

## Coherence Analysis of the Philippine Kto10 Numbers and Number Sense Most Essential Learning Competencies in the Time of Pandemic

Kelvin Carl D. Fulay<sup>1,3\*</sup>, Alex P. Furio<sup>2,3</sup>, Ryan V. Dio<sup>3</sup>, Ritzelda A. Deri<sup>3</sup>

J.P. Laurel High School, Bulan, Sorsogon, Philippines<sup>1</sup>  
San Roque National High School, Bulusan, Sorsogon, Philippines<sup>2</sup>  
Sorsogon State University, Sorsogon City, Philippines<sup>3</sup>

\*Corresponding author: [kelvincarl.fulay@deped.gov.ph](mailto:kelvincarl.fulay@deped.gov.ph)

**Published:** 20 June 2023

**To cite this article (APA):** Fulay, K. C., Furio, A. P., Dio, R. V., & Deri, R. A. (2023). Coherence Analysis of the Philippine Kto10 Numbers and Number Sense Most Essential Learning Competencies in the Time of Pandemic. *EDUCATUM Journal of Science, Mathematics and Technology*, 10(1), 18–27. <https://doi.org/10.37134/ejsmt.vol10.1.3.2023>

**To link to this article:** <https://doi.org/10.37134/ejsmt.vol10.1.3.2023>

### Abstract

The effect of the COVID-19 Pandemic brought changes in different sectors, particularly in education. There were shifts in the learning modalities, facilities, and schedules as well as in the integration of teaching-learning strategies. One of the solutions implemented by the Department of Education to assure that all the learning competencies will be covered for the entire school year was the transformation of the K to 10 Mathematics Curriculum into the identified Most Essential Learning Competencies (MELCs). This study determined the comparison between the K to 10 Mathematics Curriculum and the Most Essential Learning Competencies along Number and Number Sense. The descriptive analysis qualitative method was used to answer the problems set in the study. Analysis of data was done through mapping the Most Essential Learning Competencies in Numbers and Number Sense. Also, the qualitative approach to the analysis of the MELC is supported by the feedback and experiences of 10 mathematics teacher-informants (3Males, 7Females). Data suggest that from the original 120 listed learning competencies in Numbers and Number Sense K to 10 Mathematics Curriculum, only 83.33% of them have been retained in the MELC. The findings of the study also show the coherence of the MELC and the teaching emphasis on Numbers and Number Sense. Finally, future studies may be undertaken to further analyze the gaps in the analysis of the Most Essential Learning Competencies along Numbers and Number Sense.

**Keywords:** Coherence Analysis, Numbers and Number Sense, Most Essential Learning Competencies

### INTRODUCTION

Mathematics is one of the most essential fields in education for it is a single subject that pervades life at any age and in any circumstances. Thus, its values go beyond the classroom and the school [1]. Most of the fields need the application of Mathematics. Mathematics as a school subject, therefore, must be taught and learned comprehensively and with much depth. Many mathematics educators have recommended that the process of learning and instruction of mathematics should focus on the understanding of numbers. This context suggests that the students should understand why and how computations or algorithms are computed (Munirah Ghazali, 2001).

One of the branches of mathematics which made a meaningful and unique contribution particularly to the elementary pupils to the variance in mathematics achievement is the Number and Number Sense [2]. An earlier curriculum with a great concentration on number sense development helps children perform better in mathematics later on [3]. A strong foundation with the early number of concepts is very essential for

students' future success in mathematics (Woods, Geller, and Basaraba, 2018). Number and Number Sense also can be described as good intuition about numbers and their relationships. Individuals that are good in number sense tend to exhibit different characteristics when performing mental computation such as sense-making approach, planning, and control, flexibility and appropriateness sense of reasonableness. (Mohamed and Johnny, 2010). Mastering these skills will enable every individual to handle numerical problems in their daily life.

In the Philippine Mathematics K to 10 curriculum, Number and Number Sense includes counting numbers/whole numbers, fractions, decimals, percentage, ratio and proportion, integers, rational numbers, irrational numbers, and real numbers (K to 10 Mathematics Curriculum Guide, 2013). These key contents contain 120 learning competencies in total. These are identified by most of the elementary and secondary teachers as the pre-requisite learning competencies in other content such as algebra and geometry.

Unfortunately, the achievement of students in Mathematics is exceptionally low [4], [5]. Department of Education reported that students' performance in the National Achievement Test (NAT) was even more discouraging. In the year 2003-2005, some of one million fourth-year students had only ten percent mastery in mathematics based on the NAT result. In the succeeding years (2007-2008 to 2011-2012), the NAT performances of the secondary high schools are 49.6%, 46.71%, 45.5%, 47.92%, and 48.9% respectively. In addition, based on the result of the Program for International Student Assessment (PISA), the Philippines ranks second lowest in mathematics and science out of 79 countries.

Education is dynamic and mathematics as one of the areas in education is not an exemption to this phenomenon (Flores, 2019). Changes in different factors affecting the performance of the students such as teachers' strategies in the teaching-learning process and the paradigm shift are constant. The Department of Education continues to craft and implement various actions to address issues such as the low performance of the students. One of the solutions is properly arranging the learning competencies in the K to 10 mathematics curricula by omitting, retaining, and emerging learning content and competencies. These are now identified as the Most Essential Learning Competencies (MELC). One of the identified excellent characteristics of a well-planned spiral progression approach of the curriculum is the vertical coherence of the content topics incorporated with careful sequencing of learning competencies considering students.

The identified most essential learning competencies in Math puts a premium on the development of numeracy skills which are fundamental to practical and real-life problems, rather than Math content-knowledge; and on the development of higher-order thinking skills that go beyond procedural fluency [6]. One of the content domains articulated in the curriculum is the Number and Number Sense.

The main purpose of this study was to compare the K to 10 Mathematics Curriculum to the identified Most Essential Learning Competencies (MELC) in terms of the omitted, retained, and added learning competencies. It determines the MELC coherence (horizontal and vertical) in Numbers and Number Sense among grade levels. The teachers' feedback in the implementation of MELC upon the review and mapping of the Most Essential Learning Competencies in Numbers and Number Sense is also included in this study.

## **METHODOLOGY**

This paper was qualitatively explored and described. The researchers deemed it was necessary to use the descriptive-analysis qualitative method because the information may be derived from the major sources which are documents [Kto10 Curriculum, MELC, Module], and interviews [10 mathematics teachers] [7]. Specifically, the paper is a content analysis qualitative research since it delves into understanding the mapping of content topics and key competencies of K to 10 Most Essential Learning Competencies (MELCs) in Numbers and Number Sense. Content analysis as a research method is a systematic and objective means of describing and quantifying phenomena [8], [9], [10]. In addition, Patton (2002), as cited by [11] states that content analysis is used to analyze written texts such as interview transcripts or documents, thus, it is appropriate for the purpose of this study. Also, the changes in the learning content topics and competencies in numbers and number sense including counting numbers/whole numbers,

fractions, decimals, percentage, ratio and proportion, integers, rational numbers, irrational numbers, and real numbers were observed to identify the learning gaps.

### **Research Participants**

Interviews were conducted with 10 mathematics teachers (4elementary and 6secondary) who are generally new (three with less than 3 years in teaching, three with 5-10 teaching experience, and four with more than 10 years of experience) to obtain feedback and experiences regarding the implementation of the Most Essential Learning Competencies in Numbers and Number Sense. The purposive sampling technique was utilized wherein the participants were chosen because they are the persons who can provide the needed information under knowledge and experience. Key interview questions were used to highlight the mathematics teachers' experiences, challenges, and concerns. Participants' profile, school affiliation, position, and the number of years in the service were asked to the selected key informants including the following key interview questions: (1) How would you compare the MELC along with Numbers and Number Sense with the previous Kto10 curriculum? (2) What are the challenges you encountered in teaching Numbers and Number Sense using MELC? Follow-up questions were also raised during the interview.

### **Data Analysis**

The researchers adopted the Qualitative Data Analysis Model by Creswell (2014). This model is composed of five (6) phases: (1) Prepare and organize data, (2) Explore and code, (3) Build descriptions and themes, (4) Represent and report qualitative findings, (5) Interpret qualitative findings, and (6) Validate the accuracy of qualitative findings.

#### *Phase 1: Prepare and organize data*

The study revisited the Most Essential Learning Competencies in Mathematics in Numbers and Numbers Sense. Also, the researchers developed interview questions and recorded the raw data collected from the Google Form interview on a recorded sheet of the teacher-informants. This process is also known as data documentation which is the next level after data collection (Khan, 2008). Researchers' descriptions, views, and insights were also recorded in this phase. This was mostly for the purpose of recording the interview responses.

#### *Phase 2: Explore and code*

After writing down the responses from the participants, the researchers prepared for coding. In this phase, the researchers organize the data in a meaningful and systematic way. Also, the experiences of the teacher-informants were reviewed and presented in this part. The researchers did not code every piece of text, only the data that was relevant to Numbers and Number Sense or captured something interesting about the research questions. This guided the researchers to come up with ideas or the themes.

#### *Phase 3: Build descriptors and themes*

This phase focuses on the mapped most essential learning competencies, research participants, and themes in order to establish the study's credibility. The researchers examined the codes some of them clearly fitted together into a theme. One example is that the researchers had several codes related to the perceptions of teachers on the implementation of the Most Essential Learning Competencies focuses on Numbers and Number Sense. These were collated into an initial theme called Teaching Emphasis in the Numbers and Number Sense. Based on the results in coding, the researcher identified three themes based on the two objectives (1) Mapping of the Most Essential Learning Competencies vis-à-vis K to 10 Mathematics Curriculum and (2) Coherence of the MELC in Numbers and Number Sense. The following are the themes for the second objective: (1) Vertical Arrangements of the learning competencies, (2) Placement of Learning Competencies in MELC, and (3) Teaching Emphasis in the Numbers and Number Sense.

#### *Phase 4: Represent and report qualitative findings*

In this phase, the researchers compared the mapping of the Most Essential Learning Competencies and the K to 10 Mathematics Curriculum. Competencies that are merged, omitted, and rephrased were identified after the comparison. These were presented by using tables and figures. The researchers also collected the highlights or short excerpts which are grouped by themes from teacher-informants to target the research objectives and discussion findings.

*Phase 5: Interpret qualitative findings*

The outcomes of the coherence of the Most Essential Learning Competencies to K to 10 Mathematics Curriculum as well as the Coherence of the MELC in Numbers and Number Sense were generalized and interpreted in this step. Also, research studies were considered to support the claims of the teacher-participants.

*Phase 6: Validate the accuracy of qualitative findings.*

In this phase, member-checking is used to determine the validity of the research findings. Member-checking is used when the researcher takes summaries of the findings back to the participants in the study and asks them whether the findings are an accurate reflection of their experiences. In this part, after interpreting the qualitative findings supported by research studies, the researchers summarized and presented the findings to the ten mathematics teacher-informants.

## **RESULTS AND DISCUSSION**

### **Mapping of Most Essential Learning Competencies vis-à-vis K to 10 Mathematics Curriculum**

Table 1 presented the result of the curriculum mapping on the key learning competencies in Number and Number Sense. It revealed the comparison between K to 10 Mathematics Curriculum and the identified Most Essential Learning Competencies. Specifically, it shows the retained and omitted learning competencies from kindergarten up to grade 10.

**Figure 1** Mapping K to 10 Most Essential Learning Competencies in Number and Number Sense

KEY COMPETENCIES	GRADE LEVEL										
	K	1	2	3	4	5	6	7	8	9	10
Sorts, match, compares, and illustrates (and define) sets of objects according to color, shape, size, functions, and numbers.											
Recognizes, compares, and orders numbers up to 5-digit numbers (and up to millions) from least to greatest and vice versa.											
Count, reads, writes, and decomposes numbers up to 10000 (and up to million) in symbols and in words.											
Rounds numbers and gives the place value up to 5-digit numbers (and up to million).											
Reads and writes money in symbols and in words through 1000.											
Counts, tells the value of, and compares a set of bills and coins through 1000.											
Identifies and uses the pattern of naming ordinal numbers up to 100 <sup>th</sup> .											
Reads and write roman numerals in Hindu Arabic and vice versa.											
Represents, recognize situations, and illustrates properties of addition and subtraction as its inverse operations.											
Constructs equivalent number expression/ equation using addition and subtraction with or without the aid of manipulative objects.											
Add two to three numbers horizontally and vertically with or without regrouping to estimate and mentally get the sums up to 10,000.											
Subtracts, estimates, and mentally get the difference of numbers up to 4 digits with or without regrouping.											
Solves up to two steps word problems involving addition and subtraction (and involving multiplication and division) of whole numbers including money using appropriate solving strategies.											

Legend:  present key competencies in the MELC

The learning competencies listed under Key Competencies are the competencies included in the K to 10 Mathematics Curriculum of Number and Number Sense while the competencies shaded with the gray color in a particular grade level are the retained learning competencies in MELC. On the contrary, competencies without shade mean they are omitted. The table presented is extracted only from the original 120 learning competencies in Number and Number and Sense.

For example, in grade 1 Quarter 1, Visualizing and representing numbers from 0 to 100 using a variety of materials, Counting number of objects in a given set ones and tens, and Visualizing and counting by 2s, 5s, 10s through have been clustered as counting number of objects subsumed or is part of visualizing and representing numbers, therefore in MELC it was merge and became Visualizing and representing numbers from 0 to 100 using a variety of materials and methods. Composing and decomposing a given number, e.g 5 is 5 and 0, 4 and 1, 3 and 2, 2 and 3, 1 and 4 and 0 and 5 has been omitted as this is also discussed in Quarter 3. Visualizing, representing and ordering sets from least to greatest and vice versa and Visualizing, representing and ordering numbers up to 100 in increasing or decreasing order have been clustered and rephrased into comparing numbers up to 100 using relations symbols and ordering them in increasing and decreasing order. Another learning competencies which are clustered and rephrased are identifying the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> up to 10<sup>th</sup> object in a given set from a given point of reference and Reading and writing ordinal

numbers; 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> up to 10<sup>th</sup>. It became identifying, reading, and writing ordinal numbers; 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, up to 10<sup>th</sup> object in a given set from a given point of reference.

From the original 120 listed learning competencies in Number and Number Sense K to 10 Mathematics Curriculum, only 83.33% of it have been retained in the MELC. Table 2 presented the number of learning competencies included in the K to 10 Curriculum and in the Most Essential Learning Competencies.

**Figure 2** Comparison of Learning Competencies in Number and Number Sense

LEARNING COMPETENCY CATEGORY	GRADE LEVEL											TOTAL
	K	1	2	3	4	5	6	7	8	9	10	
K to 10 Mathematics Curriculum	12	12	15	16	13	21	13	12	2	4	0	120
MELC	1	11	15	15	12	16	14	12	0	4	0	100

All the included learning competencies in k to 10 Mathematics Curriculum for grades 2, 7, and 9 have been retained. This means that all the included competencies on Number and Number Sense in a particular grade level are attainable and significant. 1 learning competency has been omitted from grades 1, 3, and 4 while all the number and number sense learning competencies in grades 8 and 10 were removed. 11 and 5 competencies were omitted in kindergarten and grade 5 respectively, while there is 1 learning competency added in grade 6.

Based on the data provided from the curriculum mapping activity, it was identified that the disappearance of learning competencies in the curriculum in a particular grade level does not literally mean that it was already excluded or removed during the actual discussion. Some of it was not stated in the curriculum because it was combined or merged into other content topics. For example, Real Number System, Rational and Irrational Number in Algebra 9; The Nature of the Roots using the Discriminant. These topics were not stated in the grade 9 mathematics curriculum; however, it is a must for the teacher to recall or review these content topics.

### **Coherence of the MELC in Number and Number Sense**

The analysis of the MELC coherence in Numbers and Number Sense among grade levels reveals the following themes showing both the strength and the areas for improvement: (1) vertical arrangements of the learning competencies, (2) placement of learning competencies in MELC, and (3) teaching emphasis on Numbers and Number Sense.

**Vertical Arrangements of the learning competencies.** Topics are structured in increasing complexity to accommodate the learner's cognitive level of development from basic addition of whole numbers in Grade 1 and Grade 2 to problem-solving involving addition in Grade 4, 5, and 6, to addition of integers and exponents in Grade 6, 7, and 9.

**Figure 3** Fraction progression across grade level

	Lower Elementary (K to Grade 3)	Higher Elementary	High School
Learning Competencies	Visualizes, illustrates, identify, compares, and order different types of fractions including similar fractions and dissimilar fractions.	Visualizes, represents, estimates, and applies the four fundamental operations on similar and dissimilar fractions of simple or mixed form with or without regrouping.	Defines, gives place value, rounds, represents in a real-life situation, arrange and express rational numbers (terminating and repeating) from fraction to decimals and vice versa.
Sample Problem	True or False $\frac{3}{4} > \frac{1}{4}$	Perform the indicated operation $2\frac{3}{4} + 5\frac{1}{2}$	Arrange the following in increasing order $\frac{3}{4}, 0.33, 1\frac{2}{5}, 1.25$

The concepts of fractions are first presented in Lower Elementary through models and drawings, then formally in Grade 4 using basic operations, and finally mastered in Grade 7 with the representation of fractions to decimals and vice versa as shown in table 3. The table also reveals that there is an increasing complexity among grade levels in the Most Essential Learning Competencies in Numbers and Number Sense.

In line with this result, one of the teacher-informants disclosed that the MELC in Numbers and Numbers Sense among grades levels are presented from simple to complex. Feedback from an Elementary Master Teacher in Bulan, Sorsogon during the pandemic, reveals, *“Having pupils with unmastered competencies from the previous grade level makes it harder for me to manage the time in teaching a new competency.”*

**Placement of Learning Competencies in MELC.** The mapping of the Most Essential Learning Competencies reveals that there are some learning gaps in Number and Number Sense. Furthermore, several learning competencies were only introduced once, with no further development of mastery skills at a higher level. Also, there are learning competencies in the K-10 Mathematics Curriculum that are removed in MELC. This analysis can be shown in the table below.

**Figure 4** Sample Identification of the Most Essential Learning Competencies

<b>Learning Competencies</b>	<b>Comments/Recommendations</b>	<b>Identified MELCs</b>
Visualizes and represents numbers from 0-100 using a variety of materials.	Clustered as counting the number of objects subsumed or is part of visualizing and representing numbers.	Visualizes and represents numbers from 0 to 100 using a variety of materials.
Counts the number of objects in a given set by ones and tens.		
Visualizes and count 2s, 5s, and 10s, through 100.		
Composes and decomposes a given number, e.g. 5 is 5 and 0, 4 and 1, 3 and 2, 2 and 3, 1 and 4 and 0 and 5.	Omitted as this will be also discussed in Quarter 3.	
Visualizes, represents and compares two sets using expressions “less than,” “more than,” and “as many as”.	Clustered and rephrased	Compares two sets using the expressions “less than,” “more than,” and “as many as” and orders sets from least to greatest and vice versa
Visualizes, represents and orders sets from least to greatest and vice versa.		
Visualizes, represents, and compares numbers up to 100 using relation symbols	Clustered and rephrased	Compares numbers up to 100 using relations symbols and ordering them in increasing and decreasing order
Visualizes, represents, and orders numbers up to 100 in increasing or decreasing order		
Identifies the 1st, 2nd, 3rd up to 10th object in a given set from a given point of reference	Clustered and rephrased	Identifies, reads, and writes ordinal numbers: 1st, 2nd, 3rd, up to 10th object in a given set from a given point of reference.
Reads and writes ordinal numbers: 1st, 2nd, 3rd up to 10 <sup>th</sup>		

The figure above highlighted the sample identification of the Most Essential Learning Competencies in Grade 1, Quarter 1 Mathematics in Numbers and Number Sense. This shows that some learning competencies were clustered, omitted, and retained. The DepEd stated that the identified most essential learning competencies in Mathematics put a premium on the development of numeracy skills which are fundamental to practical and real-life problems, rather than Math content knowledge; and on the development of higher-order thinking skills that go beyond procedural fluency.

According to the Department of Education, public school teachers should use the identified most essential learning competencies to assist them in determining how to scaffold the attainment of learning goals and meaningful learning in Math in a limited time frame. Also, private schools are encouraged to contextualize the most essential learning competencies to take into account the different contexts in learners', teachers', and learning environments. In line with this scenario, a Teacher III in Sta. Magdalena National High School gives his insights about the implementation of MELC, “Some competencies are merged, some are removed, and some are retained. In fact, it (MELC) is a good thing because it is more simplified and easier to execute.”

**Teaching Emphasis in the Numbers and Number Sense.** The following are the teacher informants’ feedback in the implementation of MELC upon the review and mapping of the Most Essential Learning Competencies in Numbers and Number Sense. The focus is on the challenges encountered and recommendations to overcome these challenges.

According to the official statement of the Department of Education, they continue to confront the issues brought about by the pandemic and are addressing challenges in basic education through the Basic Education Learning Continuity Plan (BE-LCP). One of the principles of BE-LCP is to link and bridge the BE-LCP to DepEd’s pivot to quality and into the future of education, under the framework of Sulong



EduKalidad [12]. Within this BE-LCP is the implementation of the Most Essential Learning Competencies (MELCs) that is used by public schools to cover important topics in a short period of time.

A Teacher II in Bulan, Sorsogon who teaches Mathematics for 17 years shares her experience regarding the implementation of MELC. She stated that *“Some topics are not included which are also important to be taught.”* An example of a prerequisite learning competency that is omitted from the K to 10 Mathematics Curriculum in Grade 6 – Quarter 2 along with Numbers and Number Sense is Sets up proportions for groups of objects or numbers and for given situation (M6NS-IIb-132). This competency is a prerequisite for solving problems involving proportions. This also means that the sudden shift from the K-10 Mathematics Curriculum to MELC brought some adjustments in their teaching career. Thus, a change in mindset from the traditional paradigm to a more engaging approach. This was also supported by the statement of one of the teacher-informants, *“There are certain adjustments from the accustomed manner of teaching then and the use of MELC now.”*

A Master Teacher in Bulusan, Sorsogon, who teaches grades 5 and 6 commented that *“Although using MELC is an advantage in this time of the pandemic, still it is information overload. Thus, the challenge for me is the lack of enough time in letting the pupils master a specific competency.”* In addition, a remote Teacher III in Magallanes, Sorsogon stated that *“Teachers are not teaching, we just utilized printed modular distance learning modality.”* This scenario was the result of the implementation of MELC in response to the challenges brought by the pandemic.

On the other hand, teacher-informants share their experiences in dealing with these challenges. A Secondary Teacher III in Sta. Magdalena, Sorsogon mentioned that *“It is challenging to have a changing phase. Thus, it is important to condition and embraces the situation.”* On a more specific note, a teacher-informant shared her interventions in teaching using MELC *“I provide additional or supplemental direct to the point activities to master the specific competency even in a very short span.”*

Feedbacks from the informants reveal that there is a need for teachers to have proper training with regard to MELC. An Elementary Master Teacher from Bulan, Sorsogon suggested that *“All Mathematics teachers must undergo training to revisit the teaching strategies in teaching Mathematics.”* Also, 3 out of 10 teacher-informants recommended that limited face-to-face learning must take place.

## CONCLUSIONS

Based on the findings of the study, it can be concluded that The Most Essential Learning Competencies in Numbers and Number Sense were structured in order of increasing complexity among grade levels. Several competencies were removed, rephrased, and retained in Numbers and Number Sense to address the challenges of the pandemic and to develop a resilient education system. However, learning gaps, information overload to students, and unmastered competencies were some of the challenges revealed in the analysis of the MELC coherence along with Numbers and Number Sense. Thus, providing training and seminars on a regular basis as part of the job must be implemented by the department for the professional development of mathematics teachers to gain a thorough grasp of the Most Essential Learning Competencies. Also, the administration may consider revisiting and further exploring the MELC of different areas in Mathematics and align it to the different teaching practices. Finally, future studies may be undertaken to further analyze the gaps in the analysis of MELC along with Numbers and Number Sense.

## References

- [1] Department of Education (August 2016). K to 12 Curriculum Guide in Mathematics Grades 1 to 10. Retrieved from [www.deped.gov.ph](http://www.deped.gov.ph)
- [2] Jordan, N. C., Glutting, J., and Ramineni, C. (2010). The importance of number sense to mathematics achievement in first and third grades. *Learning and Individual Differences*, 20(2), 82-88. doi: 10.1016/j.lindif.2009.07.004
- [3] Cheng, B., Wang, M., Moormann, J., Olaniran, B.A. & Chen, N.S. (2012). The effects of organizational learning environment factors on e-learning acceptance. *Computers & Education*, 58(3), 885-899. Elsevier Ltd. Retrieved May 25, 2022 from <https://www.learntechlib.org/p/66819/>.
- [4] Morita-Mullaney, T., Renn, J., & Chiu, M. M. (2020). Contesting math as the universal language: a longitudinal study of dual language bilingual education language allocation. *International Multilingual Research Journal*, 1-18. <http://doi.org/10.1080/19313152.2020.1753930>
- [5] Maloney, E. A., Ramirez, G., Gunderson, E. A., Levine, S. C., & Beilock, S. L. (2015). Intergenerational effects of parents' math anxiety on children's math achievement and anxiety. *Psychological Science*, 26(9), 1480-1488. <https://doi.org/10.1177/0956797615592630>
- [6] Department of Education (2020) MELC Guidelines, from, <https://commons.deped.gov.ph/MELCS-Guidelines.pdf>
- [7] Merriam, S. B. (2002). Introduction to qualitative research. *Qualitative research in practice: Examples for discussion and analysis*, 1(1), 1-17.
- [8] Krippendorff K. (1980) *Content Analysis: An Introduction to its Methodology*. Sage Publications, Newbury Park.
- [9] Downe-Wamboldt B. (1992) Content analysis: method, applications, and issues. *Health Care for Women International* 13, 313– 321.
- [10] Sandelowski M. (1995) Qualitative analysis: what it is and how to begin? *Research in Nursing & Health* 18, 371–375.
- [11] Kozikoglu, I., & Senemoglu, N. (2015). The content analysis of dissertations completed in the field of curriculum and instruction (2009-2014)
- [12] Montemayor, M. T. (2020, December 31). *Education goes on amid Covid-19 thru DepEd's continuity plan*. Retrieved from Philippine News Agency: <https://www.pna.gov.ph/articles/1126058>