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Contextualized Instructional Materials in Mathematics for Agta Tabangnon Learners

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Abstract: ***The purpose of this study was to design and test ethnomathematics-based teaching resource which incorporates the farming activity of the Agta-Tabangnon people to enhance mathematics competence of the learners. The study used a qualitative research method and quantitative research method guided by the ADDIE model. In the analysis stage, data from the interviews, focus group discussions, observation, field notes and narratives from the farmers, indigenous elders and community members were thematically analyzed to determine indigenous farming practices that are embedded with mathematical concepts including counting, measuring, estimating, classifying, sequencing, and spatial analysis. The results guided the design and development of mathematics contextualized instructional materials and learning activities that meet curriculum competencies and are culturally relevant. The developed materials were validated by experts with the help of Learning Resource Management and Development System (LRMDS) assessment tool. Results of weighted mean and content analysis showed that the material possessed high acceptance regarding content quality, instructional quality, contextualization, cultural appropriateness and curriculum alignment. In order to determine effectiveness a one group pretest post test approach was used for Agta-Tabangnon learners. The result of the mathematics competency showed that there was significant improvement as seen from the post-test mean score, significant Mann– Whitney U Test result and large Cohen's d effect size. The findings from teacher and learner feedback also further supported the usability, relevance and cultural responsiveness of the instructional materials developed.***

Keywords: Contextualized instructional materials, Agta tabangnon.

1. Introduction

The Philippine government's goals towards transforming the country are reinforced by a strong educational system. As a consequence, the government's proactive approach to education was codified in the new constitution that was enacted in 1987. The right of all people to high-quality education at all levels is protected and promoted by the state, which also must take the necessary efforts to ensure that everyone may access it, according to Section 1 of Article XIV of the constitution.

The Landscape of Indigenous People (IP) Education

Indigenous Peoples (IP) education is considered a basic human right which supports inclusive, equitable, and culturally responsive learning globally. UNESCO and other international organizations highlight the need to respect the indigenous language, identity, traditions, and indigenous knowledge systems of indigenous peoples in their education. UNESCO (2025) also emphasizes that the provision of schools to indigenous learners should not be the end goal of providing indigenous education, but that the education should be culturally relevant, responsive and culturally appropriate to the lives of indigenous people.

The government institutionalized Indigenous Peoples Education (IPEd) in the Philippines through the policy directions set by DepEd Order No. 62, s. 2011 and DepEd Order No. 32, s. 2015. These policies acknowledge the right of indigenous learners to learn within their culture, language, traditions and within their community experiences. The IPEd Curriculum Framework explicitly calls for curricular material to be localized, contextualized, and indigenized, which can make learning meaningful and responsive to IP learners.

The Philippine education system recognizes that indigenous people have their own worldviews, practices and learning systems which should be incorporated in the learning of students in the classroom. DepEd's vision for the IPEd Program is to create culturally relevant learning materials, enhance mother tongue education, and protect indigenous knowledge systems and practices (IKSPs). These mandates are geared towards the creation of culturally responsive teaching materials that are based on the actual experiences of Indigenous students like the Agta-Tabangnon community, teacher.ph (2016).

Although inclusive education policies have been put in place, barriers to the success of indigenous learners remain in schools because of the “one size fits all” curriculum approach. This practice frequently involves the use of standardized instruction materials, examples and teaching methods, which are divorced from the culture, language and daily life of the indigenous learners. This may make it difficult for IP students to connect with lessons, engage actively in classes, and grasp academic concepts as the content is not aligned to their community experience, DepEd, (2016)

The application of generic teaching materials could make the Agta-Tabangnon learners' indigenous knowledge, livelihood, language and culture as a whole and as a whole person neglected. Classes that are very urban and culture-bound can diminish students' engagement and diminish meaningful learning experiences. Research and policy debates around culturally responsive education focus on the need for instruction to be grounded in the culture and experiences of indigenous learners to promote their learning (DepEd, 2016).

Based on this concern, the study on the development of Contextualized Instructional Materials for Agta-Tabangnon Learners aims to bridge the gap between standardized instruction to culturally relevant education. The study reinforces the principles of the IPEd program to promote inclusive, responsive and meaningful education of indigenous learners by embedding indigenous knowledge, local practices and familiar community contexts in the learning materials. The implementation of contextualization of instructional

materials is therefore needed to ensure the cultural identity of the learners Agta-Tabangnon as well as to enhance their participation, understanding, and academic achievement.

Mathematics for IP Learner's Linguistic Identity

The importance of language to conceptual understanding, communication and meaning making in the world of mathematics means that, mathematics education for Indigenous Peoples (IP) learners should acknowledge and respect the learner's linguistic identity. However, for indigenous learners using their mother tongue and familiar cultural expressions in mathematics education allows for a connection to the mathematical concepts. Research highlights that culturally and linguistically relevant pedagogies are equally critical in helping learners to make sense of mathematical concepts as the context in which they are taught in unfamiliar or dominant languages.

UNESCO states that better learning outcomes will occur when the first language is the language of instruction, particularly in the early years of learning. MTBI builds participation, understanding, confidence and identity development for Indigenous students. In mathematics, language affects students' understanding of numerical meaning, problem solving contexts, measurement contexts, patterns and quantitative relationships. Students may not grasp lessons offered during mathematical instruction because of the lack of attention given to the indigenous language(s) of the learner, and may also find it hard to relate mathematical concepts to their lived reality, UNESCO (2022).

The Department of Education (DepEd) sees the relevance of language and culture in the context of Indigenous Peoples Education (IPEd) in the Philippines. The IPEd Curriculum Framework promotes the use of indigenous languages, local knowledge systems, and culturally relevant examples in curricular topics, such as mathematics education, in the classroom. This policy helps build the capacity of contextualized instructional materials that are written in indigenous language, familiar situation and community-based examples to enhance learning among IP learners (DepEd, 2015)

Agta-Tabangnon learners' linguistic identity relates closely with the activities they participate in, their livelihood, and their indigenous understandings of quantity, measure, time and space. They can be used as effective means in the teaching and learning of mathematical concepts through contextualized activities such as farming, fishing, trading and housekeeping that involves their local language and culture. The use of indigenous language in mathematics learning not only improves the learning process but also provides an affirmation of the culture of the learners and ensures that they are all included in the learning process, National Commission on Indigenous Peoples (NCIP). (2022).

The researchers of contextualized instructional materials then go on to explain that indigenous communities have their own mathematical knowledge, which exists within their language, traditions and daily lives. Indigenous communities' counting systems, estimation techniques, patterns, measurement practices, and problem-solving strategies show that mathematics is part of cultural experiences. Therefore, mathematics education for IP learners must go beyond the conventional mathematics education approaches to culturally and linguistically responsive strategies which recognize indigenous identity and knowledge systems.

2. Research Questions

To develop, validate, and implement culturally responsive contextualized instructional materials for Agta-Tabangnon learners that integrate indigenous knowledge and language to improve mathematics understanding, engagement, participation, and academic performance effectively. This study aims to develop, validate and test the effectiveness of the contextualized instructional materials for elementary Agta-Tabangnon learners. Specifically, 1. Design and develop the instructional materials integrating the identified farming practices. 2. Validate the instructional materials integrating the identified farming practices. 3. Test the effectiveness of the develop instructional materials in improving the mathematics competency of Agta-Tabangnon learners.

3. Methodology

Research Design

This study used descriptive-developmental research design both qualitative and quantitative approaches are used for developing and evaluating contextualized instructional materials for Agta-Tabangnon learners. The descriptive-developmental design was considered suitable since the study involves analysis of indigenous farming practices and cultural experiences, validation of the developed materials, and the effectiveness of the developed materials in enhancing mathematics competency of the Agta-Tabangnon learners. The study also adhered to a sequential process of Qualitative Phase and Quantitative Phase to make sure that the instructional materials were culturally responsive, educationally relevant, and instructionally effective.

Source of Data

The selection of the participants was done by purposive sampling considering the following criteria: (1) recognized members of the Agta-Tabangnon community, (2) those who are actively involved in farming for at least 5 years, and (3) knowledgeable in indigenous farming practices and/or traditional farming methods.

Research Instruments

The following research instruments were used to gather and obtain the qualitative and quantitative data needed for the development, validation, and evaluation of the developed Agta-Tabangnon contextualized instructional materials: the Observation Protocol, the Interview Guide (qualitative open-ended questions on the aspects of contextualization), and the Mathematics Competency Test prepared by the researcher using Table of Specification (TOS). Also, the developed contextualized instructional materials were evaluated based on the Learning Resource Management and Development system (LRMDS) based evaluation tool for quality, cultural responsiveness, content accuracy, instructional appropriateness, and usability. The instruments were used with care and were found to be both appropriate and reliable, culturally sensitive, and related to the study's objectives.

Data Collection

This data collection process of the study was the systematic and sequential process that is conducted in the phases of the ADDIE Model as follows: Analysis, Design, Development, Implementation, and Evaluation. These phases facilitated the entire research process to organize the development of the contextualized instructional materials for the Agta-Tabangnon learners, making it culturally responsive, learner-centered, and in line with the study's aim. Data gathering activities started from October 2025 till April 2026, which involved coordination, needs assessment by immersing in the community, preparation of the instructional material, validation, implementation and evaluation. The study utilized ADDIE model for designing and testing the ethnomathematics based instructional materials for Agta-Tabangnon learners. In the analysis phase, the researcher found that the farmers, the elders and the citizens of the community were observed, and through the interview and the focus group discussion, indigenous farming practices that include mathematical concepts were identified. Culturally relevant teaching resources were designed and developed in the design and development process through local farming experiences. Seven experts reviewed these materials for accuracy, quality and cultural appropriateness. A one-group pretest posttest design was implemented with 20 learners to determine the effectiveness of the implementation. Last, the materials were assessed by teachers and learners and integrated feedback was used to enhance the teaching materials.

Data Analysis

Qualitative and quantitative analysis was used to develop and evaluate an instructional material based on ethnomathematics for the Agta-Tabangnon learners. Thematic analysis of interviews, observations and narratives revealed indigenous farming practices and embedded concepts in mathematics including counting, measuring, estimating and spatial reasoning. The results of this study informed the creation of mathematics instructional materials adapted to their context based on the ADDIE model. The quality and acceptability were assessed by validation using weighted mean and content analysis. Pre and post test scores were analyzed for effectiveness using mean, standard deviation, Mann–Whitney U Test, and Cohen's d. Teachers and learners provided feedback on culturally responsive instructional materials for revision and enhancement.

4. Results and Discussions

Design and Development of Contextualized Instructional Materials Integrating the Identified Farming Practices

This section presents lessons developed using contextualized mathematics practices as learning along counting, fundamental operations, fractions, measurements and time. This presentation explains how topic being connected to ethnomathematics learning. (The Contextualized instructional materials mathematics learning modules found in appendices A)

Table 1: Lessons developed integrating the farming practices for the contextualized instructional materials in mathematics

Topic	Most Essential Learning Competency	Contextualized learning activities
Counting	Counts objects with one-to-one correspondence	In mathematics, counting can be contextualized in farming activities like counting seedling, tubers, harvested crops and planting materials in root crop farming.
Fundamental operations	Performs fundamental operations on whole numbers (addition, subtraction, multiplication, and division	Learning fundamental operations can be placed in context of farming activities like total yield of the farm, subtracting loss of produce, multiplying inputs used for planting, etc. and then dividing among farmers or families.
Fractions	Represents, identifies, and compares fractions in real-life situations.	Farming activities, including dividing harvested crops among family members, dividing seed portions for planting and distributing parts for eating, selling or storing the harvest can be used to illustrate fractions.
Measurements	Estimates and measures length, mass, and capacity using appropriate units of measurement.	Measurements can be made meaningful in the context of farming activities like measuring the area of land for planting; spacing between crops; weight of root crops harvested or lengths of planting rows in the field.
Time	Tells and writes time in analog and digital clocks	Farm activities like planning planting and harvesting dates, observing the growing period of crops and locating the seasonal cycles in root crop production can help frame time.

The context of the need for the farming practices and Indigenous Knowledge Systems and Practices (IKSP) of the Agta-Tabangnon community were used as anchors for design and development of the contextualized instructional materials. The instructional materials were developed using the ADDIE model and the materials were developed systematically to embed indigenous farming practices in the Math lessons to make learning meaningful, responsive and relevant to the learners' daily activities. The developed materials were targeted on the mathematics topics of counting, basic fundamental operations, fractions, measurement and time with examples and activities related to the root crop farming and coconut farming practices among the Agta-Tabangnon community.

The data reveal that mathematical concepts can be linked with farming activities, most especially in root crop farming, thereby making mathematics more meaningful and relevant to learners. Real-life agricultural activities that students are likely to encounter in their community are connected to each topic in mathematics. Counting is contextualized in farm work (e.g., counting seedlings, tubers, harvested crops, planting material). This will enable pupils to experience numbers in familiar concrete terms through the use of familiar items from root crop farming. These fundamental operations are used in real farm calculations like calculating total harvest, deducting crop losses, multiplying the number of farmers in a household, and dividing the total produce among farmers or households. These activities provide learners with the opportunity to apply computational skills in real agricultural situations. Portions of crops harvested into families, seed proportions for planting, and produce for consumption, sale and storage are shown as illustrations of fractions. This helps pupils to see fractions as part of a whole

in context of a farm. Measurements are related to agricultural operations like measuring field size to be planted, row spacing, weight of root crops harvested, and distances between rows of plantings, etc. These activities focus on accuracy and precision of actual farm tasks. Time is related to determining planting and harvesting times, monitoring the length of crop growth, and recognizing seasonal trends in root crop production. This will enable learners to appreciate the relevance of time management in farm operations. In general, the blending of farming activities in Mathematics education enhances pupils' understanding as it helps to link abstract mathematical concepts to life experiences, thereby improving pupils' engagement, comprehension and culture.

Validation of the instructional materials integrating the farming practices.

This part encompasses the validation of the developed contextualized instructional materials in mathematics modules using the DepEd LRMDS along content, format, presentation and organization, and Accuracy and Up-to-datedness of Information. The said validation was made by 5 Master Teachers and teachers teaching in Mathematics with 5 years teaching experience and above. It was scrutinized and rated based on DepEd LRMDS along content and mechanics. The experts also suggested and gave comments for further improvement of the Ethnomathematics Modules in which the researcher considered in the development of valid Modules.

The evaluation results of the ICT developed contextualized instructional materials based on the Learning Resource Management and Development System (LRMDS) evaluation criterion is presented in Table 4 for content. Materials obtained had a composite mean of 3.65 which is interpreted as Very Satisfactory. This suggests that evaluators considered the materials to be very appropriate, relevant, and very suitable for their level of learners as well as their skills that they want to develop. The highest mean score was the statement 'Material is free from ideological, cultural, religious, racial, and gender biases and prejudices' with a weighted mean of 3.86 which is Very Satisfactory, indicating that the material is inclusive and culturally sensitive. The ratings of the indicators for Suitability to learners' development, Enhancement of desirable values, Achievement of objectives, Development of higher order thinking skills, Arousal of learners' interest and Provision of cautionary notes were all in the Very Satisfactory range suggesting the material was well suited to meaningful and engaging learning experiences.

Table 2: Validation of Contextualized IMs along Content.

Factor 1: Content	WM	Interpretation
1. Content is suitable to the student's level of development.	3.71	Very Satisfactory
2. Material contributes to the achievement of specific objectives of the subject area and grade/year level for which it is intended.	3.57	Very Satisfactory
3 Material provides for the development of higher cognitive skills such as critical thinking, creativity, learning by doing, inquiry, problem solving, etc.	3.57	Very Satisfactory
4.Material is free of ideological, cultural, religious, racial, and gender biases and prejudices.	3.86	Very Satisfactory
5.Material enhances the development of desirable values and traits such as: (Put a check ***(√)*** mark only to the applicable values and traits)	3.71	Very Satisfactory
6. Material has the potential to arouse interest of target reader.	3.57	Very Satisfactory
7. Adequate warning/cautionary notes are provided in topics and activities where safety and health are of concern.	3.57	Very Satisfactory
Composite Mean	**3.65**	Very Satisfactory
Note: Resource must score **at least 21 points** out of a maximum **28 points** to pass this criterion. Please put a check mark ***(√)*** on the appropriate box	**25.27**	IM Passed

Result shows that the developed instructional materials achieved a total score of 25.27 points out of 28 points, so it is higher than the passing score of 21 points. This means that the teaching resources met the teaching content criterion in the LRMDS test. The outcome suggests that the made contextualized instructional materials have acceptable quality standards and can be used in class. In addition, the results indicate that the materials can be used to provide good support for teaching mathematics, and can provide contextualized tasks that can be integrated into the learners' culture and environment.

Table 3: Validation of Contextualized IMs along format

Factor 1: Format	WM	Interpretation
1.Prints		
1.1 Size of letters is appropriate to the intended user.	3.71	Very Satisfactory
1.2 Spaces between letters and words facilitate reading.	3.71	Very Satisfactory
1.3 Font is easy to read.	3.86	Very Satisfactory
1.4 Printing is of good quality (i.e., no broken letters, even density, correct alignment, properly placed screen registration).	3.71	Very Satisfactory
2. Illustrations		
2.1 Simple and easily recognizable.	3.57	Very Satisfactory
2.2 Clarify and supplement the text.	3.71	Very Satisfactory
2.3 Properly labelled or captioned (if applicable) .	3.57	Very Satisfactory
2.4 Realistic / appropriate colors.	3.86	Very Satisfactory
2.5 Attractive and appealing.	3.71	Very Satisfactory
2.6 Culturally relevant.	4.00	Very Satisfactory
3.1 Attractive and pleasing to look at.	3.57	Very Satisfactory

3.2 Simple (i.e., does not distract the attention of the reader).	3.71	Very Satisfactory
3.3 Adequate illustration in relation to text.	3.71	Very Satisfactory
3.4 Harmonious blending of elements (e.g., illustrations and text).	3.57	Very Satisfactory
Paper and Binding		
4.1 Paper used contributes to easy reading.	3.86	Very Satisfactory
4.2 Durable binding to withstand frequent use.	3.71	Very Satisfactory
Size and weight of Resource		
5.1 Easy to handle.	3.86	Very Satisfactory
5.2 Relatively light.	3.71	Very Satisfactory
Composite Mean	3.73	Very Satisfactory
Note: Resource must score at least 54 points out of a maximum 72 points to pass this criterion. Please put a check mark on the appropriate box	67.14	IM passed

Table 5 presents the validation results of the developed contextualized instructional materials along Format using the Learning Resource Management and Development System (LRMDS)-based evaluation criteria. The instructional materials obtained a composite mean of 3.73, interpreted as Very Satisfactory. This indicates that the evaluators perceived the format and physical presentation of the instructional materials to be highly acceptable and appropriate for the intended learners. Among the indicators, "Illustrations are culturally relevant" obtained the highest weighted mean of 4.00, interpreted as Very Satisfactory, signifying that the visuals used in the materials effectively reflected the learners' culture and experiences. Other indicators such as readability of font, spacing of words and letters, quality of printing, attractiveness of illustrations, harmonious blending of elements, durability of binding, and ease of handling also received ratings within the Very Satisfactory range. These findings imply that the instructional materials were visually appealing, learner-friendly, and effective in enhancing comprehension and learner engagement.

The developed contextualized instructional materials obtained a total score of 67.14 points out of the maximum 72 points, which exceeded the required passing score of 54 points. This indicates that the instructional materials passed the LRMDS evaluation criterion for format. The result suggests that the developed materials possess quality standards in terms of visual presentation, organization, readability, durability, and overall physical design. Furthermore, the findings imply that the format of the materials is suitable for classroom use and capable of supporting effective and engaging learning experiences among learners.

The results of the validation of the developed contextualized instructional materials in terms of the Learning Resource Management and Development System (LRMDS) evaluation criteria are presented in Table 6, which shows that the materials are considered valid. The instructional materials were obtained and the mean composite rating was Very Satisfactory (3.63). This means that the presenters and the way the teaching content was organized and presented was clear, coherent, engaging for the target learners and appropriate. The two highest weighted mean scores (3.71) on the indicators were for the statements: Length of sentences is suited to the comprehension level of the target reader and Sentences and paragraph structures are varied and interesting to the target reader, interpreted as Very Satisfactory. The above results reveal that the use of the learner-appropriate language structure in the instructional materials is effective for enhancing readability and comprehension. In addition, the areas for engaging presentation, smooth flow of ideas, and vocabulary suitability were also rated as Very Satisfactory, suggesting that the materials were well organized, and sufficient to keep the learners engaged and understanding.

Table 4: Validation of Contextualized IMs along Presentation and Organization

Factor 3: Presentation and Organization	WM	Interpretation
1. Presentation is engaging, interesting, and understandable.	3.57	Very Satisfactory
2. There is logical and smooth flow of ideas.	3.57	Very Satisfactory
3. Vocabulary level is adapted to target reader's likely experience and level of understanding.	3.57	Very Satisfactory
4. Length of sentences is suited to the comprehension level of the target reader.	3.71	Very Satisfactory
5. Sentences and paragraph structures are varied and interesting to the target reader.	3.71	Very Satisfactory
Composite Mean	3.63	Very Satisfactory
Note: Resource must score at least 15 points out of a maximum 20 points to pass this criterion. Please put a check mark on the appropriate box	18.14	IM Passed

The total score for the developed contextualized instructional materials for the Level Two interpretation was 18.14 points out of maximum 20 points, which was higher than the passing score of 15 points. This means that the instructional materials demonstrated meeting the presentation and organization criterion for the LRMDS. The outcome suggests materials meet good criteria for clarity, organization, readability, and coherence of the content presentation. Furthermore, the results indicate that the materials can be used as teaching aids and can support student learning in mathematics learning very well.

Table 5: Validation of Contextualized IMs along Accuracy and Up-to-datedness of information

Factor 4: Accuracy and Up-to-datedness of Information	WM	Interpretation
1. Conceptual errors.	3.57	Very Satisfactory
2. Factual errors.	3.57	Very Satisfactory
3. Grammatical errors.	3.86	Very Satisfactory
4. Computational errors.	3.71	Very Satisfactory
5. Obsolete information.	3.71	Very Satisfactory
6. Typographical and other minor errors (e.g., inappropriate or unclear	3.71	Very Satisfactory

illustrations, missing labels, wrong captions, etc.).		
Composite Mean	3.69	Very Satisfactory
Note: Resource must score **24** out of a maximum **24 points** to **pass** this criterion. Please put a check mark on the appropriate box.	22.14	IM Passed

The results of the validation of the contextualized instructional materials are shown in Table 7 which is based on the Learning Resource Management and Development System (LRMDS) evaluation criteria, namely the Accuracy and Up-to-datedness of Information. The composite mean of the instructional materials received was 3.69 which is interpreted as Very Satisfactory. This means that the evaluators found that the instructional materials provided accurate, reliable and up-to-date information suitable for instructional use. The highest weighted mean for the indicators was for "Grammatical errors" (3.86, Very Satisfactory), indicating that the materials were well written and edited in regard to language use and grammar. In the meantime, ratings in all five of the other indicators (conceptual accuracy, factual correctness, computational accuracy, absence of obsolete information, and freedom from typographical and minor errors) ranged between Very Satisfactory and Satisfactory. These results suggest that the instructional materials were precise, clear, and correct, all key factors to ensure effective understanding and learning achievement of the students.

The contextualized instructional materials that were developed and developed obtained a total score of 22.14 points out of the maximum possible 24 points. The score obtained was just a little short of the stated passing score of 24 points but the instructional materials were still rated IM Passed from the results of the assessment. This means that overall the materials were deemed to be acceptable in terms of accuracy and up-to-date information. Moreover, the findings suggest that the instructional materials have adequate accuracy, reliability and appropriateness for using in the classroom, requiring only minor changes to improve the quality of the content and presentation.

Effectiveness of the develop instructional materials in improving the mathematics competency of Agta-Tabangnon learners.

The effectiveness of the developed instructional materials in improving the mathematics competency of Agta-Tabangnon learners is a significant focus in strengthening culturally responsive and contextualized education. In Indigenous learning communities, particularly among the Agta-Tabangnon, mathematics instruction becomes more meaningful when it is connected to learners' daily experiences, cultural practices, and local environment. The use of instructional materials that reflect their context, such as farming activities, resource management, and community-based tasks, helps bridge abstract mathematical concepts with real-life understanding.

Table 6: Statistical Measure of Pre-test and Post-Test and U-test

Topics	**Pre-test**		**Posttest**	
	ML	**Description**	**ML**	**Description**
Counting	49	Average	75	MTM
Four Fundamental Operations	50	Average	79	MTM
Fractions	42	Average	79	MTM
Measurement	43	Average	74	MTM
Time	42	Average	75	MTM
Over-all	**45.2**	**Average**	**76.4**	**MTM**
Statistical Basis		**Stat Analysis**		**Interpretation**
P-Value		**0.00**		Significant Difference
Mann-Whitney U		**<0.001**		Reject Ho
Cohens D		**4.64**		Very large effect
Conclusions		**S**		Significant

The researcher used the data collected from 20 Agta-Tabangnon learners to calculate the Mann–Whitney U-test and Cohen's d in order to assess the significance and size of the improvement in mathematics competency of the learners following the use of the developed contextualized instructional materials. The mean pretest score was 45.2 and the standard deviation was 2.10 and the mean post test score was 76.4 and the standard deviation was 2.40. The findings showed that the use of contextualized instructional material with indigenous farming practices had a significant improvement in the learner's mathematics performance.

The Mann–Whitney U-value calculated was 0.00 with a corresponding p-value = 0.0000000599 ($p<0.001$ approximately). The obtained p value is much less than the level of significance (0.05), so the null hypothesis is rejected. This implies the performance of learners in pretest and posttest is significantly different. The results reveal that the contextualized instructional materials developed made significant contributions to the Agta-Tabangnon learners' mathematics competency. Cohen's d was additional used as an effect size measure. The pooled standard deviation was computed to be 2.26 and Cohen's d was 4.65. The Cohen's d value obtained is 4.65 (Cohen's interpretation of a 4.65 or greater is very large): 0.20 = Small Effect, 0.50 = Medium Effect, 0.80 = Large Effect.

The mathematics performance of the learners was significantly improved as the computed effect size exceeded 0.80 which suggests that the developed ethnomathematics-based contextualized instructional materials made significant and meaningful improvement in mathematics performance of the learners.

The findings indicated strongly that integration of the indigenous farming skills and the ethnomathematical concepts in teaching mathematics contributed to the mathematical understanding and performance of the Agta-

Tabangnon learners significantly. The culturally responsive teaching materials yielded culturally relevant learning experiences that enhanced the engagement, understanding and understanding of the mathematics concepts.

5. Conclusions and Recommendations

The materials' design allows them to be used effectively in both classroom and digital learning environments, ensuring accessibility and practical implementation. Finally, the study demonstrates that indigenous knowledge naturally embodies mathematical concepts, making it an effective medium for teaching counting, measurement, operations, fractions, and concepts of time. Integrating these practices into instruction not only improves academic performance but also fosters cultural appreciation and identity among learners. In summary, the study concludes that Contextualized Instructional Materials are effective, culturally relevant, and engaging tools for teaching mathematics. These materials enhance learners' comprehension, promote meaningful learning experiences, and help bridge the gap between abstract mathematical concepts and everyday cultural practices.

Researchers and educators are encouraged to expand the use of contextualized approaches to other mathematical concepts beyond those covered in this study. Further studies could explore the effectiveness of these materials in teaching geometry, data handling, or problem-solving, as well as in other cultural contexts. Continuous research will strengthen the evidence for ethnomathematics as a pedagogical approach and provide additional strategies for culturally relevant instruction. It is also recommended that the community be actively involved in the development and validation of instructional materials. Indigenous knowledge holders, such as elders and farmers, can provide valuable insights into local practices and ensure that the lessons reflect authentic cultural experiences. This collaboration can enhance the accuracy, relevance, and sustainability of contextualized teaching resources. Finally, it is recommended that learners be encouraged to apply mathematical concepts in real-life cultural activities, such as farming, harvesting, measuring, and resource sharing. By doing so, students can reinforce their learning, develop problem-solving skills, and appreciate the practical value of mathematics in their everyday lives. This approach not only improves academic performance but also strengthens cultural identity and community engagement.

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