

Contextualization and Localization of Teaching Mathematics in the New Normal

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ABSTRACT

To understand how contextualization and localization have been applied to mathematics instruction, this study explored the effects of the shift in the educational paradigm brought about by the COVID-19 pandemic. This research determined the extent of implementation of contextualization and localization in teaching Mathematics among the Mathematics teachers in the fourteen schools in the El Nido Del Norte and Del Sur Districts in the new normal. Mixed methods, quantitative, and qualitative research designs were employed using a survey questionnaire as the primary data-gathering tool and a semi-structured interview guide. The level of implementation of contextualization and localization in teaching Mathematics, specifically in terms of assessment tools and instructional materials, was found to be "High." It was found that creating localized materials was challenging among teaching teachers because it required translating materials into local languages, especially since there are multiple languages spoken in the area. However, teachers receive support from administrators, colleagues, parents, and the community to overcome challenges. Based on these findings, recommendations made in the study included regular professional development, building a community of practice, research and evaluation, policy and technology support, involving parents/local community, and monitoring and feedback.

Keywords: *Contextualization, localization, teaching Mathematics, adversities, coping mechanisms*

INTRODUCTION

The COVID-19 pandemic has drastically changed how educators teach, requiring them to adopt cutting-edge technologies and modern teaching methods. This new age of education, commonly known as the "new normal," presents educators with a unique challenge: to find innovative ways of providing students with engaging and meaningful learning experiences to address the learning gap in mathematics brought about by the pandemic.

Contextualization is helping pupils make connections between the mathematics they are learning and the world around them. Students are more likely to take an active interest in and be motivated by mathematics if it is presented as a tool relevant to their immediate experience. Examples from other disciplines, such

as business, engineering, sports, or even the arts, can help students see how mathematics applies to real-world situations (Gurwitz, 2020).

Math education tailored to a local community recognizes the importance of incorporating material and perspectives relevant to the student's culture. This type of education can be more engaging and effective by making the educational material relatable to the student's culture. In the study of Taban and Cadorna, (2022), they showed the importance of ethnomathematics in Ilocano culture through the wood carved products by providing awareness to the community and also to students by providing them knowledge on the application of mathematics. According to Lau (2018), teachers can make lessons more relevant to their students' lives by incorporating local history, culture, and practices. Students benefit from this method because they gain an understanding of the cultural significance of mathematics as well as its universality. According to Agup & Agup (2020), Mathematics education should become holistic, relevant, and connected with learners' everyday lives, including their culture.

The most widely circulated news regarding the education issue in the Philippines came from a 2018 Organization for Economic Co-operation and Development (OECD) assessment, which revealed that Filipino learners ranked last among 79 countries in mathematics, science, and reading. In the 2019 Trends in International Mathematics and Science Study (TIMSS) report, our Grade 4 pupils scored the lowest in mathematics and science among the 58 countries studied. According to the SEA-PLM Program 2019 Main Regional Report, just 10% of Grade 5 students met reading competency levels, 2% met writing proficiency standards, and 17% met mathematics proficiency standards.

In this case, thousands of learners in the Municipality of El Nido do not attend school daily due to a public health decision to close schools. The Department of Education believes that learning continuity plans (LCP) should be in place to secure the right to education even during hardship. Nonetheless, learners are finding it hard to get through their education at their own pace because all schools in the municipality use modular education as a mode of delivery. Hence, the intended quality of education is not being impacted.

The recent quarterly assessment report in mathematics for El Nido districts has revealed a mean percentage score of only sixty-four percent (64%) for secondary school learners - a worrying figure given the total number of items in their quarterly assessments. The pandemic's learning gap has caused many learners to struggle with comprehension, leading to poor assessment performance.

Due to the unprecedented public health crisis caused by the pandemic, face-to-face interaction was impossible, and students had to rely on learning materials to complete their education. Unfortunately, the quality of content in remote learning resources was often subpar, leading to 2.7 million students dropping out due to a lack of access to educational technology. This has forced governments to reduce

their spending on education and training as funds are diverted toward healthcare demands (Kim & Park, 2020).

The K-12 program's delivery of teachings through contextualization recognizes that the curriculum should be flexible and localized best to serve each school's educational and social settings. This is mandated by the Department of Education (DepEd) through several policies and guidelines, such as the National Adoption and Implementation of the Learning Resource Management and Development System (LRMDS) and the Indigenous Peoples Education (IPEd) Curriculum. In response to the learning gap due to the COVID-19 pandemic, DepEd MIMAROPA, through its Division Offices in Palawan, launched the Math-TLAP (Tracking Learners Academic Performance) project to provide training and workshops on crafting contextualized assessment tools and instructional materials. With this initiative, DepEd MIMAROPA is confident that schools in the region will be able to meet educational goals set out by RA 10533, otherwise known as the Enhanced Basic Education Act of 2013.

As Aninag et al. (2021) mentioned, inspecting the variables that influence student performance is important, given the worldwide interest in improving students' academic performance. In addition, Taban (2021) stated that differences between students within a learning context were considered in the areas of general skills, aptitude, information processing, and application of information to new situations. In particular, the importance of contextualization and localization in teaching Mathematics has become even more relevant as educators face the challenges and possibilities of the new normal. Educators can use these methods to equip their students with essential Mathematics and life skills while boosting student engagement, relevance, and cultural awareness. The new standards provide a solid basis for transforming Mathematics education and creating mathematically literate citizens prepared to handle an unpredictable future. Nevertheless, the extent of implementation of contextualization and localization of teaching mathematics, particularly in the assessment tools and instructional materials in El Nido districts, was investigated.

Understanding how curricula are being implemented in the district can help district supervisors, school heads, and principals create action plans and work programs to generate support and action from their constituents. Developing best practices in teaching Mathematics will set standards among schools and provide a practical way to apply contextualized and localized teaching for quality education. This study will be of great value to stakeholders, policymakers, implementers, teachers, and learners and will add to the existing body of knowledge.

Objectives of the Study

In general, this study determined the extent of implementation of contextualization and localization in teaching Mathematics in the new normal at the

El Nido districts. Specifically, it sought to determine the extent of implementation of contextualization and localization in teaching Mathematics, the adversities in implementing contextualization and localization in teaching Mathematics, and the coping mechanisms for overcoming adversities in implementing contextualization and localization in teaching Mathematics.

METHODOLOGY

Research Design

The study employed mixed methods of research, which involved quantitative and qualitative research methods. The quantitative method was utilized to determine the extent of the implementation of contextualization and localization in teaching Mathematics at El Nido Del Norte and Del Sur Districts. Meanwhile, the qualitative method was utilized through semi-structured interviews with one selected teacher from each school. This part focused on asking them about the adversities in implementing contextualization and localization of teaching Mathematics and their coping mechanisms despite those adversities.

Respondents of the Study

The study was conducted in El Nido Del Norte and Del Sur Districts, comprising fourteen secondary schools. These two districts were selected because the teachers are far from the city and urban areas. They were presumed to have fewer opportunities to study further and attend seminars and workshops. Thirty-four junior and senior high school teachers actively teaching mathematics in their respective schools served as respondents by total enumeration. Based on their profile, the teachers are a combination of young and old teachers, of which a substantial percentage (11 or 32.35%) were 25-30 years old. Majority of the respondents (22 or 64.71%) were females and (19 or 55.88%) with Masteral Units.

For the qualitative part of the study, 14 teachers, one from each school, were selected to participate in the interview. The inclusion criteria were teachers with at least ten years of teaching experience and willingness to be interviewed.

Data Collection and Instrumentation

The study used a questionnaire to determine the level of implementation in the contextualization and localization in teaching mathematics, particularly in assessment tools and instructional materials. It comprises 31 statements, divided into three subparts, namely, accessibility, quality and relevance, and effectiveness. The questionnaire was adapted as paralleled from the Monitoring and Evaluation Tool for Localized Learning Resources of Bahay Elementary School, Libmanan North District, Division of Camarines Sur. The questions were reconstructed to make them suitable for this study. Mr. Nimrod I. Naranjo (Mathematics Master Teacher II) and

Ms. Magdalena A. Paredes (Mathematics Department Head Teacher III) validated the survey questionnaire. The following norm was used to describe the extent of implementing contextualization and localization in teaching mathematics.

Mean Range	Descriptive Rating
4.21 – 5.00	Very High
3.41 – 4.20	High
2.61 – 3.40	Moderate
1.81 – 2.60	Low
1.00 - 1.80	Very Low

The researchers sought permission to adapt the Monitoring and Evaluation Tool for Bahay Elementary School, requested validation of the survey questionnaire through Mr. Naranjo and Ms. Paredes, and then obtained permission from the Public Schools District Supervisors to conduct the study. The researchers then asked the school heads for permission to administer the questionnaires. The questionnaire was administered to the identified respondents and retrieved personally by one of the researchers.

A schedule for the interview with the selected participants was arranged. Some interviews were done face-to-face, while others were done through telephone calls based on the interviewees' accessibility.

Analysis of Data

Mean was used to determine the extent of implementation of the contextualization and localization of teaching mathematics. Meanwhile, the qualitative data were analyzed using thematic analysis and were presented through narrative descriptions.

Ethical Considerations

Research ethics were strictly considered in the conduct of the study in which the respondents' privacy was respected. Their identities were not revealed to guarantee anonymity, and all information was kept confidential. There were no conflicts of interest in the study.

RESULTS AND DISCUSSIONS

Extent of implementation of contextualization and localization in Teaching Mathematics

The extent of implementation of contextualization and localization in teaching Mathematics in the El Nido Districts was determined in terms of

accessibility, quality and relevance, and effectiveness. The summary of the mean ratings is shown in Table 1.

Overall, the extent of implementation of contextualization and localization in teaching Mathematics is high, with a mean rating of 3.76.

On Accessibility in Preparations by the Schools Division Office Prior to the Development and Use of the Contextualized and Localized Assessment Tools and Instructional Materials. The implementation is described as "High," as shown by the computed mean of 3.57. This means that the schools observe the preparations by the school's division office prior to developing and using the contextualized and localized assessment tools and instructional materials for schools and teachers.

Table 1

Summary of the mean ratings on the extent of implementation of contextualization and localization in teaching mathematics

Indicators	Mean	Descriptive Rating
A. Accessibility		
1. Preparations by the Schools Division Office Prior to the Development and Use of the Contextualized and Localized Assessment Tools and Instructional Materials	3.57	High
2. Resources Used in Printing, Reproduction, Distribution, and Utilization of Contextualized and Localized Assessment Tools and Instructional Materials	3.04	Moderate
B. Quality and Relevance	4.39	Very High
C. Effectiveness	4.04	High
Overall	3.76	High

Legend: 4.01-5.0 (Very High), 3.01-4.0 (High), 2.01-3.0 (Average), 1.01-2.0 (Low), and 0-1.0 (Very Low)

Based on this, the schools identify the learning needs and characteristics of the target students and teacher indicating that efforts were made to understand the specific requirements of the learners and adapt the materials accordingly. They also establish a team or committee to oversee the development and localization process, involving subject matter experts, teachers, and curriculum specialists, was another significant aspect implemented. According to Alsubaie (2016), meeting the requirements and present demands of the culture, society, and expectations of the people being served should be the primary focus of any good educational program and curriculum creation. It may be topic-specific or provide a broad outline of typical behavior. It has to be a practical resource that guides educators in creating unique lesson plans and identifying appropriate resources.

Providing training and support for teachers on effectively using the assessment tools and instructional materials indicates a proactive effort to ensure

that educators are equipped with the necessary skills and knowledge to implement the materials in their teaching practice. Teachers should be able to freely and effectively employ continuous assessment for and as learning. First, this entails recognizing the need for continuous assessment in the classroom, i.e., a tool that educators and learners can use to monitor and steer their progress in a positive direction (Muskin, 2017).

On Accessibility to Resources Used in Printing, Reproduction, Distribution, and Utilization of Contextualized and Localized Assessment Tools and Instructional Materials. The table reveals that the extent of accessibility to resources used in printing, reproduction, distribution, and utilization of contextualized and localized assessment tools and instructional materials is described as "Moderate," as manifested by the computed mean of 3.04.

In different learning areas, teachers can adapt and localize teaching tools by receiving funds facilities from school and receiving funds from the donations. Using tools adapted to a specific place and time is a good way to teach in the classroom. Teachers have trouble contextualizing teaching materials in the classroom because they do not have enough money, enough time, enough materials, enough support from the community, enough knowledge of the area, enough support from the school head, and enough support from their co-workers. There is a plan of action to improve the contextualization and localization of classroom teaching tools (Sape, 2019). Moreover, Garland (2021) supported that Immersive settings can be bad in several ways. Virtual environments can be confusing, so teachers will need guidance and technical help to get around them, especially at the beginning. Teachers who have never been asked to think critically or independently may find it very hard in a virtual world, which is a very different setting. Thus, addressing the moderate level of accessibility by allocating more funds and resources, seeking additional funding sources, and developing sustainable financial strategies can further enhance the implementation of contextualized and localized assessment tools and instructional materials, ultimately improving the quality of mathematics education in the new normal.

On Quality and Relevance. It can be seen from the table that the extent of implementation of contextualization and localization in teaching mathematics, particularly in the assessment tools and instructional materials in terms of quality and relevance, is described as "Very High," as displayed by the computed mean of 4.39. This means that the teachers practice the statements that explain the implementation of contextualization and localization in teaching mathematics, particularly in the assessment tools and instructional materials regarding quality and relevance.

As guided by the contextualization and localization instructional materials, teachers make the contents logical (simple to complex) and structured to guide learners in the learning skills/concepts. Local beliefs, norms, values, traditions, folklore, current events, and existing technologies are also documented and used and used to develop a lasting curriculum.

According to Reyes et al. (2019), contextualization and localization in teaching math, especially in evaluation tools and teaching materials, are vital to ensuring the learning experience is high-quality and relevant. Teachers can use these methods to make the classroom more important and interesting for students. In this study, the researcher looked at the most important parts of contextualization and localization in math teaching, focusing on how they affect the quality and usefulness of testing tools and teaching materials. Contextualized evaluation tools and teaching materials give students a chance to use what they know about math in real-world situations and solve problems that look like those situations. This improves the testing process because it tests how well students can use their math skills in real-world situations (Reyes et al., 2019). Hence, localization makes educational materials that fit the students' culture, language, and situation. It acknowledges the importance of including students' cultural backgrounds, customs, and models from their communities in the teaching and learning process. When evaluation tools and teaching materials are made for a specific area, they are easier for students to understand and use. Putting contextualization and localization into testing tools and teaching materials requires planning, working together, and creativity. Teachers must find real-world situations important to the curriculum goals and students' hobbies. They must also consider their students' backgrounds and ensure the translated materials are open and sensitive to different cultures (Lorbis, 2019). Testing tools and teaching materials must be constantly evaluated and improved to maintain quality and usefulness. Educators should get comments from students, teachers, and other interested parties to determine how well the tools work and where they can be improved. Changes in the curriculum, technological improvements, and new needs in the teaching and learning scene should lead to regular updates and changes (Merlo, 2023).

On Effectiveness. It can be seen from the table that the extent of implementation of contextualization and localization in teaching mathematics, particularly in the assessment tools and instructional materials in terms of effectiveness, is described as "High," as displayed by the computed mean of 4.04. This means that the implementation of contextualization and localization in teaching mathematics, particularly in the assessment tools and instructional materials are able to enhance learner performance and achievement. The contextualized and localized assessment tools and instructional materials provide the opportunity to integrate diverse teaching strategies. Teachers observe that the contextualized and

localized assessment tools and instructional materials assures that all the students are on task.

The contextualization and localization of assessment tools and instructional materials reveal several key benefits and implications for learners and teachers. These benefits include keeping the learner and the teacher on track, encouraging reflection, refinement, and improvement, improving learner performance and achievement, optimizing instructional time, and integrating diverse teaching strategies. According to Kim et al. (2019), contextualized and localized assessment tools and instructional materials provide a clear and focused learning path, encourage reflection, refinement, and improvement, enhance learner performance and achievement, maximize instructional time, and integrate diverse teaching strategies. Moreover, Darling-Hammond et al. (2020) concluded that contextualized and localized assessment tools and instructional materials help ensure all students are engaged and focused on assigned tasks. They also help teachers gain confidence in facilitating learning by providing a framework and support to guide instruction. These materials promote effective teaching and learning practices while maximizing instructional time.

Adversities in Implementing Contextualization and Localization in Teaching Mathematics

The interview results revealed the following adversities in implementing contextualization and localization in teaching Mathematics.

- 1. Creating localized materials requires translating materials into local languages.*
- 2. Creating and distributing digital materials was difficult.*
- 3. Creating contextualized and localized assessment tools and instructional materials requires additional resources such as time, money, and technology.*
- 4. Teachers require training and support to implement contextualization and localization in their teaching effectively.*
- 5. Some teachers and students resist change and are not open to using new approaches or materials.*

Despite the high extent of implementation of the contextualization and localization in teaching Mathematics by the schools as presented in Table 1, the teachers have faced challenges or adversities. For instance, the teachers found it challenging to create localized materials because multiple languages are spoken in the area. The teachers have a limited understanding of the local context, making it difficult to create effective localized materials. Creating and distributing digital materials was also difficult because students and teachers cannot access technology or the Internet.

Moreover, they lack the resources. Most of the time, the resources needed to contextualize instructional materials and assessment tools are not readily available. They also stressed that without adequate training, they may be unable to integrate the new materials into their teaching effectively. This could be why some teachers and students do not fully embrace this new approach to teaching and learning, particularly in Mathematics.

Because of these adversities, Garin et al. (2017) stated that using contextualization and localization to teach Mathematics has a lot of positive effects. However, teachers need to be aware of the problems that could come up. Some of the problems that educators have to deal with are limited resources, aligned education, teacher training, standardized tests, limited time, pushback to change, and the validity of assessments. Recognizing these problems and coming up with ways to deal with them can help with implementation and make sure that contextualized and localized evaluation tools and teaching materials are successfully integrated into mathematics education (Panthi & Belbase, 2017).

Coping Mechanisms for the Adversities in Implementing Contextualization and Localization in Teaching Mathematics

The following are the common coping mechanisms among teachers in implementing contextualization and localization in teaching Mathematics.

1. *Support from administrators, colleagues, parents, and the community to overcome challenges*
2. *Reflecting on their teaching practices*
3. *There is continuous professional development for teachers.*
4. *Collaborating with other teachers, stakeholders, and the community*

When using contextualization and localization to teach math, coping strategies are a key part of getting through problems and problems that come up. Cadorna et al. (2016) mentioned that findings on the strategies to reduce pathological fear will make teachers and parents select the appropriate strategies for their students/children to overcome this anxiety.

Teachers can get around these problems using a number of different methods, as presented above.

According to them, administrators are providing resources and training. Teaching and learning mathematics were a struggle, especially during the pandemic, but they saw the hard work and cooperation of parents who support their children's learning at home.

The teachers also spend time to reflect on their teaching practices. Through this process, they can identify areas for improvement. They also sought feedback from their colleagues, students, and parents to help them identify challenges and successes. As a result, they were able to develop plans to overcome challenges.

The presence of continuous professional development programs also serves as their driving force to cope with the challenges in the implementation of contextualization and localization in teaching Mathematics. These programs help teachers learn new methods and strategies for teaching and learning Mathematics in different contexts. These also reduce anxiety and build confidence in teachers.

It is crucial to understand that different students have diverse learning needs and to develop various strategies that cater to those needs. Teachers collaborate with stakeholders and the community, which can provide additional resources, knowledge, and support to develop and implement contextualized and localized instructional materials. Being flexible with instructional methods and techniques can help teachers adapt to the learning needs of their students.

According to Patzer (2023), creating a supportive and collaborative atmosphere lets teachers share their experiences, thoughts, and best practices. This allows them to learn from each other and figure out how to solve problems. Looking for professional development chances focusing on contextualization and localization gives teachers the information and skills they need to successfully use localized content and teaching methods. Also, building strong relationships with stakeholders like curriculum experts, local communities, and educational institutions can provide valuable resources, advice, and support. Lastly, having a growth attitude and staying strong when things do not go as planned helps teachers change and improve their methods, making contextualization and localization of math education better. With these ways of dealing with problems, teachers can get through the problems and create a setting that makes math education important and interesting (Acharya et al., 2021).

CONCLUSIONS

The Department of Education, Schools Division of Palawan, particularly in El Nido districts, is actively implementing contextualization and localization in teaching mathematics, as evidenced by a high extent of implementation as assessed by the teachers. The teachers encounter adversities because multiple languages are spoken in the area and resources such as time, money, and technology are limited. The teachers strive to implement contextualization and localization in teaching mathematics using various coping mechanisms that address the identified adversities.

RECOMMENDATIONS

Regular and focused chances for professional development are encouraged to help teachers learn more about contextualization and localization techniques. To build a community of practice, teachers, subject matter experts, and curriculum

professionals should work together to share best practices, resources, and experiences in teaching math related to contextualization and localization. Collaboration projects can also be encouraged, including making and sharing materials, lesson plans, and evaluation tools specific to a particular area. Doing more research and evaluation to find out how contextualization and localization affect how well math students learn must also be conducted. Educational organizations, policymakers, and managers should strengthen the policies and rules on the localization and contextualization by providing teachers the support and resources to integrate effectively this program into teaching Mathematics. Administrators should also set up ways for constant monitoring and feedback to make sure that contextualization and localization efforts are always getting better. Regular comments from teachers, students, and other parties can figure out what needs to be changed and how to deal with any problems that might come up.

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