinions related to curriculum applicability, in particular, teachers' opinions. Teachers are the link between the curriculum and students, so Kilpatrick (2009) believes that teachers' thoughts, feelings, and application-oriented opinions about the curriculum have great importance. Hence, it may be concluded that checking up on teachers' thoughts about the updated curriculum is essential (Aksan & Baki, 2017).

In the study of Incebacak, Ersoy, and Akaydin (2016), classroom teachers' views on the spiral program in Elementary School Mathematics Curriculum were examined. Results indicated that the spiral approach, which exists in the mathematics curriculum they examined, was constantly structured as information transfer, thus does not give students the opportunity to review. It was determined that it does not let teachers bridge a connection between subjects due to their worries about keeping up with the curriculum and; therefore, they were not able to review the subjects. It was believed that in order to enable students to

obtain permanent information, it would be more beneficial to teach them by establishing connections among teaching methods and reviewing the subjects.

In a similar study by Özüdoğru (2016), the 10th grade mathematics curriculum of General Secondary Education Institutions was evaluated through the perceptions of mathematics teachers, students, and classroom observations. Mixed method design and Malcolm Provus' Discrepancy Evaluation Model were utilized. Data were collected through questionnaire, semi-structured interview schedule, and observation form. The results showed that although the existing program was planned as learner-centered, the implementation process revealed that teachers maintained their traditional roles and teacher-centered methods. There was a discrepancy between the curriculum and implementation process. In order to improve the implementation stage of the curriculum, it was suggested that in-service training programs about different teaching learning and assessment strategies be provided, cooperation between teachers, parents and schools be strengthened; and finally, teachers be provided with necessary teaching materials.

Curriculum assessment could focus on checking the adequacy of curriculum materials. In the study of Smith (2012), participants were asked to examine curriculum materials and assessment tasks from two different science courses at the case study school. These curriculum materials and assessments were scored against a series of instruments adapted from curriculum evaluation models used in previous research. The reviewers scored the material to determine the degree of alignment between the intended outcomes, curriculum materials, and assessment tasks. The data provided an understanding into both the degree of alignment of the curriculum as well as the features of strongly aligned

curriculum materials. The effectiveness of the evaluation model was determined by analysis of the scoring data and semi-structured interviews with the participants. The current investigation established that the case study Middle School science program had some degree of alignment, but there were a number of materials and tasks which were not adequately aligned. The features of the curriculum materials and assessment tasks generally matched those identified in the literature, and provided the basis for potential reform to increase the degree of alignment in intended curriculum and assessment in science courses designed to address scientific literacy. The curriculum analysis can highlight areas of any curriculum which are not aligned and hence focus on curriculum improvement efforts.

Curriculum assessment is a way to check the present status of an education system. Checking on the academic performance of students, discovering how actual classroom situations support the goals of the curriculum, or examining the content and analyzing the adequacy of a group of curriculum materials along with the appropriate pedagogies could be scopes of curriculum assessment. All these, along with others, contribute to identifying the strengths and weaknesses of a curriculum; and, could lead to initiating curriculum reform and education system improvement.

Theoretical Perspectives

Goal of Mathematics Education in the 21st Century

It is a major goal of education to prepare a student for his/her role as a self-reliant lifelong learning citizen. Problem solving and critical thinking are considered as the new basic skills by many (Trilling & Fadel, 2009). Students should be able to reason effectively,

use system thinking, make judgements and decisions and solve problems. In order to develop these skills, it is important to stimulate creative thinking and productivity.

Jayanthi (2014) described mathematics as a universal part of human culture which provides a broad range of skills in problem solving, logical reasoning and flexible thinking. Definitely, mathematics education has to equip students with 21st century skills.

According to New York State United Teachers (2015), critical thinking and problem solving for the 21st century learner means preparing students for a global society that has become defined by high speed communications, multifaceted and fast change, and increasing variety. It also means engaging students to use multiple approaches when solving a problem, to consider differing points of view, and to explore with many modalities. These two skills are what mathematics education in the 21st century envisions their learners to achieve.

Defining Curriculum

There is no single way to define curriculum. The term 'curriculum' is etymologically derived from a Latin word that means 'race course'. The Asia Pacific Economic Cooperation (APEC) Human Resources Development Working Group (n.d.) defines curriculum as a course meant to be connected and integrated that should lead to learning. Although their view of curriculum is quite technical, the ultimate goal a curriculum achieves will be influenced by the context and those involved.

The curriculum is the key statement that an institution makes about itself, about what it can contribute to the intellectual development of learners, and about what it believes to be important in its teaching service to society. Goodson described curriculum "as a multifaceted

concept, constructed, negotiated and renegotiated at a variety of levels and in a variety of arenas" (as cited in Su, 2012). Alexander (2009) stresses that curriculum links the educational aims and content with the teaching pedagogy and assessment in the classroom, and is best seen as 'a series of translations, transpositions, and transformations'.

Curriculum provides the structure for the delivery of quality learning, especially where teachers might be under-qualified and inexperienced, their classrooms under-resourced, and their students lacking the prior frameworks within which to situate their learning (Stabback, 2016).

Similarly, Stabback (2016) states that curriculum is, in the simplest terms, a description of what, why, how and when students should learn. The curriculum itself may be used in many different contexts, by principals in schools, by teachers, by curriculum writers in education systems, and increasingly by politicians. It can mean different things in each of these contexts.

The issues, difficulties, and visions of an educational system are ultimately associated and intertwined with issues, difficulties, and visions of the curriculum. More specifically, the curriculum can be regarded as the source of life of any school which essentially determines its success or failure. Whenever school officials and administrators, and faculty members would like to know where the educational system is heading, they inevitably anchor their decision upon the curriculum.

Curriculum plays a significant role in educational practice. They provide a crucial link between standards and accountability measures. Confrey and Stohl (2004) discussed

that curriculum is shaped by the professionals who teach with them. Typically, it also determines the content of the subjects being taught.

Thus, a significant part of the education system depends on the content of the curriculum and its implementation determines the success and failure of the education system.

K to 12 Mathematics Spiraling Curriculum

The K to 12 Basic Education Program consists of Kindergarten, six years of elementary education, four years of junior high school, and two years of senior high school. The Junior High School and Senior High School are primarily intended to build on the foundation knowledge, skills, and attitudes developed in the elementary level and to discover and enhance the abilities and interests of the students. This is to equip the students with the skills for productive endeavor and prepare them for the tertiary level of education.

According to Southeast Asian Ministers of Education Organization (2012), this program of the department validates the principles of inclusive education, growth and development, teaching and learning, and assessment. More precisely, the K to 12 Program gives much importance on learner-centered pedagogies to teaching and learning processes as the program rests on the theory of constructivism. In addition to this, the Department of Education (2013) emphasized the assessment process which includes the utilization of traditional and authentic assessment tools and techniques for a more valid, reliable, and accurate assessment of learning.

On the other hand, Montebon (2014) stated that a number of issues and problems have faced the educational system since the first year of the program's implementation.

Limited slots for teachers in seminar-workshops and trainings, deficiency of learner's materials, shortages in classrooms and new buildings, unavailability of technology, and the resistance of teachers to change are among these problems. While some of these problems have already been addressed by the education authorities, a number of considerations, like curriculum materials, still have to be looked into and thoroughly examined.

One consideration when it comes to the educational system is the curriculum. As mentioned, a key feature of the K to 12 Basic Education Program is the spiraling design of its curriculum. In a spiral curriculum, students first learn the fundamental concepts. As learning progresses, more and more details are discussed.

The K to 12 Junior High School Mathematics spiraling curriculum contents include Numbers and Number Sense, Measurement, Patterns and Algebra, Geometry, and Statistics and Probability. Mathematics is one subject that encompasses life at any age and in any circumstances. While this subject may be perceived challenging by a significant number of students, nobody can deny its significance in everyday life. Its value goes over and beyond the four walls of the classroom and the school. The Department of Education (2013) affirmed that mathematics as a school subject, therefore, must be learned comprehensively and with much depth.

In Junior High School Mathematics spiraling curriculum, Patterns and Algebra is one of the curriculum contents along with Numbers and Number Sense, Measurement, Geometry, and Statistics and Probability. Algebraic expressions, properties of real numbers as applied in linear equations, and inequalities in one variable are discussed in Grade 7 as introductory topics in Patterns and Algebra. More complicated lessons in Patterns and

Algebra follow in Grade 8 like factors of polynomials, rational algebraic expressions, linear equations and inequalities in two variables, systems of linear equations and inequalities in two variables and linear functions, linear inequalities in two variables, systems of linear inequalities in two variables, and linear functions. In Grade 9, quadratic equations, inequalities and functions, and rational algebraic equations, variation, and radicals are to be discussed. And, finally most difficult lessons, like sequences, polynomials and polynomial equations, and polynomial function appear in Grade 10. This increasing level of difficulty may help students broaden their knowledge and skills as they are exposed to numerous and various activities in class.

Basic principles that are introduced in the earlier grades are rediscovered in succeeding grades in more complex forms. In other words, the scope and sequence of the content are developed in a way that concepts and skills are revisited at each grade level with increasing complexity. As more facts and principles on each topic are encountered, the understanding grows in breadth and depth, generating a metaphorical spiral.

The spiral progression of the K to 12 Basic Education Curriculum is anchored on Jerome Bruner's theory of learning. Clark (2010) wrote that Jerome Bruner was the main proponent of constructivism and was also the proponent of spiral curriculum. Bruner's theory of discovery learning suggests that students learn best by building on their current knowledge. It supports the theory of constructivism which states that a learner constructs his/her own learning when s/he is able to draw ideas from his own experiences and connects them to new ideas that are encountered.

According to Bruner (1960), engaging information in a spiral fashion helps children to organize knowledge into a structure that makes it both increasingly accessible and usable in areas beyond the immediate learning situation. Bruner also believed that, as children grow, curriculum should revisit earlier learned ideas, expanding upon them until a child reaches a more complete understanding of individual ideas and how they relate to one another. Bruner was the one who termed this as the spiral curriculum, wherein ideas are presented in repeated learning opportunities over time, and are organized from the simple to the complex, from the general to the specific, and are examined in relation to one another.

The K to 12 Program is absolutely a fundamental reform to the curriculum, philosophy, and structure of the Philippine educational system (Okabe, 2013). Assessing the program gives reassurance to the stakeholders that the curriculum implementation mirrors the aim of mathematics education in the 21st century.

Nuances of Curriculum Assessment

Insorio (2013) remarked that no curriculum is permanent and that it undergoes continuous revision, reform, and reorganization in response to changes in people and society. It implies that researches and studies have to be conducted in order to determine its effectiveness as well as its strong and weak points.

Andres and Francisco (2008) asserted that there must be an examination of the place of formative process and summative assessment of curriculum programs and of the practical materials for the actual process of installing new curriculum in schools.

Wolf, Hill, and Evers defined curriculum assessment as a process of gathering and analyzing information from multiple sources in order to improve student learning in

sustainable ways (as cited in Rahmawati, 2013). It is an important part of the systems approach to curriculum development.

Curriculum assessment has been the object of interest of some researchers since it provides solutions to problems in the field of education. A curriculum can only be determined to be valid and effective after it has been applied and its outcomes assessed. In some curriculum studies, assessment and evaluation are used interchangeably. According to McNay (2009), the purposes of curriculum assessment, evaluation, and review are to: demonstrate the strengths and evaluate recent changes in a program; identify aspects of the program that should be reconsidered or changed; provide a basis for renewing or reforming components of a program; enhance student learning, engagement, and satisfaction; and, to ensure that professional accreditation standards are met.

However, Stabback (2016) wrote that curriculum assessment is a stage of the curriculum cycle that is frequently overlooked or under-valued. In judging the quality of any curriculum, it is critical that criteria related to the effectiveness of assessment processes, as well as how the information gathered from the assessment is used, are developed. Curriculum implementation is, in sum, not a 'once-off' thing. There has to be a continuous monitoring of curriculum to determine its strong and weak parts and to propose reform for further improvement of the curriculum.

Curriculum Content Analysis

The goal of content analysis is to provide knowledge and understanding of the phenomenon under study. Confrey and Stohl (2004) noted that crucial to any curriculum is its content. It focuses almost solely on examining the content of curriculum materials; this

analysis usually may rely on expert review and judgments about such things as accuracy, depth of coverage, or the logical sequencing of topics. Confrey and Stohl (2004) stated that analyzing the content of a curriculum involves an examination of the adequacy of a set of materials in relation to its treatment of the discipline, learner(s), and the teacher. Learning occurs through an interaction of these three elements. Beyond being examined independently, an analysis must consider how they interact with one another. Confrey and Stohl (2004) identified the three dimensions of content analysis: discipline-oriented; learner-oriented; and, resource-oriented dimensions. Learning occurs through an interaction of these three elements.

Approaches to Curriculum Assessment

Curriculum assessment can be a daunting task considering the wide array of assessment models and approaches that specialists propose.

Fitzpatrick et al. stated that there are five approaches to curriculum assessment: objectives-oriented, management-oriented, consumer-oriented, expertise-oriented, and participant-oriented assessment (as cited in Berk, 2018). The strengths and weaknesses of the different facets of a curriculum can be determined by employing these approaches.

In the 1930s, Ralph W. Tyler introduced the Objectives-Oriented Approach (Stufflebeam & Shinkfield, 2014), which focuses on determining program objectives and the extent to which these objectives have been achieved (Berk, 2018). There are five objectives-oriented assessment models: (1) the Tyler Model, (2) the Metfessel-Michael Model, (3) the Logic Model, (4) the Goal-Free Program Model, and (5) Provus's Discrepancy Model (Fitzpatrick et al., 2004).

In the 1960s, Stufflebeam conceptualized the Management-Oriented Approach based on a systems approach (Zhang et al., 2011), which emphasizes the importance of information in the decision-making process and aims to provide decision-makers with information (Berk, 2018). In this approach, the evaluators and managers work closely together to identify the decisions that must be made and the information needed to make them. The necessary data about the advantages and disadvantages of each decision alternative to allow for fair judgment based on specified criteria are collected. The success of the assessment rests on the quality of the teamwork between assessors and decision makers. There are two management-oriented assessment models: the Context, Input, Process, and Product Model (CIPP Model) and the UCLA Model.

In 1967, Michael Scriven conceptualized the Consumer-Oriented Approach (Stufflebeam & Shinkfield, 2007), which helps decide curriculum or other services' effectiveness by considering views of those who benefit from output and from the product related to the program or of those whom the program affects (Scriven, 1991). This approach is especially and commonly preferred for assessment of educational tools and materials.

The Expertise-Oriented Approach is the oldest known and most widely used approach. Although its origin and the person who contributed most to this approach are not known for certain, its application in education dates to the 1800s, when standardized tests were administered for entrance to higher education (Fitzpartick et al., 2004). In this approach, evaluattors, who are professional content experts, conduct an assessment by using their professional expertise and existing criteria (Berk, 2018). Assessments conducted by accrediting agencies for accreditation of institutions and by juries formed to grant an award

or to confirm competency are typical examples of this approach (Lodico, Spaulding, & Voegtle, 2010; Kuzmina-Merlino & Savina, 2015; Uşun, 2016). It was believed that the use of experts as evaluators of a program will be more objective. The Eisner's Model of Educational Connoiseurship and Criticism is an expertise-oriented assessment model.

The Participant-Oriented Approach stresses participants' importance in the assessment process and emphasizes views of those directly involved in program activities (Hogan, 2007). The participant-oriented assessment approach is based on Robert Stake's studies, which valued information obtained firsthand during assessment (Stufflebeam & Coryn, 2014; Fitzpatrick et al., 2004). In this approach, evaluators are involved in a continuous, strong interaction with the application environment of the evaluand, and they directly observe and record behaviors subjected to assessment. When necessary, evaluators can provide participants training in issues related to evaluation. In this approach to program evaluation, an evaluation coordinator, often from outside the program or organization, works in partnership with program "stakeholders" in all phases of the evaluation process (Berk, 2012). Program stakeholders are those individuals who have a stake in how the assessment comes out. They are persons who will later make decisions and use the information generated by the assessment. Exactly who the program stakeholders are will vary from one situation, or assessment, to another. In each instance, assessment planners will have to decide who the appropriate stakeholders are and to what extent some or all of them should be involved. Involving a larger rather than smaller number of people is not necessarily better. Also, it is important to remember that not all stakeholders will be interested or able to participate in

this time-consuming exercise. Responsive Model, Utilization-Focused Evaluation (UFE), and Empowerment Model are participant-oriented assessment models:

Robert Stake (1975) made a major contribution to curriculum evaluation in his development of the responsive model. The responsive model is primarily based on the assumption that the concerns of the stakeholders—those for whom the evaluation I done—should be paramount in determining the evaluation issues. To highlight evaluation, the responsive evaluation approach is suggested for issues that are vital for a specific program. It is an approach that trades off some measurement precision in order to increase the usefulness of the findings to persons in and around the program. An educational evaluation is a responsive evaluation if it positions more directly to program activities than to program intents; responds to audience requirements for information; and if the different value perspectives present are referred to in reporting the success and failure of the program.

David Fetterman (2001) defined empowerment evaluation as "the use of evaluation concepts, techniques, and findings to foster improvement and self-determination" (p. 3). Although this definition of empowerment evaluation has remained consistent since the origin of this approach, the definition, theory, methods, and values have continued to evolve and become more refined over time. (p. 140). It is an evaluation approach that aims to increase the probability of achieving program success by (1) providing program stakeholders with tools for assessing the planning, implementation, and self-evaluation of their program, and (2) mainstreaming evaluation as part of the planning and management of the program/organization (Wandersman et. al., 2005, p. 28).

Michael Patton (2008) stated that utilization-focused evaluation begins with the premise that evaluations should be judged by their utility and actual use; therefore, evaluators should facilitate the evaluation process and design any evaluation with careful consideration of how everything that is done, from beginning to end, will affect use.

To summarize, the participant-oriented assessment approach is based on the assumption that the stakeholders' involvement will help ensure that the assessment addresses the appropriate issues of a program. Stakeholder involvement also leads to greater use of evaluation results by program decision-makers and implementers (Aubel, 1999). The present study used the participant-oriented assessment models because not only do they include teachers as stakeholders of education, but also the idea that data obtained from those involved in or affected by the curriculum will be more functional in this research. In this study, the participant-oriented assessment approach constitutes a learning experience for the mathematics teachers who are involved and it reinforces their skills in curriculum assessment by analyzing the content of curriculum materials.

Conceptual Framework

According to The Praxis Study Companion (2014), curriculum pertains to topics, materials, and resources of each content area and the implication for using them: components of curriculum and how they are organized; integration of concepts within each content area and across content areas and the pedagogical implications of that integration; and types of curriculum materials, media, and resources. Curriculum is certainly a dynamic process and assessment of its content is a must to conduct.

The Department of Education (DepEd) developed both the Junior High School Mathematics curriculum and the materials needed to implement it (e.g., curriculum guides, teaching guides, and learner's materials) through the help of experts in various fields of mathematics education. These materials are distributed to all public schools in the Philippines and are used as the primary reference in delivering the curriculum to students.

The content and performance standards in the K to 12 Basic Education Curriculum for Junior High School Mathematics (i.e., Grade 7, Grade 8, Grade 9, and Grade 10) as specified on the learning competencies are aligned with the learning objectives stated on the curriculum materials. The curriculum is carefully embodied in the curriculum materials. The Department of Education – Bureau of Learning Resource, the one in-charge of curriculum materials development, ensured that the learner's materials are well-aligned with the present curriculum. And, if in case, there are misalignments, the bureau has been collecting the needed information and feedback since the curriculum's first year of implementation to do the necessary reforms.

These materials affect content of each lesson, depth and duration of instruction for particular topics, and topic organization. So, while curriculum materials may be thought of as just "resources," the fact is that they greatly influence classroom instruction. These affirm that curriculum materials can be used to assess the present curriculum as it explicitly reflects the content standards, performance standards, and learning competencies stated in the K to 12 Basic Education Curriculum for Junior High School Mathematics.

Figure 1 shows the conceptual framework of this assessment study.

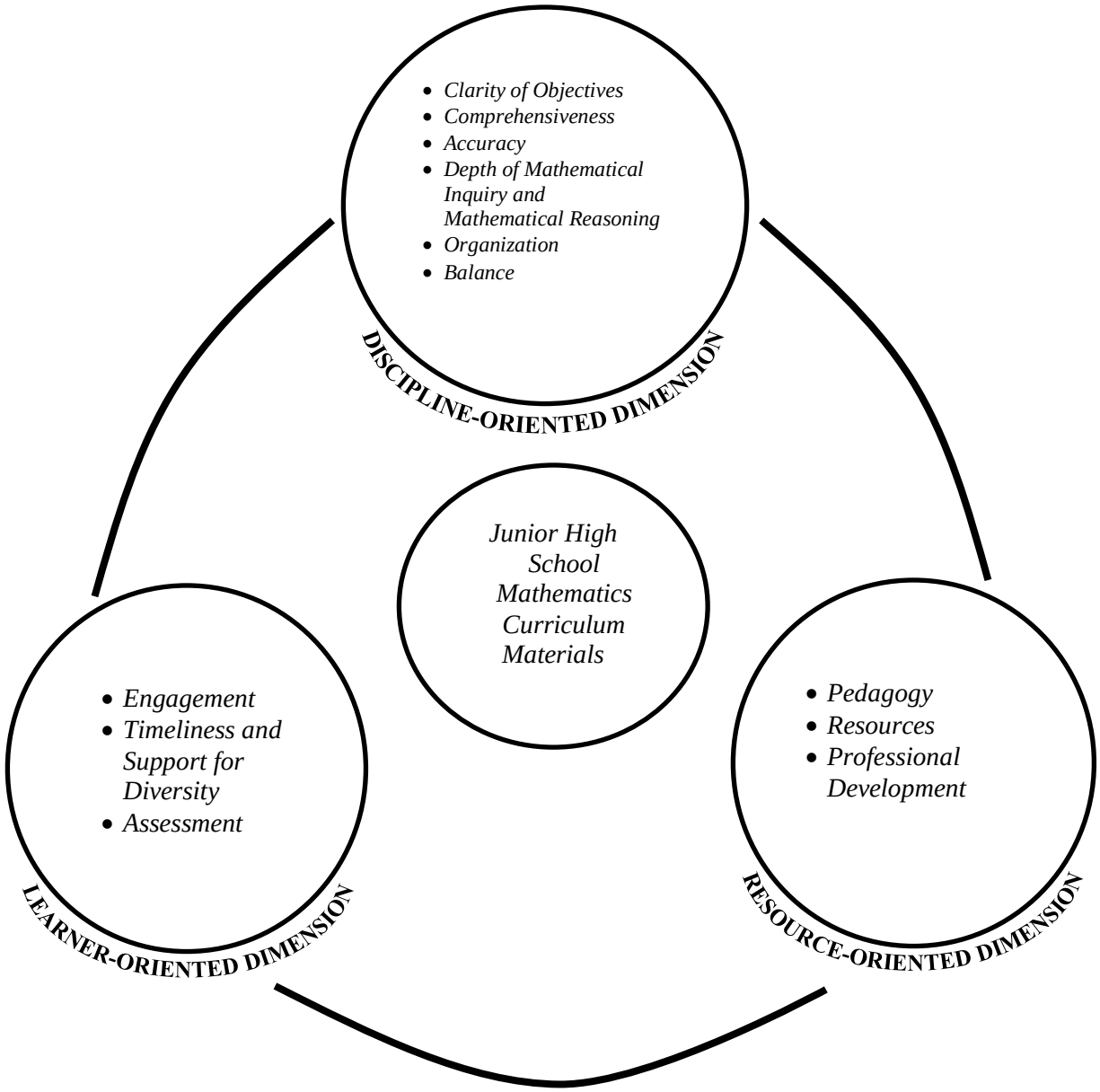


Figure 1. Conceptual Framework of the Study.

In the figure, the K to 12 Junior High School Mathematics curriculum materials is at the middle of the conceptual framework because it is the central construct of this assessment

study. The curriculum material was assessed through content analysis. Content analysis of curriculum involves an examination of the adequacy of a set of materials in relation to its treatment of the discipline, learner(s), and the teacher as mentioned by Confrey and Stohl (2004). They further specify the characteristics of a quality content analysis of mathematics curriculum materials.

The discipline-oriented dimension (Dimension One) examines the *clarity of objectives*, checks on *comprehensiveness*, determines the *accuracy*, measures *depth of mathematical inquiry and mathematical reasoning*, examines the *organization*, and evaluates the *balance* of curricular choices within the curriculum materials.

Clarity of objectives refers to the identification of major conceptual ideas in each lesson that a reviewer can search for missing or superfluous content (Confrey & Stohl, 2004). The Department of Education, Prince Edward Island (2008) indicated that instructional goals and learner objectives need to be clearly stated, that is, objectives of a curriculum have to be explicitly stated, free of jargon, and unambiguous.

Comprehensiveness refers to the introduction of standard algorithms, giving precise definitions, and developing skills through repetitive practice (Confrey & Stohl, 2004). According to the Department of Education, Prince Edward Island (2008), concepts have to be clearly developed. Definitions, explanations, illustrations, and examples should be available where necessary.

Accuracy refers to being free from errors (Confrey & Stohl, 2004). According to Peer Review Special Interest Group (2004), the content of a high quality learning materials has to be valid and reliable. It should be consistently accurate and up-to-date. Moreover, content

should not have outdated information, factual errors, improper use of statistics, inaccurate graphs or displays, invalid or oversimplified models, examples, or simulations, and errors in spelling or grammar (Department of Education, Prince Edward Island, 2008).

Mathematical inquiry refers to the elements of intuition necessary to create insight into the genesis and evolution of mathematical ideas, to make conjectures, to identify and develop mathematical patterns, and to conduct and study simulations while mathematical reasoning refers to the formalization, definition, and proof, often based on deductive reasoning, formal use of induction, and other methods of establishing the correctness, rigor, and precise meanings of ideas and patterns found through mathematical inquiry (Confrey & Stohl, 2004). Stabback (2016) stated that curriculum should promote higher-order thinking and stimulate students' imagination, curiosity, and critical thinking skills. Furthermore, students need to analyze how all of the different parts of a problem interact as a whole by analyzing and evaluating evidence, arguments, claims, beliefs and alternative views. They need to interpret information, make solid connections between different types of information and draw a conclusion out of the information. The ability to understand academic content deeply is also supported by this skill (Soland et al., 2013).

Organization refers to the logical progression of concept development which determines the sequence of lesson activities (Confrey & Stohl, 2004). Stabback (2016) noted that the content of a curriculum has to be well-organized and structured into a number of different but interrelated lessons. The Department of Education, Prince Edward Island (2008) also stated that curriculum materials have to be well-organized and structured, that

is, the order in which the information is presented in the materials need to be logical and suited to the subject and objectives.

Balance refers to the relative emphasis among choices of approaches used to attain comprehensiveness, accuracy, depth of mathematical inquiry and reasoning, and organization (Confrey & Stohl, 2004). Stabback (2016) stated that a good quality curriculum needs to be balanced in terms of the elements of the curriculum content such as content – knowledge, skills, and values in developing the desired level of competency.

In summary, the first dimension of content analysis is derived fairly directly from one's knowledge of and perspective on the discipline of mathematics. There is indeed no single view of coherence of mathematics.

The learner-oriented dimension (Dimension Two) examines the *engagement* of students, discusses the *timeliness and support for diversity* of the curriculum materials in relation to the particular grade level(s) for which the materials are designated, and discusses *assessment* of what is learned.

Student engagement refers to capturing a variety of aspects of attention to students' participation in the learning process that may vary because of considerations of prior knowledge, interests, curiosity, compelling misconceptions, alternative perspectives, or motivation (Confrey & Stohl, 2004). Delaware Department of Education and Office of Early Learning (2013) stated that activities that are connected with children's experiences are more meaningful and often provide more successful ways for them to learn. Moreover, the Delaware Department of Education and Office of Early Learning (2013) stated that a curriculum material that supports the integration of personal, familiar, and cultural contexts

of society is meaningful for many students; and that learning becomes more meaningful and successful when activities are connected with students' experiences.

Timeliness and support for diversity refers to meeting the needs of all students, in terms of the level of preparation, diverse perspectives, the cultural resources and background of students, and the timeliness of the pace of instruction (Confrey and Stohl, 2004). UNESCO (2014) stated that curriculum materials should allow for differentiation of content and presentation formats in order to cater the needs and abilities, diverse learning styles, languages, cultural backgrounds, and interests of the students.

Assessment refers to how one determines what students know (Confrey and Stohl, 2004). Stabback (2016) wrote in his journal that a good quality curriculum needs to be supported by appropriate methods and strategies for assessing student achievement as defined by the curriculum. Moreover, it was stated by the Department of Education, Prince Edward Island (2008) that curriculum materials should contain adequate/appropriate assessment/evaluation tools.

In summary, the very different perspectives of the learner and his/her needs are vital in the assessment of curriculum materials. These curriculum materials need to be assessed in the perspectives of those who use them.

The resource-oriented dimension (Dimension Three) discusses teacher *pedagogy*, *resources*, and *professional development* needed to present the curriculum materials.

Pedagogy refers to the abilities and needs of teachers (Confrey & Stohl, 2004). Whelan (2009) noted that educational systems have to ensure that curriculum accommodates the different needs of the learners. However, none is nearly as important as the quality of

teaching. This leads to saying that teachers should have appropriate pedagogies when delivering the content of curriculum. Moreover, the Department of Education, Prince Edward Island (2008) which stated that curriculum materials should be suitable for a wide range of teaching styles.

Resources refer to the materials needed to present the curriculum materials (Confrey & Stohl, 2004). According to RA 10533: Enhanced Basic Education Act of 2013, "The curriculum shall be flexible enough to enable and allow schools to localize, indigenize, and enhance (the curriculum) based on their respective educational and social contexts." The Department of Education, Prince Edward Island (2008) also stated that appropriate support materials have to be provided and assess whether support materials contribute to the achievement of the curriculum objectives.

Professional development refers to the introduction of new approaches and new technologies that are required for successful implementation of the curriculum (Confrey & Stohl, 2004). UNESCO (2014) considered training of teachers on the role of the curriculum materials in the teaching-learning process as an important tool in effectively using the materials. OECD (2009) stated that effective professional development is continuous, includes training, practice and feedback, and provides adequate time and follow-up support. Successful training programs involve teachers in learning activities that are similar to ones they will use with their students, and encourage the development of teachers' learning communities.

In summary, a successful curriculum is impossible if it does not pay attention to the

abilities and needs of teachers. The curriculum may be seen as a vehicle to strengthen teachers' content knowledge and design materials with this purpose in mind. Appropriate presentation of the curriculum materials in the classroom is an important consideration.

These dimensions can be seen differently depending on assessors' perspectives of the discipline, the student, and the resources and capacity in schools. However, as cited by Confrey and Stohl (2004), these three dimensions of content analysis are interrelated with each other as indicated by the curved lines on the conceptual paradigm. Elements of these dimensions overlap and interact with each other, and no dimension should be assumed as logically or hierarchically prior to the others. A content analysis neglecting any dimension would be considered incomplete.

This study is anchored to participant-oriented assessment approach. In this approach to assessment, stakeholders are actively involved in the process of assessment. The role of the stakeholders is: to share their experiences working with the program; to participate in collecting additional information about program implementation; to work with the evaluation team to analyze both the data collected and the experiences described; and, to formulate conclusions about the program strategy and outcomes (Aubel, 1999). For the purpose of this study, it increases mathematics teachers' understanding of the strengths and weaknesses of the Junior High School Mathematics curriculum materials.

Participant-oriented approach to assessment ensures that the assessment focuses on locally relevant questions that meet the needs of the curriculum. This approach allows mathematics teachers to determine the most important evaluation questions that will affect and improve the curriculum materials (Patton, 2018). Moreover, this approach is reflective

and action-oriented. It provides the mathematics teachers, with the opportunity to reflect on the curriculum materials and generate knowledge that result in being able to apply the lessons learned. In other words, it provides opportunities for teachers to take corrective action and initiate curriculum improvements (Stake, 1975). Finally, it empowers the mathematics teachers, as stakeholders of education, because teachers control and own the process of making assessment decisions and implementing them (Fetterman & Wandersman, 2007).

Statement of Purpose

The main purpose of the study was to describe the Junior High School Mathematics Curriculum materials in terms of the three dimensions – discipline-oriented, learner-oriented, and resource-oriented, as assessed by mathematics teachers.

More specifically, it aimed to:

1. Describe the discipline-oriented dimension of the Mathematics Curriculum Materials in terms of:
    i. clarity of objectives;
    ii. comprehensiveness;
    iii. accuracy;
    iv. depth of mathematical inquiry and mathematical reasoning;
    v. organization; and
    vi. balance.
2. Describe the learner-oriented dimension of the Mathematics Curriculum Materials in terms of:

i. engagement;
ii. timeliness and support for diversity; and
iii. assessment.

3. Describe the resource-oriented dimension of the Mathematics Curriculum Materials in terms of:

i. pedagogy;
ii. resources; and
iii. professional development.

4. Determine the strengths and weaknesses of the Junior High School mathematics curriculum materials in terms of the discipline-oriented, learner-oriented, and resource-oriented dimensions, as assessed by mathematics teachers.
5. Provide inputs to improve the Junior High School Mathematics Curriculum materials.

Definition of Terms

Defining the following key terms in the study is paramount to facilitating understanding of their use in this research endeavor.

Curriculum Materials. According to The Glossary of Education Reform (2015), curriculum materials refer to the lessons and academic content taught in a school or in a specific course or program. In this study, curriculum materials refer to the Junior High School Mathematics learner's materials (LM) developed and distributed by the Department of Education (DepEd).

Curriculum Assessment. Wolf, Peter, and Evers (2006) define curriculum assessment as a process of gathering and analyzing information from multiple sources in

order to improve the present curriculum and student learning in sustainable ways. In this study, curriculum assessment refers to the assessment of Junior High School Mathematics curriculum materials in terms of the discipline-oriented, learner-oriented, and resource-oriented dimensions, as assessed by mathematics teachers.

Discipline-Oriented Dimension. Confrey and Stohl (2004) refer to discipline-oriented dimension as the first dimension in the content analysis of mathematics curriculum materials which examines the clarity of objectives, comprehensiveness, accuracy, depth of mathematical inquiry and mathematical reasoning, organization, and balance. In this study, disciplinary dimension refers to the descriptions of mathematics teachers on the learner's material in terms of clarity of objectives, comprehensiveness, accuracy, depth of mathematical inquiry and mathematical reasoning, organization, and balance. This was measured using the instrument on the Assessment of Junior High School Mathematics Curriculum Materials (Dimension 1) developed by the researcher and described analytically.

Learner-Oriented Dimension. Confrey and Stohl (2004) refer to learner-oriented dimension as the second dimension in the content analysis of mathematics curriculum materials which examines student engagement, timeliness and support for diversity, and assessment. In this study, learner-oriented dimension refers to the descriptions of mathematics teachers on the learner's material in terms of student engagement, timeliness and support for diversity,

and assessment. This was measured using the instrument on the Assessment of Junior High School Mathematics Curriculum Materials (Dimension 2) developed by the researcher and described analytically.

Resource-oriented Dimension. Confrey and Stohl (2004) refer to resource-oriented dimension as the third dimension in the content analysis of mathematics curriculum materials which examines the pedagogy, resources, and professional development needed to present the curriculum materials with competence. In this study, resource-oriented dimension refers to the descriptions of the mathematics teachers on the abilities and needs of teachers in terms of pedagogy, resources, and professional development that are needed to deliver the content of learner's materials. This was measured using the instrument on the Assessment of Junior High School Mathematics Curriculum Materials (Dimension 3) developed by the researcher and described analytically.

Stakeholder. According to the Glossary of Education Reform (2014), the term stakeholder typically refers to anyone who is invested in the welfare and success of a school and its students, including administrators, teachers, staff members, students, parents, families, community members, and elected officials such as school board members, city councilors, and state representatives. In this study, stakeholder refers to a Junior High School Mathematics teacher.

Chapter 2

METHODS

This chapter discusses the research design, sampling and participants, instruments and method of validation, data gathering procedure, data analysis, and ethical considerations in the study.

Research Design

This research endeavor was an assessment study which employed survey-descriptive method of research. Loeb et. al. (2017) stated that quantitative descriptive analysis characterizes the world or a phenomenon by identifying patterns in data to answer questions about who, the "gold standard" for what, where, when, and to what extent. Moreover, Johnson and Christensen (2014) wrote in their book that the main purpose of descriptive research is to provide an accurate description or picture of the status or characteristics of a situation or phenomenon. The focus is not on searching out cause-and-effect relationships but rather on describing the variables that exist in a given situation and, sometimes, on describing the relationships that exist among those variables. This study attempted to provide an accurate description or picture of the Junior High School Mathematics curriculum materials through the use of frequencies, weighted means, and percentages. It aimed to describe the present status of the Junior High School Mathematics curriculum; consequently, it can provide inputs for the improvement of the curriculum materials.

Often the best approach prior to writing descriptive research, is conducting a survey investigation. Survey research is defined as "the collection of information from a sample of

individuals through their responses to questions" (Check & Schutt, 2012, p. 160). This type of research allows for a variety of methods to recruit participants, collect data, and utilize various methods of instrumentation. This legitimate approach to research was useful such that the researcher clearly benefited in describing and exploring variables and constructs of interest of this study.

This study sought to determine the present status of the K to 12 Program by conducting an analysis of the Junior High School Mathematics curriculum materials through an assessment of mathematics teachers. A series of statements was posed to the respondents; their responses were summarized in a table, and the mean per criterion was calculated.

This study employed the participant-oriented approach to curriculum assessment. It is an approach in which teachers, as internal stakeholders in education, actively engage in the assessment. Fundamentally, it seeks to honor the perspectives, voices, preferences, and decisions of the least powerful and most affected stakeholders and program beneficiaries. Teachers, as stakeholders, could be the best possible source of information in the assessment of curriculum materials as they use them as primary reference for teaching.

Sampling and Participants

Teachers are considered vital in the improvement of a curriculum program. Insorio (2013) emphasized that teachers represent the most accurate views regarding the program because they are directly involved in the program as implementers. Hence, the views of teachers were considered in the present study.

There was a total of 115 mathematics teachers in the District I of Valenzuela City who have at least three years of experience in teaching the K to 12 Junior High School

Mathematics Curriculum. Using the Slovin's Formula $n = \frac{N}{1+Ne^2}$, with 0.05 level of significance, the number of teacher participants was computed as follows:

$$\text{number of sample} = \frac{115}{1+115(0.05)^2}$$

$$= 89.32 \sim 90$$

Table 1 shows the number of mathematics teachers who participated in this study.

Table 1

Number of Teacher Respondents per Grade Level by School

	Number of Mathematics Teachers per Grade Level by School				Total
	Grade 7	Grade 8	Grade 9	Grade 10	
School 1	1	1	2	1	5
School 2	2	3	2	2	9
School 3	1	1	1	1	4
School 4	2	1	1	1	5
School 5	3	3	3	2	11
School 6	3	3	2	2	10
School 7	2	1	0	0	3
School 8	4	3	3	3	13
School 9	4	4	3	3	10
School 10	2	0	1	2	5
School 11	1	1	1	1	4
School 12	2	2	2	1	7
Total	**27**	**23**	**21**	**19**	**90**

As shown in the table, there were 27 Grade 7 mathematics teachers, 23 Grade 8 mathematics teachers, 21 Grade 9 mathematics teachers, and 19 Grade 10 mathematics teachers – a total of 90 respondents in all, who assessed the content of Junior High School Mathematics Curriculum.

Table 2 shows the distribution of teachers across the four grade levels in Junior High School.

Table 2

Distribution of Teachers across Grade Levels According to Position

	Grade 7	Grade 8	Grade 9	Grade 10	Total
Master Teachers	4	3	3	3	13
Teachers	23	20	18	16	77
	27	**23**	**21**	**19**	**90**

Note. Master Teachers are either Master Teacher I or Master Teacher II while Teachers are either Teacher I, Teacher II, or Teacher III.

The participant-oriented assessment model, to which this study is anchored on, is based explicitly on the assumption that the concerns of the stakeholders—those for whom the assessment is done—should be paramount in determining the assessment issues. Teachers are stakeholders of education along with students, parents, and barangay council. Based on previously discussed researches, considering teachers' opinions on the curriculum's strengths and weaknesses would guarantee a more valid and reliable gathered information. In this study, Master Teacher I, Master Teacher II, Teacher I, Teacher II, and Teacher III were the participants (stakeholders) of the study to produce more valid and reliable results.

Instruments

The instruments of the study were the questionnaire entitled "Assessment of Junior High School Mathematics Curriculum Materials" and the semi-structured interview guide. These were used to determine the strengths and weaknesses of the Junior High School curriculum materials based on the assessment of mathematics teachers.

Related literature and studies were reviewed and examined beforehand to prepare the contents of the questionnaire. Furthermore, focus group discussions were conducted to obtain relevant information about the views of teachers on the strengths and weaknesses of the mathematics curriculum materials. The responses in the focus group discussions served as basis for determining specific descriptions of each category under the three dimensions of content analysis and were specifically included in the questionnaire. The questionnaire was categorized into three main dimensions: discipline-oriented, learner-oriented, and resource-oriented dimensions. This questionnaire was quantitative in nature since it is structured. However, it may be noted that open-ended questions were included to provide support on the teachers' responses and triangulate data results.

Table 3 shows the item distribution in the questionnaire by criterion. As shown in the table, there were 6 criteria with 24 questions on discipline-oriented dimension; 3 criteria with 13 questions on learner-oriented dimension; and another 3 criteria with 13 questions on research-oriented dimension.

Prior to administration, the questionnaire was submitted to a group of five experts in the field of 'Mathematics Education' for an assessment of its content validity. It was ensured

Table 3

Distribution of Items in the Questionnaire by Criterion

Dimensions of Content Analysis	Number of Items
I. Discipline-Oriented Dimension	
1. Clarity	4
2. Comprehensiveness	5
3. Accuracy	4
4. Depth of Mathematical Inquiry and Mathematical Reasoning	4
5. Organization	4
6. Balance	3
II. Learner-Oriented Dimension	
1. Engagement	4
2. Timeliness and Support for Diversity	4
3. Assessment	5
III. Resource-Oriented Dimension	
1. Pedagogy	5
2. Resources	4
3. Professional Development	4
TOTAL	**50**

that these experts are knowledgeable of the K to 12 Junior High School Mathematics curriculum and the purpose of curriculum assessment. They were asked to review and judge the items in the questionnaire so as to determine if they adequately sampled the domain of interest, and to check how closely the categories corresponded to the objectives and explanations for the content of the curriculum materials. This helped the researcher develop

a valid and reliable research instrument. The research instrument was validated by the mathematics experts using the criteria proposed by Scriven (1972).

Table 4 shows the scale used by the experts to validate the instrument.

Table 4

Likert Scale for Instrument Validation

Scale	Description
5	Strongly Agree
4	Agree
3	Slightly Agree
2	Disagree
1	Strongly Disagree

The mean score for each category was calculated and interpreted by the researcher. If the computed mean score in a category ranged from 3.00 – 5.00, then the instrument's content was considered valid in terms of the category. On the other hand, if the computed mean score in a category ranged only from 1.00 – 2.99, then the instrument had to be revised or improved in terms of the category. Furthermore, the mean of the mean scores of the categories under each criterion was calculated. If the calculated mean under a criterion was greater than or equal to 3, then the criterion was considered valid. On the other hand, if the calculated mean under a criterion was less than 3, then the criterion had to be improved.

All five experts validated the instrument and gave feedbacks for the improvement of the instrument. However, only four experts were able to rate the instrument in terms of the given criteria in the validation matrix. The instrument gained an overall score of 3.65 which

indicated that the instrument is suitable for the purpose of the study. Necessary revisions per item were made to improve the instrument.

The semi-structured guide, on the other hand, was constructed through literature review, focus group discussions among colleagues, and inputs from the adviser of the researcher. Please refer to Appendix K to see the interview guide. It may be noted that the researcher asked questions to the respondents not on the interview guide to probe responses of the teachers.

Data Gathering Procedure

Data must be gathered and recorded in a form suitable for the intended analysis. The gathering of data requires time and substantial effort for acquiring skills and making the necessary arrangements to ensure adequate quality (Pandey and Pandey, 2015).

This study started progressing by gaining ethics approval from the Philippine Normal University (PNU) Research Ethics Committee. Then, permission for the conduct of the study was sought from the Division of City Schools - Valenzuela.

Information letters and informed consent forms were provided to the participants to ensure that teachers completely understood the nature of the research endeavor and participate voluntarily in it. The researcher asked the participants to keep the information letters with them for future referencing.

The instruments in this study, in the form of questionnaire and semi-structured interview guide, were all free from biases (e.g. gender, class, ethnic, cultural). This study used instruments designed by the researcher using both close-ended and open-ended questions. Then the instruments were validated by the experts and necessary revisions were

made by the researcher, after which the questionnaires were administered to the participants of the study. The questionnaires were given to the mathematics teachers by school. They were given a week to accomplish the questionnaire to ensure thorough analysis and breadth in their responses.

The researcher collected the data himself and a semi-structured interview followed on the next days on ten (10) randomly selected participants. This was done to ensure truthfulness and completeness and to gain more substantial information from the responses in the questionnaires. During the semi-structured interview, a set of predetermined questions was used and the respondents answered in their own words. A topic guide was used and served as a checklist to ensure that all respondents provide information on the same topics. The researcher probed areas based on the respondent's answers and asked supplementary questions for clarification. The responses from the questionnaires and recorded audios from the semi-structured interviews were kept with much care and confidentiality.

Data Analysis

Data analysis is the process of systematically arranging and analyzing all data collected for the study. It involves interpreting and making sense of the accumulated data in order to increase the understanding of them and to enable the researcher to present what was discovered. Peersman (2014) mentioned that analyzing data in order to summarize them and look for patterns is an important part of every assessment.

The researcher studied and analyzed all of the data and made sense of it. The quantitative data were tabulated and analyzed in order to produce a relatively valid conclusion about the constructs of the study under investigation. The responses to open-

ended questions and semi-structured interview were organized into categories or themes and were used to support the responses on the questionnaire.

To analyze the responses obtained from the questionnaire, the quantitative data were converted into frequencies and percentages. Moreover, weighted means were computed which helped the researcher reach conclusions about the discipline-oriented, learner-oriented, and resource-oriented dimensions of the Junior High School Mathematics curriculum materials. Thematic categories for commonalities were utilized to analyze the responses on the semi-structured interview.

To accomplish research purpose 1 through 3, mathematics teachers' assessment of the discipline-oriented, learner-oriented, and resource-oriented dimensions, respectively, of the Junior High School Mathematics curriculum materials were converted into frequencies and percentages. Weighted means in all criteria and descriptions were computed. The weighted mean per description and the overall weighted mean per criterion were interpreted using Table 5.

Table 5 shows weighted mean ranges and the corresponding verbal interpretation.

Table 5

Weighted Mean Range and Verbal Interpretation

Weighted Mean Range	Verbal Interpretation
3.25 – 4.00	Strongly Agree
2.50 – 3. 24	Agree
1.75 – 2.49	Disagree
1.00 – 1.74	Strongly Disagree

Furthermore, responses on the open-ended questions were studied and used to triangulate data for more valid results.

To accomplish research purpose 4, mathematics teachers' assessment of the discipline-oriented, learner-oriented, and resource-oriented dimensions, respectively, of the Junior High School Mathematics curriculum materials were carefully examined and analyzed. Commonalities among the responses from the semi-structured interviews were determined and studied to identify the strengths and weaknesses of the curriculum materials as assessed by mathematics teachers.

Finally, to accomplish research purpose 5, results of the study were analyzed to provide inputs for the improvement of the Junior High School Mathematics curriculum materials.

Ethical Considerations

Dooly, Moore, and Vallejo (2017) itemized in their book that before embarking on any research project, the researcher should carefully consider whether the study can cause potential harm to anyone involved. This relates to moral standards that the researcher should consider in all research methods in all stages of the research design.

The researcher first sought approval from the Research Ethics Committee of the Philippine Normal University - Manila. Then, permission of conduct of the study was secured from the Division of City Schools – Valenzuela.

The researcher followed three principles, namely beneficence, respect for human dignity, and justice.

Principle of Beneficence

Freedom from harm. According to Australian Council for International Development (2017), beneficence is action that is done for the benefit of others. This principle indicates that the expected benefit to participants or the wider community justifies any risks of harm or discomfort to participants. To achieve this principle, no physical harm resulted from completing the questionnaires or conducting interviews. The researcher was sensitive to the participants' emotions when probing questions that could psychologically harm the participants. The researcher asked the participants that if they feel that some parts of the focus group discussion were too much for them, they were free to withdraw from the study or choose not to answer the questions.

Principle of Human Dignity

Right to self-determination. Participants were approached and the purpose of the study was thoroughly explained. No remuneration was offered. Incentives or compensation, financial incentives, or re-imbursement of study-related expenses for the participants were not relevant in this research endeavor. Also, they were informed of the opportunity to withdraw at any stage of the research. Individuals who refused to participate were not coerced.

Right to full disclosure. The researcher shared the purpose of study with the participants. Informed consent form was given to each participant a day before administering the questionnaire. Likewise, results of the study were shared to the participants. This was done through school-to-school visitation of the researcher and providing the teacher-participants with the furnished copy of the results of the study.

Principle of Justice

The principle of justice means treating people equally and fairly and ensuring that they are accorded their full rights (Glasgow Caledonian University, 2015).

Right to fair treatment. Participants who refused to take part or those who withdrew were given non-prejudicial treatment. The participants had access to the researcher at any point in the study to clarify information. Sensitivity to and respect for the participants' beliefs, habits, lifestyles, culture, and emotions was also practiced.

Right to privacy. There was no intrusion of privacy with regard to information provided. Anonymity was therefore upheld in protection of the participants so that even the researcher could not link the subject with the information provided (Glasgow Caledonian University, 2015). This was achieved by voice-recording the interview conducted. Furthermore, the responses of the participants in the questionnaire were treated with utmost confidentiality.

Chapter 3

RESULTS AND DISCUSSION

Purpose 1: **Describe the discipline-oriented dimension of the Mathematics curriculum materials in terms of:**

i. clarity of objectives;

ii. comprehensiveness;

iii. accuracy;

iv. depth of mathematical inquiry and mathematical reasoning;

v. organization; and

vi. balance.

Discipline-Oriented Dimension of the Mathematics Curriculum Materials

Table 6 shows a summary of the discipline-oriented dimension in terms of clarity of objectives of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 6 indicates that teachers strongly agreed that the purpose of the lesson is clearly established and the learning competencies are clearly stated on the learner's materials. Furthermore, they agreed that the pre-requisites and the time allotment for each lesson are stated. Overall, the table shows a weighted mean of 3.17 which means that mathematics teachers agreed that the objectives of the content of the curriculum materials are clear.

Table 6

Discipline-Oriented Dimension on Clarity of Objectives

The objectives of the content of the curriculum materials are clear such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
The purpose of the lesson is clearly established.	3	2	54	31	3.26	Strongly Agree
The learning competencies are clearly stated.	4	2	47	37	3.30	Strongly Agree
The pre-requisites of the lesson are stated.	1	13	51	25	3.11	Agree
The time allotment is stated.	4	16	45	25	3.01	Agree
TOTAL	**12**	**33**	**197**	**118**	**3.17**	**Agree**
PERCENTAGE	**3.3%**	**9.2%**	**54.7%**	**32.8%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

These results are supported by some answers to the open-ended question:

> *"The objectives of the contents of the curriculum materials are clearly stated that students themselves can clearly grasp them on the beginning of each topic."* – Teacher 2

> *"The objectives of the contents of the curriculum materials are well-organized and specific."* – Teacher 76

It may be emphasized that each of the 90 teachers had 4 responses on the descriptions in this criterion; thereby, generating a total of 360 responses. Of the total number of responses, 9.2% and 3.3% indicated disagreement and strong disagreement, respectively, on the clarity of objectives of the content of curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"The objectives are appropriate and attainable but might be difficult for some students since the chapters cover topics from different branches of Mathematics."* – Teacher 13

> *"The objectives of the contents of the curriculum might not be attainable due to time constraint."* – Teacher 80

A teacher suggested the following:

"The objectives should also state the minimum requirements of the subject."
– Teacher 79

The responses to the open-ended question showed that the objectives of the curriculum materials are clearly stated. Likewise, the purpose of the lessons is clearly established. It supported the Department of Education, Prince Edward Island (2008) which stated that instructional goals and learner objectives need to be clearly stated, that is, objectives of a curriculum have to be explicitly stated, free of jargon, and unambiguous. This implies that the objectives of the curriculum materials should be clearly stated as they are significant in conveying the content of the curriculum. However, some teachers mentioned that some objectives may not be attainable due to time constraint and wide coverage of topics as dictated by the spiraling curriculum.

Table 7 shows a summary of the discipline-oriented dimension in terms of comprehensiveness of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 7 indicates that teachers agreed that the content of the curriculum materials introduces standard procedures, gives practice for developing skills, and covers all the skills that students should master in a lesson. Moreover, it relates to other topics across grade levels as the curriculum design is spiral. In this criterion, teachers least agreed that the content of the curriculum materials discusses word problems completely and with breadth. Overall, the table shows a weighted mean of 2.98 which means that mathematics teachers agreed that the content of the curriculum materials is comprehensive.

Table 7

Discipline-Oriented Dimension on Comprehensiveness

The content of the curriculum materials is comprehensive such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It introduces standard procedures.	2	4	60	24	3.18	Agree
It gives practice for developing skills.	3	3	56	28	3.21	Agree
It covers all the skills that students should master in a lesson.	1	24	55	10	2.82	Agree
It discusses word problems completely and with breadth.	2	24	57	7	2.77	Agree
It relates to other topics across grade levels.	2	21	51	16	2.90	Agree
TOTAL	**10**	**76**	**279**	**85**	**2.98**	**Agree**
PERCENTAGE	**2.2%**	**16.9%**	**62.0%**	**18.9%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

These results are supported by some answers to the open-ended question:

> *"There is a continuity of the content topics to the next grade level."*
> – Teacher 76, Teacher 84

> *"The content of the curriculum materials uses varied strategies in solving a specific problem."* – Teacher 80

However, it may be emphasized that 16.9% and 2.2% of the responses indicated disagreement and strong disagreement, respectively, on the comprehensiveness of the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"The explanation in getting the answer to a problem is not always complete which may cause confusion to students."* – Teacher 2

> *"There are topics in lower grade level that are somehow irrelevant with the students' current grade level (e.g., Grade 9 – Trigonometry → Grade 10 – Probability). The continuity of the*

lessons which is supposed to be the best feature of a spiral curriculum is not that evident." – Teacher 13

"The coverage of content topics for the 4th quarter of Grade 10 is too short." – Teacher 38

"There is no Statistics in Grade 9. The students may not be able to remember the concepts after a gap of 2 years in the learning process." – Teacher 51, Teacher 55

Some teachers suggested the following:

"I suggest that topics on factoring should be retained." – Teacher 55

"Trigonometry should have (a) follow-up topic(s) in Grade 10." – Teacher 88

The responses to the open-ended question revealed that the content of curriculum materials uses different strategies in showing the solution to a problem. However, some teachers observed that there are lacking parts on some solutions in the materials which may be critical to the complete understanding of the lesson. Moreover, continuity of the lessons is not that evident particularly with Statistics and Probability. This opposed the Department of Education, Prince Edward Island (2008) which stated that concepts have to be clearly developed. Definitions, explanations, illustrations, and examples should be available where necessary. This implies that the content of the curriculum materials should be complete in scope, without missing important information, so it will provide a holistic learning which will then provide more learning opportunities for the students.

Table 8 shows a summary of the discipline-oriented dimension in terms of accuracy of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 8

Discipline-Oriented Dimension on Accuracy

The content of the curriculum materials is accurate such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It establishes the correctness and precise meaning of ideas and patterns.	1	4	75	10	3.04	Agree
It gives precise definitions of concepts.	1	10	64	15	3.03	Agree
It provides accurate solution to every word problem.	2	25	50	13	2.82	Agree
It presents updated information.	1	26	54	9	2.79	Agree
TOTAL	**5**	**65**	**243**	**47**	**2.92**	**Agree**
PERCENTAGE	**1.4%**	**18.1%**	**67.5%**	**13.1%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 8 indicates that teachers agreed that the content of the curriculum materials establishes the correctness and precise meaning of ideas and patterns, gives precise definitions of concepts, and provides accurate solution to every word problem. In this criterion, teachers least agreed that the content of the curriculum materials presents updated information. Overall, the table shows a weighted mean of 2.92 which means that mathematics teachers agreed that the content of the curriculum learner's materials is accurate.

However, it may be emphasized that 18.1% and 1.4% of the responses indicated disagreement and strong disagreement, respectively, on the accuracy of the content of the curriculum materials. These results were supported by some conceptual/typographical errors on the curriculum materials found by mathematics teachers:

"In Grade 7 material, there is something wrong with a part of the solution on Problems involving Real Numbers found on page 89." – Teacher 4

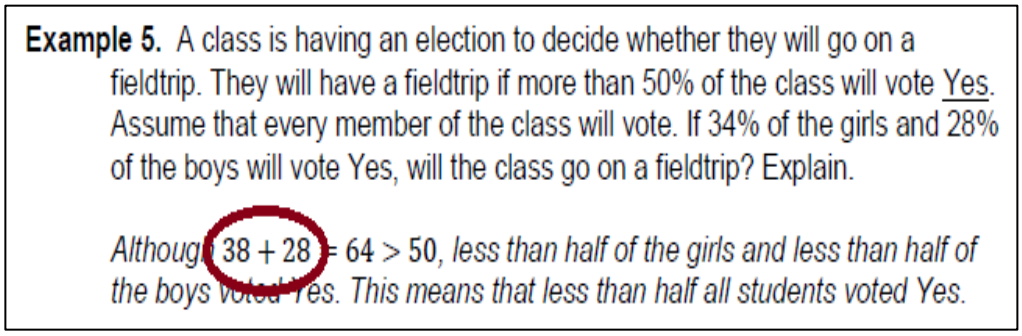


Figure 2. Error Found on More Problems Involving Real Numbers.

"For Grade 7, I saw many errors on page 138 that might cause confusion to the students." – Teacher 12, Teacher 68

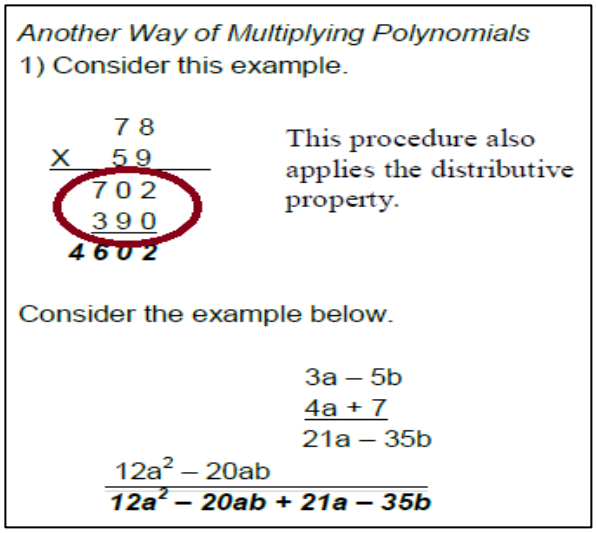


Figure 3. Error Found on Multiplying Integers.

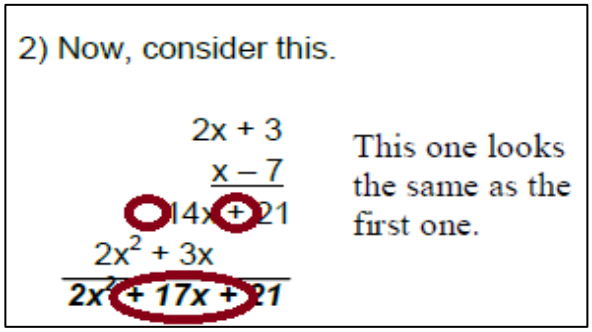


Figure 4.1. Error Found on Multiplying Polynomials.

D. To multiply a polynomial with more than one term by a polynomial with three or more terms, simply distribute the first term of the first polynomial to each term of the other polynomial. Repeat the procedure up to the last term and simplify the results by combining similar terms.

Examples:

1) $(x + 3)(x^2 - 2x + 3) = x(x^2 - 2x + 3) - 3(x^2 - 2x + 3)$

$= x^3 - 2x^2 + 3x - 3x^2 + 6x - 9$

$= \mathbf{x^3 - 5x^2 + 9x - 9}$

Figure 4.2. Error Found on Multiplying Polynomials.

"On page 143 of Grade 7 material, exponent "2" is missing on the solution." – Teacher 55

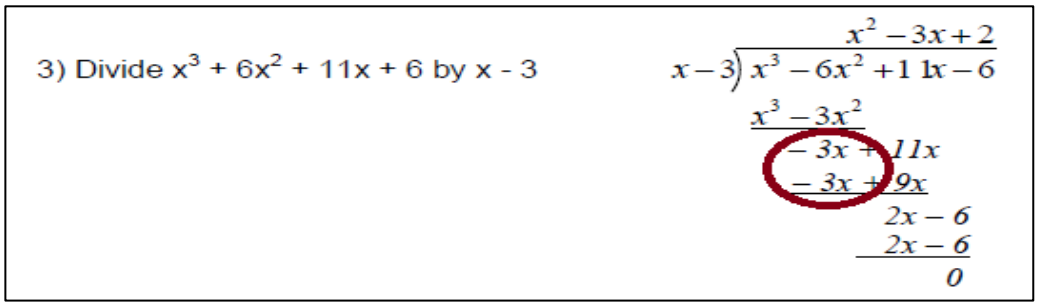


Figure 5. Error Found on Dividing Polynomials.

"For Grade 8 materials, wrong denominators, i.e. "-3" should be "-2" and missing exponent can be found in the illustrative examples on pages 94 and 96, respectively." – Teacher 24

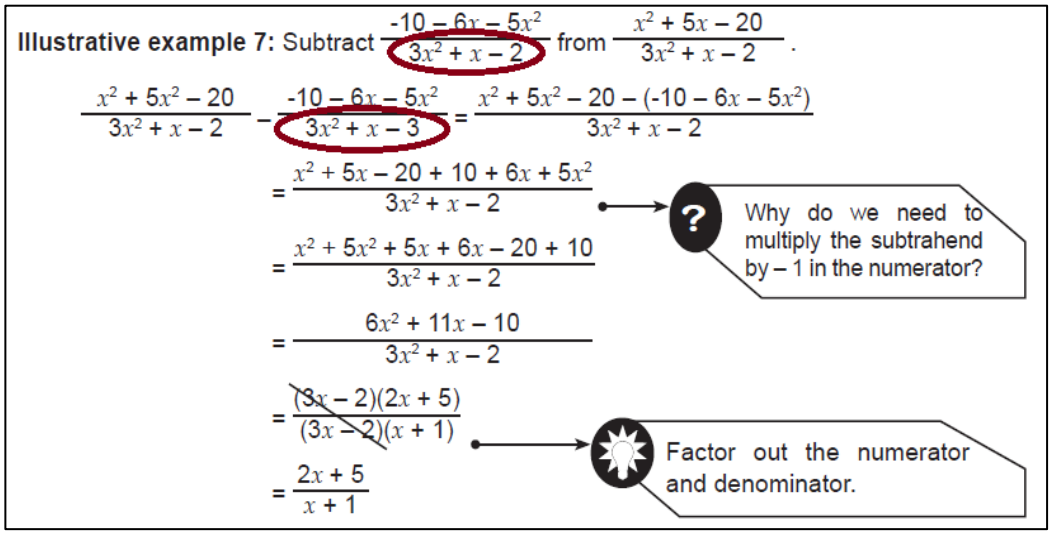


Figure 6.1. Error Found on Adding and Subtracting Dissimilar Rational Algebraic Expressions.

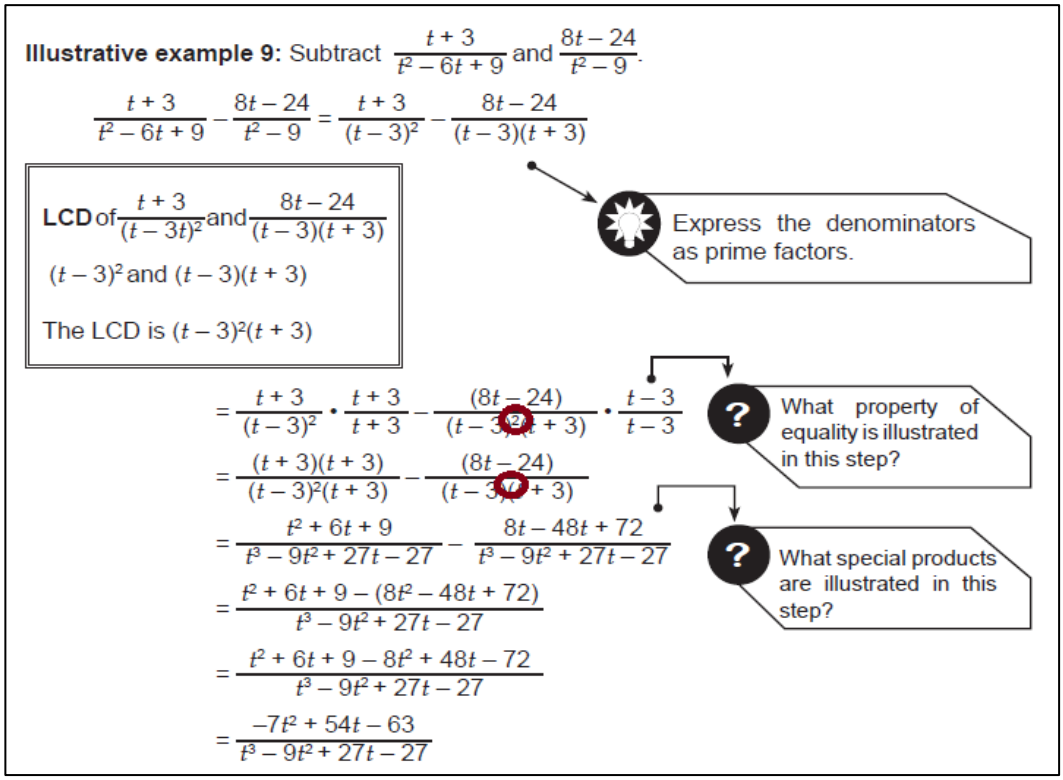


Figure 6.2. Error Found on Adding and Subtracting Dissimilar Rational Algebraic Expressions.

"For Grade 9, there are missing labels on parts of the triangle on Law of Sines and its Application on page 490. – Teacher 2

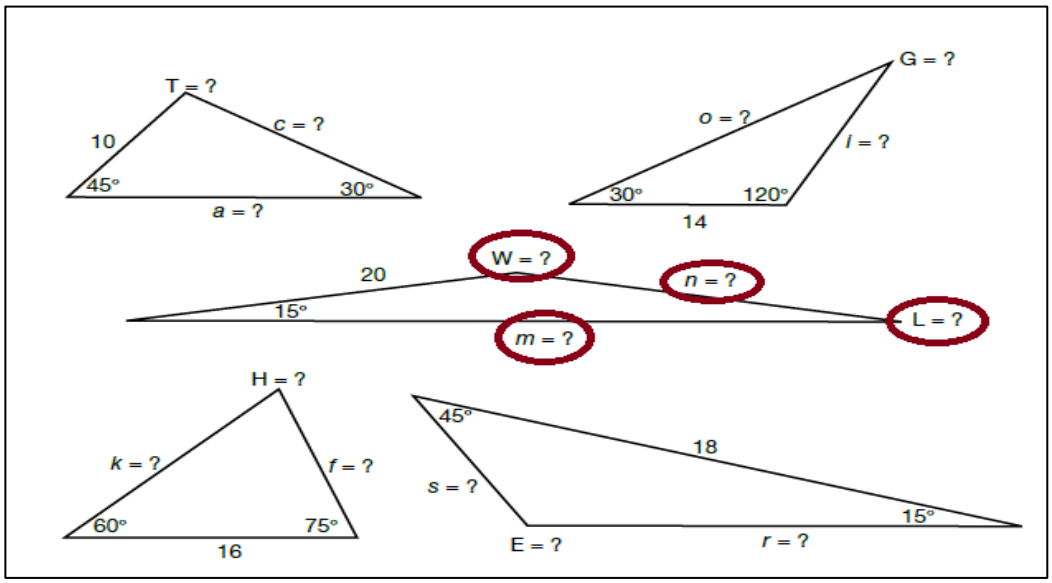
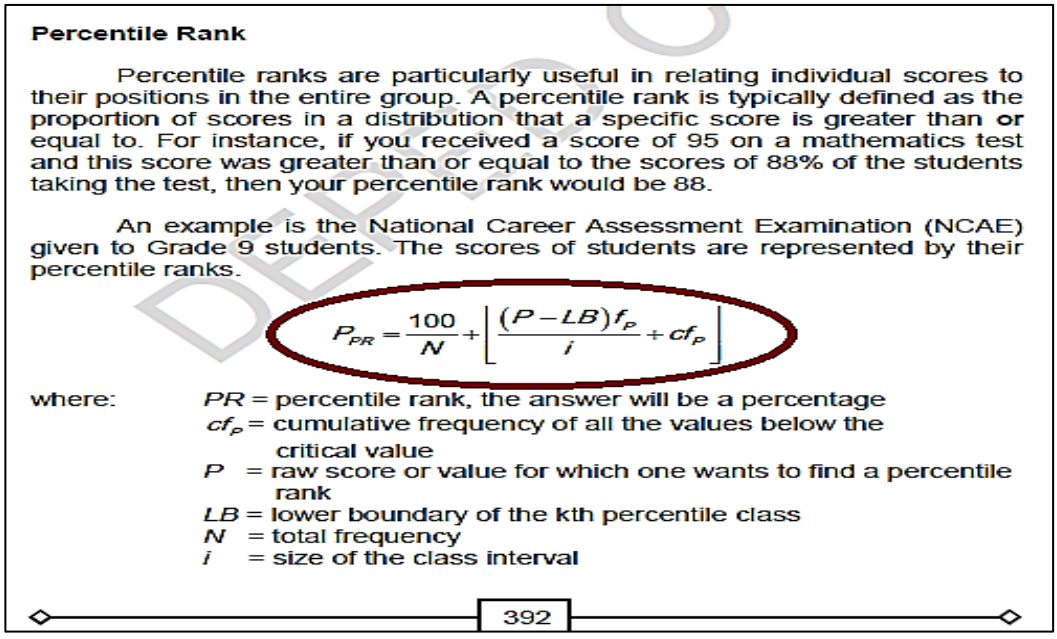


Figure 7. Error Found on the Law of Sines.

"For Grade 10 materials, there is a conceptual error on the discussion of Percentile Rank on pages 392 – 402. I used other references to check on the consistency of the mathematical ideas in this particular lesson." – Teacher 19, Teacher 21, Teacher 51



Percentile Rank

Percentile ranks are particularly useful in relating individual scores to their positions in the entire group. A percentile rank is typically defined as the proportion of scores in a distribution that a specific score is greater than or equal to. For instance, if you received a score of 95 on a mathematics test and this score was greater than or equal to the scores of 88% of the students taking the test, then your percentile rank would be 88.

An example is the National Career Assessment Examination (NCAE) given to Grade 9 students. The scores of students are represented by their percentile ranks.

$$P_{PR} = \frac{100}{N} + \left\lfloor \frac{(P - LB) f_p}{i} + cf_p \right\rfloor$$

where:
- PR = percentile rank, the answer will be a percentage
- cf_p = cumulative frequency of all the values below the critical value
- P = raw score or value for which one wants to find a percentile rank
- LB = lower boundary of the kth percentile class
- N = total frequency
- i = size of the class interval

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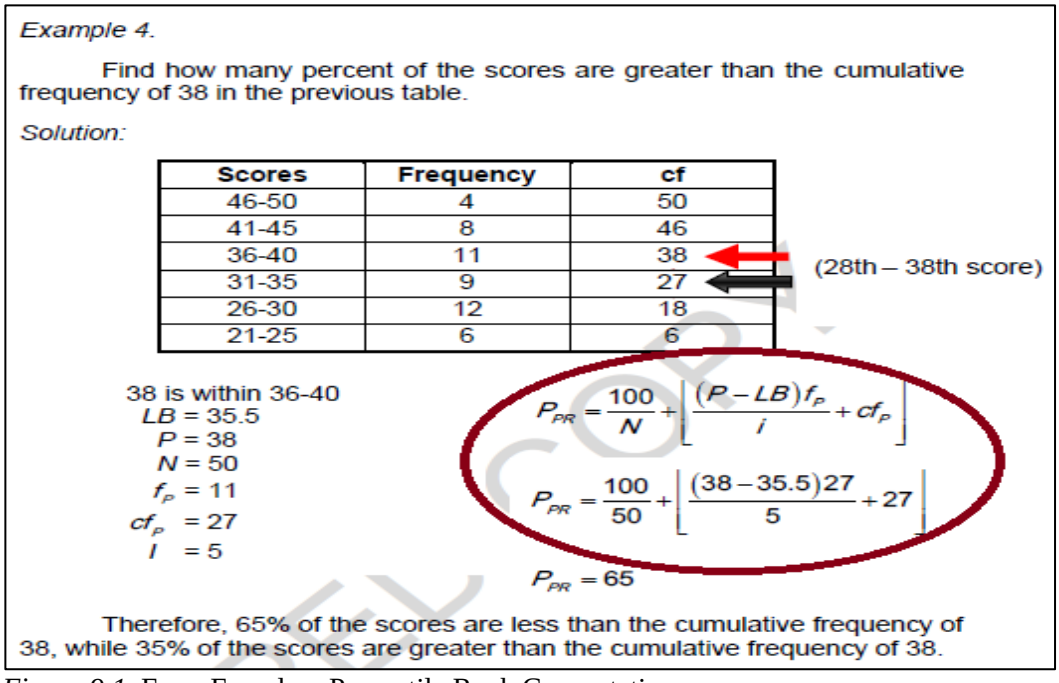
Figure 8. Error Found on the Definition of Percentile Rank.



Example 4.

Find how many percent of the scores are greater than the cumulative frequency of 38 in the previous table.

Solution:

Scores	Frequency	cf
46-50	4	50
41-45	8	46
36-40	11	38
31-35	9	27
26-30	12	18
21-25	6	6

(28th – 38th score)

38 is within 36-40
$LB = 35.5$
$P = 38$
$N = 50$
$f_p = 11$
$cf_p = 27$
$I = 5$

$$P_{PR} = \frac{100}{N} + \left\lfloor \frac{(P - LB) f_p}{i} + cf_p \right\rfloor$$

$$P_{PR} = \frac{100}{50} + \left\lfloor \frac{(38 - 35.5)27}{5} + 27 \right\rfloor$$

$$P_{PR} = 65$$

Therefore, 65% of the scores are less than the cumulative frequency of 38, while 35% of the scores are greater than the cumulative frequency of 38.

Figure 9.1. Error Found on Percentile Rank Computation.

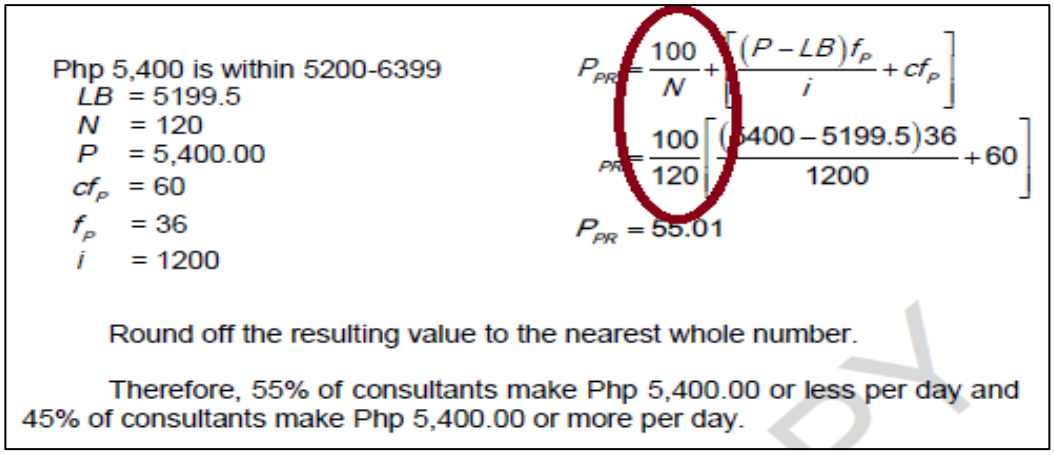


Figure 9.2. Error Found on Percentile Rank Computation.

The responses to the open-ended question indicated that there are errors found on the materials. The result did not agree with Peer Review Special Interest Group (2004) which stated the content of a high quality learning materials has to be valid and reliable. More specifically, content should not have outdated information, factual errors, improper use of statistics, inaccurate graphs or displays, invalid or oversimplified models, examples, or simulations, and errors in spelling or grammar (Department of Education, Prince Edward Island, 2008). Any wrong information given to the students may be a cause of misunderstanding or lack of interest in mathematics. The content, therefore, has to be consistently accurate and up-to-date throughout the material.

Table 9 shows a summary of the discipline-oriented dimension in terms of depth of mathematical inquiry and mathematical reasoning of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 9

Discipline-Oriented Dimension on Depth of Mathematical Inquiry and Mathematical Reasoning

The content of curriculum materials focuses on the depth of mathematical inquiry and mathematical reasoning such that:	SD	D	A	SA	x	Verbal Interpretation
It identifies and develops mathematical patterns.	3	8	67	12	2.98	Agree
It develops critical thinking and problem solving skills.	3	9	61	17	3.02	Agree
It presents examples of varying difficulty.	3	17	54	16	2.92	Agree
It provides questions that could allow deepening of ones' understanding of the lesson.	3	16	57	14	2.91	Agree
TOTAL	**12**	**50**	**239**	**59**	**2.96**	**Agree**
PERCENTAGE	**3.3%**	**13.9%**	**66.4%**	**16.4%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 9 indicates that teachers agreed that the content of the curriculum materials identifies and develops mathematical patterns, develops critical thinking and problem solving skills, and presents examples of varying difficulty. In this criterion, teachers least agreed that the content of the curriculum learner's materials provides questions that could allow deepening of ones' understanding of the lesson. Overall, the table shows a weighted mean of 2.96 which means that mathematics teachers agreed that the content of the curriculum materials focuses on the depth of mathematical inquiry and mathematical reasoning.

These results are supported by some answers to the open-ended question:

> *"The content of the curriculum materials provides variety of activities that develops mathematical inquiry and reasoning amongst students."* – Teacher 2

"Learners can easily relate and express their ideas about each topic." – Teacher 50

"It provides problem solving in real life situations." – Teacher 76

However, it may be emphasized that 13.9% and 3.3% of the responses indicated disagreement and strong disagreement, respectively, on the depth of mathematical inquiry and mathematical reasoning of the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

"Proper scaffolding is observed in some parts (i.e., proving) but other chapters do not give enough opportunity for students to think a lot." – Teacher 13

"Some of the lessons in the material do not develop with patterns and critical thinking." – Teacher 89

One of the twin goals of K to 12 Program is to develop learners who are critical thinkers. However, some responses to the open-ended question showed that some parts of the curriculum materials do not develop critical thinking. While the materials provide a variety of activities, some parts of the materials do not give students the opportunity to construct their own knowledge and to think critically. The result contrasted Stabback (2016) who stated that curriculum should be promoting higher-order thinking and stimulating students' imagination, curiosity, and critical thinking skills. Hence, it implies that curriculum materials should provide more problem solving activities that would stimulate students' skills on mathematical inquiry and mathematical reasoning.

Table 10 shows a summary of the discipline-oriented dimension in terms of organization of the Junior High School mathematics curriculum materials, as assessed by mathematics teachers.

Table 10

Discipline-Oriented Dimension on Organization

The content of curriculum materials is organized such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It presents a logical sequencing of activities.	4	19	56	11	2.82	Agree
It designs the spiraling of lessons in increasing levels of difficulty.	3	20	57	10	2.82	Agree
Topics within a grade level are well-arranged.	4	32	45	9	2.66	Agree
Topics across other grade levels are well-arranged.	7	40	37	6	2.47	Disagree
TOTAL	**18**	**111**	**195**	**36**	**2.69**	**Agree**
PERCENTAGE	**5.0%**	**30.8%**	**54.2%**	**10.0%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 10 indicates that teachers agreed that the content of the curriculum materials presents a logical sequencing of activities and designs the spiraling of lessons in increasing levels of difficulty. In this criterion, however, the teachers least agreed that topics within a grade level are well-arranged. Furthermore, the teachers disagreed that topics across other grade levels are well-arranged. This is the only criterion where most of the teachers disagreed on and may be considered as a weakness of the Junior High School Mathematics curriculum materials. Overall, the table shows a weighted mean of 2.69 which means that mathematics teachers agreed that the content of the curriculum materials is organized.

These results are supported by an answer to the open-ended question:

"There is a continuity of lessons across grade levels." – Teacher 76

However, it may be emphasized that 30.8% and 5.0% of the responses indicated disagreement and strong disagreement, respectively, on the organization of the content of the

curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"Some of the content topics are not well-arranged across grade levels so that mastery of the topics cannot be achieved. Probability is being discussed only in Grades 8 and 10."* – Teacher 13

> *"The measures of position should be tackled in Grade 9 since the measures of central tendency and measures of variations are introduced in the lower grade levels (Grade 7 and Grade 8, respectively)."* – Teacher 21

The teachers suggested the following:

> *"Although the activities are organized well, I would suggest that there have to be additional activities that would allow review of previous knowledge to be able to connect it with the new topic."* – Teacher 2

> *"Provide continuity for Probability in Grade 9*." – Teacher 13

> *"It should start with the pre-requisites of the topic leading to the introduction, discussion, examples, drills which build the mastery of the topic, formative assessment, etc."* – Teacher 79, Teacher 80

The responses to the open-ended question revealed that the organization of topic contents within and across grade levels are not well-arranged as manifested by the lack of mastery of the students. This did not support the Department of Education, Prince Edward Island (2008) which stated that curriculum materials have to be well-organized and structured. The order in which the information is presented in the materials need to be logical and suited to the subject and objectives. It may also be emphasized that among other criteria, it was the only criterion where teachers indicated their disagreement. This result did not also conform to the idea of Stabback (2016) that the content of a curriculum materials has to be well-organized and structured into a number of different but interrelated lessons. As the current curriculum follows a spiral progression, the arrangement of content topics has to be

critically organized according to the reviewed literature and gained feedbacks from previous researches.

Table 11 shows a summary of the discipline-oriented dimension in terms of balance of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 11

Discipline-Oriented Dimension on Balance

The content of the curriculum materials is balanced such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
Conceptual knowledge is covered.	2	1	71	16	3.12	Agree
Procedural knowledge is covered.	2	6	72	10	3.00	Agree
Theories are discussed together with their applications.	2	18	54	16	2.93	Agree
Numerical data and tables, graphs, and equations are equally used as representations.	2	14	58	16	2.98	Agree
TOTAL	**8**	**48**	**250**	**54**	**2.97**	**Agree**
PERCENTAGE	**2.2%**	**13.3%**	**69.4%**	**15.0%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 11 indicates that teachers agreed that the content of the curriculum materials covers both conceptual and procedural knowledge, and numerical data and tables, graphs, and equations are equally used as representations. In this criterion, teachers least agreed that theories are discussed together with their applications. Overall, the table shows a weighted mean of 2.97 which means that mathematics teachers agreed that the content of the curriculum materials is balanced.

These results are supported by an answer to the open-ended question:

> *"A good balance on the content of curriculum materials is achieved since there is review, practice exercises, and reflection."* – Teacher 13

However, it may be emphasized that 13.3% and 2.2% of the responses indicated disagreement and strong disagreement, respectively, on the balance of the content of the curriculum materials. These results are supported by a response to the open-ended question which revealed that:

> *"Some theories are not being discussed on the materials."* – Teacher 89

A teacher suggested that:

> *"Theories must be followed immediately by translation in symbols or representations."* – Teacher 85

In terms of review, practice exercises, and reflection, the responses to the open-ended question indicated that the curriculum material is balanced. This supported Stabback (2016) who stated that a good quality curriculum needs to be balanced in terms of the elements of the curriculum content such as content – knowledge, skills, values in developing the desired level of competency. He further mentioned that a good quality curriculum also promotes integrated learning. This implies that the content of the curriculum materials has to be balanced in terms of the content-knowledge, skills, and values. These materials should also bridge to other subjects of the same grade level for integration.

Figure 10 shows a summary of the discipline-oriented dimension of the Junior High School Mathematics curriculum materials. It can be seen from the figure that *Clarity of Objectives* got the highest mean while *Organization* got the lowest.

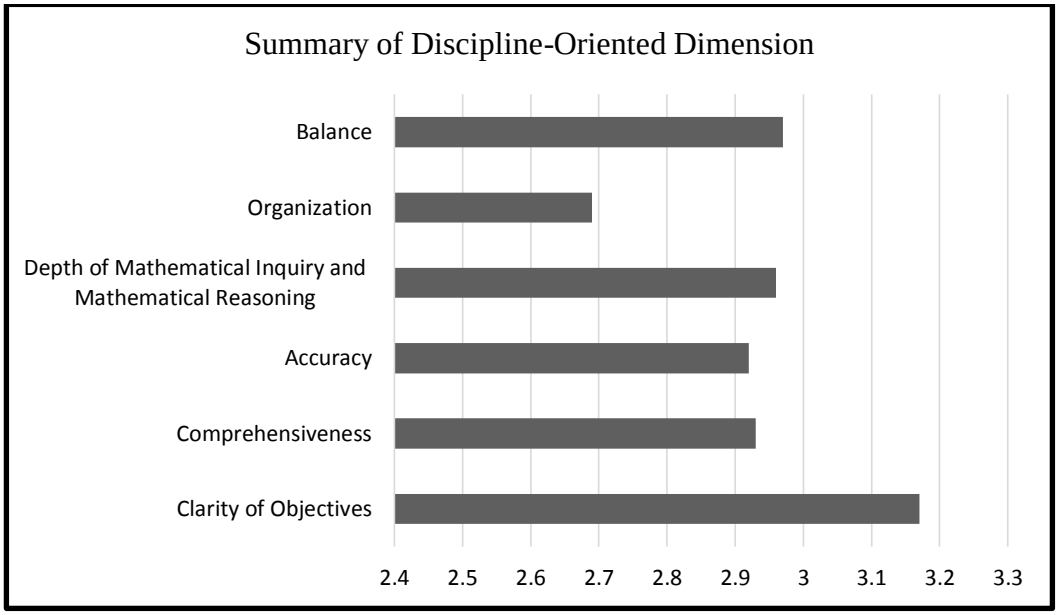


Figure 10. Summary of Discipline-Oriented Dimension.

Purpose 2: **Describe the learner-oriented dimension of the Mathematics curriculum materials in terms of:**

i. engagement;
ii. timeliness and support for diversity; and
iii. assessment.

Learner-Oriented Dimension of the Mathematics Curriculum Materials

Table 12 shows a summary of the learner-oriented dimension in terms of engagement on the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 12 indicates that teachers agreed that the content of the curriculum materials builds on prior knowledge of the students, provides fun and enjoyable activities, and caters to individual interests of the students. In this criterion, teachers least agreed that the content of curriculum learner's materials addresses compelling misconceptions of the students.

Overall, the table shows a weighted mean of 2.89 which means that mathematics teachers agreed that the content of the curriculum materials is engaging.

Table 12

Learner-Oriented Dimension on Engagement

The content of the curriculum materials allows student engagement such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It builds on prior knowledge of the students.	2	10	59	19	3.06	Agree
It provides fun and enjoyable activities.	2	21	57	10	2.83	Agree
It caters to individual interests of the students.	2	20	57	11	2.86	Agree
It addresses compelling misconceptions of the students.	2	21	59	8	2.81	Agree
TOTAL	**8**	**72**	**232**	**48**	**2.89**	**Agree**
PERCENTAGE	**2.2%**	**20.0%**	**64.4%**	**13.3%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

These results are supported by some answers to the open-ended question:

"My students are engaged with the activities especially the decoding activities. They really enjoyed them." – Teacher 2

"Yes. Students nowadays are engaged in the lessons because of the activities/games found on the materials. They really appreciate and enjoy the lessons." – Teacher 50, Teacher 55

"Yes. The students enjoy the activities but must be guided accordingly." – Teacher 76

However, it may be emphasized that 20.0% and 2.2% of the responses indicated disagreement and strong disagreement, respectively, on the engagement of learners on the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

"Some of the activities found on the curriculum materials are enjoyable for the students; some are not." – Teacher 13, Teacher 38, Teacher 51, Teacher 57, Teacher 79, Teacher 88, Teacher 89

"Some of the activities are difficult to follow." – Teacher 84

The responses to the open-ended question showed that the activities provided on the curriculum materials are enjoyable for many students. This conformed to the Department of Education, Prince Edward Island (2008) which indicated that curriculum materials could promote student engagement by attracting students' attention through activities. However, there are some activities that are difficult to follow and hence need to be improved in terms of the level of difficulty. As the Delaware Department of Education and Office of Early Learning (2013) stated that a curriculum material that supports the integration of personal, familiar, and cultural contexts of society is meaningful for many students, the curriculum materials must then provide activities that reflects the experiences and backgrounds of the students. Learning becomes more meaningful and successful when activities are connected with students' experiences.

Table 13 shows a summary of the learner-oriented dimension in terms of timeliness and support for diversity of the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 13 indicates that teachers agreed that the content of the curriculum materials has appropriate pace of instruction, follows timely discussion of topics, and provides extensions for those ready for more challenge. In this criterion, the teachers least agreed that content of the curriculum materials scaffolds for those needing more assistance. Overall, the

table shows a weighted mean of 2.81 which means that mathematics teachers agreed that the content of curriculum materials is timely and supportive of students' diversity.

Table 13

Learner-Oriented Dimension on Timeliness and Support for Diversity

The content of curriculum materials is timely and supportive of learners' diversity such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It has appropriate pace of instruction.	3	13	66	8	2.88	Agree
It follows timely discussion of topics.	3	18	61	8	2.82	Agree
It scaffolds for those needing more assistance.	3	27	55	5	2.69	Agree
It provides extensions for those ready for more challenge.	3	22	51	14	2.84	Agree
TOTAL	**12**	**80**	**233**	**35**	**2.81**	**Agree**
PERCENTAGE	**3.3%**	**22.2%**	**64.7%**	**9.7%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean .

These results are supported by an answer to the open-ended question:

> *"The curriculum materials cater to every student's needs as the materials provide activities which are easy to answer. The materials also provide activities to fast/advanced learners who would like to challenge themselves further."* – Teacher 2

However, it may be emphasized that 22.2% and 3.3% of the responses indicated disagreement and strong disagreement, respectively, on the timeliness and support for diversity of the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"The materials cannot dictate the pace of the students. The teachers and the students are the only ones who can dictate the pace."* – Teacher 79

> *"Too much topics are included in the curriculum that's why some topics are not discussed anymore."* – Teacher 88

The responses to the open-ended question revealed that the curriculum materials cater to the individual differences of the students. Furthermore, it provides scaffolding to the ones who need assistance and gives more challenging exercises to the ones who learn fast. The result agreed with UNESCO (2014) which stated that curriculum materials should allow for differentiation of content and presentation formats in order to cater the needs and abilities, diverse learning styles, languages, cultural backgrounds, and interests of the students. Moreover, the curriculum materials should always be promoting child-directed activities as it claims to be supportive of the constructivist approach. However, the content topics of curriculum materials are too many and diverse that it may not always be possible to cover all of the topics. Consequently, the time allotted for each topic may be re-examined to be able to cover every topic indicated on the curriculum materials.

Table 14 shows a summary of the learner-oriented dimension in terms of assessment on the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 14 indicates that teachers agreed that the content of the curriculum materials provides well-aligned summative assessments, allows assessment of content standards, and allows assessment of performance standards, and allows assessment of 21st century skills. In this criterion, the teachers least agreed that the content of the curriculum materials includes various types of assessments. Overall, the table shows a weighted mean of 3.06 which means that mathematics teachers agreed that the content of curriculum materials provides varied forms of assessments.

Table 14

Learner-Oriented Dimension on Assessment

The content of curriculum materials includes assessment of learning such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It includes various types of assessments.	4	13	56	17	2.96	Agree
It provides well-aligned summative assessments.	3	6	59	22	3.11	Agree
It allows assessment of content standards.	3	2	65	20	3.13	Agree
It allows assessment of performance standards.	2	6	66	16	3.07	Agree
It allows assessment of 21st century skills.	2	10	62	16	3.02	Agree
TOTAL	**14**	**37**	**308**	**91**	**3.06**	**Agree**
PERCENTAGE	**3.1%**	**8.2%**	**68.4%**	**20.2%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

However, it may be emphasized that 8.2% and 3.1% of the responses indicated disagreement and strong disagreement, respectively, on the above-mentioned descriptions of assessment of the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"The assessment of performance standards is very limited; more of it must be provided or at least resources/references."* – Teacher 13

The teachers suggested the following:

> *"Provide more of generalized assessment or non-test assessment."* – Teacher 79

> *"Try to provide an online assessment."* – Teacher 84

The responses to the open-ended question indicated that teachers look for varied forms of assessment especially for the performance standards. This result conformed to the journal of Stabback (2016) saying that a good quality curriculum needs to be supported by

appropriate methods and strategies for assessing student achievement as defined by the curriculum. Adequate/appropriate assessment/evaluation tools should be found on the curriculum materials (Department of Education, Prince Edward Island, 2008). As assessment is the bridge between teaching and learning, curriculum materials should be able to measure effectively the content knowledge, performance, and learning competencies of the students as indicated on the curriculum by providing varied forms of assessment.

Figure 11 shows a summary of the learner-oriented dimension of the Junior High School Mathematics curriculum materials. It can be seen from the figure that *Assessment* got the highest mean while *Timeliness and Support for Diversity* got the lowest.

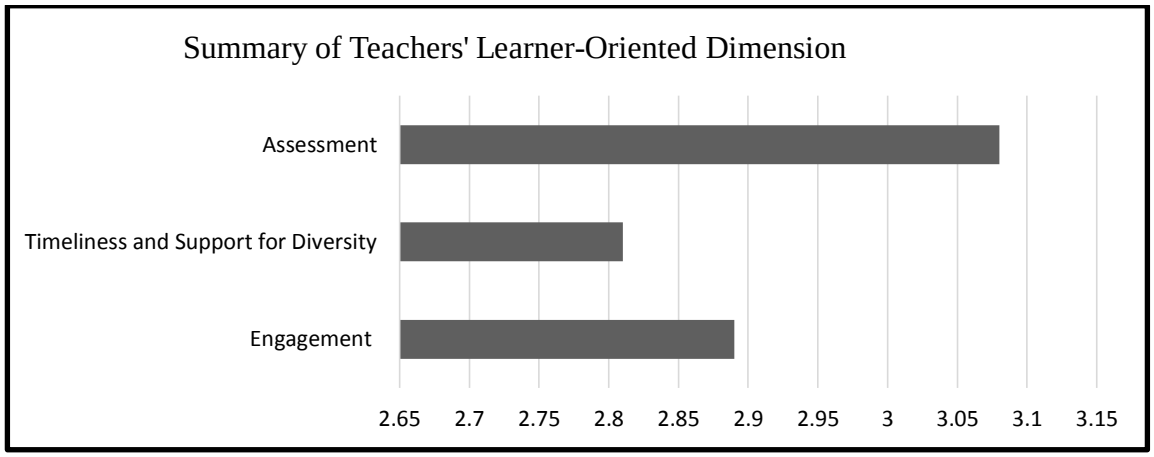


Figure 11. Summary of Teachers' Learner-Oriented Dimension.

Purpose 3: **Describe the resource-oriented dimension of the Mathematics curriculum materials in terms of:**

i. pedagogy;

ii. resources; and

iii. professional development.

Resource-Oriented Dimension of the Mathematics Curriculum Materials

Table 15 shows a summary of the resource-oriented dimension in terms of pedagogy on the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 15

Resource-Oriented Dimension on Pedagogy

The content of the curriculum materials reflects an efficient pedagogy such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It employs student-centered approaches.	1	7	70	12	3.03	Agree
It employs teacher-centered approaches.	4	24	54	8	2.73	Agree
It utilizes varied teaching strategies.	2	14	62	12	2.93	Agree
It is tailored on the needs of the students.	1	12	64	13	2.99	Agree
It is aligned with the K to 12 Mathematics Curriculum Framework in terms of developing critical thinking and problem solving skills.	1	6	63	20	3.13	Agree
TOTAL	**9**	**63**	**313**	**65**	**2.96**	**Agree**
PERCENTAGE	**2.0%**	**14.0%**	**69.6%**	**14.4%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 15 indicates that teachers agreed that the content of the curriculum materials employs student-centered approaches and utilizes varied teaching strategies. They also agreed that it is tailored on the needs of the students and aligned with the K to 12 Mathematics Curriculum Framework in terms of developing critical thinking and problem solving skills. In this criterion, the teachers least agreed that the content of curriculum

materials employs teacher-centered approaches. Overall, the table shows a weighted mean of 2.96 which means that mathematics teachers agreed that the content of curriculum materials reflects efficient pedagogy.

These results are supported by the following responses to the open-ended question:

> *"All activities are well-explained because students can easily understand them and they are aligned with the K to 12 Mathematics Curriculum Framework which focuses on students."* – Teacher 2

> *"The students learned using different strategies used by the teachers."* – Teacher 50

However, it may be emphasized that 14.0% and 2.0% of the responses indicated disagreement and strong disagreement, respectively, on the reflection of efficient pedagogy on the content of the curriculum materials. These results are supported by a response to the open-ended question which revealed that:

> *"Problem solving activities are very limited although somehow discovery approach is emphasized."* – Teacher 13

A suggestion from one of the teachers stated:

> *"Provide more problem solving activities paralleled to the learning capacities of the students particularly in the lower groups."* – Teacher 76

The responses to the open-ended questions showed that the problem solving activities on the curriculum materials allow discovery approach that builds on constructivism. In addition to this, teachers use varied techniques in teaching. The result provided support to the Department of Education, Prince Edward Island (2008) which stated that curriculum materials should be suitable for a wide range of teaching styles. However, it was suggested that more problem solving activities be given to the lower groups to address their needs. This agreed with Whelan (2009) who noted that educational systems have to ensure that curriculum accommodates the different needs of the learners. On the other hand,

none is nearly as important as the quality of teaching. This leads to saying that teachers do not simply implement the curriculum. They develop, define, and reinterpret it too. It is what teachers think, what teachers believe in, and what teachers do at the level of the classroom that ultimately shapes the kind of learning that young people get. This implies that teachers of the curriculum should continue on exploring different pedagogies so students may feel that they are absolutely at the center of their own learning. Different pedagogies in teaching would make the students feel that their individuality as a student is being valued by their teacher and in turn would motivate them achieve their maximum potentials.

Table 16 shows a summary of resource-oriented dimension in terms of resources on the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 16

Resource-Oriented Dimension on Resources

The content of the curriculum materials needs resources such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
The resources are varied.	1	11	68	10	2.97	Agree
The resources are localized.	1	15	64	10	2.92	Agree
The resources are indigenized.	1	14	63	12	2.96	Agree
The resources are flexible.	1	14	64	11	2.94	Agree
TOTAL	**4**	**54**	**259**	**43**	**2.95**	**Agree**
PERCENTAGE	**1.1%**	**15.0%**	**71.9%**	**11.9%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 16 indicates that teachers agreed that the content of the curriculum materials needs varied, localized, indigenized, and flexible resources. Overall, the table shows a

weighted mean of 2.95 which means that mathematics teachers agreed that the content of the curriculum materials is varied, localized, indigenized, and flexible.

However, it may be emphasized that 15.0% and 1.1% of the responses indicated disagreement and strong disagreement, respectively, on the need for varied, localized, indigenized, and flexible resources to deliver the content of the curriculum materials. These results are supported by some responses to the open-ended question which revealed that:

> *"Curriculum materials are barely not localized but students can easily relate to it because of the real life applications written on it."* – Teacher 2

> *"There is not enough resources that are localized and it is quite hard to find other parts of it since the topics came from different branches of Mathematics."* – Teacher 13

According to RA 10533: Enhanced Basic Education Act of 2013, "The curriculum shall be flexible enough to enable and allow schools to localize, indigenize, and enhance (the curriculum) based on their respective educational and social contexts." The responses to the open-ended question revealed, however, that there are not enough resources that are localized. This result opposed the Department of Education, Prince Edward Island (2008) stating that appropriate support materials have to be provided and assess whether support materials contribute to the achievement of the curriculum objectives. This implies that teachers need to provide localized materials, use authentic materials, and relate teaching on the context of learners' lives.

Table 17 shows a summary of resource-oriented dimension in terms of professional development on the Junior High School Mathematics curriculum materials, as assessed by mathematics teachers.

Table 17

Resource-Oriented Dimension on Professional Development

The content of the curriculum materials requires professional development for teachers such that:	SD	D	A	SA	$\bar{x}$	Verbal Interpretation
It focuses on content knowledge.	3	8	67	12	2.98	Agree
It discusses pedagogical content knowledge.	3	9	71	7	2.91	Agree
It promotes reflective teaching.	2	13	62	13	2.96	Agree
It introduces new technologies and trends in mathematics education.	4	21	54	11	2.80	Agree
TOTAL	**12**	**51**	**254**	**43**	**2.91**	**Agree**
PERCENTAGE	**3.3%**	**14.2%**	**70.6%**	**11.9%**		

Note. SD – strongly disagree, D – disagree, A – agree, SA – strongly agree, $\bar{x}$ – weighted mean.

Table 17 indicates that teachers agreed that the content of the curriculum materials requires professional development for teachers that focuses on content knowledge, discusses pedagogical content knowledge, promotes reflective teaching, and introduces new technologies and trends in mathematics education. Overall, the table shows a weighted mean of 2.91 which means that mathematics teachers agreed that the content of curriculum materials requires professional development for teachers.

These results are supported by the following responses to the open-ended question:

> *"These seminars and trainings are a big help to me as a teacher because they equip me with the skills needed for a 21st century educator. It also allows teachers to be updated with the trends and issues in the curriculum."* – Teacher 2

> *"Some innovations are presented and clarifications on the content (misconceptions) are also discussed so it's good."*- Teacher 13

> *"Seminars and trainings conducted by the DepEd are a big opportunity for teachers' improvement. These helps create an effective learning environment, improved teaching-learning situations, and inspires teacher to be better."* – Teacher 70

> *"Seminars and trainings are beneficial to both teachers and students for them to cope up with the international standard."* – Teacher 77

However, it may be emphasized that 14.2% and 3.3% of the responses indicated disagreement and strong disagreement, respectively, on the requirement of professional development for teachers to deliver the content of the curriculum materials. These results are supported by a response to the open-ended question which revealed that:

> *"The DepEd focuses on the content rather than teaching strategies."* – Teacher 84, Teacher 85, Teacher 90

A suggestion from one of the teachers stated that:

> *"For me, instead of content, they should focus on strategies and techniques, current trends, and technology that can be utilized in teaching."* – Teacher 66

The responses to the open-ended question indicated that the seminars and trainings conducted by the Department of Education (DepEd) were a great help for 21st century educators. The result supported UNESCO (2014) which considered training of teachers on the role of the learner's materials in the teaching-learning process as an important tool in effectively using the materials. Moreover, it conformed to OECD (2009) which stated that effective professional development is continuous, includes training, practice and feedback, and provides adequate time and follow-up support. Successful programs involve teachers in learning activities that are similar to ones they will use with their students, and encourage the development of teachers' learning communities. However, the seminars and trainings aforementioned would have been more efficient if the seminars and trainings focused on pedagogical knowledge rather than content knowledge. These imply that seminars and

trainings on the K to 12 Program should give emphasis on the pedagogies in teaching the content of the curriculum materials.

Figure 12 shows a summary of the resource-oriented dimension of the Junior High School Mathematics curriculum materials. It can be seen from the figure that both the *Pedagogy* and *Resources* got the highest means while *Professional Development* got the lowest.

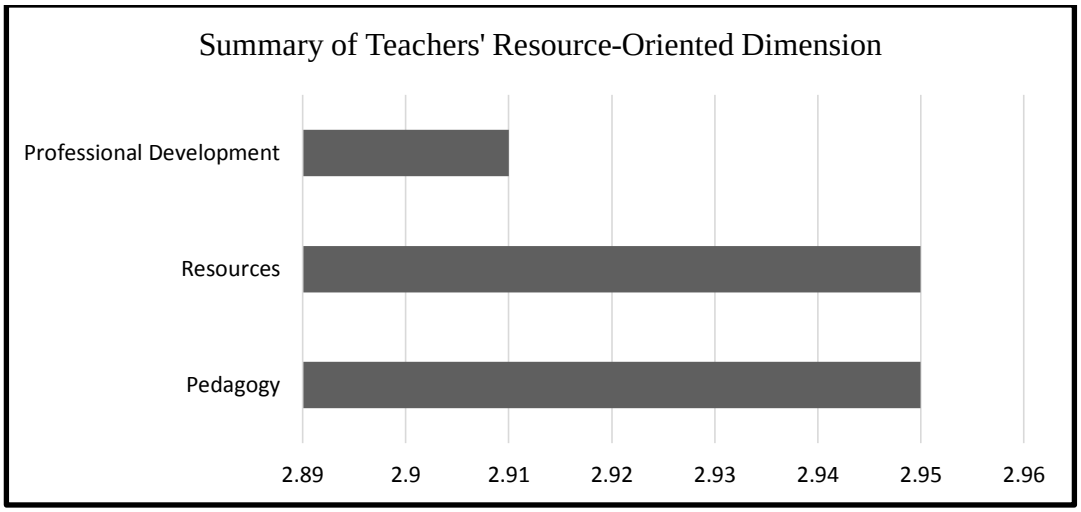


Figure 12. Summary of Teachers' Resource-Oriented Dimension.

Purpose 4. **Determine the strengths and weaknesses of the Junior High School mathematics curriculum materials in terms of the discipline-oriented, learner-oriented, and resource-oriented dimensions, as assessed by mathematics teachers.**

1. In terms of the discipline-oriented dimension:

    A. The strength of the Junior High School Mathematics curriculum materials is having learner-centered activities. Students tend to discover concepts through

discovery and experiential learning. Its weaknesses are the sequencing of some topics and presence of conceptual/typographical errors on the curriculum materials. This opposed Peer Review Special Interest Group (2004 which stated the content of a high quality learning materials has to be valid and reliable. It should be accurate, up-to-date and complete. The content has to be complete in scope without missing important information, consistently accurate, and up-to-date throughout the material.

B. The content of the curriculum materials is comprehensive. It covers different branches of Mathematics. It provides opportunities for different learning experiences of certain hierarchy like developing number sense in topics like sequence, analytical thinking in problem solving in Geometry, critical thinking in proving, and so on. This supported Delaware Department of Education and Office of Early Learning (2013) which indicated that a curriculum which is comprehensive provides a framework to help teachers in planning activities and experiences that are appropriate for the age and development of children in the classroom. However, the coverage of the curriculum material is too idealistic that it may be hard to cover everything in the given period of time. Making it comprehensive also congests the learning competencies. The more competencies there are, the harder it is for students to master critical contents. In some cases, the prerequisites are discussed in a much advanced time requiring the teachers to go back from the start before discussing a new topic. In addition to this, there are also chapters that are still congested, which seem

to be in contrary to the aim of K to 12 Curriculum of decongesting the old curriculum.

2. In terms of learner-oriented dimension:

A. The strengths of the K to 12 program rely on the flexibility of the learning content and varied learning activities that caters to the different needs of the students. The material should explicitly provide guideline for teachers to create engaging and encouraging learning environment in the class, and value and respect students' ideas (Hussain & Shaheen, 2017). Also, they are presented in a pragmatic way so as to entice the imagination of the students. On the other hand, while there may be a variety of learning activities, it may also hamper the smooth flow of the lesson sequence at times. It affects the lesson time-table and eventually may lead to unfinished chapters before the periodic exams. But because of its variety and flexibility, the teacher chooses a fast-paced learning session to catch up and cover the module intended for the grading period. The downside of it affects those students who cannot catch-up the lessons on a daily basis.

B. The materials of the Junior High School Mathematics curriculum provide real-world situations and problems that make students appreciate Mathematics more in its utmost essence. This result agreed with Hussain and Shaheen (2017) who mentioned curriculum materials should integrate multiple teaching methods requiring active students' participation and provides links between real world situations and mathematics.

3. In terms of the resource-oriented dimension:

One strength of the K to 12 Junior High School Mathematics curriculum materials is the use of student-centered approaches and utilization of varied teaching strategies. This result supported Hussain and Shaheen (2017) who stated that the use of pictorial models, diagrams, and manipulatives supports students' understanding of key conceptual ideas of mathematics. However, during seminar-trainings of teachers, focusing more on content knowledge rather than pedagogical content knowledge is a weakness. There has to be a balance between the two. In addition to this, UNESCO (2014) considered training of teachers on the role of the learner's materials in the teaching-learning process as an important tool in effectively using the materials.

Purpose 5: **Provide inputs to improve the Junior High School mathematics curriculum materials.**

The Department of Education, Prince Edward Island (2008) stated that concepts have to be clearly developed. Definitions, explanations, illustrations, and examples should be available where necessary. Moreover, curriculum content should not have outdated information, factual errors, improper use of statistics, inaccurate graphs or displays, invalid or oversimplified models, examples, or simulations, and errors in spelling or grammar. It also has to be well-organized and structured, that is, the order in which the information is presented in the materials need to be logical and suited to the subject and objectives (Department of Education, Prince Edward Island, 2008). A good curriculum should promote

higher-order thinking and stimulate students' imagination, curiosity, and critical thinking skills (Stabback, 2016). These literatures support the inputs provided by the researcher to improve the Junior High School Mathematics curriculum materials.

Table 18 shows inputs for the improvement of curriculum materials based on its weaknesses as assessed by mathematics teachers.

Table 18

Inputs for Curriculum Materials Improvement

Weaknesses of the Curriculum Materials as Assessed by Mathematics Teachers	Inputs for the Improvement of Mathematics Curriculum Materials
1. Some objectives may not be attainable based on the time allotment and level of difficulty of each lesson.	The time allotment of some lessons may be revised according to the level of difficulty.
2. There are missing parts in the solutions of some problems which might lead to students' confusion and misunderstanding of the lesson.	A detailed step-by-step solution to each of the examples presented may be provided.
3. Conceptual/typographical errors are found in the curriculum materials.	Small group discussions need to be done to check on the accuracy of the curriculum materials.
4. Some problems and activities do not develop critical thinking and creative thinking skills.	More non-routine problems and contextual tasks that encourage students to formulate, model and apply their understanding may be provided.
5. Some of the content topics are not well-arranged across grade levels.	A rigid review of the organization of lessons within and across grade levels may be conducted.
6. Some parts of the curriculum materials are still congested.	The distribution of topics in the materials within and across grade levels could be revisited by curriculum experts.

Curriculum developers may revise the time allotment of some lessons based on the level of difficulty. Since one of the goals of the K to 12 Mathematics curriculum is to develop problem solving skills among students, lessons involving problem solving activities may be

given longer time allotment. Problem solving entails more intellectual ability for the students and so they need more time to comprehend and think of a best possible solution. In this way, objectives of the content dealing with problem solving may be attainable.

Critical to the understanding of a mathematical concept is the completeness of the solution presented. However, there appear missing parts in the solutions of some problems on the curriculum materials which might lead to students' confusion and misunderstanding of the lesson. Consequently, a detailed step-by-step solution to each of the examples on the curriculum materials may be presented. Moreover, short explanations across the solutions may be provided so students will clearly understand the solution. Teachers also need to identify incomplete solutions beforehand to address this weakness of the materials.

Small group discussions need to be done to check on the accuracy of the curriculum materials. Mathematics teachers, together with the department head teacher and master teacher(s), may form a quality circle which task is to identify all errors on the curriculum materials, whether they may be conceptual or typographical. It could also be a topic for discussion during In-Service Trainings (InSeT) during semestral or summer breaks.

As some problems and activities do not develop critical thinking and creative thinking skills among students, more non-routine problems and contextual tasks that encourage students to formulate, model and apply their understanding may be provided. Teachers may consult other references in order to provide students with non-routine problems and therefore help them develop both critical and creative thinking skills.

A key feature of the present curriculum is the spiral progression of topics. However, some of the content topics are not well-arranged across grade levels. Hence, a rigid review

of the organization of lessons within and across grade levels may be conducted by curriculum developers and/or experts. Furthermore, the Department of Education (DepEd) may conduct workshops focusing solely on the spiraling progression of content topics. The gaps between content may be intensively re-examined during these workshops.

Since some parts of the curriculum materials are still congested based on the assessment of some teachers, the distribution of topics in the materials within and across grade levels could be revisited by curriculum experts. Meanwhile, in the classroom setting, the teacher needs to prepare very well in terms of teaching strategies to be able to save time and therefore be able to cover all the learning competencies stated on the curriculum guide. Benjamin Franklin was known for the following saying, "By failing to prepare, you are preparing to fail". If only teachers could analyze the entirety of the Mathematics curriculum and foresee the challenges it brings and poses, then there is no reason at all for not being able to discuss all the content with breadth and quality.

Chapter 4

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter presents the summary of the study, summary of results, limitations of the study, the conclusions based on the results, and the recommendations based on the conclusions.

Summary of the Study

The aim of this study was to assess the discipline-oriented, learner-oriented, and resource-oriented dimensions of the Junior High School Mathematics curriculum materials. It used a participant-oriented approach that considered teachers' views. Ninety mathematics teachers participated in the study. They were asked to assess the content of the curriculum materials using the questionnaire developed by the researcher and validated by a group of five experts. Then, semi-structured interview was conducted to validate answers and gain breadth in the responses. Results revealed the strengths of the K to 12 Junior High School Mathematics curriculum materials: It has clear objectives; is comprehensive; gives depth in mathematical inquiry and reasoning; and is balanced. Moreover, its content is engaging, timely and is supporting students' diversity, and utilizes assessment appropriate for the 21st century. Furthermore, it reflects an efficient pedagogy, needs flexible, indigenized, localized, and varied resources, and requires professional development for teachers. However, the weaknesses of the curriculum materials appeared to be on the presence of errors and the content topics across other grade levels which were not well-arranged.

Summary of Results

Based on the data gathered, the following results are hereby summarized.

1. Based on the discipline-oriented dimension, the content of curriculum materials has clear objectives; is comprehensive; gives depth in mathematical inquiry and reasoning; and is balanced. However, it contains errors and topics across other grade levels were not well-arranged.
2. Based on the learner-oriented dimension, the content of curriculum materials is engaging, timely and is supporting students' diversity, and utilizes assessment appropriate for the 21st century.
3. Based on the resource-oriented dimension, the content of curriculum materials reflects an efficient pedagogy, needs flexible, indigenized, localized, and varied resources, and requires professional development for teachers.
4. The strength of the Junior High School Mathematics curriculum materials seems to be on its learner-centered approach as manifested on the learning activities. On the other hand, its weakness seems to be on the presence of errors and arrangement of content topics across grade levels which were not well-arranged.

Limitations of the Study

This study aimed to assess the content of the K to 12 Junior High School Mathematics curriculum materials using participant-oriented approach. The content of the curriculum materials was assessed by Junior High School mathematics teachers (as stakeholders) using the three dimensions of content analysis as stated by Confrey and Stohl (2004).

One limitation of this study was not considering the demographic profile of the teachers as this may be an intervening variable in the study. Only the length of teaching experience and the teaching positions were determined.

Furthermore, not including students as participants in this study was one limitation because students are the ones who actively participate in the implementation of the curriculum together with teachers. Their beliefs, thoughts, and perceptions may be as important as teachers' beliefs and perceptions in describing the process of implementation. To reduce this limitation, rich interpretative information drawn from teachers regarding their classroom activities and their students' engagement were collected using the questionnaire under Dimension Two (2) of the content analysis.

Finally, time constraint of the study was a limitation of the study since the research was conducted during the last month of School Year 2017 - 2018 when teachers were so busy accomplishing their school forms and doing rehearsals for moving up or graduation ceremonies. To address this, triangulation techniques were employed using semi-structured interviews on randomly selected participants.

Conclusions

In light of the summary of results, the following conclusions are hereby derived:

1. The strength of the curriculum materials is its support to constructivism as it provides varied learner-centered activities. Therefore, the attendance of teachers to seminars and trainings is a great help to equip the teachers with appropriate pedagogies needed to deliver the content of curriculum materials more effectively.

2. The curriculum materials follow a spiral progression. Hence, teachers are ensuring that students have the pre-requisite skills because these are the basic skills that students should have mastered before learning other more difficult skills. Teachers conduct a regular review of necessary lessons.
3. As the weaknesses of the curriculum materials appear to be on the presence of conceptual/typographical errors, teachers of the K to 12 Junior High School Mathematics are careful and could not rely solely in the curriculum materials. Teachers' role is critical in safeguarding accuracy in the discussions. Consequently, they are using other references to check on the consistency of the mathematical ideas in the curriculum materials.
4. Some parts of the curriculum materials are still congested. On one hand, it may be the case that teachers tend to choose more important lessons and skip less important ones due to time constraint. On the other hand, it may be the case that all the learning competencies indicated in the curriculum guide are covered but with a low mastery.

Recommendations

The conclusions of this assessment study, in conjunction with the reviewed literature, have resulted in the series of recommendations stated below:

1. The K to 12 Junior High School Mathematics curriculum materials follow a spiral progression. It is therefore highly recommended that organization of content topics across Grade 7 to Grade 10 be reviewed to rearrange the topics in proper and more sequential order.
2. As the curriculum materials demand for varied teaching pedagogies, the Department of Education (DepEd) and other private institutions could facilitate more seminars and

trainings among Junior High School Mathematics teachers focusing on the pedagogical content knowledge. New trends in the 21st century education could be shared during these seminars and trainings to equip teachers not just with the content knowledge but also pedagogical content knowledge. Likewise, school heads are encouraged to motivate their teachers to pursue their graduate studies in order for them to grow both academically and professionally.

3. It is the prime responsibility of the school heads to provide for the necessities of the teachers and students. Consequently, it is suggested that the school heads assist their teachers in providing the students with indigenized, localized, or flexible materials needed to deliver the curriculum more efficiently. Moreover, frequent monitoring of classes may be maintained by the school and department heads to determine the strong and weak points of the curriculum and provide immediate solutions where needed.
4. It is recommended that the Junior High School Mathematics curriculum guides (CG) and teaching guides (TG) be assessed by mathematics experts to propose necessary modifications for the improvement of the curriculum materials. Curriculum developers may conduct regular assessments of the K to 12 Mathematics Curriculum and make modifications where necessary. Consequently, the Department of Education officials may seek for the opinion of teachers from other regions of the country to produce a more valid and reliable assessment.
5. This assessment study may be replicated in other divisions in the National Capital Region (NCR) to determine the strengths and weaknesses of the K to 12 Junior High

School Mathematics curriculum materials and validate the results of this study in a wider context and perspective.

6. Since conceptual/typographical errors are found on the curriculum materials, future researchers may focus their studies on a more in-depth analysis of the accuracy of the content of the curriculum materials.
7. The organization of the topics across grade levels may be a topic of interest for future researchers since it is very critical in the successful implementation of a spiral curriculum.

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APPENDIX A

Junior High School Mathematics Curriculum

The K to 12 Mathematics Curriculum Guides for Grade 7, Grade 8, Grade 9, and Grade 10 levels with the content, content standards, performance standards, learning competencies, codes of each one, and respective learning materials are as follows:

Table 1. K to 12 Mathematics Curriculum Guide for Grade 7

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
GRADE 7 – First Quarter				
Numbers and Number Sense	demonstrates understanding of key concepts of sets and the real number system.	is able to formulate challenging situations involving sets and real numbers and solve these in a variety of strategies.	1. describes well-defined sets, subsets, universal sets, and the null set and cardinality of sets.	M7NS -Ia-1
			2. illustrates the union and intersection of sets and the difference of two sets.	M7NS -Ia-2
			3. uses Venn Diagrams to represent sets, subsets, and set operations.	M7NS -Ib-1
			4. solves problems involving sets.	M7NS -Ib-2
			5. represents the absolute value of a number on a number line as the distance of a number from 0.	M7NS -Ic-1
			6. performs fundamental operations on integers.	M7NS -Ic-d-1
			7. illustrates the different properties of operations on the set of integers.	M7NS -Id-2
			8. expresses rational numbers from fraction form to decimal form and vice versa.	M7NS -Ie-1
			9. arranges rational numbers on a number line.	M7NS -Ie-2
			10. performs operations on rational numbers	M7NS -If-1
			11. describes principal roots and tells whether they are rational or irrational.	M7NS -Ig-1
			12. determines between what two integers the square root of a number is.	M7NS -Ig-2

			13. estimates the square root of a whole number to the nearest hundredth.	M7NS -Ig-3
			14. plots irrational numbers (up to square roots) on a number line.***	M7NS -Ig-4
			15. illustrates the different subsets of real numbers.	M7NS -Ih-1
			16. arranges real numbers in increasing or decreasing order.	M7NS -Ih-2
			17. writes numbers in scientific notation and vice versa.	M7NS -Ii-1
			18. represents real-life situations which involve real numbers.	M7NS -Ii-2
			19. solves problems involving real numbers.	M7NS -Ij-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 7- SECOND QUARTER				
Measurement	demonstrates understanding of the key concepts of measurement.	is able to formulate real-life problems involving measurements and solve these using a variety of strategies.	1. illustrates what it means to measure.	M7ME-IIa-1
			2. describes the development of measurement from the primitive to the present international system of units.	M7ME-IIa-2
			3. approximates the measures of quantities particularly length , weight/mass, volume, time, angle and temperature and rate.	M7ME-IIa-3
			4. converts measurements from one unit to another in both Metric and English systems.***	M7ME-IIb-1
			5. solves problems involving conversion of units of measurement.***	M7ME-IIb-2
Patterns and Algebra	demonstrates understanding of key concepts of algebraic expressions, the properties of real numbers as applied in linear equations, and	is able to model situations using oral, written, graphical, and algebraic methods in solving problems involving algebraic expressions, linear equations, and inequalities in one variable.	6. translates English phrases to mathematical phrases and vice versa.	M7AL-IIc-1
			7. interprets the meaning of where a^n is a positive integer.	M7AL-IIc-2
			8. differentiates between constants and variables in a given algebraic expression.	M7AL-IIc-3
			9. evaluates algebraic expressions for given values of the variables.	M7AL-IIc-4
			10. classifies algebraic expressions which are polynomials according to degree and number of terms.	M7AL-IId-1

	inequalities in one variable.		11. adds and subtracts polynomials.	M7AL -IId-2
			12. derives the laws of exponent.	M7AL -IId-e-1
			13. multiplies and divides polynomials.	M7AL -IIe-2
			14. uses models and algebraic methods to find the: (a) product of two binomials; (b) product of the sum and difference of two terms; (c) square of a binomial; (d) cube of a binomial; (e) product of a binomial and a trinomial.***	M7AL -IIe-g-1
			15. solves problems involving algebraic expressions.	M7AL -IIg-2
			16. differentiates between algebraic expressions and equations.	M7AL -IIh-1
			17. translates English sentences to mathematical sentences and vice versa.	M7AL -IIh-2
			18. differentiates between equations and inequalities.	M7AL -IIh-3
			19. illustrates linear equation and inequality in one variable.	M7AL -IIh-4
			20. finds the solution of linear equation or inequality in one variable.	M7AL -IIi-1
			21. solves linear equation or inequality in one variable involving absolute value by: (a) graphing; and (b) algebraic methods.	M7AL -IIi-j-1
			22. solves problems involving equations and inequalities in one variable.	M7AL -IIj-2
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 7- THIRD QUARTER				
Geometry	demonstrates understanding of key concepts of geometry of shapes and sizes, and geometric relationships.	is able to create models of plane figures and formulate and solve accurately authentic problems involving sides and angles of a polygon	23. represents point, line and plane using concrete and pictorial models.	M7GE -IIIa-1
			24. illustrates subsets of a line.	M7GE -IIIa-2
			25. classifies the different kinds of angles.	M7GE -IIIa-3
			26. derives relationships of geometric figures using measurements and by inductive	M7GE -IIIb-1

			reasoning; supplementary angles, complementary angles, congruent angles, vertical angles, adjacent angles, linear pairs, perpendicular lines, and parallel lines.***	
			27. derives relationships among angles formed by parallel lines cut by a transversal using measurement and by inductive reasoning.	M7GE-IIIc-1
			28. uses a compass and straightedge to bisect line segments and angles and construct perpendiculars and parallels.	M7GE-IIId-e-1
			29. illustrates polygons: (a) convexity; (b) angles; and (c) sides.	M7GE-IIIe-2
			30. derives inductively the relationship of exterior and interior angles of a convex polygon.	M7GE-IIIf-1
			31. illustrates a circle and the terms related to it: radius, diameter chord, center, arc, chord, central angle, and inscribed angle.	M7GE-IIIg-1
			32. constructs triangles, squares, rectangles, regular pentagons, and regular hexagons.	M7GE-IIIh-i-1
			33. solves problems involving sides and angles of a polygon.	M7GE-IIIj-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 7- FOURTH QUARTER				
Statistics and Probability	demonstrates understanding of key concepts, uses and importance of Statistics, data collection/gathering and the different forms of data representation, measures of central tendency, measures of	is able to collect and organize data systematically and compute accurately measures of central tendency and variability and apply these appropriately in data analysis and interpretation in different fields.	34. explains the importance of Statistics.	M7SP-IVa-1
			35. poses problems that can be solved using Statistics.	M7SP-IVa-2
			36. formulates simple statistical instruments.	M7SP-IVa-3
			37. gathers statistical data.	M7SP-IVb-1
			38. organizes data in a frequency distribution table.	M7SP-IVc-1
			39. uses appropriate graphs to represent organized data: pie chart, bar graph, line graph, histogram, and ogive.***	M7SP-IVd-e-1
			40. illustrates the measures of central tendency (mean, median, and mode) of a statistical data.	M7SP-IVf-1

	variability, and probability.		41. calculates the measures of central tendency of ungrouped and grouped data.	M7SP -IVf-g-1
			42. illustrates the measures of variability (range, average deviation, variance, standard deviation) of a statistical data.	M7SP -IVh-1
			43. calculates the measures of variability of grouped and ungrouped data.	M7SP -IVh-i-1
			44. uses appropriate statistical measures in analyzing and interpreting statistical data.	M7SP -IVj-1
			45. draws conclusions from graphic and tabular data and measures of central tendency and variability.	M7SP -IVj-2

Table 2. K to 12 Mathematics Curriculum Guide for Grade 8

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 8 - FIRST QUARTER				
Patterns and Algebra	demonstrates understanding of key concepts of factors of polynomials, rational algebraic expressions, linear equations and inequalities in two variables, systems of linear equations and inequalities in two variables and linear functions.	is able to formulate real-life problems involving factors of polynomials, rational algebraic expressions, linear equations and inequalities in two variables, systems of linear equations and inequalities in two variables and linear functions, and solve these problems accurately using a variety of strategies.	1. factors completely different types of polynomials (polynomials with common monomial factor, difference of two squares, sum and difference of two cubes, perfect square trinomials, and general trinomials).	M8AL -Ia-b-1
			2. solves problems involving factors of polynomials.	M8AL -Ib-2
			3. illustrates rational algebraic expressions.	M8AL -Ic-1
			4. simplifies rational algebraic expressions.	M8AL -Ic-2
			5. performs operations on rational algebraic expressions.	M8AL -Ic-d-1
			6. solves problems involving rational algebraic expressions.	M8AL -Id-2
			7. illustrates the rectangular coordinate system and its uses.***	M8AL -Ie-1
			8. illustrates linear equations in two variables.	M8AL -Ie-3
			9. illustrates the slope of a line.	M8AL -Ie-4
			10. finds the slope of a line given two points, equation, and graph.	M8AL -Ie-5

			11. writes the linear equation $ax + by = c$ in the form $y = mx + b$ and vice versa.	M8AL -If-1
			12. graphs a linear equation given (a) any two points; (b) the x – and y – intercepts; (c) the slope and a point on the line.***	M8AL -If-2
			13. describes the graph of a linear equation in terms of its intercepts and slope.***	M8AL -If-3
			14. finds the equation of a line given (a) two points; (b) the slope and a point; (c) the slope and its intercepts.	M8AL -Ig-1
			15. solves problems involving linear equations in two variables.	M8AL -Ig-2
			16. illustrates a system of linear equations in two variables.	M8AL -Ih-1
			17. graphs a system of linear equations in two variables.***	M8AL -Ih-2
			18. categorizes when a given system of linear equations in two variables has graphs that are parallel, intersecting, and coinciding.	M8AL -Ih-3
			19. solves a system of linear equations in two variables by (a) graphing; (b) substitution; (c) elimination.***	M8AL -Ii-j-1
			20. solves problems involving systems of linear equations in two variables.	M8AL -Ij-2
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 8 - SECOND QUARTER				
Patterns and Algebra	demonstrates key concepts of linear inequalities in two variables, systems of linear inequalities in two variables and linear functions.	is able to formulate and solve accurately real-life problems involving linear inequalities in two variables, systems of linear inequalities in two variables, and linear functions.	21. illustrates linear inequalities in two variables.	M8AL -IIa-1
			22. differentiates linear inequalities in two variables from linear equations in two variables.	M8AL -IIa-2
			23. graphs linear inequalities in two variables.	M8AL -IIa-3
			24. solves problems involving linear inequalities in two variables.	M8AL -IIa-4
			25. solves a system of linear inequalities in two variables.***	M8AL -IIb-1

			26. solves problems involving systems of linear inequalities in two variables.	M8AL -IIb-2
			27. illustrates a relation and a function.	M8AL -IIc-1
			28. verifies if a given relation is a function.	M8AL -IIc-2
			29. determines dependent and independent variables.	M8AL -IIc-3
			30. finds the domain and range of a function.	M8AL -IId-1
			31. illustrates a linear function.	M8AL -IId-2
			32. graphs a linear function's (a) domain; (b) range; (c) table of values; (d) intercepts; and (e) slope.	M8AL -IId-e-1
			33. solves problems involving linear functions.	M8AL -IIe-2
Geometry	demonstrates understanding of key concepts of logic and reasoning.	is able to communicate mathematical thinking with coherence and clarity in formulating and analyzing arguments.	34. determines the relationship between the hypothesis and the conclusion of an if-then statement.	M8GE -IIf-1
			35. transforms a statement into an equivalent if-then statement.	M8GE -IIf-2
			36. determines the inverse, converse, and contrapositive of an if-then statement.	M8GE -IIg-1
			37. illustrates the equivalences of: (a) the statement and its contrapositive; and (b) the converse and inverse of a statement.	M8GE -IIg-2
			38. uses inductive or deductive reasoning in an argument.	M8GE -IIh-1
			39. writes a proof (both direct and indirect).	M8GE -IIi-j-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 8 - THIRD QUARTER				
Geometry	demonstrates understanding of key concepts of axiomatic structure of geometry and triangle congruence.	1. is able to formulate an organized plan to handle a real-life situation.	40. describes a mathematical system.	M8GE -IIIa-1
			41. illustrates the need for an axiomatic structure of a mathematical system in general, and in Geometry in particular: (a) defined terms; (b) undefined terms; (c) postulates; and (d) theorems.	M8GE -IIIa-c-1
		2. is able to communicate	42. illustrates triangle congruence.***	M8GE -IIId-1

		mathematical thinking with coherence and clarity in formulating, investigating, analyzing, and solving real-life problems involving congruent triangles using appropriate and accurate representations.	43. illustrates the SAS, ASA and SSS congruence postulates.***	M8GE-IIId-e-1
			44. solves corresponding parts of congruent triangles	M8GE-IIIf-1
			45. proves two triangles are congruent.	M8GE-IIIg-1
			46. proves statements on triangle congruence.	M8GE-IIIh-1
			47. applies triangle congruence to construct perpendicular lines and angle bisectors.	M8GE-IIIi-j-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 8 - FOURTH QUARTER				
Geometry	demonstrates understanding of key concepts of inequalities in a triangle, and parallel and perpendicular lines.	is able to communicate mathematical thinking with coherence and clarity in formulating, investigating, analyzing, and solving real-life problems involving triangle inequalities, and parallelism and perpendicularity of lines using appropriate and accurate representations.	48. illustrates theorems on triangle inequalities (Exterior Angle Inequality Theorem, Triangle Inequality Theorem, Hinge Theorem).***	M8GE-IVa-1
			49. applies theorems on triangle inequalities.	M8GE-IVb-1
			50. proves inequalities in a triangle.	M8GE-IVc-1
			51. proves properties of parallel lines cut by a transversal.***	M8GE-IVd-1
			52. determines the conditions under which lines and segments are parallel or perpendicular.	M8GE-IVe-1
Statistics and Probability	demonstrates understanding of key concepts of probability.	is able to formulate and solve practical problems involving probability of simple events.	53. illustrates an experiment, outcome, sample space and event.***	M8GE-IVf-1
			54. counts the number of occurrences of an outcome in an experiment: (a) table; (b) tree diagram; (c) systematic listing; and (d) fundamental counting principle.***	M8GE-IVf-g-1
			55. finds the probability of a simple event.	M8GE-IVh-1

			56. illustrates an experimental probability and a theoretical probability.	M8GE-IVi-1
			57. solves problems involving probabilities simple events.	M8GE-IVi-j-1

Table 3. K to 12 Mathematics Curriculum Guide for Grade 9

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 9 - FIRST QUARTER				
Patterns and Algebra	demonstrates understanding of key concepts of quadratic equations, inequalities and functions, and rational algebraic equations.	is able to investigate thoroughly mathematical relationships in various situations, formulate real-life problems involving quadratic equations, inequalities and functions, and rational algebraic equations and solve them using a variety of strategies.	1. illustrates quadratic equations.	M9AL-Ia
			2. solves quadratic equations by: (a) extracting square roots; (b) factoring; (c) completing the square; and (d) using the quadratic formula.	M9AL-Ia-b-1
			3. characterizes the roots of a quadratic equation using the discriminant.	M9AL-Ic-1
			4. describes the relationship between the coefficients and the roots of a quadratic equation.	M9AL-Ic-2
			5. solves equations transformable to quadratic equations (including rational algebraic equations).	M9AL-Ic-d-1
			6. solves problems involving quadratic equations and rational algebraic equations.	M9AL-Ie-1
			7. illustrates quadratic inequalities	M9AL-If-1
			8. solves quadratic inequalities.	M9AL-If-2
			9. solves problems involving quadratic inequalities.	M9AL-If-g-1
			10. models real-life situations using quadratic functions.	M9AL-Ig-2
			11. represents a quadratic function using: (a) table of values; (b) graph; and (c) equation.	M9AL-Ig-3
			12. transforms the quadratic function defined by $y = ax^2 + bx + c$ into the form $y = a(x - h)^2 + k$.	M9AL-Ih-1

			13. graphs a quadratic function: (a) domain; (b) range; (c) intercepts; (d) axis of symmetry; (e) vertex; (f) direction of the opening of the parabola.	M9AL-Ig-h-i-1
			14. analyzes the effects of changing the values of a, h and k in the equation $= a(x - h)^2 + k$ of a quadratic function on its graph.***	M9AL-Ii-2
			15. determines the equation of a quadratic function given: (a) a table of values; (b) graph; (c) zeros.	M9AL-Ij-1
			16. solves problems involving quadratic functions.	M9AL-Ii-j-2
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 9 - SECOND QUARTER				
Patterns and Algebra	demonstrates understanding of key concepts of variation and radicals.	is able to formulate and solve accurately problems involving radicals.	17.illustrates situations that involve the following variations: (a) direct; (b) inverse; (c) joint; (d) combined.	M9AL-IIa-1
			18.translates into variation statement a relationship between two quantities given by: (a) a table of values; (b) a mathematical equation; (c) a graph, and vice versa.	M9AL-IIa-b-1
			19.solves problems involving variation.	M9AL-IIb-c-1
			20.applies the laws involving positive integral exponents to zero and negative integral exponents.	M9AL-IId-1
			21.illustrates expressions with rational exponents.	M9AL-IId-2
			22.simplifies expressions with rational exponents.	M9AL-IIe-1
			23.writes expressions with rational exponents as radicals and vice versa.	M9AL-IIf-1
			24.derives the laws of radicals.	M9AL-IIf-2
			25.simplifies radical expressions using the laws of radicals.	M9AL-IIg-1
			26.performs operations on radical expressions.***	M9AL-IIh-1
			27.solves equations involving radical expressions.***	M9AL-IIi-1

			28. solves problems involving radicals.	M9AL-IIj-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 9 - THIRD QUARTER				
Geometry	demonstrates understanding of key concepts of quadrilaterals (parallelograms, trapezoids, kites) and triangle similarity.	is able to investigate, analyze, and solve problems involving quadrilaterals (parallelograms, trapezoids, kites) and triangle similarity through appropriate and accurate representation.	29. identifies quadrilaterals that are parallelograms.	M9GE-IIIa-1
			30. determines the conditions that guarantee a quadrilateral a parallelogram.	M9GE-IIIa-2
			31. uses properties to find measures of angles, sides and other quantities involving parallelograms.	M9GE-IIIb-1
			32. proves theorems on the different kinds of parallelogram (rectangle, rhombus, square).	M9GE-IIIc-1
			33. proves the Midline Theorem.	M9GE-IIId-1
			34. proves theorems on trapezoids and kites.	M9GE-IIId-2
			35. solves problems involving parallelograms, trapezoids and kites.	M9GE-IIIe-1
			36. describes a proportion.	M9GE-IIIf-1
			37. applies the fundamental theorems of proportionality to solve problems involving proportions.	M9GE-IIIf-2
			38. illustrates similarity of figures.	M9GE-IIIg-1
			39. proves the conditions for similarity of triangles. *** 39.1 SAS similarity theorem 39.2 SSS similarity theorem 39.3 AA similarity theorem 39.4 right triangle similarity theorem 39.5 special right triangle theorems	M9GE-IIIg-h-1
			40. applies the theorems to show that given triangles are similar.	M9GE-IIIi-1
			41. proves the Pythagorean Theorem.	M9GE-IIIi-2
			42. solves problems that involve triangle similarity and right triangles.***	M9GE-IIIj-1

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 9 - FOURTH QUARTER				
Geometry	demonstrates understanding of the basic concepts of trigonometry.	is able to apply the concepts of trigonometric ratios to formulate and solve real-life problems with precision and accuracy	43. illustrates the six trigonometric ratios: sine, cosine, tangent, secant, cosecant, and cotangent.	M9GE-IVa-1
			44. finds the trigonometric ratios of special angles.	M9GE-IVb-c-1
			45. illustrates angles of elevation and angles of depression.	M9GE-IVd-1
			46. uses trigonometric ratios to solve real-life problems involving right triangles. ***	M9GE-IVe-1
			47. illustrates laws of sines and cosines.	M9GE-IVf-g-1
			48. solves problems involving oblique triangles.	M9GE-IVh-j-1

Table 4. K to 12 Mathematics Curriculum Guide for Grade 10

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 10 - FIRST QUARTER				
Patterns and Algebra	demonstrates understanding of key concepts of sequences, polynomials and polynomial equations.	is able to formulate and solve problems involving sequences, polynomials and polynomial equations in different disciplines through appropriate and accurate representations.	1. generates patterns.***	M10AL-Ia-1
			2. illustrates an arithmetic sequence	M10AL-Ib-1
			3. determines arithmetic means and nth term of an arithmetic sequence.***	M10AL-Ib-c-1
			4. finds the sum of the terms of a given arithmetic sequence.***	M10AL-Ic-2
			5. illustrates a geometric sequence.	M10AL-Id-1
			6. differentiates a geometric sequence from an arithmetic sequence.	M10AL-Id-2
			7. differentiates a finite geometric sequence from an infinite geometric sequence.	M10AL-Id-3

			8. determines geometric means and nth term of a geometric sequence.***	M10AL -Ie-1
			9. finds the sum of the terms of a given finite or infinite geometric sequence.***	M10AL -Ie-2
			10. illustrates other types of sequences (e.g., harmonic, Fibonacci).	M10AL -If-1
			11. solves problems involving sequences.	M10AL -If-2
			12. performs division of polynomials using long division and synthetic division.	M10AL -Ig-1
			13. proves the Remainder Theorem and the Factor Theorem.	M10AL -Ig-2
			14. factors polynomials.	M10AL -Ih-1
			15. illustrates polynomial equations.	M10AL -Ii-1
			16. proves Rational Root Theorem.	M10AL -Ii-2
			17. solves polynomial equations.	M10AL -Ij-1
			18. solves problems involving polynomials and polynomial equations.	M10AL -Ij-2
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 10 - SECOND QUARTER				
Patterns and Algebra	demonstrates understanding of key concepts of polynomial function.	is able to conduct systematically a mathematical investigation involving polynomial functions in different fields.	19. illustrates polynomial functions.	M10AL -IIa-1
			20. graphs polynomial functions.	M10AL -IIa-b-1
			21. solves problems involving polynomial functions.	M10AL -IIb-2
Geometry	demonstrates understanding of key concepts of circles and coordinate geometry.	1. is able to formulate and find solutions to challenging situations involving circles and other related terms in different	22. derives inductively the relations among chords, arcs, central angles, and inscribed angles.	M10GE -IIc-1
			23. proves theorems related to chords, arcs, central angles, and inscribed angles.	M10GE -IIc-d-1
			24. illustrates secants, tangents, segments, and sectors of a circle.	M10GE -IIe-1

		disciplines through appropriate and accurate representations. 2. is able to formulate and solve problems involving geometric figures on the rectangular coordinate plane with perseverance and accuracy.	25. proves theorems on secants, tangents, and segments.	M10GE-IIe-f-1
			26. solves problems on circles.	M10GE-IIf-2
			27. derives the distance formula.	M10GE-IIg-1
			28. applies the distance formula to prove some geometric properties.	M10GE-IIg-2
			29. illustrates the center-radius form of the equation of a circle.	M10GE-IIh-1
			30. determines the center and radius of a circle given its equation and vice versa.	M10GE-IIh-2
			31. graphs a circle and other geometric figures on the coordinate plane.***	M10GE-IIi-1
			32. solves problems involving geometric figures on the coordinate plane.	M10GE-IIi-j-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 10 - THIRD QUARTER				
Statistics and Probability	demonstrates understanding of key concepts of combinatorics and probability.	is able to use precise counting technique and probability in formulating conclusions and making decisions.	33. illustrates the permutation of objects.	M10SP-IIIa-1
			34. derives the formula for finding the number of permutations of objects taken at a time. n r	M10SP-IIIa-2
			35. solves problems involving permutations.	M10SP-IIIb-1
			36. illustrates the combination of objects.	M10SP-IIIc-1
			37. differentiates permutation from combination of *n* objects taken *r* at a time.	M10SP-IIIc-2
			38. derives the formula for finding the number of combinations of *n* objects taken *r* at a time	M10SP-IIId-1
			39. solves problems involving permutations and combinations.	M10SP-IIId-e-1
			40. illustrates events, and union and intersection of events.	M10SP-IIIf-1
			41. illustrates the probability of a union of two events.	M10SP-IIIg-1
			42. finds the probability of $(A \cup B)$.	M10SP-IIIg-h-1

			43. illustrates mutually exclusive events.	M10SP -IIIi-1
			44. solves problems involving probability.	M10SP -IIIi-j-1
CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE
	The learner …	The learner …	The learner …	
Grade 10 – FOURTH QUARTER				
Statistics and Probability	demonstrates understanding of key concepts of measures of position.	is able to conduct systematically a mini-research applying the different statistical methods.	45. illustrates the following measures of position: quartiles, deciles and percentiles.***	M10SP -IVa-1
			46. calculates a specified measure of position (e.g. 90th percentile) of a set of data.	M10SP -IVb-1
			47. interprets measures of position.	M10SP -IVc-1
			48. solves problems involving measures of position.	M10SP -IVd-e-1
			49. formulates statistical mini-research.	M10SP -IVf-g-1
			50. uses appropriate measures of position and other statistical methods in analyzing and interpreting research data.	M10SP -IVh-j-1

Table 5. Summary of the Contents of Junior High School Mathematics Spiraling Curricula

	First Quarter	*Second Quarter*	*Third Quarter*	*Fourth Quarter*
Grade7	1. Numbers and Number Sense	1. Measurement 2. Patterns and Algebra	1. Geometry	1. Statistics and Probability
Grade 8	1. Patterns and Algebra	1. Patterns and Algebra 2. Geometry	1. Geometry	1. Geometry 2. Statistics and Probability
Grade 9	1. Patterns and Algebra	1. Patterns and Algebra	1. Geometry	1. Geometry
Grade 10	1. Patterns and Algebra	1. Patterns and Algebra 2. Geometry	1. Statistics and Probability	1. Statistics and Probability

APPENDIX B

Letter to the Instrument Validator

Date: _____

_____

_____

_____

Greetings in the name of our Lord Jesus Christ!

I am currently writing my thesis entitled "Assessment of Junior High School Mathematics Curriculum Materials" as a partial fulfillment of the requirements for the degree Master of Arts in Education with specialization in Mathematics Education in Philippine Normal University - Manila.

As an expert in the field of _____, I would like to ask a favor from your good office to validate the instrument that I have prepared. I come up with an instrument in the form of a questionnaire which I will be utilizing for my research endeavor.

I have attached herewith the rationale of the study, validation matrix, and the instrument.

Your favorable consideration of my request will be highly appreciated.

Very respectfully yours,

DAVE CARLOS A. CALIXTO
Researcher

APPENDIX C

Instrument Validation Matrix

Assessment of Junior High School Mathematics Curriculum Materials

Direction: At the scale of 1 to 5, 1 being the lowest and 5 being the highest, rate the validity of the instrument to be used in the study.

I. FORMAT AND DESIGN	
1. The format of the instrument is simple.	
2. The instrument is easy to read.	
3. The font style and the size are appropriate.	
4. The lay-out is proportional.	
5. The instrument conveys logical sequence.	
II. CONTENT	
1. It contains all the necessary components to be assessed.	
2. It relates to measurable attributes.	
3. It is aligned with the objectives of the study.	
4. It gives emphasis to the spiraling of the curriculum contents.	
5. It is reliable.	
III. CLARITY	
1. It is expressed in a language that is understandable.	
2. It provides the research with a clear set of criteria.	
3. It is expressed in the simplest way.	
4. The directions are clear.	
5. The directions are easy to follow.	
IV. USEFULNESS	
1. It is a valuable assessment tool.	
2. It is free from bias.	
3. It is easy to administer.	
4. It is relevant to the needs of the time.	
5. It is appropriate for the study.	

Other comments and/or suggestions for improvement:

_____

APPENDIX D

Instrument Validation Computation and Summary Tables

	Experts						
CATEGORIES	**1**	**2**	**3**	**4**	**Total**	**Mean**	**Interpretatio**
I. FORMAT AND DESIGN							
1. The format of the instrument is simple.	2	4	5	3	14	3.5	Suitable
2. The instrument is easy to read.	3	5	4	4	16	4.0	Suitable
3. The font style and the size are appropriate.	3	5	3	5	16	4.0	Suitable
4. The lay-out is proportional.	2	5	4	5	16	4.0	Suitable
5. The instrument conveys logical sequence.	2	4	4	4	14	3.5	Suitable
II. CONTENT							
1. It contains all the necessary components to be assessed.	2	3	4	3	12	3.0	Needs Improvement
2. It relates to measurable attributes.	2	4	4	2	12	3.0	Needs Improvement
3. It is aligned with the objectives of the study.	3	4	5	3	15	3.75	Suitable
4. It gives emphasis to the spiraling of the curriculum contents.	2	4	4	3	14	3.5	Suitable
5. It is reliable.	2	4	5	3	14	3.5	Suitable
III. CLARITY							
1. It is expressed in a language that is understandable.	3	4	4	2	13	3.25	Needs Improvement
2. It provides the research with a clear set of criteria.	3	4	4	2	13	3.25	Needs Improvement
3. It is expressed in the simplest way.	2	4	4	2	12	3.0	Needs Improvement
4. The directions are clear.	3	4	5	4	16	4.0	Suitable
5. The directions are easy to follow.	3	4	5	4	16	4.0	Suitable

IV. USEFULNESS							
1. It is a valuable assessment	2	4	4	5	15	3.75	Suitable
2. It is free from bias.	3	4	5	5	17	4.25	Suitable
3. It is easy to administer.	3	4	5	5	17	4.25	Suitable
4. It is relevant to the needs of the time.	2	4	4	5	15	3.75	Suitable
5. It is appropriate for the study.	2	4	4	5	15	3.75	Suitable
Total	49	82	87	74	292	73	
Mean	2.45	4.1	4.35	3.7	14.6	**3.65**	**Suitable**

Evaluation Scale
5 – Strongly Agree
4 - Agree
3 – Slightly Agree
2 - Disagree
1 – Strongly Disagree

The Equivalent Mean Range and its Interpretation

Mean Range	**Description**
3.50 – 5.00	Suitable
2.50 – 3.49	Needs Improvement
1.00 – 2.49	Not Suitable

Instrument Validation Summary

	Expert 1	**Expert 2**	**Expert 3**	**Expert 4**	**Mean**
I. Format and Design	2.4	4.6	4	4.2	3.8
II. Content	2.2	3.8	4.6	2.8	3.35
III. Clarity	2.8	4	4.4	2.8	3.5
IV. Usefulness	2.4	4	4.4	5	3.95
Mean	**2.45**	**4.1**	**4.35**	**3.7**	**3.65**

Interpretation: **SUITABLE**

Evaluation Scale
5 – Strongly Agree
4 - Agree
3 – Slightly Agree
2 - Disagree
1 – Strongly Disagree

The Equivalent Mean Range and its Interpretation

Mean Range	**Description**
3.50 – 5.00	Suitable
2.50 – 3.49	Needs Improvement
1.00 – 2.49	Not Suitable

APPENDIX E

Endorsement Letter

FIRST ENDORSEMENT

March 13, 2018

Respectfully forwarded to _____, this Division, this City, inviting attention to the herewith request-letter of Dave Carlos A. Calixto, Teacher III in this school to administer a researcher-made questionnaire and conduct an interview to selected mathematics teachers in the District I of the Division of City Schools - Valenzuela, and recommending approval.

_____
Name of Principal

_____
Position/Designation

_____
Name of School

Appendix F

REQUEST LETTER FOR THE CONDUCT OF STUDY

Date: _____

_____
_____
_____

Sir:

I have the honor to request permission to administer a researcher-made questionnaire and conduct an interview to selected Junior High School mathematics teachers in the District I of the Division of City Schools – Valenzuela.

This request is in connection with the completion of my thesis entitled "ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS" as partial fulfillment of the requirements for degree in Master of Arts in Education with specialization in Mathematics Education at the Philippine Normal University. It aims to gather data that aims to determine the strengths and weaknesses of the Junior High School Mathematics curriculum materials.

Hoping that the above-mentioned merits your immediate action.

Respectfully yours,

Dave Carlos A. Calixto
Researcher

Noted by:

_____
Name of Principal

_____
Name of School

APPENDIX G

Request Letter for the School Heads

Date: _____

_____
_____
_____

Sir/Madam:

I have the honor to request permission to administer a researcher-made questionnaire and conduct an interview to selected mathematics teachers of ____(Name of School) _____.

This request is in connection with the completion of my research study entitled "ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS" in partial fulfillment of the requirements for the degree of Master of Arts in Education with specialization in Mathematics Education at the Philippine Normal University. It aims to gather data that will determine the strengths and weaknesses of the K to 12 Junior High School Mathematics curriculum materials and in turn providing inputs for curriculum materials improvement.

Your earnest approval to this request is highly appreciated.

Respectfully yours,

DAVE CARLOS A. CALIXTO
Researcher

Approved by:

_____
_____
_____

APPENDIX H

Letter of Introduction for Participants

Date: _____

Dear Sir/Madam:

Good day!

This letter is in connection with the completion of my research study entitled "ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS" in partial fulfillment of the requirements for the degree of Master of Arts in Education with specialization in Mathematics Education at the Philippine Normal University – Manila.

In 2012, the Department of Education launched the K to 12 Program in its eager desire to produce holistically developed learners who acquire 21st century skills. The learners of the 21st century are expected to be highly competent since industries nowadays require them to think *outside of the box*, probe questions, solve problems from different perspectives, and demonstrate an innovative way of thinking.

The twin goals of the K to 12 Mathematics Education is to mold learners with critical thinking and problem solving skills. The first batch of completers for Junior High School is already Grade 12 now and feedbacks on the Junior High School Mathematics Curriculum have been heard from various stakeholders. Some issues include the adequacy of curriculum materials, teacher pedagogies, and seminar-trainings.

In light of the implementation of the K to 12 Program, the curriculum materials has to be assessed rigorously to determine its strong and weak points. The focus of this study would be the analysis of the content of the curriculum materials. Content analysis of curriculum involves an examination of the adequacy of a set of materials in relation to its treatment of the discipline, learner(s), and the teacher as mentioned by Confrey and Stohl (2004).

The assessment of the participants will help the researcher determine the strengths and weaknesses of the content of the curriculum materials. This study, in turn, could provide inputs for the improvement of Junior High School Mathematics curriculum materials.

I am hoping for your participation to help me realize the objectives of this research endeavor.

Very respectfully yours,

DAVE CARLOS A. CALIXTO
Researcher

APPENDIX I

Informed Consent Form for Participants

I, _____ being over the age of 18 years old (legally independent) hereby consent to participate/be a respondent in this project entitled: **Assessment of Junior High School Mathematics Curriculum Materials.**

I am aware that I should keep a copy of the Letter of Introduction and Consent Form for future reference;

I understand that:

I may not directly benefit from taking part in this research.

I am free to withdraw from the participation in this research at any time and I am free to refuse to answer particular questions.

While the information gained in the study will be published as explained, I will not be identified, and individual information will remain confidential.

I may ask the audio recording be stopped at any time, and that I may withdraw at any time from the interview without disadvantage.

Participant's Signature: _____ Date: _____

I certify that I have explained the purpose of research to the participant and consider that he/she understands what is involved and liberally consents to participate.

DAVE CARLOS A. CALIXTO
Researcher
(Signature over printed name)

_____
Date

APPENDIX J

Survey-Questionnaire Form

Name of Teacher (Optional): _____
Teaching Position: _____ Length of Teaching Experience (in years): ____
School: _____ Grade Level Currently Teaching: ____

ASSESSMENT OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM MATERIALS

Dimension 1: **DISCIPLINE-ORIENTED DIMENSION**

Clarity, Comprehensiveness, Accuracy,
Depth of Mathematical Inquiry and Mathematical Reasoning, Organization, and Balance

To the teacher: Please assess the content of Junior High School Mathematics curriculum materials in terms of discipline-oriented dimension. Put tick marks (/) inside the box where your specific descriptions of each criterion apply.

1. CLARITY

The objectives of the content of the curriculum materials are clear such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
The purpose of the lesson is clearly established.				
The learning competencies are clearly stated.				
The pre-requisites of the lesson are stated.				
The time allotment is stated.				

What are your other perceptions on the objectives of the contents?

_____

_____

_____

_____

2. COMPREHENSIVENESS

The content of the curriculum materials is comprehensive such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It introduces standard procedures.				
It gives practice for developing skills.				
It covers all the skills that students should master in a lesson.				
It discusses word problems completely and with breadth.				
It relates to other topics across grade levels.				

What are your perceived gaps (missing parts/competencies) on the content of curriculum materials?

_____

_____

_____

3. ACCURACY

The content of the curriculum materials is accurate such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It establishes the correctness and precise meaning of ideas and patterns.				
It gives precise definitions of concepts.				
It provides accurate solution to every word problem.				
It presents updated information.				

*Please indicate the grade level, page number(s), and the **conceptual** and/or **typographical** errors you have encountered on the curriculum material:*

_____

_____

_____

Please use extra sheet of paper when necessary.

4. DEPTH OF MATHEMATICAL INQUIRY AND MATHEMATICAL REASONING

The content of curriculum materials focuses on the depth of mathematical inquiry and mathematical reasoning such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It identifies and develops mathematical patterns.				
It develops critical thinking and problem solving skills.				
It presents examples of varying difficulty.				
It provides questions that could allow deepening of one's understanding of the lesson.				

What are your other perceptions on mathematical inquiry and mathematical reasoning as reflected on the curriculum material?

_____

_____

_____

5. ORGANIZATION

The content of curriculum materials is organized such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It presents a logical sequencing of activities.				
It designs the spiraling of lessons in increasing levels of difficulty.				
Topics within the grade level are well-arranged.				
Topics across other grade levels are well-arranged.				

What are your specific suggestions for the sequencing of activities or content topics?

_____

_____

_____

6. BALANCE

The content of the curriculum materials is balanced such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
Conceptual knowledge is covered.				
Procedural knowledge is covered.				
Theories are discussed together with their applications.				
Numerical data and tables, graphs, and equations are equally used as representations.				

Please specify your other perceptions in balance on the curriculummaterials:

_____

_____

_____

Dimension 2: **LEARNER-ORIENTED DIMENSION**

Engagement, Timeliness and Support for Diversity and Assessment

To the teacher: Please assess the content of Junior High School Mathematics curriculum materials in terms of learner-oriented dimension. Put tick marks (/) inside the box where your specific descriptions of each criterion apply.

1. ENGAGEMENT

The content of the curriculum materials allows student engagement such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It builds on prior knowledge of the students.				
It provides fun and enjoyable activities.				
It caters to individual interests of the students.				
It addresses compelling misconceptions of the students.				

Are your students engaged with the activities found in curriculum material? Do they enjoy the activities presented in every content?

_____

_____

_____

2. TIMELINESS AND SUPPORT FOR DIVERSITY

The content of curriculum materials is timely and supportive of learners' diversity such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It has appropriate pace of instruction.				
It follows timely discussion of topics.				
It scaffolds for those needing more assistance.				
It provides extensions for those ready for more challenge.				

What are your other comments on the timeliness and support for diversity of the curriculum material?

_____

_____

_____

_____

3. ASSESSMENT

The content of curriculum materials includes assessment of learning such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It includes various types of assessments.				
It provides well-aligned summative assessments.				
It allows assessment of content standards.				
It allows assessment of performance standards.				
It allows assessment of 21st century skills.				

Please specify your suggestions on assessment:

_____

_____

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_____

Dimension 3: **RESOURCE-ORIENTED DIMENSION**

Pedagogy, Resources, and Professional Development

To the teacher: Please assess the content of Junior High School Mathematics curriculum materials in terms of resource-oriented dimension. Put tick marks (/) inside the box where your specific descriptions of each criterion apply.

1. PEDAGOGY

The content of the curriculum materials reflects an efficient pedagogy such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It employs student-centered approaches.				
It employs teacher-centered approaches.				
It utilizes varied teaching strategies.				
It is tailored on the needs of the students.				
It is aligned with the K to 12 Mathematics Curriculum Framework in terms of developing critical thinking and problem solving skills.				

Please justify your response.

_____

_____

_____

_____

2. RESOURCES

The content of the curriculum materials needs resources such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
The resources are varied.				
The resources are localized.				
The resources are indigenized.				
The resources are flexible.				

What are your perceived problems with the curriculum resources?

_____

_____

_____

3. PROFESSIONAL DEVELOPMENT

The content of the curriculum materials requires professional development for teachers such that:	Strongly Disagree	Disagree	Agree	Strongly Agree
It focuses on content knowledge.				
It discusses pedagogical content knowledge.				
It promotes reflective teaching.				
It introduces new technologies and trends in mathematics education.				

Please indicate the title and/or theme of seminars and trainings you attended under the K to 12 Curriculum: (Use extra sheet of paper when necessary.)

_____

_____

_____

What was your over-all perception of the seminars and trainings conducted by the Department of Education in terms of its usefulness to your work as a teacher?

_____

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Appendix K

Semi-Structured Interview Guide

1. What are the strengths of the Junior High School Mathematics Curriculum materials?
2. What are the weaknesses of the Junior High School Mathematics Curriculum materials?
    2.1. Could you provide specific examples?
    2.2. How do you address the weaknesses of the materials?
    2.3. What can you suggest to improve the curriculum materials?

APPENDIX L

Sample Interview Transcript

Researcher:	*Good morning, Ma'am. This interview serves as follow-up on your responses in the questionnaire entitled "Assessment of Junior High School Mathematics Curriculum Materials".*
Teacher:	*Good morning. Alright.*
Researcher:	*Do you use the curriculum materials in teaching?*
Teacher:	*Yes.*
Researcher:	*What are the strengths of the Junior High School Mathematics Curriculum materials?*
Teacher:	*The content topics are arranged according to the degree of difficulty – basic to complex. This enables learners to grasp the topic easier since it builds on the strong foundation of concepts in Mathematics. In addition to this, the materials provide various activities which help the students develop their critical and problem solving thinking skills. It also provides problems which are related to real-life situations which can help students realize the application of mathematical concepts in daily lives.*
Researcher:	*What are the weaknesses of the Junior High School Mathematics Curriculum materials?*
Teacher:	*Firstly, some topics do not have continuity on the next grade level. Consequently, students tend to have short retention of the content topics. Secondly, there are chapters in the materials that are still congested.*
Researcher:	*Could you cite an example for the first weakness you mentioned?*
Teacher:	*Statistics and Probability is discussed only in Grade 7 and Grade 8, and then in Grade 10. No topic under this content is discussed in Grade 9.*
Researcher:	*What do you do to address this gap?*
Teacher:	*I usually provide review exercises every time that a lesson demands for a pre-requisite skill. Oftentimes, it entails much time and I cannot finish everything indicated on the curriculum materials.*
Researcher:	*Would you mind to cite an example for the second weakness you mentioned?*
Teacher:	*It is my first time to teach Grade 10 students this year but my co-teachers in the department skipped the lessons on Circles for the second time because of the congestion of topics.*
Researcher:	*Could you please explain what you mean by congestion?*
Teacher:	*Congestion means having so many content topics in a quarter that it is likely that teachers will not be able to discuss everything with breadth or even worse, will not be able to finish the scope of the curriculum materials.*
Researcher:	*Okay. What then are your suggestions to improve the curriculum materials?*
Teacher:	*Curriculum experts may revisit the arrangement and distribution of the topics on the materials.*
Researcher:	*Thank you very much for sharing your time and thoughts with me. Have a nice day ahead.*
Teacher:	*You are welcome.*

CURRICULUM VITAE

Dave Carlos A. Calixto

122 Narra Street, Wawang Pulo, Valenzuela City
(02) 281-2072, (+63) 975-648-3630
deyvkarlos@gmail.com, dcdajc_24@yahoo.com

PROFESSIONAL QUALIFICATIONS

- Deeply committed in educating the youth and to continuously strive for excellence
- Passionate in teaching, learning, and student success
- Well-organized and capable of working under pressure
- Remarkable ability to follow and implement instructional process

TEACHING EXPERIENCES

Senior High School Mathematics Teacher (June 2017 – Present)
Lawang Bato National High School, Valenzuela City

Has been teaching Business Mathematics, General Mathematics, Statistics and Probability, Practical Research 1 (Qualitative Research), and Practical Research 2 (Quantitative Research)..

Junior High School Mathematics Teacher (June 2010 – May 2017)
Vicente P. Trinidad National High School, Valenzuela City

Worked as a grade level chairman whose functions involved monitoring of students' behavior and ensuring completeness and accuracy of forms made by class advisers.

Received Principal Citation Awards for winning students in various academic and co-curricular competitions.

Taught Elementary Algebra, Intermediate Algebra, Geometry, and Advanced Algebra and Trigonometry.

EDUCATION & HONORS

Graduate (2014 – 2019)
Philippine Normal University - Manila
Master of Arts in Education with specialization in Mathematics Education
Graduated April 2019

Tertiary (2005 – 2009)
University of the Philippines – Diliman, Quezon City
Bachelor of Secondary Education major in Mathematics and minor in Chemistry
Graduated November 2009

Secondary (2001 – 2005)
Polo National High School, Valenzuela City
Batch 4th Honorable Mention
Graduated April 2005

SEMINARS AND TRAININGS ATTENDED

Primary (1995 – 2001)

Wawang Pulo Elementary School, Valenzuela City
Batch Valedictorian
Graduated March 2001

- **MASS TRAINING OF SENIOR HIGH SCHOOL (SHS) TEACHERS ON ACADEMIC TRACK AND TECHNICAL-VOCATIONAL AND LIVELIHOOD TRACK**
  Department of Education - National Capital Region
  January 18 – February 4, 2018, Atrium Hotel, Pasay City

- **MATHTED's 11th BIENNIAL INTERNATIONAL CONFERENCE ON MATHEMATICS EDUCATION**
  Philippine Council of Mathematics Teacher Educators (MATHTED), Inc. in partnership with De La Salle University – Dasmariñas, Mathematics and Statistics Department. October 19 – 21, 2017, De La Salle University, Dasmariñas, Cavite

- **SENIOR HIGH SCHOOL (SHS) MASS TRAINING WORKSHOP ON COMMON/GENERAL TOPICS**
  Human Resource Development Division
  National Educators Academy of the Philippines (NEAP)
  September 4 – 8, 2017, Eurotel Hotel – North EDSA, Quezon City

- **INTERNATIONAL SEMINAR-WORKSHOP ON MATHEMATICS**
  Philippine Association for the Career Advancement of Educators (PACAE)
  September 2 – 4, 2016, Baguio City

- **REGIONAL WRITESHOP ON THE DEVELOPMENT OF LEARNING MATERIALS IN MATHEMATICS**
  Department of Education - NCR (NEAP - RELC)
  August 2 – 5, 2016, Marikina City

- **NATIONAL SEMINAR-WORKSHOP ON MATHEMATICS AND SCIENCE EDUCATION IN THE K+12 CURRICULUM**
  Institute of Leaders in Educational Advancement and Development (i.LEAD)
  January 22 – 24, 2016, Baguio City

- **MTAP - DepEd - NCR Seminar Workshop in Mathematics with the Theme: *"Equipping Teachers for K-12"***
  Department of Education – National Capital Region
  October 4 – 5, 2014, San Francisco High School, Quezon City

- **POLICY, GOVERNANCE, AND CAPACITY BUILDING (PGCB) CONFERENCE FOR PHILIPPINE EDUCATORS**
  TEMASEK Foundation - Ateneo de Manila University
  May 29 – 31, 2014, Quezon City

- **MTAP - DepEd - NCR Seminar Workshop in Mathematics with the Theme: *"Meeting the Challenges of the K-12 Basic Education Curriculum"***
  Department of Education – National Capital Region
  August 31 – September 1, 2013, Quezon City Science High School, Quezon City

- **MTAP - DepEd - NCR Seminar Workshop in Mathematics with the Theme: "*Meeting the Challenges of the K-12 Basic Education Curriculum*"**
  Department of Education – National Capital Region
  October 6 – 7, 2012, Quezon City Science High School, Quezon City

- **TEACHER TRAINING WORKSHOP: Effective Pedagogical Approaches in Teaching High School Math**
  TEMASEK Foundation - Ateneo de Manila University
  April 25 – 27, 2012, Quezon City

ACHIEVEMENTS

Passed the Suken Certification Test for 3rd Kyu
Winning Trainor in the Sectoral Individual Finals during the 2017 Metrobank-MTAP-DepEd Math Challenge
Tower of Hanoi Champion for two consecutive years (Division Level)
Winning Coach in various Mathematics-related contests