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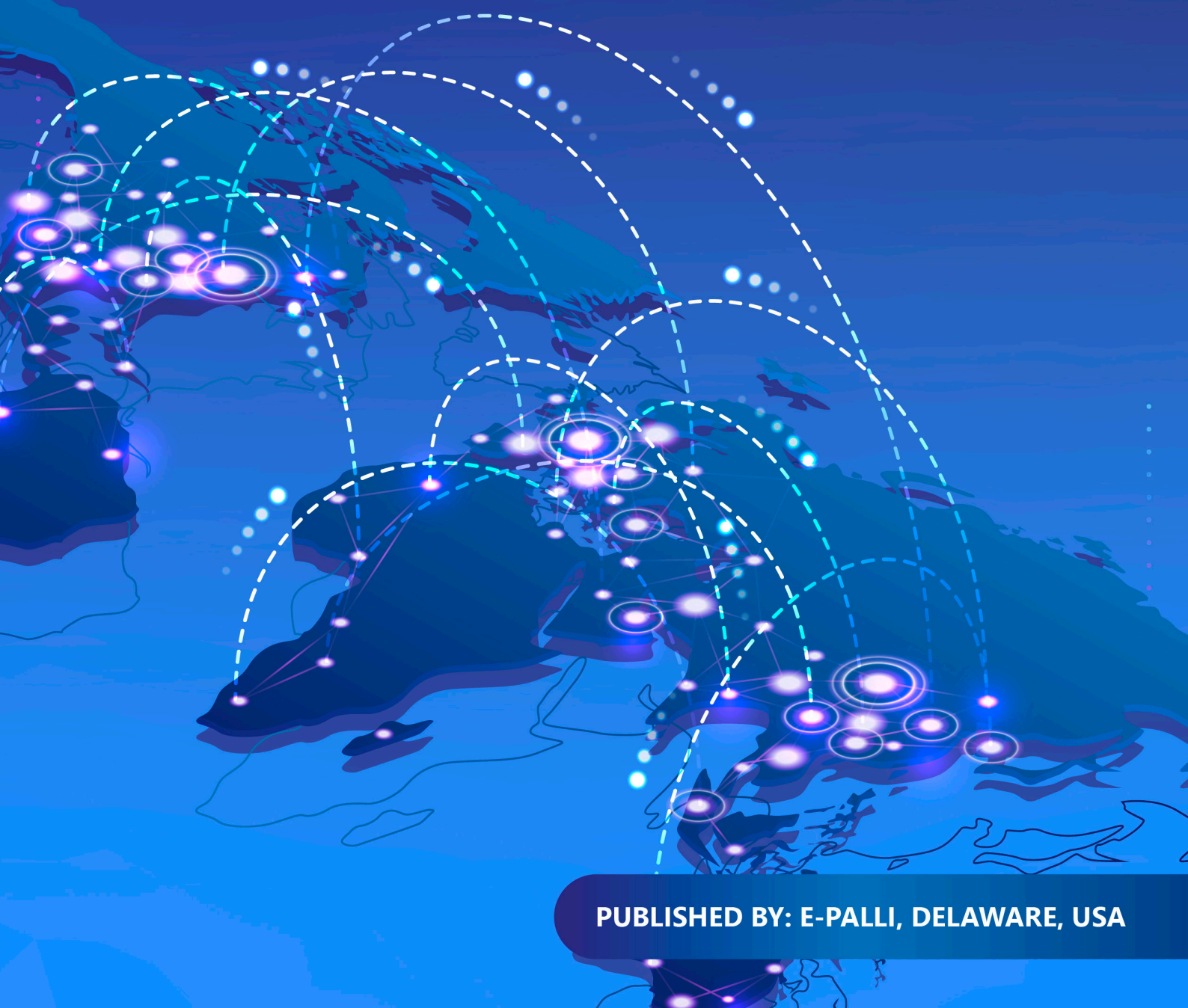

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Localized Game-Based Learning Activities in Mathematics 7 (LGBLAs)

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ABSTRACT

To become a critical thinker and problem solver, learners need the mastery of the basic competencies. To ensure that meaningful learning occurs in a mathematics classroom, learning resources reflecting their context must be readily available. Unfortunately, there has been a dearth of localized materials for the Ilocano learners. Hence, this study developed Localized Game-Based Learning Activities (LGBLAs) in Mathematics 7 based on the teachers' perceived level of mastery of the learners along with the Most Essential Learning Competencies (MELCs) in Number and Number Sense, Algebra, Geometry, and Statistics and Probability. Following the research and development (R and D) framework, data were gathered using a survey rating scale from the 66 Mathematics 7 teachers in the Schools Division of Ilocos Norte. Means with their equivalent descriptive interpretations were utilized to analyze and interpret the data. The results showed that learners exhibited nearly mastery in some of the learning competencies in Mathematics 7. This could mean that they have not sufficiently acquired the fundamental skills required to move to more advanced mathematical learning tasks. However, the key concepts and skills could be enriched by supplementing instruction with appropriate, contextualized, and relevant curriculum support materials. Hence, LGBLAs in Mathematics 7 was developed. The LGBLAs was found to be very highly valid and very highly acceptable as a curriculum support material for mathematics instruction as evaluated by the content experts and the key teachers in Mathematics 7. It is then recommended that LGBLAs be adopted for classroom use to improve the mastery level of learners in the different learning competencies along with Number and Number Sense, Algebra, Geometry, and Statistics and Probability.

INTRODUCTION

Mathematics is a language of nature and plays a dynamic and significant role in human life and society. Its application is evident not only in the field of education but in almost every aspect of life (Mukanda, 2014). Mathematics teaches students critical reasoning, decision-making, and problem-solving abilities that will help them make sense of many elements of the fast-changing environment (Tablit, 2019). It promotes self-reflection and develops the general problem-solving ability in all facets of life (Manuel, 2012).

Considering the importance of mathematical knowledge and skills to be successful in any human endeavor, it is disheartening to note that many students tend to develop a fear of the subject and become more anxious to learn, resulting in low performance in the subject (Mazana *et al.*, 2018). Learners even consider it a nightmare tackling the requirements of the subject, a notion overshadowing its importance as the prime vehicle in developing learners' logical thinking and higher-order cognitive skills (Visitacion, 2020). In fact, the dismal performance of learners in Mathematics could be reflected in various assessments. The latest result of the Programme for International Student Performance (PISA) of the Organisation for Economic Co-operation and Development (OECD) revealed that Filipino learners placed last among 79 participating countries and near last in Science and Mathematics. According to Briones, the result of the 2018 PISA puts an even sharper focus on the need to address quality basic education.

As also shown in the results of the Trends in International Mathematics and Science Study (TIMSS) 2019 by the International Association for the Evaluation of Educational Achievement (IEA), Filipino learners are not performing well in the subject scoring 297 in mathematics which is significantly lower than any other participating country and placing the lowest among all 58 participating countries (Bernardo, 2020).

Moreover, the quality of education in the country was put under the spotlight in 2019 following the results of both local and international assessments on students' performance which highlighted the low performance of Filipino learners. Education Secretary Leonor Briones said that the performance of Filipino students in large-scale assessment, which is the National Achievement Test (NAT), gravitates toward the low proficiency levels, especially in Science, Math, and English.

As cited in Reyes *et al.* (2019), problems in how to teach Mathematics have emerged over the last two decades, including difficulties in interpreting mathematical statements, the conflict between mathematics lesson analysis and real-life experiences, and valuable exposure to highly abstract mathematics lessons (Reyes *et al.*, 2019). They also said that teachers frequently provide a few examples in some high school mathematics classes and ask students to respond to what is written on the board. Students in such classes frequently pay attention to their teachers and attend their lectures, but they

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rarely raise questions or seek clarification. Students are unlikely to be interested in the topic under discussion or driven to complete the work assigned by their teachers. Furthermore, it has been claimed that children lack common sense in the classroom.

As expressed in Principle 3 of the Mathematics Framework for Philippine Basic Education, Mathematics is best learned when learners are actively engaged. According to Visitacion (2017), mathematical ideas should be explored in ways that stimulate curiosity, create appreciation and enjoyment of mathematics, developing critical and analytical thinking and depth of understanding. Therefore, learners must be given activities that the teacher developed.

Adora (2014) contends that one way of maintaining the interest of the learners in difficult subjects like Mathematics is to provide them with activities that they could perform individually, thereby making learning interesting and engaging. Teacher competency, therefore, requires not only mastery and effective strategies but also resources to support and enhance the learning process and skills of the learners (Visitacion, 2017). Hence, to ensure that all learners have access to quality education amid the present crisis, there is a need to address the learners' unique needs, situations, and resources by giving them practical, reality-based, and localized-based learning experiences that will help them live and adjust in this new normal scheme (Alvaro, 2020).

Localization is one of the keys to engaging the students in the teaching-learning process wherein students can relate their situations in their lesson. It makes the lesson meaningful and relevant to the students' lives by relating the students' context to mathematical content taught in school. Teaching the lesson in a real-life context significantly increases the learning of students (Center for Occupational Research and Development, 2012). Likewise, localization motivates students to know more about their cultural heritage and to appreciate and understand other cultural heritage. Republic Act 10533 mandated that education follow certain standards and principles in establishing upgraded basic education curricula that are contextualized, global, and culturally sensitive. The curriculum should likewise be adaptable enough to allow schools to contextualize and improve it based on the educational and social circumstances in which they operate. The regional and division education units will approve these resources in compliance with national policies and standards.

Localization of materials is beneficial to learners as it would make the materials more familiar and thus more enjoyable to learn (Mahabadi, 2012). Things students do and associate with them are the learning that lasts forever. Therefore, using localized materials is like valuing and appreciating the cultural and social identities of the students. It also helps teachers and students comprehend concepts by relating and presenting the lesson in the context of the prevailing local environment, culture, and resources. Hence, lessons will become more real-life, customized, and appropriate.

As per the researcher's observation in her classes, students had difficulty in accomplishing the activities incorporated in the SLMs last school year in Mathematics 7 because some seem not suited to the context of students' lived experiences. Thus, it could be said that when the students cannot relate to the activities in the SLMs, they would give up easily and move away from their lesson, especially when their parents do not supervise them. As a result, they could not answer all the activities and would fail to submit their answer sheets on the scheduled date.

Therefore, appropriate learning activities should be developed as supplementary material that would level up the mathematics performance of learners and as a timely response to their needs during this time of the pandemic. With the use of relevant learning activities, the learners will be inspired to continuously enhance their knowledge and skills in Mathematics and eradicate their perception that it is a difficult subject. Moreover, such material would strengthen the acquisition and retention of the Most Essential Learning Competencies in Mathematics 7 for better application in real-life scenarios.

Since the goal of teaching is for the students to learn, it was then highly needed to have relevant learning materials that would widen their understanding and knowledge. Thus, the researcher undertook this study to develop the Localized Game-based Learning Activities (LGBLAs) to address the low mastery level of the learners in the learning competencies in Mathematics 7.

LITERATURE REVIEW

Mathematics Education in the Philippines

The Philippine basic education curriculum has been altered several times over the years. Despite numerous curriculum changes, the goals of mathematics remain nearly unchanged: to provide opportunities for individuals to develop the skills and attitudes required for effective participation in everyday life, as well as to prepare them for further education and the world of work so that they can make valuable contributions to society (SEI-DOST & MATHETED, 2011).

Mathematics Education in the New Normal

The COVID-19 pandemic has resulted in school closures worldwide. This closure has affected more than 1.2 billion learners worldwide, with more than 28 million learners in the Philippines (UNESCO, 2020). Responses like community lockdown and quarantine have led students and teachers to study and work from home (Crawford, 2020). The virus is still wreaking havoc on the country today, and the education sector is particularly hard hit (Marquez *et al.*, 2020).

To prepare for the country's pandemic condition, the Department of Education (DepEd) issued the Most Essential Learning Competencies (MELCs), which will serve as a framework for the implementation of the updated K–12 curricula (Gonzales, 2020). Even if the classes are delivered in different ways, the MELCs narrow

down all of the possible key teachings, concepts, and skill sets that a student must know, acquire, and understand.

A Mathematics 7 learner is expected to demonstrate understanding of key concepts and principles of Numbers and Number Sense (sets and real number system); measurement (conversion of units of measurement); Patterns and Algebra (algebraic expressions and properties of real numbers as applied in linear equations and inequalities in one variable); geometry (sides and angles of polygons); and Statistics and Probability (data collection and presentation, and measures of central tendency and variability) as applied – using appropriate technology – in critical thinking, problem solving, reasoning, communicating, making connections, representations, and decisions in real life.

DepEd (2016) claimed that non-print materials should contain contents that stimulate and promote critical thinking, include sentences/paragraphs that encourage prior knowledge and understanding, and are aligned to learning objectives that are clearly stated and measurable. Also, the difficulty level is aligned to the intended user, and feedback is always positive, motivational, and user-sensitive. Furthermore, visuals are an accurate representation of the topics discussed. Pictures are not pixelated, and hyperlinking is appropriately used.

The MELCs served as the primary reference for all schools, Schools Division Offices (SDOs), and Regional Offices (ROs) in determining and implementing learning delivery approaches that are appropriate for the local context and learner diversity while adapting to the challenges posed by the COVID-19 pandemic. Because these are already available through the MELCs, ROs, SDOs, and schools do not need to generate a new list of learning competencies for the various learning areas. Schools, SDOs, and ROs are urged to augment the MELCs by improving and contextualizing them

Localization of Instructional Materials

The primary purpose of education is to instill learning in the minds of all students and assist them in understanding mathematical concepts in a simple manner (Reyes *et al.*, 2019). To effectively deliver the lesson, educators may use the context of the students' life as a starting point, allowing the students to experience a sense of belonging inside the classroom. And, because the purpose of teaching is for pupils to learn, having localized materials that will broaden their knowledge and understanding is critical. The Enhanced Basic Education Curriculum Act of 2013, or RA 10533, recommends that the curriculum be contextualized and global. The curriculum must be adaptable enough to allow schools to localize, indigenize, and improve it based on their individual educational and social situations.

The localization approach is a subfield of Contextualization where teachers utilize the students' tradition, locality, and culture in the assessment and instruction. Also, localization relates learning content specified in the curriculum to local information and materials from the learner's community. It is also the process of modifying and linking curricular content and the teaching and learning process to local conditions, environment, and resources.

Localization can also be viewed as freedom for schools or local education authorities to adapt the curriculum to local conditions and relate the content curriculum and teaching and learning processes to the local environment (Dimacali, 2018). According to Castillo (2019), it maximizes materials, activities, and issues readily available in the local environment. A localized curriculum is based on local needs and relevance for the learners, which allows for flexibility and creativity in the lessons. It gives awareness of the current happenings or status of a certain topic being discussed (Dimacali, 2018). It also gives the students an aggressive mind to learn more about a topic since it became familiar. Localized materials have numerous advantages when applied or adopted in the educational system. It entails employing local materials as both a subject and an object of instruction. Localization will also entail incorporating local culture into the curriculum.

While there are benefits, there are also drawbacks, such as a lack of local technical competence and material resources, apprehension about the unfamiliar, and aversion to challenge among teachers and local educators (Castillo, 2019). However, these can be managed by developing a curriculum framework, including a clear set of curriculum standards at the central level; ensuring compliance with these standards in local and school developed curriculum, either through paper-based accreditation or endorsement process or through supervision and monitoring process (or both); providing training of local-based curriculum developers; and ensuring clear and open communication exists between central and localized authorities (Castillo, 2019).

To develop concepts and principles, teachers must use manipulative, concrete, and authentic materials and anchor teaching in the context of learners' lives. Therefore, sufficient instructional materials should be provided to the students to ensure the meeting of concepts and enhance their mathematical skills. Moreover, teachers should build on the school's resources and must accommodate and respect cultural, linguistic, and racial diversity. Teachers should also encourage learners to pose problems and issues and use strategies to address these.

Game-based Learning (GBL)

Game-based learning is an active learning strategy that employs games to improve student learning. The learning, in this case, comes from playing the game, which fosters critical thinking and problem-solving skills. Game-based learning can be achieved through the use of digital or non-digital games, as well as simulations that allow students to experience the learning directly. Game-based learning entails employing games in educational environments to achieve certain goals (Connolly, 2012). These games could be entertaining or instructional. While engaging games are primarily intended for enjoyment, pleasure, and recreation, educational games are a subset of games

that are intended to educate. The primary purpose of game-based learning is to improve learning and behavior. Games are used to aid learning for three primary reasons: motivation, material mastery, and higher-order thinking skills.

Motivation

Game-based Learning is a potential means for improving students' confidence and increasing their motivation by incorporating challenge, curiosity, and fantasy to a specific problem. The application of Game-based Learning (GBL) positively impacts student motivation and involvement in Mathematics learning (Ramli *et al.*, 2020).

Content mastery

This refers to the acquisition of facts and information generated by experts. Most games designed for content mastery provide opportunities for drill and practice, a dominant learning model in the 20th century. Content mastery games are perhaps the most used and sustainable games in schools due to their close alignment with learning practices in schools.

Higher-order thinking

This refers to skills used to solve problems, analyze data, and synthesize findings. They are often seen as essential 21st century competencies. Games that foster (instead of teaching) higher-order thinking are often intellectually demanding. They provide challenging contexts for players to experience and develop thinking skills. Teaching should attempt to make the learning experience pleasant and gratifying so that learners continue learning. Thus, to maintain the interest and motivate students to study in this time of the pandemic, it is worthwhile to use games as a strategy in the teaching-learning process. Games serve as an interesting springboard in starting their study and answering their self-learning modules every day.

Situation Cognition

Learners' understanding is developed by interaction with their environment. They are formed by a combination of content, context activity, and goals and are individually constructed.

Cognitive Puzzlement

Cognitive puzzlement is the stimulus for learning and determines the organization or nature of what is learned.

Experiential Learning

Like some that involve the Visual and Performing Arts, games promote experimental learning-learning through doing/experiencing. The constructivist viewpoint also proposes that children learn best when they explore and experience real environments for themselves and discover their own meaning from experience.

Problem-based Learning. Problem-based learning is linked to Game-based Learning as most games involve problem solving, often with a small group of students working to solve a problem. Very often, these are cross-disciplinary problems.

Learning Activity Sheets

With the further development of COVID-19 in 2020, forbidding public meetings, even in schools, has expanded internationally. According to the United Nations, almost 300 million children have already skipped school worldwide. As a result of the COVID-19 epidemic in the Philippines, the Department of Education created Learning Activity Sheets for all grade levels for the 2020-2021 school year. Any paper that contains questions, assignments, or activities is considered an activity sheet. And the pupils will either write their answers or complete the given exercises. Coloring, word search, maze, English spelling bee, math test, and more activities are all possible. According to the Department of Education, the development of Learning Activities (LAS) shall be based on the Most Essential Learning Competencies (MELCs) issued by the Central Office. The Department uses a uniform template for the development of LAS.

The agency said that learning areas for Grade 1 to 3 should be prepared by their respective Schools Division Offices (SDOs) based on their MTB used as Methods of Teaching (MOT). Meanwhile, preparation for learning areas for Grades 4 to 6 and Junior High School and Senior High School shall be based on the agreed distribution per grade level. Mathematics deals with an abstract that is difficult to teach and learn; hence, classroom instruction should be backed-up with varied instructional materials. Thus, teachers should continue developing Learning Activity Sheets based on the context of their learners and the availability of instructional materials within their locality to have meaningful learning.

To develop concepts and principles, teachers must use manipulative, concrete, authentic materials and anchor teaching in the context of learners' lives. Therefore, sufficient instructional material should be provided to the learners to ensure the meeting of concepts and enhance their mathematical skills. Moreover, teachers should build on the school's resources and must accommodate and respect cultural, linguistic, and racial diversity. In addition, teaching should make the learning experience pleasant and gratifying so that learners continue learning. Games serve as an interesting springboard in starting their study and answering their self-learning modules every day.

The presented related literature has provided sufficient background information that enlightened and strengthened this research, thus making it more meaningful to the readers. Discussions about the Mathematics Education in the Philippines, Localization of Instructional Materials, Game-based Learning, and Learning Activity Sheets have certainly formed a strong foundation so that this study will be able to capture what it intends to know as a basis for the development of the Localized Game-Based Learning Activity Sheets (LGBLAS) in Mathematics 7.

MATERIALS AND METHODS

Research Design

The study utilized the Research and Development (R & D) model, also referred to as the research-based development method. R and D is used to produce a certain product and test its effectiveness (Sugiyono, 2014). It aims to discover solutions to problems by creating new goods or knowledge. In this study, Localized Game-Based Learning Activities were developed to enhance the level of mastery of the mathematics 7 learners along with the four content areas, namely: Number and Number Sense, Algebra, Geometry, and Statistics and Probability. The study involved the three basic stages: Planning Stage, Development Stage, and Validation Stage.

Population and Sample

The Mathematics 7 teachers in 54 public secondary schools in the Schools Division of Ilocos Norte served as the population in this study. Total enumeration was applied to determine the samples. A total of 66 teachers were involved as respondents. The other groups of respondents were five content specialists composed of an education program supervisor, a school head, a master teacher, and department heads. For the evaluation of the level of acceptability, 15 key teachers representing the four zones were randomly selected from the samples of the study.

Instruments

Three instruments were used to gather data for this study: the survey questionnaire on the perceived level of mastery for the teacher-respondents; the content validation rating scale for the content specialists; and the level of acceptability rating scale for the key teachers in Grade 7 Mathematics. Survey Questionnaire on the Level of Mastery of Grade 7 Learners on MELCs. This survey instrument was used to determine the level of mastery of the mathematics 7 learners on MELCs covering the four content areas, namely: Number and Number Sense, Algebra, Geometry, Statistics, and Probability. The respondents used a three-point rating scale with 3 for mastered (M), 2 for nearly mastered (NM), and 1 for least mastered (LM). The results of this survey became the bases for developing LGBLAs in Mathematics 7. The level of mastery of the mathematics 7 learners was analyzed and interpreted using the following range of means.

Range of Means	Descriptive Interpretation
2.51 - 3.00	Mastered (M)
1.51 - 2.50	Nearly Mastered (NM)
1.00 - 1.50	Least Mastered (LM)

Content Validation Rating Scale

The content validation tool, adopted from Picat (2020), was used to validate the LGBLAs. The content specialists responded to the indicators for content quality, instructional quality, and degree of localization. A five-point Likert-type scale was used with 5, the highest, as Very Highly Valid, and 1, the lowest, as Not Valid. The content validity of the developed LGBLAS was analyzed and interpreted using the range of means and descriptive interpretations.

Range of Means	Descriptive Interpretation
4.51 – 5.00	Very Highly Valid (VHV)
3.51 – 4.50	Highly Valid (HV)
2.51 – 3.50	Moderately Valid (MV)
1.51 – 2.50	Slightly Valid (SV)
1.00 – 1.50	Not Valid (NV)

Level of Acceptability Survey Rating Scale. The level of acceptability tool was adopted from Bacnat (2020) and was responded to by the key teachers of Mathematics 7 teachers from the four zones of SDOIN. The tool measured the level of acceptability of the material along with clarity, usefulness, language and style, illustrations, presentations, and suitability. A five-point Likert-type rating scale was utilized using 1, for the lowest as Not Acceptable, and 5, for the highest as Very Highly Acceptable. The range of means with the corresponding descriptive interpretation for the level of acceptability was adopted as follows:

Range of Means	Descriptive Interpretation
4.51 – 5.00	Very Highly Acceptable (VHA)
3.51 – 4.50	Highly Acceptable (HA)
2.51 – 3.50	Moderately Acceptable (MA)
1.51 – 2.50	Slightly Acceptable (SA)
1.00 – 1.50	Not Acceptable (NA)

Data Gathering Procedure

The study involved the three basic stages: Planning Stage, Development Stage, and Validation Stage. In the planning stage the researcher surveyed mathematics 7 public school teachers in the Schools Division of Ilocos Norte (SDOIN). This stage helped the researcher identify the level of mastery of the mathematics 7 learners based on the Most Essential Learning Competencies (MELCs) that need the preparation of the LGBLAs. Competencies that received nearly mastered to least mastered ratings were considered in the development of LGBLAs. In the development stage, the researcher identified the learning activities that need to be enhanced. The researcher conceived the development of the LGBLAs to contain all these parts: learning objectives, learning procedures, and localized game-based learning activities.

While in the validation stage focused on the content validation, evaluation of the level of acceptability, modification, revision, finalization, and production of the LGBLAs. The LGBLAs was evaluated by a group of content specialists composed of an education program supervisor, a school head, a master teacher, and department heads regarding content quality, instructional quality, and degree of localization. Key teachers in Grade 8 assessed the level of acceptability in terms of clarity, usefulness, language and style, illustrations,

presentations, and suitability. The results of the validation and evaluation and level of acceptability became the bases for the modification and finalization of the LGBLAs. All suggestions, corrections, and comments are incorporated before the final production of the material.

Data Analysis

Mean was used in determining the level of mastery of the learners in Mathematics 7 on the Most Essential Learning Competencies (MELCs). The level of mastery of the mathematics 7 learners was analyzed and interpreted using the following range of means with the corresponding descriptive interpretations:

Range of Means	Descriptive Interpretation
2.51 - 3.00	Mastered (M)
1.51 - 2.50	Nearly Mastered (NM)
1.00 - 1.50	Least Mastered (LM)

Mean was also used to describe the content validity of the developed Localized Game-Based Learning Activity Sheets in Mathematics 7 (LGBLAs) in terms of content quality, instructional quality, and degree of localization. This was interpreted using the following range of means with their corresponding descriptive interpretations:

Furthermore, mean was also used to determine the level of acceptability in terms of clarity, usefulness, language and style, illustrations, presentations, and suitability of the developed Localized Game-Based Learning Activity Sheets in Mathematics 7 (LGBLAs). This was interpreted using the following range of means with their corresponding descriptive interpretations;

Range of Means	Descriptive Interpretation
4.51 – 5.00	Very Highly Valid (VHV)
3.51 – 4.50	Highly Valid (HV)
2.51 – 3.50	Moderately Valid (MV)
1.51 – 2.50	Slightly Valid (SV)
1.00 – 1.50	Not Valid (NV)

Range of Means	Descriptive Interpretation
4.51 – 5.00	Very Highly Acceptable (VHA)
3.51 – 4.50	Highly Acceptable (HA)
2.51 – 3.50	Moderately Acceptable (MA)
1.51 – 2.50	Slightly Acceptable (SA)
1.00 – 1.50	Not Acceptable (NA)

RESULTS AND DISCUSSION

Results

The Level of Mastery of the Learners in Mathematics 7 on the Most Essential Learning Competencies (MELCs) on Number and Number Sense, Algebra, Geometry, Statistics and Probability.

Teachers' perception of the level of mastery of the learners in Mathematics along with Numbers and Number Sense Numbers and Number Sense as a strand focuses on how students can read, write and understand the meaning, order, and relationship among numbers and number systems. Table 1 shows the teachers' perception of the level of mastery of the learners in Mathematics along with Numbers and Number Sense.

The table shows that the teacher-respondents assessed five out of the 15 competencies as Nearly Mastered. These competencies include solving word problems on sets with Venn Diagram (M=2.26), representing real situations and solving problems using real numbers (M =2.27), estimating square roots of a whole number to the nearest hundredth (M=2.41), plotting irrational numbers on the number line (M=2.42), and performing operations on rational numbers (M=2.45)

Table 1: teachers' perception of the level of mastery of the learners on the Most Essential Learning Competencies (MELCs) in Mathematics along with Number and Number Sense. (n=66)

Most Essential Learning Competencies		Mean	Descriptive Interpretation
1.	Illustrates well-defined sets, subsets, universal sets, null sets, the cardinality of sets, union and intersection of sets, and the difference between two sets.	2.65	M
2.	Solves problems involving sets with the use of the Venn Diagram.	2.26	NM
3.	Represents the absolute value of a number on a number line as the distance of a number from 0	2.83	M
4.	Performs fundamental operations on integers.	2.62	M
5.	Illustrates the different properties of operations on the set of integers	2.68	M
6.	Expresses rational numbers from fraction form to decimal form and vice versa.	2.65	M
7.	Performs operations on rational numbers.	2.45	NM
8.	Describes principal roots and tells whether they are rational or irrational.	2.53	M
9.	Determines between what two integers the square root of a number is	2.61	M
10	Estimates the square root of a whole number to the nearest hundredth.	2.41	NM
11.	Plots irrational numbers (up to square roots) on a number line	2.42	NM
12.	Illustrates the different subsets of real numbers.	2.61	M

13.	Arranges real numbers in increasing or decreasing order and on a number line.	2.80	M
14.	Writes numbers in Scientific Notation and vice versa.	2.59	M
15.	Represents real-life situations and solves problems involving real numbers.	2.27	NM
Composite Mean		**2.56**	**M**

Legend

Range of Means	*Descriptive Interpretation*
2.51 – 3.00	*Mastered (M)*
1.51 – 2.50	*Nearly Mastered (NM)*
1.00 – 1.50	*Least Mastered (LM)*

The results suggest that learners have remained inadequate in these skills. They seem to still have confusion in making connections with these key concepts as applied to real-life situations or problem-solving. They can perform basic actions and struggle to answer straightforward mathematical problems without guidance or instructional support from their teachers. This finding supports the idea of Mohammed and Johnny (2012) that learners have difficulty understanding the number system as they have difficulty matching experience with new situations. Tambychik and Meerah (2012) further explained that deficiency of many mathematics skills such as number-fact, visual-spatial and information skills, and cognitive abilities in learning inhibit mathematics problem-solving. The 10 remaining competencies were assessed by the teacher-respondents as Mastered. This suggests that the learners can conceptualize, generalize, and utilize information about absolute value, principal roots, scientific notation, subsets of real numbers, operation of integers, and kinds of sets in modeling advanced mathematical situations. This is evident from the obtained mean ratings ranging from 2.53 to 2.83.

Meanwhile, the computed composite mean rating of 2.56 indicates that the learners generally had mastery of the Most Essential Learning Competencies along with Numbers and Number Sense. This implies that the students could apply their insights and understanding of numbers and number systems to any mathematical learning task. Moreover, it suggests that they are capable of advanced mathematical thinking and reasoning. As explained by Louange *et al.* (2012), learners with mastery of Mathematics could understand the words and the calculations to be made in complex problem situations.

Teachers' perception of the level of mastery of the learners in Mathematics along Algebra

Algebra as a strand is all about understanding the key concepts of algebraic expressions, the properties of real numbers as applied in linear equations, and inequalities in one variable. The level of mastery of the learners on the Most Essential Learning Competencies in Mathematics along Algebra is shown in Table 2.

Among the four strands in Mathematics 7, Algebra has the most number of nearly mastered competencies. Out of the 16 competencies, there were 10 items rated by the teacher-respondents nearly mastered by the learners. These include problem solving involving algebraic expressions (M = 2.03), equations and inequalities in one variable (M = 2.05), absolute value by graphing or algebraic methods (M = 2.14), and conversion of units of measurement (M = 2.21).

In addition, the topics on modeling product of algebraic

Table 2: Teacher's perception of the level of mastery of the learners on the Most Essential Learning Competencies (MELCs) in Mathematics along with Algebra. (n=66)

Learning Competency		Mean	Descriptive Interpretation
1.	Approximates the measures of quantities, particularly the length, weight/mass, volume, time, angle, temperature, and rate.	2.70	M
2.	Converts measurements from one unit to another in both Metric and English systems.	2.41	NM
3.	Solves problems involving the conversion of units of measurement.	2.21	NM
4.	Translates English phrases to mathematical phrases and English sentences, and vice versa.	2.62	M
5.	Illustrates and differentiates related terms in algebra: (a) where n is a positive integer; (b) Constants and variables; (c) Literal coefficients and numerical coefficients; (d) Algebraic expressions, terms, and polynomials; (e) Number of terms, degree of the term and degree of the polynomial.	2.77	M
6.	Evaluates algebraic expressions for given values of the variables.	2.59	M
7.	Adds and subtracts polynomials.	2.52	M
8.	Derives the laws of exponent.	2.44	NM
9.	Multiplies and divides polynomials.	2.32	NM
10.	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.	2.17	NM

11.	Solves problems involving algebraic expressions.	2.03	NM
12.	Differentiates algebraic expressions, equations, and inequalities.	2.53	M
13.	Illustrates linear equation and inequality in one variable.	2.47	NM
14.	Finds the solution of linear equation or inequality in one variable.	2.36	NM
15.	Solves linear equation or inequality in one variable involving absolute value by: (a) graphing; (b) algebraic methods.	2.14	NM
16.	Solves problems involving equations and inequalities in one variable.	2.05	NM
Composite Mean		**2.40**	**NM**

Legend.

Range of Means	*Descriptive Interpretation*
2.51 – 3.00	*Mastered (M)*
1.51 – 2.50	*Nearly Mastered (NM)*
1.00 – 1.50	*Least Mastered (LM)*

expressions (M = 2.17), multiplication and division of polynomials (M = 2.32), solution of linear equation or inequality in one variable (M = 2.36), conversion of units involving the Metric and English systems (M = 2.41), derivation of laws of exponents (M = 2.44), an illustration of linear equation and inequality in one variable (M = 2.47) were given mean ratings descriptively interpreted as nearly mastered.

These results indicate that the Grade 7 students were able to show some evidence of understanding of the mathematical concepts and procedures along with algebraic expressions, equations, and inequalities. They could model situations using oral, written, graphical, and algebraic methods in solving problems but with little guidance from the teacher and/or with some assistance from peers. The responses of the teacher-respondents below showed that their learners' performance in Algebra could be attributed to their inappropriate behavior during discussion and their negative thoughts towards this area in Mathematics.

The nearly mastered results could further be explained by other factors cited in the literature. Mulwa (2015) pointed out that the learners' difficulties in Mathematics are associated with learning and using mathematical terminology. The learners' inadequate grasp of the language of Mathematics and their inability to express it explicitly in ordinary language would not enable them to see the relatedness of mathematical concepts. It should be noted that to become successful in Algebra, the students must be knowledgeable of the language of Mathematics, so they can translate their understanding to identify information and carry out routine and non-routine procedures. On the contrary, the teacher-respondents assessed six of the competencies as mastered. In particular, the learners are now capable of adding and subtracting polynomials (M = 2.52), differentiating algebraic expressions, equations, and inequalities (M = 2.53), evaluating algebraic expressions for given values of the variables (M = 2.59), translating English phrases to mathematical phrases and English sentences, and vice versa (M = 2.62), approximating the measures of quantities, particularly the length, weight/mass, volume, time, angle and temperature and rate (M = 2.70) and illustrating and differentiating related terms in algebra (M = 2.77). As such, they manifest consistent and integrative application of procedural knowledge and conceptual understanding to compute, estimate, translate, illustrate, and evaluate algebraic expressions, equations, and inequalities.

Meanwhile, the computed composite mean rating of the participants at 2.40 indicates that the students, generally, nearly mastered the most essential learning competencies along with Algebra. This means that the learners could perform the required tasks but may need time to fully grasp the key concepts and to sufficiently acquire the skills necessary for advanced mathematical learning endeavors. The nearly mastered level of performance among the learners in Algebra could be explained in the study of Phonapichat *et al.* (2014).

They posited that students' ability in Mathematics could be affected by their difficulty interpreting keywords appearing in problems into mathematical sentences and their inability to figure out what to assume and what information from the problem is necessary to solve it. Moreover, they struggle to understand the problem because they are impatient and do not like reading very long word problems.

Teachers' perception of the level of mastery of the learners in Mathematics along with Geometry

Geometry as a strand is all about understanding the key concepts of geometry of shapes and sizes and geometric relationships. Table 3 shows the students' level of mastery of geometry as perceived by their teachers.

Out of the 11 most essential learning competencies in Geometry, it appears from the table that four of them were assessed by the teacher-respondents as nearly mastered by the learners. These include solving problems on sides and angles of a polygon (M = 2.15), deriving inductively the relationship of exterior and interior angles of a convex polygon (M = 2.33), constructing triangles, squares, rectangles, regular pentagons, and regular hexagons (M = 2.42), and bisecting line segments and angles and constructing perpendiculars and parallels (M = 2.47).

These mean ratings denote that the learners have acquired the basic skills in applying their knowledge and understanding in problem solving on sides and angles of polygons and in constructing different geometric shapes and figures. However, these skills could not be sufficient

Table 3: Teachers' perception of the level of mastery of the learners on the Most Essential Learning Competencies (MELCs) in Mathematics along with Geometry. (n=66)

Most Essential Learning Competencies		**Mean**	**Descriptive Interpretation**
1.	Represents point, line, and plane using concrete and pictorial models.	2.88	M
2.	Illustrates subsets of a line.	2.83	M
3.	Classifies the different kinds of angles.	2.85	M
4.	Derives relationships of geometric figures using measurements and by inductive reasoning; supplementary angles, complementary angles, congruent angles, vertical angles, linear pairs, perpendicular lines, and parallel lines.	2.53	M
5.	Derives relationships among angles formed by parallel lines cut by transversal using measurement and by inductive reasoning.	2.55	M
6.	Uses a compass and straightedge to bisect line segments and angles and construct perpendiculars and parallels.	2.47	NM
7.	Illustrates polygons; (a) convexity; (b) angles; and (c) sides.	2.59	M
8.	Derives inductively the relationship of exterior and interior angles of a convex polygon.	2.33	NM
9.	Illustrates a circle and the terms related to it: radius, diameter chord, center, arc, chord, central angle, and inscribed angle.	2.64	M
10.	Construct's triangles, squares, rectangles, regular pentagons, and regular hexagons.	2.42	NM
11.	Solves problems involving sides and angles of a polygon.	2.15	NM
Composite Mean		**2.57**	**M**

Legend

Range of Means	*Descriptive Interpretation*
2.51 – 3.00	*Mastered (M)*
1.51 – 2.50	*Nearly Mastered (NM)*
1.00 – 1.50	*Least Mastered (LM)*

to work with models for complex situations.

One of the reasons for the students not being able to gain mastery of the listed competencies is the mode of teaching-learning during this time of the pandemic. Knowing how complex these competencies are, the teachers could not adequately teach the required skills since printed modular distance learning limits their direct communication with the students. Moreover, access to information remains a challenge for students with limited internet connections.

The findings support what Fabiyi (2017) claimed about the reasons for learners' difficulty in learning these competencies in Geometry. According to him, the causes of this difficulty could be traceable to teachers' method of instruction, unavailability of instructional materials, insufficient time allocation, students' gender, the complexity of the learning competency, and misconceptions of concepts.

While construction of geometric figures and shapes appeared to be a challenge among the learners, the teacher-respondents significantly noted the remaining seven competencies to be mastered by them. This is evident from the obtained mean ratings ranging from 2.53 to 2.88.

The result could mean that the learners are capable of making sound connections of the different geometric relationships by properly illustrating, representing, and classifying basic geometric concepts involving angles, undefined terms, lines, polygons, and circles. Further, it could suggest that their interpretations of these relationships are sufficient to build a simple model or to select simple problem-solving strategies.

In spite of having four nearly mastered competencies, generally, the learners were found to have mastery in Geometry. This is indicated by the composite mean rating of 2.57. This could mean that the learners could gain sufficient understanding and strategic skills to venture into higher geometrical learning activities. As cited in Fabiyi (2017), such proficiency in Geometry could provide a rich visualization source for understanding arithmetical, algebraic, and statistical concepts. It could be used to develop students' spatial awareness, intuition, and visualization and solve practical problems.

Teachers' perception of the level of mastery of the learners in Mathematics along Statistics and Probability.

Table 4 reveals the level of mastery of the Mathematics 7 learners in Statistics and Probability. Statistics and Probability as a strand is all about understanding the key concepts, uses, and importance of Statistics, data collection/gathering, and the different forms of data representation, measures of central tendency, measures of variability, and probability.

As reflected in the table, six of the 11 competencies were given mean ratings ranging from 2.23 to 2.47, which are within the descriptive interpretation of nearly mastered. These competencies involve computation of the measures of variability of grouped and ungrouped data, analysis and interpretation of statistical data, illustration

of computation drawing conclusions from graphical and statistical data, organization of data using graphs, and formulation of simple statistical instruments.

It can be deduced from the results that mathematics 7 learners can compute variability, organize, analyze and interpret data, draw conclusions from the data, and formulate statistical instruments. They have the fundamental knowledge and skills to do these tasks but cannot work independently yet. Guidance from the learning facilitators and/or some assistance from peers is still necessary to accurately transfer understandings through authentic performance tasks.

The above results and statements reinforce the findings of Fitzmaurice *et al.* (2014). They argued that the learners perceived Statistics to be difficult because of the whole uncertainty of the topic and the language, symbols, and

Table 4: Teachers' perception of the level of mastery of the learners on the Most Essential Learning Competencies (MELCs) in Mathematics with Statistics and Probability. (n=66)

Learning Competency		**Mean**	**Descriptive Interpretation**
1.	Poses real-life problems that can be solved by Statistics.	2.53	M
2.	Formulates simple statistical instruments.	2.47	NM
3.	Gathers statistical data.	2.55	M
4.	Organizes data in a frequency distribution table.	2.64	M
5.	Uses appropriate graphs to represent organized data: pie chart, bar graph, line graph, histogram, and ogive.	2.47	NM
6.	Illustrates the measures of central tendency (mean, median, and mode) of statistical data.	2.70	M
7.	Calculates the measures of central tendency of ungrouped and grouped data.	2.52	M
8.	Illustrates the measures of variability (range, average deviation, variance, standard deviation) of statistical data.	2.42	NM
9.	Calculates the measures of variability of grouped and ungrouped data.	2.23	NM
10.	Uses appropriate statistical measures in analyzing and interpreting statistical data.	2.32	NM
11.	Draws conclusions from graphic and tabular data and measures of central tendency and variability.	2.36	NM
Composite Mean		**2.47**	**NM**

Legend

Range of Means	Descriptive Interpretation
2.51 – 3.00	Mastered (M)
1.51 – 2.50	Nearly Mastered (NM)
1.00 – 1.50	Least Mastered (LM)

terminology used. Moreover, these topics in Statistics require conceptual understanding and interpretative skills, which are regarded as more difficult than those which require factual recall or the use of routine procedures.

Nevertheless, the learners were found to have mastered the other five learning competencies relating to measures of central tendency, data gathering, frequency distribution table, and statistics in real life. The corresponding competencies received mean ratings ranging from 2.52 to 2.70. This result implies that learners can strategically work on the assigned tasks using broad, well-developed thinking and reasoning skills.

However, taking their performance holistically, learners were shown to have not fully mastered Statistics. This is indicated by the composite mean rating of 2.47, descriptively interpreted as nearly mastered. This implies that learners could benefit further from doing additional activities to deepen their skills, knowledge, and understanding of Statistics. They may have the fundamental skills but could be inadequate to work and develop models for more complex statistical situations.

This finding is quite understandable for one major reason, as claimed by Watts (2012). In his view, the major difficulty inhibiting the learning of Statistics and distinguishing it from other disciplines is that the important fundamental concepts in Statistics are quintessentially abstract. This means that these concepts could not be directly demonstrated, experienced, and illustrated through pictures.

Summary of the results on the teachers' perceptions on the level of mastery of the learners in Mathematics

Mathematics 7 allows the learners to demonstrate an understanding of key concepts and principles of numbers and number sense (sets and real number system); measurement (conversion of units of measurement); patterns, and algebra (algebraic expressions and properties of real numbers as applied in linear equations and inequalities in one variable); geometry (sides and angles of polygons); and statistics and probability (data collection and presentation, and measures of central tendency and variability) as applied - using appropriate technology - in critical thinking, problem solving, reasoning, communicating, making connections, representations, and decisions in real life (DepEd, 2016).

The summary of results on teachers' perceptions of the level of mastery of the learners in Mathematics is displayed in Table 2e. Considering the competencies under

the four strands comprising Mathematics 7, the students are assessed as nearly mastered in Algebra (M=2.40) and Statistics and Probability (M=2.47) while as mastered in Number and Number Sense (M=2.56) and Geometry (M = 2.57). This suggests that the Mathematics 7 learners were able to exhibit sufficient understanding, skills, and knowledge about Number and Number Sense and Geometry. However, they might need reinforcement to deepen their learning in Algebra Statistics and Probability.

Overall, the learners learned Mathematics 7 at a nearly mastered level, as shown by the overall mean rating of 2.50. This implies that, overall, they were able to acquire the fundamental skill to allow them to move to more advanced mathematical learning tasks. However, the key concepts and skills could be enriched by adding more mathematical learning experiences, which could be offered by supplementing instruction with appropriate, contextualized, and relevant curriculum support materials. Hence, a Localized Game-based Learning Activity Sheets is useful for them.

Table 5: Summary of results of the Teacher's perception on the level of mastery of the Grade 7 learners on the Most Essential Learning Competencies (MELCs) in Mathematics 7. (n=66)

Indicators		Composite Mean	Descriptive Interpretation
1.	Numbers and Number Sense	2.56	M
2.	Algebra	2.40	NM
3.	Geometry	2.57	M
4.	Statistics and Probability	2.47	NM
Overall Mean		**2.50**	**NM**

Legend

Range of Means	Descriptive Interpretation
2.51 – 3.00	Mastered (M)
1.51 – 2.50	Nearly Mastered (NM)
1.00 – 1.50	Least Mastered (LM)

As Alvaro (2020) explained, Activity Sheets could be effective delivery systems for learners' acquisition of the Most Essential Learning Competencies. Calilit (2020) also concluded that curriculum support material is very useful in delivering quality learning to the learners in the new normal setting of education. When students maximize the use of these Activity sheets, their performance in Mathematics will be enhanced.

Content Validity of the Localized Game-Based Learning Activities in Mathematics 7 (LGBLAs) Content Quality

The developed Localized Game-Based Learning Activities in Mathematics 7 was validated in terms of their content quality, instructional quality, and degree of localization adopted.

Content Quality. Table 6 shows the validity of the content quality of the LGBLAs, as perceived by an education program supervisor, a school head, a master teacher, and head teachers specializing in Mathematics.

The validators found that the content quality of the material is very highly valid, as shown by the composite mean of 4.86. It suggests that the LGBLAs is aligned with the prescribed competencies, promote and stimulate critical thinking, and encourage prior knowledge and understanding.

Considering the indicators, all of them were rated very highly valid. Specifically, the concepts of the LGBLAs were found to be consistent, accurate, up-to-date, stimulating and promoting critical thinking, and relevant to real-life situations (M=5.00).

Table 6: Panel of experts' evaluation on the validity of the LGBLAs along with content quality. (n=5)

Indicators		Mean	Descriptive Interpretation
1.	Content is consistent with topics/skills found in the Most Essential Learning Competencies for the subject and grade level it was intended.	5.00	VHV
2.	Concepts are developed to contribute to enrichment, reinforcement or mastery of the identified learning objectives.	4.80	VHV
3.	Content is accurate.	5.00	VHV
4.	Content is up-to-date.	5.00	VHV
5.	Content is logically developed and organized.	4.60	VHV
6.	Content is free from cultural, gender, racial, or ethnic bias.	4.80	VHV
7.	Content stimulates and promotes critical thinking.	5.00	VHV
8.	Content is relevant to real-life situations.	5.00	VHV
9.	Language (including vocabulary) is appropriate to the target user level.	4.60	VHV
10.	Content promotes positive values that support formative growth.	4.80	VHV
Composite Mean		**4.86**	**VHV**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

Also, the LGBLAs contribute to enrichment, reinforcement or mastery of the identified learning objectives, are free from cultural, gender, racial, or ethnic bias, and promote positive values that support formative growth (M=4.80). It was also found that LGBLAs is organized and appropriate to the target user level (M= 4.60).

The validators found that the content quality of this material is very highly valid as shown by the composite mean 4.86. The very highly valid rating could mean that the LGBLAs could engage students more in Mathematics with high success rates. According to Clements, (2018), the context in Mathematics helps students solve mathematical problems by facilitating their learning, providing an avenue to try different ways of solving a problem, developing good problem-solving skills, allowing them to figure out the mathematical solution.

Instructional Quality

Table 7 shows the validity of the LGBLAs along with instructional quality. As shown from the table, the instructional quality of the LGBLAs is very highly valid, with the corresponding composite mean of 4.88. This means that the LGBLAs has a solid instructional purpose, has an appropriate level of complexity and materiality could provide feedback and could be integrated with the target user's experiences.

The validators found that the developed materials contain very highly valid examples that are well-defined, appropriate, enjoyable, stimulating, challenging, and engaging, and effectively stimulate the creativity of the target user (M = 5.00). Also, the learning objectives are clearly stated and measurable, and the instruction integrated with the target user's previous experience (M = 4.80).

According to the Department of Education (2016), printed materials should contain contents that stimulate and promote critical thinking, include sentences or paragraphs that encourage prior knowledge and understanding, and align to learning objectives clearly stated and measurable. Also, the level of difficulty is aligned to the intended user, and feedback is always positive, motivational, and user-sensitive.

Degree of Localization

Table 8 shows the validity of the degree of Localization of the LGBLAs. The validators found that the materials' content quality in terms of localization is very high, with a composite mean of 4.80. This indicates that the LGBLAs have a high level of cultural inclusiveness, emphasizing the context of the learners' lives. This is corroborated by the individual mean ratings of the indicators as very highly valid, which ranged from 4.60 to 5.00.

Specifically, the LGBLAs is thought to contain many

Table 7: Panel of experts' evaluation on the validity of the LGBLAs along with instructional quality.

Indicators		**Mean**	**Descriptive Interpretation**
1.	Purpose of the activities is well defined.	5.00	VHV
2.	Activities achieve their defined purpose.	5.00	VHV
3.	Learning objectives are clearly stated and measurable.	4.80	VHV
4.	Level of difficulty is appropriate for the intended target user.	4.40	HV
5.	Graphics and colors are used for appropriate instructional reasons.	5.00	VHV
6.	Activity is enjoyable, stimulating, challenging, and engaging.	5.00	VHV
7.	Activity effectively stimulates the creativity of the target user.	5.00	VHV
8.	Instruction is integrated with the target user's previous experience.	4.80	VHV
Composite Mean		**4.88**	**VHV**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

real-life problem-solving situations, local materials, and knowledge relevant to the learner's real-life situation. The material inspires them to learn, respect, comprehend their cultural history, and apply concepts and facts in practical situations.

Localization gives awareness of what is the current status of a certain topic being discussed, and since it is more specific and it is very closely related to people, it will give the students an aggressive mind to really learn more about it since it became familiar with them. Because of this, if the topic is something to deal with an issue, they can easily relate and can be a great way for the students to participate in solving issues of the nation (Dimacali, 2018).

Summary of the panel of experts' evaluation on the

content validity of the LGBLAs in Mathematics 7

Table 9 summarizes the LGBLAs' content validity in terms of content quality, instructional quality, and degree of localization. As shown in the table, the overall mean rating of 4.85 indicates that the LGBLAs are very highly valid. Through localized examples, activities, and exercises, the materials could help learners build the habit of solving mathematical problems while also instilling pride in their identity.

All of the components were given a rating of very highly valid with the composite means ranging from 4.80 to 4.88. This suggests that the material's components met the quality standards. As a result, the LGBLAs may be used as a curriculum supplement to help students learn Mathematics. The very highly valid results could be supported by the expert panel's testimonies, such as:

Table 8: Panel of experts' evaluation on the validity of the LGBLAs along with the degree of localization. (n=5)

Indicators		**Mean**	**Descriptive Interpretation**
1.	The LGBLAs include many real, believable problem-solving situations that learners can recognize as important to their current and possible future lives.	5.00	VHV
2.	The LGBLAs relate mathematical concepts to the real-life situation of the learner.	4.80	VHV
3.	The LGBLAs utilize local materials or information in the development of the lesson.	4.80	VHV
4.	The LGBLAs encourage the learners to apply concepts and information in useful contexts.	4.60	VHV
5.	The LGBLAs motivate the learners to know, understand and appreciate their cultural heritage.	4.80	VHV
Composite Mean		**4.80**	**VHV**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

Validator 1

The material is timely and relevant in developing skills essential to understand MELCs through localization

.

Validator 2

Congratulations! I am optimistic that if this LGBLAs will be properly utilized by the Grade 7 teachers will give a great impact on the learners not only on their Mathematical skills and conceptual understanding but also in appreciating the Ilocano Culture.

Validator 3

Very useful to our learners. The material contains useful introductions, reviews and pictures that facilitate learning. Also, it enhances the development of desirable values and traits in the locality. Overall, it is a great contribution to Mathematics education.

Validator 4

This learning material is a great help to teachers and learners to enhance the mathematical ability of learners. The localization of activities was well done. Likewise, it is integrated to other subject areas like social studies (History of Ilocos Norte).

Table 9: Summary of the panel of experts' evaluation on the validity of the LGBLAs in Mathematics 7 (n=5)

Content	**Composite Mean**	**Descriptive Interpretation**
1. Content Quality	4.86	VHV
2. Instructional Quality	4.88	VHV
3. Degree of Contextualization	4.80	VHV
Overall Mean	**4.85**	**VHV**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

Level of Acceptability of the Localized Game-Based Learning Activities in Mathematics 7

The level of acceptability of the localized game-based learning materials in mathematics 7 was evaluated by the fifteen Mathematics 7 teachers in the Schools Division of Ilocos Norte, along with clarity, usefulness, language and style, illustrations, presentations, and suitability.

Clarity

Table 10 shows the respondents' evaluation of the level of acceptability of the LGBLAs' clarity. As indicated in the table, the composite mean of 4.63 indicates that the material's clarity is very highly acceptable, denoting that the learners could easily comprehend the discussions,

examples, and activities even when they perform independent learning.

This composite mean rating could be supported by the individual mean of 4.73 and 4.53 which are descriptively interpreted as very highly acceptable.

The results imply that the concepts for each activity in the LGBLAs is clear and simple, and the basic information is presented using an easy-to-understand language.

Usefulness

Table 11 shows that the level of acceptability for the LGBLAs' usefulness is very highly acceptable, with a composite mean value of 4.81. This finding indicates that the LGBLAs allow learners to obtain a deeper understanding of basic procedures and their applicability in real-life situations.

All five indicators were assessed as very highly acceptable,

Table 10: Key teachers' evaluation on the level of the acceptability of the LGBLAs along with clarity. (n=15)

Indicators		Mean	Descriptive Interpretation
1.	The LGBLAs provides information that is clear and simple.	4.73	VHA
2.	The LGBLAs makes use of language that is clear and easy to understand.	4.53	VHA
Composite Mean		**4.63**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

with mean ratings ranging from 4.73 to 4.87. This implies that LGBLAs is straightforward and easy to understand, allows learners to think logically and critically, and encourages them to participate actively in the learning activities based on these findings.

Furthermore, its concepts in the LGBLAs were developed to provide enough stimulating information that leads to the refinement of mathematical skills, as well as making connections between prior and new concepts learned

Table 11: Key teachers' evaluation on the level of acceptability of the LGBLAs along with usefulness. (n=15)

Indicators		Mean	Descriptive Interpretation
1.	The LGBLAs prepare the learners to think logically and critically.	4.87	VHA
2.	The LGBLAs provide opportunities for the development and enrichment of mathematical skills.	4.87	VHA
3.	The LGBLAs provide adequate information on the topics presented	4.73	VHA
4.	The LGBLAs encourage the learners to become actively involved in the learning activities	4.80	VHA
5.	The LGBLAs are useful to teachers and learners.	4.80	VHA
Composite Mean		**4.81**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

previously.

Language and Style

The level of acceptability for the LGBLAs' language and style is shown in Table 12. The material is very highly acceptable, as evidenced by the composite mean of 4.60. This means that LGBLAs is grammatically correct, uses easy-to-understand vocabulary, and has an appropriate style and format.

This finding is supported by the two indicators (items items 1 and 3), whose means are 4.60 and 4.87, equivalent to a highly acceptable rating, and the other indicator (item 2) with a mean of 4.33 descriptively interpreted as highly acceptable. This suggests that the material has an acceptable utilization of words, grammar structures, vocabulary, tone, style, and format.

Illustrations

The level of acceptability of LGBLAs along illustrations

Table 12: Key teachers' evaluation on the level of acceptability of the LGBLAs along with language and style. (n=15)

Indicators		Mean	Descriptive Interpretation
1.	The LGBLAs is free from grammatical errors.	4.60	VHA

2.	The LGBLAs utilizes sufficient and familiar vocabulary to ensure learning.	4.33	HA
3.	The LGBLAs adopts style and format that are appropriate to the target level.	4.87	HA
Composite Mean		**4.60**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

is shown in table 13 with a composite mean of 4.70, which indicates that LGBLAs are very highly acceptable. LGBLAs contain pictures that are well-placed in the text to enable the development of mathematical abilities necessary for a thorough knowledge of the essential concepts and themes in Mathematics 7.

All items were given a very highly acceptable rating. These results indicate that the illustrations are clear and simple (M = 4.60), provide concrete visual clues (M = 4.60), are appropriate for the topic (M = 4.67), guide learners to follow direction (M = 4.73), and arouse students' interest making learning more effective and enjoyable (M = 4.87).

Suitability

Table 13: Key teachers' evaluation on the level of acceptability of the LGBLAs along with illustrations. (n=15)

Indicators		**Mean**	**Descriptive Interpretation**
1.	The illustrations are clear and simple.	4.60	VHA
2.	The illustrations arouse students' interest making learning effective and enjoyable.	4.87	VHA
3.	The illustrations provide concrete visual clues.	4.60	VHA
4.	The illustrations guide learners to follow directions.	4.73	VHA
5.	The illustrations are appropriate for the topic.	4.67	VHA
Composite Mean		**4.70**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

Table 14 shows the level of acceptability of the LGBLAs in terms of suitability.

The composite mean of 4.82 indicates that the material is very highly acceptable. Further, the result means that the LGBLAs applies to all types of learners and that its use of words, images, and situations is appropriate for students to learn concepts and skills cheerfully and effectively.

The composite mean of 4.82 indicates that the material is very highly acceptable. Further, the result means that the LGBLAs applies to all types of learners and that its use of words, images, and situations is appropriate for students to learn concepts and skills cheerfully and effectively.

Specifically, all the indicators are given a very highly acceptable rating. This shows that the LGBLAs includes activities that take into consideration the varying attitudes and capabilities of the learners (M = 4.73). Furthermore, the findings indicate that the material provides relevant activities that are suitable to the subject matter (M = 4.80) and that the activities are relevant, entertaining, and self-motivating for the learner (M = 4.93).

Table 14: Key teachers' evaluation on the level of acceptability of the LGBLAs along with suitability. (n=15)

Indicators		**Mean**	**Descriptive Interpretation**
1.	The LGBLAs includes activities that take into consideration the varying attitudes and capabilities of the learner.	4.73	VHA
2.	The LGBLAs includes activities that are suitable to the subject matter.	4.80	VHA
3.	The LGBLAs includes activities that are relevant, interesting, and self-motivating to the learner.	4.93	VHA
Composite Mean		**4.82**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

Summary of key teachers' evaluation on the level of

acceptability of LGBLAs in Mathematics 7

The results of the evaluators' level of acceptability of the LGBLAs along with the six indicators, namely; clarity, usefulness, language and style, illustrations, presentations, and suitability are summarized in Table 15.

The material is very highly acceptable for use as a curricular support material, as evidenced by the overall mean rating of 4.70. This means that LGBLAs could provide meaningful mathematical experience in mastering The LGBLAs' highest-rated component is suitability (M = 4.82), while the lowest-rated indicator is language and style (M = 4.62).

Nonetheless, all six components received a very highly acceptable rating, denoting that the LGBLAs could be a useful supplementary material for Grade 7 teachers in delivering mathematics instruction.

Table 15: Summary of key teachers' evaluation on the level of acceptability of LGBLAs. (n=15)

Indicators		Composite Mean	Descriptive Interpretation
1.	Clarity	4.63	VHA
2.	Usefulness	4.81	VHA
3.	Language and Style	4.60	VHA
4.	Illustrations	4.70	VHA
5.	Presentations	4.62	VHA
6.	Suitability	4.82	VHA
Overall Mean		**4.70**	**VHA**

Legend

Range of Means	*Descriptive Interpretation*
4.51 – 5.00	*Very Highly Valid (VHV)*
3.51 – 4.50	*Highly Valid (HV)*
2.51 – 3.50	*Moderately Valid (V)*
1.51 – 2.50	*Slightly Valid (MV)*
1.00 – 1.50	*Not Valid (NV)*

CONCLUSIONS

Based on the results of this study, it can be concluded that the learners exhibited nearly mastery in some of the learning competencies in Mathematics 7. This could mean that they have not sufficiently acquired the fundamental skills required to move to more advanced mathematical learning tasks. However, the key concepts and skills could be enriched by supplementing instruction with appropriate, localized, and relevant curriculum support materials. Hence, LGBLAs in Mathematics 7 was developed.

It is also concluded that LGBLAs is very highly valid and very highly acceptable. The material could provide learners with meaningful experiences in mastering the various competencies in Mathematics 7. Hence, LGBLAs could be adopted as supplementary curriculum support material for mathematics instruction to improve the mastery level of Grade 7 learners.

The results of this study have shown how effective the Instructional Design Theory is in crafting instructional materials, similar to LGBLAs. Furthermore, it affirmed the principle of the Theory of Constructivism that play and learning experiences are powerful forces in the development of the individual mind. Meanwhile, it confirmed the principles of the Situated Learning Theory that the local context plays a significant role in skills formation.

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