Research in Management and Humanities

DWIJMH VOL 2 NO 3 (2023) ISSN: 2980-4817

Available online at www.dwijmh.org
Journal homepage: http://www.dwijmh.org
ORCID ID: https://orcid.org/0000-0001-6884-3504

Contextualized Interactive Learning Materials (CILMs) for mathematics 1

Robinson D. Picat: Teacher III, Pacifico Elementary School, Marcos, Ilocos Norte Schools Division of Ilocos Norte

Eldefonso B. Natividad Jr.: Education Program Supervisor, Schools Division of the City of Batac

A R T I C L E I N F O

Article history:

Received: May 26, 2023
Received in rev. form July 15, 2023
Published: September 30, 2023

Keywords: ***contextualized interactive learning materials, Mathematics, Public elementary school teachers***

A B S T R A C T

This study developed Contextualized Interactive Learning Materials (CILMs) for Grade 1 Mathematics based on a needs assessment survey among public elementary school teachers in the Schools Division of Ilocos Norte. Stratified random sampling was used to select 148 teachers as samples. The findings highlighted a significant need for CILMs in Grade 1 Mathematics, addressing challenges faced by teachers in instructional material preparation and use. CILMs were created and evaluated by experts and Grade 1 teachers, resulting in high validity and acceptability. The adoption of CILMs for mathematics instruction is recommended.

JEL Classification:
E23; M 15

Introduction

Mathematics education is a global concern, as indicated by the Programme for International Student Assessment (PISA, 2018) and low proficiency levels reported by PISA (2013) and the National Center for Education Statistics (NCES, 2013). In the Philippines, the quality of mathematics education remains low, as evidenced by National Achievement Test (NAT) scores and global rankings (Antonio, 2015).). Particularly, the Philippines ranked 76th out of 140 countries in Mathematics and Science Education, while Filipino students scored significantly lower than the OECD average in Mathematical Literacy according to the 2018 PISA results (Antonio, 2015; PISA, 2018).To address these challenges, policymakers and educators prioritize improving learners' mathematics performance by integrating ICT and contextualizing learning resources (Saeed, Ahmed, & Malik, 2018). However, the lack of instructional materials, including manipulatives, poses challenges to effective teaching and learning (Antonio, 2015). This response, this study

* *Corresponding author. ORCID ID: 0000-0001-6884-3504*

developed Contextualized Interactive Learning Materials (CILMs) for Grade 1 students, tailored to their needs and designed to enhance mathematics performance.

Literature review

This part investigates literature that provides the concepts, which serve as a basis for the study's conceptual framework.

Instructional materials

Instructional materials are vital in teaching-learning, facilitating communication, motivation, and engagement (Adalikwu & Lorkpilgh, 2012). They concretize concepts, simplify learning, and improve knowledge retention (Mazgon & Stefanc, 2012). Selecting appropriate materials requires considering student characteristics (abilities, gender, age, prior knowledge, and progress) and teacher factors (attitudes, experience, qualifications in technology use, and professional judgment) (Mazgon & Stefanc, 2012). The materials should be adaptable to support educational goals (Mazgon & Stefanc, 2012).

Interactive Learning Materials (ILMs)

Interactive Learning Materials (ILMs) engage students actively, save time, and provide feedback (Dimasuay, 2015). They further consider learners' characteristics for effective interactive technology (Gushchin, 2012). Moreover, evaluating ICT-based materials requires content, instruction, and technical quality (Castillo, 2019). In terms of content quality, this aligns with objectives, promotes cognitive skills, and addresses social content. Instructional quality includes clear objectives, stimulating content, and appropriate difficulty. Technical quality focuses on usability, visuals, text display, and sound effects. Non-print materials, therefore, should stimulate critical thinking, incorporate prior knowledge, align with objectives, provide user-sensitive feedback, and use accurate visuals with appropriate hyperlinking (DepEd, 2016).

Contextualization in mathematics education

Teaching mathematics has encountered challenges, with students struggling with computational problems lacking real-world applications, resulting in disengagement and decreased motivation (Mazana, 2018; Nicolas, 2020). To address this, contextualized instruction is proposed, wherein teachers consider students' readiness, interests, and diverse classroom settings, promoting active participation and learning development (Reyes et al., 2019; Villanueva, 2018). Contextualization enables students to connect their knowledge to various situations, facilitating problem- solving and transfer of learning (Mazana, 2018). Teaching mathematics in real-life contexts enhances student learning, motivation, and appreciation of cultural heritage (Center for Occupational Research and Development, 2012; Mouraz & Leite, 2013).

Engaging students in the context surrounding mathematical problems improve success rates by supporting learning, problem-solving skills, and conceptual organization (Clements, 2018). Contextualization allows students to explore different approaches, connect with prior knowledge, and tackle complex problems (Clements, 2018). However, not all teachers possess the necessary knowledge and skills for effective contextualization in mathematics (Reyes et al., 2019).

To create equitable learning environments, educators should consider contextualization that connects students' understanding to real-life contexts, fostering a sense of belonging and engagement (Mazana, 2018). Starting lessons with students' experiences and addressing their emotions can further enhance belongingness and engagement (Mazana, 2018).

Learning competencies in mathematics 1

The Department of Education (DepEd) recognizes the importance of mathematics as a subject that extends beyond the classroom and school, emphasizing the need for comprehensive and in-depth learning (DepEd, 2016). In the basic education levels, the twin goals of mathematics education are critical thinking and problem-solving. Critical thinking involves actively and skillfully using the information to guide belief and action, while problem-solving entails finding solutions to unknown problems (DepEd, 2016). Achieving these goals requires an organized and rigorous curriculum, high-level skills and processes, values and attitudes, and appropriate tools, taking into account the diverse contexts of Filipino learners (DepEd, 2016). The teacher plays a significant role in helping students develop these competencies and gain a meaningful understanding of mathematics (DepEd, 2016)

Conceptual framework

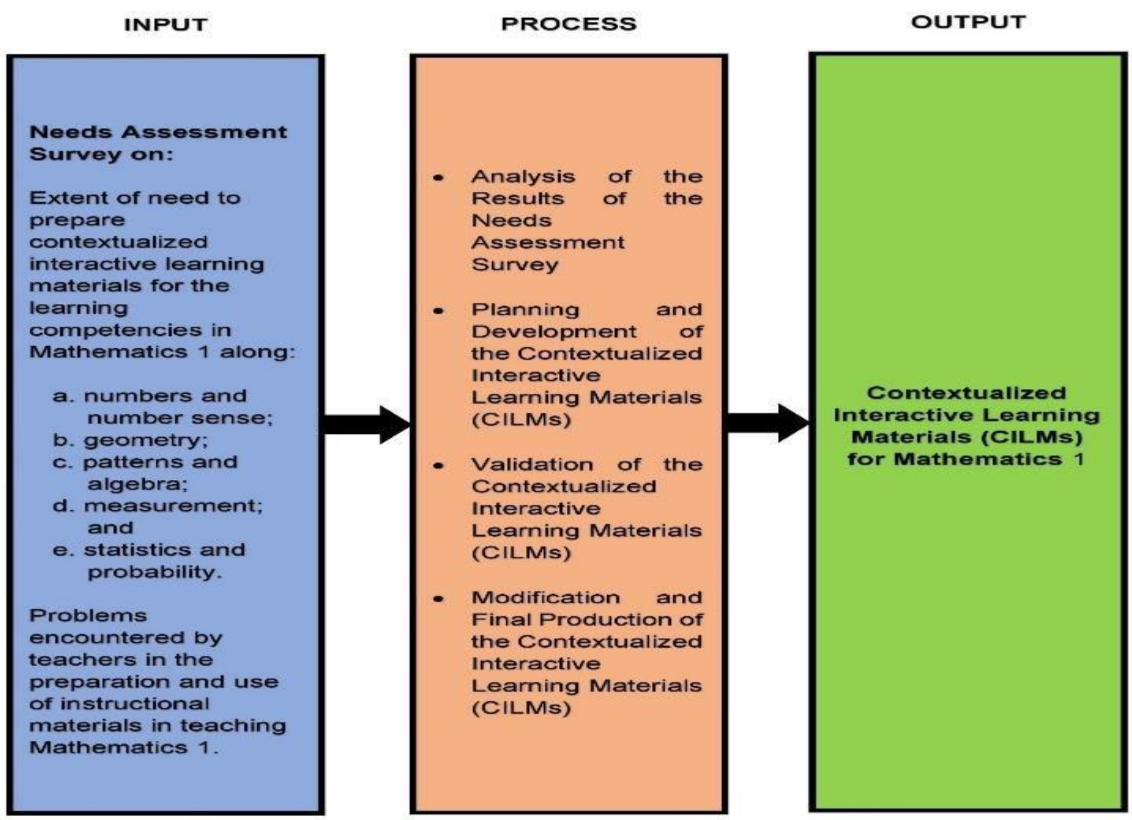

Figure1: The conceptual framework explains an Input-Process-Output (IPO) model. It involves Grade 1 mathematics teachers' input on the need for Contextualized Interactive Learning Materials (CILMs) and their challenges in instructional material preparation. The processes include data analysis, planning, development, validation, modification, revision, and final production of

CILMs. The output is validated CILMs with contextualized activities to enhance Grade 1 learners' math knowledge and skills.

Statement of the problem

This study was conducted to develop Contextualized Interactive Learning Materials (CILMs) that will enhance the competencies of Grade 1 learners.

Specifically, it sought answers to the following questions:

1. **What is the extent of the need to prepare contextualized interactive learning materials as perceived by the teacher-respondents along:**
   1.1 numbers and number sense;
   1.2 geometry;
   1.3 patterns and algebra;
   1.4 measurement; and
   1.5 statistics and probability?

2. **What are the problems encountered by the teachers in the preparation and use of instructional materials in teaching mathematics?**

3. **What learning materials can be developed to further improve the performance of the learners?**

4. **What is the validity of the Contextualized Interactive Learning Materials (CILMs) in terms of the following:**
   4.1 content quality;
   4.2 instructional quality;
   4.3 degree of contextualization; and
   4.4 technical quality?

5. **What is the level of acceptability of the CILMs along:**
   5.1 ***clarity;***
   5.2 usefulness;
   5.3 language and style;
   5.4 illustrations and layout; and
   5.5 suitability?

Research methodology

The study employed rigorous research methodologies including research design, data gathering instruments, population, study locale, data gathering procedures, and statistical treatment of data.

Research design

The study employed research and development methodology (R&D) to prepare and develop educational outputs, specifically Contextualized Interactive Learning Materials (CILMs), to achieve a specific goal. The development and validation of the CILMs involved three stages: planning, development, and validation.

Locale of the study

This study was conducted in the Schools Division of Ilocos Norte, which is divided into four zones: Central, East, North, and South. The Central Zone comprises Bacarra, Vintar, San Nicolas, and Sarrat; the East Zone includes Piddig, Carasi, Solsona, Dingras, Marcos, Banna, and Nueva Era. The South Zone covers Paoay, Currimao, Pinili, and Badoc; while the North Zone consists of Pasuquin, Burgos, Bangui, Dumalneg, Pagudpud, and Adams. The division comprises 22 districts and a total of 195 public elementary schools without multigrade classes.

Population and sampling

The study encompassed all Grade 1 public elementary school teachers in the Schools Division of Ilocos Norte (SDOIN). Through stratified random sampling, 148 teachers were selected as samples from 132 public elementary schools in SDOIN, utilizing Slovin's Formula.

Data gathering instruments

The study employed three survey questionnaires: one for teacher respondents to assess the need for Contextualized Interactive Learning Materials (CILMs) based on indicators from DepEd(2016) and identified problems from literature review and studies; a content validation rating scale for content specialists and ICT experts to evaluate content and technical aspects, adapted from Castillo (2016); and a level of an acceptability rating scale for randomly selected Grade 1 teachers to measure the CILMs' acceptability, adopted from Nicolas (2020).

Statistical treatment of data

The collected data were analyzed and interpreted using frequency counts, percentages, ranks, and means. To interpret the extent of the need for preparing Contextualized Interactive Learning Materials (CILMs) for Grade 1 Mathematics, the following range of means and corresponding descriptive interpretations were utilized.

Range of Means	***Descriptive Interpretation***
3.51 - 4.00	*Much Needed (MN)*
2.51 - 3.50	*Needed (N)*
1.51 - 2.50	*Slightly Needed (SN)*
1.00 - 1.50	*Not Needed (NN)*

The problems faced by teachers in the preparation and use of instructional materials for Grade 1 Mathematics were analyzed and interpreted using frequency counts, percentages, and ranks. The content validity of the developed Contextualized Interactive Learning Materials (CILMs) was analyzed and interpreted using a range of means and descriptive interpretations.

Range of Means	***Descriptive Interpretation***	
	Level of Validity	**Level of Acceptability**
4.51 – 5.00	*Very Highly Valid (VHV)*	*Very Highly Acceptable (VHA)*
3.51 – 4.50	*Highly Valid (HV)*	*Highly Acceptable (HA)*
2.51 – 3.50	*Moderately Valid (V)*	*Moderately Acceptable (MA)*
1.51 – 2.50	*Slightly Valid (MV)*	*Slightly Acceptable (SA)*
1.00 – 1.50	*Not Valid (NV)*	*Not Acceptable (NA)*

Data presentation and analysis

The presentation of the findings followed the arrangement of the statement of the problem. It specifically answered the following questions:

1. ***What is the extent of need to prepare contextualized interactive learning materials as perceived by the teacher- respondents along:***
   1.1 ***numbers and number sense;***
   1.2 ***geometry;***
   1.3 ***patterns and algebra;***
   1.4 ***measurement; and***
   1.5 ***statistics and probability?***

Table 1. Extent of need to prepare CILMs along numbers and number sense in mathematics 1

Learning competency		**Mean**	**DI**
1.	Visualizes and represents numbers from 0 to 100 using a variety of materials.	2.87	N
2.	Counts the number of objects in a given set by ones and tens.	2.88	N
3.	Identifies the number that is one more or one less from a given number.	2.91	N
4.	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, 0, and 5.	2.97	N
5.	Regroups sets of ones into sets of tens and sets of tens into hundreds using objects.	3.00	N
6.	Visualizes, represents, and compares two sets using the expressions “less than,” “more than,” and “as many as.”	2.94	N
7.	Visualizes, represents, and orders sets from least to greatest and vice versa.	2.91	N
8.	Visualizes and counts by 2s, 5s, and 10s through 100.	2.94	N
9.	Reads and writes numbers up to 100 in symbols and words.	2.98	N
10.	Visualizes and gives the place value and value of a digit in one- and two-digit numbers.	2.95	N
11.	Renames numbers into tens and ones.	2.93	N
12.	Visualizes, represents, and compares numbers up to 100 using relation symbols.	2.95	N
13.	Visualizes, represents, and orders numbers up to 100 in increasing or decreasing order.	3.02	N
14.	Identifies the 1st, 2nd, 3rd, up to 10th object in a given set from a given point	2.94	N

	of reference.		
15.	Reads and writes ordinal numbers: 1st, 2nd, 3rd up to 10th.	2.93	N
16.	Recognizes and compares coins and bills up to php100 and their notations.	3.07	N
17.	Illustrates addition as "putting together or combining or joining sets".	2.97	N
18.	Visualizes and adds two one-digit numbers with sums up to 18 using the order and zero properties of addition.	2.95	N
19.	Adds two one-digit numbers using appropriate mental techniques e.g. Adding doubles and/or near-doubles.	3.05	N
20.	Visualizes and adds three one-digit numbers using the grouping property of addition.	2.99	N
21.	Visualizes and adds two to three one-digit numbers horizontally and vertically.	2.99	N
22.	Uses expanded form to explain the meaning of addition with regrouping.	2.99	N
23..	Visualizes and adds numbers with sums through 99 without or with regrouping.	3.03	N
24.	Adds mentally two to three one-digit numbers with sums up to 18 using appropriate strategies.	2.99	N
25.	Adds mentally two-digit numbers and one-digit numbers with regrouping using appropriate strategies.	2.96	N
26.	Visualizes and solves one-step routine and non-routine problems involving the addition of whole numbers including money with sums up to 99 using appropriate problem-solving strategies.	3.09	N
27.	Creates situations involving the addition of whole numbers including money.	3.07	N
28.	Illustrates subtraction as "taking away" or "comparing" elements of sets.	3.05	N
29.	Illustrates that addition and subtraction are inverse operations.	3.02	N
30.	Visualizes, represents, and subtracts one-digit numbers with minuends through 18 (basic facts)	2.97	N
31.	Visualizes, represents, and subtracts one- to two-digit numbers with minuends up to 99 without regrouping.	3.05	N
32.	Uses the expanded form to explain subtraction with regrouping.	3.05	N
33.	Visualizes, represents, and subtracts one- to two-digit numbers with minuends up to 99 with regrouping.	3.11	N
34.	Subtracts mentally one-digit numbers from two-digit minuends without regrouping using appropriate strategies.	3.03	N
35.	Visualizes, represents, and solves routine and non-routine problems involving subtraction of whole numbers including money with minuends up to 99 with and without regrouping using appropriate problem-solving strategies and tools.	3.04	N
36.	Creates situations involving subtraction of the whole number including money.	3.09	N
37.	Counts groups of equal quantity using concrete objects up to 50 and writes an equivalent expression. E.g. 2 groups of 5.	3.11	N
38.	Visualizes, represents, and separates objects into groups of equal quantity using concrete objects up to 50. E.g. 10 grouped by 5s.	3.06	N
39.	Visualizes and identifies ½ and ¼ of a whole object.	2.97	N

40.	Visualizes and identifies ½ and ¼ of a whole object.	2.99	N
41.	Visualizes, represents, and divides a whole into halves and fourths.	3.06	N
42.	Visualizes, and divides the elements of sets into two groups of equal quantities to show halves.	3.06	N
43.	Visualizes represents, and divides the elements of sets into four groups of equal quantities to show fourths.	3.06	N
Composite Mean		**3.00**	**N**

Source: DepEd (2016)

Legend:

Range of Means	***Descriptive Interpretation***
3.51 - 4.00	*Much Needed (MN)*
2.51 - 3.50	*Needed (N)*
1.51 - 2.50	*Slightly Needed (SN)*
1.00 - 1.50	*Not Needed (NN)*

The data indicate that all 43 learning competencies received a descriptive interpretation rating of "needed," with mean ratings ranging from 2.87 to 3.11. Notably, the competencies with the highest ratings were counting groups of equal quantity using concrete objects up to 50 and writing equivalent expressions (mean = 3.11), as well as visualizing, representing, and subtracting one- to two-digit numbers with regrouping up to 99 (mean = 3.11). These findings suggest that teachers should employ effective techniques and procedures to help students acquire knowledge in counting groups of equal quantity and accurately apply mathematical procedures and processes in adding and subtracting whole numbers.

Table 2. Extent of need to prepare CILMs in mathematics 1 along geometry

Competency		**Mean**	**DI**
1.	Identifies, names, and describes the four basic shapes (square, rectangle, triangle, and circle) in 2-dimensional (flat/plane) and 3-dimensional (solid) objects.	3.35	N
2.	Compares and classifies 2-dimensional (flat/plane) and 3-dimensional (solid) figures according to common attributes.	3.51	MN
3.	Draws the four basic shapes.	3.32	N
4.	Constructs three-dimensional objects (solid) using manipulative materials.	3.51	MN
Composite Mean		**3.42**	**N**

Source: DepEd (2016)

The results indicate a composite mean of 3.42 with a descriptive interpretation of "needed," suggesting the potential development of Contextualized Interactive Learning Materials (CILMs) to enhance the acquisition of knowledge and skills in Geometry. Teachers believe that CILMs can make learning Geometry more interesting and engaging for students. Additionally, two competencies were rated as "much needed" with a mean rating of 3.51, highlighting the importance of CILMs in enabling students to compare and classify 2-dimensional and 3-dimensional figures based on common attributes and construct three-dimensional objects using manipulative materials.

Table 3. Extent of need to prepare CILMs along patterns and algebra.

Competency		Mean	DI
1.	Determines the missing term/s in a given continuous pattern using one attribute (letters/ numbers/events). e.g. A, b, c, d; 2, 3, __, 5, 6, 7; __, wed, thur, fri; Aa, bb, cb, __,	3.58	MN
2.	Determines the missing term/s in a given repeating pattern using one attribute (letters, numbers, colors, figures, sizes, etc.).	3.51	MN
3.	Constructs equivalent number expression using addition and subtraction. E.g. 6 + 5 = 12 - 1	3.62	MN
4.	Identifies and creates patterns to compose and decompose using addition. E.g. 7 = 0 + 7, 1 + 6, 2 + 5, 3 +4, 4 + 3, 5 + 2, 6 + 1, 7 + 0	3.59	MN
5.	Visualizes and finds the missing number in an addition or subtraction sentence using a variety of ways e.g. N + 2 = 5; 5 – n = 3	3.62	MN
Composite Mean		**3.58**	**MN**

Source: DepEd (2016)

The computed composite mean of 3.58, descriptively indicating "much needed," suggests that Grade 1 teachers highly value the use of Contextualized Interactive Learning Materials (CILMs) for teaching Patterns and Algebra concepts and skills. The individual mean ratings for the five learning competencies range from 3.51 to 3.62, all falling under the "much needed" descriptive interpretation. This indicates that the competencies related to constructing number expressions, visualizing and finding missing terms in addition or subtraction sentences, creating patterns to compose and decompose numbers, and determining missing terms in continuous or repeating patterns could be effectively taught using Contextualized Interactive Learning Materials (CILMs). Consequently, such materials can facilitate easier recognition of patterns and mastery of algebraic skills, promoting effective learning outcomes.

Table 4. Extent of need to prepare CILMs along measurement.

Competency		Mean	DI
1.	Tells the days in a week; months in a year in the right order.	3.64	MN
2.	Determines the day or the month using a calendar.	3.53	MN
3.	Tells and writes time by hour, half-hour and quarter-hour using analog clock.	3.59	MN
4.	Solves problems involving time (days in a week, months in a year, hour, half-hour, and quarter-hour).	3.68	MN
5.	Compares objects using comparative words: short, shorter, shortest; long, longer, longest; heavy, heavier, heaviest; light, lighter, lightest.	3.57	MN
6.	Estimates and measures length using non- standard units of linear measures.	3.57	MN
7.	Estimates and measures mass using non-standard units of mass measure.	3.61	MN
8.	Estimates and measures capacity using non-standard unit.	3.53	MN
Composite Mean		**3.59**	**MN**

Source: DepEd (2016)

The table displays a composite mean of 3.59, which is descriptively interpreted as "much needed," indicating that the learning competencies related to time and non-standard units of length, mass, and capacity can be effectively delivered using Contextualized Interactive Learning Materials (CILMs). The teacher-respondents strongly believe that by employing contextualized and interactive instructional materials, the gap between underachievement and success in mathematics learning can be bridged.

Furthermore, all eight learning competencies received mean ratings ranging from 3.53 to 3.68, falling under the descriptive interpretation of "much needed." This suggests that learners can enhance their application of the Measurement competencies when they engage with contextualized and interactive learning materials.

Table 5. Extent of need to prepare CILMs along statistics and probability

Competency		Mean	DI
1.	Collects data on one variable through simple interview.	3.63	MN
2.	Sorts, classifies, and organizes data in tabular form and presents this into a pictograph without scales.	3.70	MN
3.	Infers and interprets data presented in a pictograph without scales. e.g. Finding out from the title what the pictograph is all about, comparing which has the least or greatest	3.60	MN
4.	Solves routine and non-routine problems using data presented in pictograph without scales.	3.64	MN
5.	Tells whether an event is likely or unlikely to happen.	3.61	MN
6.	Describe events in real-life situations using the phrases “likely” or “unlikely to happen”. e.g. tomorrow it will rain.	3.60	MN
Composite Mean		**3.63**	**MN**

Source: DepEd (2016)

According to the table, respondents highly valued the use of Contextualized Interactive Learning Materials (CILMs) for teaching data-related competencies. The overall composite means of 3.63 indicates a strong belief that contextualized and interactive materials can enhance the teaching-learning process. The competency with the highest perceived need is sorting, classifying, and organizing data in tabular form and presenting it as a pictograph without scales, receiving a rating of 3.70. Teachers also emphasized the importance of CILMs for teaching problem-solving with data presented in pictographs without scales (M=3.64). Furthermore, CILMs are seen as crucial for teaching data collection through interviews (M=3.63), determining the likelihood of events (M=3.61), interpreting data in pictographs (M=3.60), and describing the likelihood of events (M=3.60). These findings highlight the potential of CILMs to facilitate meaningful learning in Mathematics, particularly in data collection, interpretation, inference, event identification, and description.

2. ***What are the problems encountered by the teachers in the preparation and use of***

instructional materials in teaching mathematics?

Table 6. Problems encountered by teachers in the preparation and use of instructional materials in teaching mathematics 1.

Problem encountered	Frequency	Percentage	Rank
1. Limited interactive learning materials to be used	131	88.51	2
2. Poor internet connectivity in the classroom to support the use of interactive learning materials	139	93.92	1
3. Limited of access to relevant interactive learning materials	76	51.35	5
4. Inappropriateness of the existing interactive learning materials to the readiness of the learners	35	23.65	8
5. Limited contextualized learning materials to be used in the classroom	110	74.32	4
6. Inadequate knowledge in making interactive learning materials to be used	22	14.86	9
7. Limited of administrative support in creating instructional materials	16	10.81	10
8. Limited of funding support in the development of instructional materials	65	43.92	6
9. Time-constraint to create instructional materials	126	85.14	3
10. Inadequate knowledge to create contextualized learning materials	41	27.7	7

Most teacher-respondents (93.92%) express significant concern about poor internet connectivity in the classroom, which hinders the use of interactive learning materials. Slow internet connection undermines the potential of these materials to enhance literacy skills and cater to diverse learning styles. Consequently, teachers lack motivation to prepare and utilize interactive learning materials in Mathematics instruction. On the other hand, limited administrative support in creating instructional materials is the least of their concerns (10.81%). This suggests that most teachers receive sufficient administrative support to excel as creators and developers of instructional materials.

3. ***What learning materials can be developed to further improve the performance of the learners?***

Mathematics is an essential discipline in daily life, but many students still feel scared and lazy when it comes to learning math. Teachers are making efforts to engage students and encourage them to study math. One such effort is the contextualization of teaching, where students can relate math lessons to their own lives, making the subject more meaningful and relevant. The use of Interactive Learning Materials (ILMs) is another important part of these efforts.

ILMs stimulate student learning and provide immediate feedback, making it easier for students to understand and master math concepts. Contextualized Interactive Learning Materials (CILMs) were developed to address the need for additional instructional materials in teaching mathematics and to allow students to connect math concepts to real-life experiences. The CILMs are designed to be easy to use, adaptable to different devices, and provide immediate feedback to students. It is hoped that the use of CILMs will enhance students' mathematical learning experiences and enrich teaching practices. (Abadi et al., 2015; Reyes et al., 2019; Motteram, 2013; Mohamed & Osama, 2017; Ampa et al., 2013)

4. ***What is the validity of the Contextualized Interactive Learning Materials (CILMs) in terms of the following:***
   4.1 ***content quality;***
   4.2 ***instructional quality;***
   4.3 ***degree of contextualization; and***
   4.4 ***technical quality?***

Table 7. The panel of experts' evaluation on the validity of the CILMs along with content quality.

Indicators		Mean	DI
1.	Content is consistent with topics/skills found in the DepEd Learning Competencies for the subject and grade/year level it was intended.	4.80	VHV
2.	Concepts developed contribute to enrichment reinforcement or mastery of the identified learning objectives.	4.80	VHV
3.	Content is accurate.	4.80	VHV
4.	Content is up-to-date.	4.60	VHV
5.	Content is logically developed and organized.	4.80	VHV
6.	Content is free from cultural, gender, racial, or ethnic bias.	4.80	VHV
7.	Content stimulates and promotes critical thinking.	4.60	VHV
8.	Content is relevant to real-life situations.	4.40	HV
9.	Language (including vocabulary) is appropriate to the target user level.	4.60	VHV
10.	Content promotes positive values that support formative growth.	4.60	VHV
Composite Mean		**4.68**	**VHV**

Source: Castillo (2016)

The 5 content experts and 5 ICT experts' evaluation on the developed CILMs is very highly valid as indicated by the overall mean rating of 4.72. Specifically, the composite mean ratings of the four indicators on content quality, instructional quality, degree of contextualization, and technical quality range from 4.66 to 4.85, which indicate that the CILMs could provide meaningful experiences to learners in gaining mastery on the different learning competencies in Mathematics.

Table 8. Panel of experts' evaluation on the validity of the CILMs along instructional quality.

Indicators		Mean	DI
1.	Purpose of the material is well defined.	4.80	VHV
2.	Material achieves its defined purpose.	4.80	VHV
3.	Learning objectives are clearly stated and measurable.	4.80	VHV
4.	Level of difficulty is appropriate for the intended target user.	4.60	VHV
5.	Graphics / colors / sounds are used for appropriate instructional reasons.	4.40	HV

6.	Material is enjoyable, stimulating, challenging, and engaging.	4.80	VHV
7.	Material effectively stimulates the creativity of the target user.	4.60	VHV
8.	Feedback on the target user's responses is effectively employed.	4.60	VHV
9.	Target user can control the rate and sequence of presentation and review.	4.60	VHV
10.	Instruction is integrated with the target user's previous experience.	4.60	VHV
Composite Mean		**4.66**	**VHV**

Source: Castillo (2016)

As it is shown in the table, the instructional quality of the CILMs is very highly valid with the corresponding composite mean of 4.66. This implies that the CILMs have a very good educational purpose and with the appropriate level of difficulty and materiality; include the provision of feedback; and allow integration with the target user's experiences.

Table 9. Panel of experts' evaluation on the validity of the CILMs along degree of contextualization.

Indicators		**Mean**	**DI**
1.	The CILMs include many real, believable problem-solving situations that learners can recognize as important to their current and possible future lives.	4.80	VHV
2.	The CILMs relate mathematical concepts to the real-life situation of the learner.	4.80	VHV
3.	The CILMs utilize local materials or information in the development of the lesson.	4.40	HV
4.	The CILMs encourage the learners to apply concepts and information in useful contexts.	4.60	VHV
5.	The CILMs motivate the learners to know, understand and appreciate their cultural heritage.	4.80	VHV
Composite Mean		**4.68**	**VHV**

Source: Castillo (2016)

The results show that the content quality of the material in terms of the degree of contextualization is very highly valid with a composite mean of 4.68. This result implies that the CILMs have a very high extent of cultural inclusion highlighting the context where every learner comes from.

Table 10. The panel of experts' evaluation on the validity of the CILMs along with technical quality.

Indicators		**Mean**	**DI**
1.	Audio enhances understanding of the concept.	4.80	VHV
2.	Speech and narration (correct pacing, intonation, and pronunciation) is clear and can be easily understood.	4.60	VHV
3.	There is complete synchronization of audio with the visuals, if any.	4.80	VHV
4.	Music and sound effects are appropriate and effective for instructional purposes.	5.00	VHV
5.	Screen displays (text) are uncluttered, easy to read, and aesthetically	4.80	VHV

	pleasing.		
6.	Visual representations (non-text) are clear and easy to interpret.	4.80	VHV
7.	Visuals sustain interest and do not distract user's attention.	4.80	VHV
8.	Visuals provide accurate representation of the concept discussed.	5.00	VHV
9.	The user support materials (if any) are effective.	5.00	VHV
10.	The design allows the target user to navigate freely through the material.	5.00	VHV
11.	The material can be easily and independently be used.	4.80	VHV
12.	The material will run using minimum system requirements.	4.80	VHV
13.	The program is free from technical problems.	4.80	VHV
Composite Mean		**4.85**	**VHV**

Source: Castillo (2016)

It appears from the table that the technical quality of CILMs is very highly valid as indicated by the composite mean of 4.85, implying that the materials have appropriately used sound effects, screen displays, visual presentations, visuals, and user support materials.

5. ***What is the level of acceptability of the CILMs along:***
   5.1 ***clarity;***
   5.2 ***usefulness;***
   5.3 ***language and style;***
   5.4 ***illustrations and layout; and***
   5.5 ***suitability?***

Table 11. End-users' evaluation on the level of acceptability of the CILMs along clarity.

Indicators		**Mean**	**DI**
1.	Information is clear and simple	4.63	VHA
2.	Language used is clear and easy to understand	4.63	VHA
3.	The concepts for each activity are arranged logically	4.38	HA
4.	There is no duplication	4.63	VHA
Composite Mean		**4.57**	**VHA**

Source: Nicolas (2020)

It appears from the table that the clarity of the material is very highly acceptable as shown by the composite mean of 4.57, suggesting that the exercises, examples, and activities can be easily understood by the learners even if they do independent learning.

Table 12. End-users' evaluation on the level of acceptability of the CILMs along usefulness.

Indicators		**Mean**	**DI**
1.	The CILMs prepare the learners to think logically and critically	4.63	VHA
2.	The concepts in the CILMs are simple and comprehensible as a whole and the enrichment activity is teachable	4.63	VHA
3.	The CILMs provide an opportunity for the development and enhancement	4.63	VHA

	of mathematical skills		
4.	The learning contents provide adequate information on the topics presented	4.50	HA
5.	The CILMs encourages the learners to become actively involved in the learning activities	4.63	VHA
6.	The CILMs stimulate the learners to intellectual activities	4.63	VHA
7.	The activities seek to relate new concepts from previous learning	4.50	HA
Composite Mean		**4.59**	**VHA**

Source: Nicolas (2020)

The table shows the level of acceptability on the usefulness of the CILMs is very highly acceptable with a composite mean rating of 4.59. This finding implies that the materials offer learning opportunities for the learners to gain a meaningful understanding of the basic operations and their applications to real-life.

Table 13. End-users' evaluation on level of acceptability of the CILMs along language and style.

Indicators		**Mean**	**DI**
1.	The presentation is clear observing correct grammar	4.75	VHA
2.	The language is clear and comprehensive in terms of vocabulary	4.75	VHA
3.	There is sufficient familiar vocabulary to ensure learning	4.50	HA
4.	The structure, style and format are appropriate to the target level.	4.63	VHA
Composite Mean		**4.66**	**VHA**

Source: Nicolas (2020)

Table 12 displays the level of acceptability on the language and style of the CILMs. As shown by the composite mean, the material is very highly acceptable ($\overline{x}$ =4.66) implying that the CILMs sound grammatically correct; utilize words that are easy to understand and adopt an appropriate style and format.

Table 14. End-users' evaluation on the level of acceptability of the CILMs along illustrations and layout.

Indicators		**Mean**	**DI**
The illustrations and layout…			
1.	are clear and simple	4.63	VHA
2.	arouse learners' interest in making learning effective and enjoyable	4.50	HA
3.	provide concrete visual clues	4.38	HA
4.	guide learners to follow directions	4.63	VHA
5.	are relevant to the topic	4.88	VHA
Composite Mean		**4.60**	**VHA**

Source: Nicolas (2020)

As depicted in table, the overall mean of the level of acceptability on the illustrations of the material is 4.60, which is descriptively equivalent to very highly acceptable. This means that the illustrations are appropriately embedded in the material to allow the deepening of mathematical skills for a gainful understanding of the key concepts and topics in Mathematics 1.

Table 15. End-users' evaluation on level of acceptability of the CILMs along suitability.

Indicators		Mean	DI
1.	The activities take in consideration the varying attitudes and capabilities of the learner	4.63	VHA
2.	The activities are suitable to the subject matter	4.75	VHA
3.	The activities provide relevant background knowledge to have a meaningful understanding of the content	4.63	VHA
4.	The activities are relevant, interesting and self-motivating to the learner	4.75	VHA
5.	The activities present real-life situations and learning opportunities that are reflected in the curriculum	4.50	HA
Composite Mean		**4.65**	**VHA**

Source: Nicolas (2020)

It appears that the material is very highly acceptable along suitability as indicated by the composite mean of 4.65. This means that the CILMs apply to all types of learners and that the use of words, images, and situations is suitable to the learners to learn the concepts and skills joyfully and effectively.

Results and discussion

The use of contextualized interactive learning materials (CILMs) in mathematics education has been found to have several positive effects on student engagement, understanding, and achievement. Contextualization connects math lessons to real-life situations, making them more meaningful and relevant to students (Reyes et al., 2019). CILMs provide interactive elements that engage students in the learning process and offer immediate feedback, which stimulates learning and enhances problem-solving skills (Mohamed & Osama, 2017).

Research has shown that the use of CILMs based on local wisdom and real-world contexts can enhance students' conceptual development and improve their ability to learn (Abadi et al., 2018; Reyes et al., 2019). By incorporating pictures of sceneries, local games, or materials readily available in the community, teachers can make mathematical concepts more concrete and relatable for students (Reyes et al., 2019). This approach fosters conceptual understanding and increases student interest in mathematics.

Furthermore, CILMs have been found to be effective in various mathematical domains. In geometry, CILMs that discuss the classification and construction of geometric objects can help students understand their attributes and differences (Clements et al., 2018). In patterns and algebra, interactive learning materials based on local wisdom can enhance students' knowledge and improve their learning abilities (Abadi et al., 2018). CILMs that incorporate contextualized content in statistics and probability promote critical thinking and problem-solving skills (Andriotis, 2017).

However, the implementation of CILMs can face challenges. Time constraints and other responsibilities can hinder teachers in creating and using instructional materials effectively (Natividad, 2018). Moreover, the availability of infrastructure and proper policy implementation are important factors in ensuring the quality of teaching and learning with the use of ICT (Osiyemi, 2016). To successfully implement CILMs, administrative support and positive relationships between principals and teachers are crucial (Methner, 2013). These factors contribute to creating a positive learning environment and fostering increased student achievement.

Conclusion

Implementing contextualized learning materials in mathematics education can yield positive learning outcomes. The development of Contextualized Interactive Learning Materials (CILMs) as curriculum support materials has been widely recognized as valid and valuable resources for educators. By incorporating CILMs into mathematics education, teachers can foster mastery of mathematical skills, critical thinking, and problem-solving abilities, ultimately enhancing the teaching-learning process and promoting student success in mathematics. However, addressing challenges such as time constraints and infrastructure is necessary for successful implementation. The support of school administrators and fostering positive principal-teacher relationships are crucial in creating a conducive learning environment.

References

Abadi, M. K. et al., (2016). *Development of Teaching Materials Based Interactive Scientific Approach towards the Concept of Social Arithmetic For Junior High School Student. Journal of Physics*, 8 (12), 25-26.

Adalikwu, S. A., Iorkpilgh I. T., (2012, August 29). *Academic Performance of Senior Secondary School Students in Chemistry in Cross River State*. Retrieved from Global Journal of Educational Research: http://dx.doi.org/10.4314/gjedr.v12i1.6.

Andriotis, N. (2017, June). *Contextualized learning: Teaching made highly effective!* Retrieved August 16, 2020, from efrontlearning.com: https://bit.ly/3gZWbaw

Antonio, G. J. C. (2015). *Academic hardiness, mathematics anxiety, and mathematics performance of high school students*. Unpublished Master's Thesis. Northwestern University, Laoag City, Philippines.

Bartolome, J. C. S. (2019). *A Self-Learning Kit in Improving the Mathematical Problem-Solving Skills of Grade Six Pupils*. Unpublished Master's Thesis. Laoag City: Divine Word College of Laoag.

Castillo, C. (2019). *Developing Student's Conceptual Understanding in Mathematics through*

Technology-Enhanced Instructional Materials. Unpublished Thesis: Laoag City: Mariano Marcos State University.

Center for Occupational Research and Development. https://www.cord.org. Accessed 8th October 2019.

Clements, D. H., Sarama, J., & Swaminathan, S. (2018). *Teaching and learning Geometry: Early foundations*. Quadrante, 27(2), 1-31.

Department of Education (2016). *K to 12 Curriculum Guide for Mathematics*.

Dimasuay, M. (2015). *Interactive Learning Materials (ILMs)*. Retrieved from https://bit.ly/32HK8tE.

Gushchin, Y., (2016). *The use of interactive methods of learning in college*. International Journal of Environmental & Science Education, 11 (18), 12528-12539.

Mazana, M. Y. (2018). *Investigating Students' Attitude towards Learning Mathematics*. International Electronic Journal of Mathematics Education, 35-39. Retrieved November 13, 2020 from International Electronic Journal of Mathematics Education.

Mazgon, J., & Stefanc, D. (2012). *Importance of the Various Characteristics of Educational Materials: Different Opinions, Different Perspectives*. The Turkish Online Journal of Educational Technology, 174-176.

Methner, G. (2013). *Perceptions of administrative support and follower readiness in middle school teachers.* Ohio, USA: Published Dissertation: Graduate College at Bowling Green State University.

Mohamed & Osama, (2018). *Role Of Information Communication Technology (Ict) In 21st Century*. IBT Journal of Business Studies, 10-13.

Motteram, G. (2013). *Situated Learning Theory: The Key to Effective Classroom Teaching.* International Journal for Educational, Social Political & Cultural Studies, 10-11

Mouraz, A., & Leite, C. (2013). *Contextualization Tracking the Meaning of a Concept*. Retrieved from Academia Education: https://bit.ly/2FM6voJ.

Natividad, E. (2018). *Capability enhancement framework in Mathematics for Secondary School Master Teachers.* Laoag City: Unpublished Dissertation. Divine Word College of Laoag.

NCES (2013). National Center for Education Statistics. Retrieved November 13, 2019 from Organisation for Economic Co-operation and Management: https://nces.ed.gov/

Nicolas, M. (2020). *Localized Supplementary Reading Material for Intermediate Grades*. Unpublished Dissertation. Laoag City: Divine Word College of Laoag.

Osiyemi, O. (2016, December 3). *Lack of eLearning materials in secondary schools.* Retrieved August 16, 2020, from eLearning Industry: https://bit.ly/2PY8isw

PISA (2018). *Program for International Student Assessment*. Retrieved November 13, 2019, from Organisation for Economic Co-operation and Management: https://bit.ly/2FHyCpi.

Reyes, J. D., Insorio, A. O., Ingreso, M. V., Hilario, F. F., & Gutierrez, C. R. (2019). *Conception and application of contextualization in Mathematics education*. International Journal of Educational Studies in Mathematics, 6(1), 1-18.

Saeed, S., Ahmed, M. O., & Malik, U. (2018*). Role Of Information Communication Technology (Ict) In 21st Century*. IBT Journal of Business Studies, 10-13.

Siemens, G. (2004). *Connectivism as a Digital Age Learning Theory*. Retrieved October 26, 2019, from https://bit.ly/33I4gLt.

Silao, Jr. I, (2018). *Factors Affecting the Mathematics Problem-Solving Skills of Filipino Pupils*. International Journal of Scientific and Research Publications, 8(2) 24-28.

Villanueva, J. (2018). *Differentiated Learning Material for Mathematics 2*. Laoag City: Unpublished Master's Thesis. Divine Word College of Laoag.