

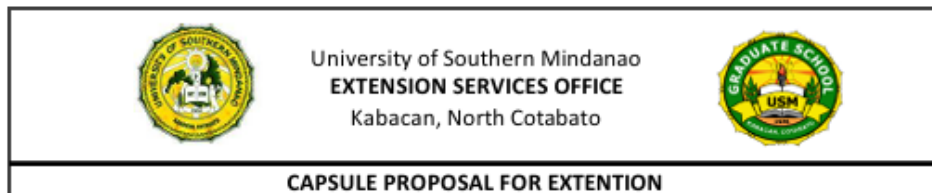


PhD in Education Major in Mathematics Checklist

Course Code	Course Title	Extension-Related	Remark
DCTed 01	Qualitative Research Methods	✓	Community- engaged research potential
DCTed 02	Quantitative Research Methods	✓	Community-engaged research potential
DMMath 01	Advanced Linear Algebra and Applications	✓	Involved indirect community service through research-informed material development, which supported extension delivery and teacher training in mathematics concepts.
DMMath 02	Modern Algebra		
DMMath 03	Modern Geometries and Models		
DMMath 04	Number Theory Applications		
DMMath 05	Real Analysis		
DMMath 06	Mathematical Statistics		
DEMath 01	Philosophy of Mathematics		
DEMath 02	Critical Analysis of Mathematics Education Theories		
DETed 01	Curriculum Planning, Development, and Management	✓	Directly involved in the extension project through community service application of outputs.
DETed 02	Innovation and Technology as Applied in Education		
DSpMath 01	Special Topics for Mathematics Education Research	✓	Research-driven extension interventions
DDMath 01	Dissertation 1	✓	Community-engaged research potential
DDMath 02	Dissertation 2		



2023 Extension Project



A. Basic Information

1. Project Title:

Strengthening Mother-tongue based Education in DepEd Cotabato/MBHTE BARMM through Instructional Materials Development and Validation.

2. Proponent/s

Name: Philip Lester P. Benjamin (Project Leader)
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3. Implementing Agency/ies

Lead Agency: USM Graduate School and College of Science and Mathematics
Collaborating Agency(s): DepEd Cotabato/MBHTE BARMM

4. Project Duration: January 2023 – December 2023

5. Project Location: Nangaan, Kabacan

6. Total Budget Requested: PhP 60,000.00

B. Technical Description

1. Rationale

The United Nations declared 2022-2032 as the International Decade of Indigenous Languages to focus on preserving and promoting endangered indigenous languages. In the Philippines, Republic Act No. 10533 emphasizes using languages understood by learners, aligning with Mother Tongue-Based Multilingual Education principles. The Department of Education supports indigenous languages through the Indigenous Peoples Education Program, requiring an orthography, primer guide, vocabulary, grammar sketch, and learning materials for official recognition as a medium of instruction.

The Department of Education also trains teachers to effectively teach in indigenous languages and supports instructional material development. Using indigenous languages in education improves learning outcomes and cultural identity among indigenous learners. Challenges include resource and expertise shortages. It's crucial for the government and stakeholders to continue supporting these languages' preservation, revitalization, and promotion, engaging indigenous communities in program development and implementation.

Efforts to preserve indigenous languages extend beyond education to media, government services, and public life. This requires translation services, media content in indigenous



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languages, and encouraging their use in public settings. Preserving these languages benefits not just the communities but also global linguistic and cultural diversity. Sustaining these efforts involves ongoing commitment and resources from various stakeholders.

The extension project in the DepEd Cotabato Division aims to strengthen mother-tongue-based education through instructional material development and teacher capacity building. This project promotes linguistic and cultural diversity, improves student learning outcomes, and addresses the specific needs of students in the region. Overall, it enhances mother-tongue-based education by providing tailored instructional materials and teacher training, contributing to improved learning outcomes and cultural preservation.

2. Objectives

General Objective:

To improve mother-tongue based education of elementary school teachers in Deped Cotabato/MBHTE BARMM by developing and validating instructional materials.

Specific Objectives:

At the end of the year, it is expected that the project shall be able to:

1. To develop high-quality mother-tongue based instructional materials in elementary mathematics that effectively engage and educate students.
2. To validate mother-tongue based instructional materials developed for elementary mathematics through data analysis and feedback from teachers, students, and parents.

3. Expected Output

The project is expected to generate the following:

1. Developed mathematics instructional materials for mother-tongue based education.



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- Validated mathematics instructional materials for mother-tongue based education.

4. Potential Impact

The project's potential impacts include:

- Improved mathematics academic performance and learning outcomes for students.
- Increased cultural pride and self-esteem among students.
- Stronger linguistic and cultural identity among students.
- Improved quality of education in the area.

5. Beneficiaries

The teachers and pupils of Nangaan Elementary School.

6. Budgetary Requirement (including counterpart funds or other sources)



Item	Year 1				Total
	Q1	Q2	Q3	Q4	
I. Personnel Services (PS)					
A. Salaries and Wages					
B. Honoraria	2,500.00	2,500.00	2,500.00	2,500.00	10,000.00
C. Others (Bonus, etc)	500.00	500.00	500.00		1,500.00
Sub-Total for PS					
II. Maintenance and Other Operating Expenses (MOOE)	11,250.00				11,250.00
A. Laboratory Chemicals					
B. Meals			7,500.00		7,500.00
C. Supplies (Office)	3,000.00				3,000.00
D. Miscellaneous and Contingency		20,000.00			20,000.00
E. Fuel and Diesel			6,750.00		6,750.00
F. Training					
Sub-Total for MOOE					
TOTAL	17,250.00	23,00.00	17,250.00	2,500.00	60,000.00



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2025 Extension Project

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CAPSULE PROPOSAL FOR EXTENTION		

A. BASIC INFORMATION	
1. Project Title Component 1 Component 2 Component 3 Component 4 Component 5	Strengthening Barangay High Schools: Validating and Implementing Representation Approach-Based Learning Materials for Independent Study of Mathematics in Remote Schools Building Capacity for Teachers in Instructional Development Building Capacity for Teachers in the Conduct of Action Research Design and Development of Representation Approach-Based Learning Materials for Independent Learning of Mathematics Validation and Packaging of Representation Approach-Based Learning Materials for Independent Learning of Mathematics Implementation of Representation Approach-Based Learning Materials for Improved Learning of General Mathematics
2. Proponent/s Indicate Name Designation, Office 2.1. Email Address 2.2. Contact Number	Lorence C. Tandog, Debbie Marie Verzosa, Jonald Pimentel Philip Lester Benjamin, Leonard Paleta, Anna Jean Sebastian, Jupiter Pilongo, Daryl Mae Catubig, Lawton Yabes, Roel Valenton, Shandra Nanding, Rowel Madio Faculty, College of Science and Mathematics lctandog@usm.edu.ph 09466115568
3. Lead Unit/College 3.1. Collaborating Unit/College 3.2. Partner Agency	College of Arts and Sciences Graduate School DepEd
4. Thematic Area	<input checked="" type="checkbox"/> Quality Learning Skills Development and Literacy <input type="checkbox"/> Food Security and Poverty Reduction <input type="checkbox"/> Social Development, and Strong Institutions <input type="checkbox"/> Good Health and Well-being <input type="checkbox"/> Preservation of Culture <input type="checkbox"/> Innovations in Science, Engineering, and Technology <input type="checkbox"/> Environmental Protection, Conservation, and Risk Reduction <input type="checkbox"/> Sustainable Entrepreneurship and Management





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5. Sector/Discipline	Mathematics Education
6. Project Duration	One year (January – December, 2025)
7. Project Service Area/s:	DepEd Cotabato
8. Total Budget Requested (Php)	60,000
B. TECHNICAL DESCRIPTION	
1. Need-based Rationale	
<p>(State rationale based on current set-up, the need, your solution, and connect) please refer to Magbanua, G.G. (n.d.) Writing a Need-based Rationale for Extension Proposal, <i>TeknoGiya</i> University of Southern Mindanao.</p> <p>Barangay high schools, formerly known as barrio high schools, were established in 1964 to provide wider access to secondary education (Orata, 1979). Since then, additional barangay high schools have opened with the passage of RA 6054 or the "Barrio High School Charter" in 1969. The establishment of barangay high schools is considered as equalizing opportunity for all Filipino children to access education regardless of their place of residence or economic condition.</p> <p>The performance of Philippine barangay schools has always been viewed to be inferior. In 1987 the Department of Education (DepEd) temporarily halted the opening of barangay high schools with acknowledgement that the quality of instruction in most of the barangay high schools suffered as evidenced by poor results in national achievement tests (DepEd DO 69, s. 1987). The quality of education in barangay high schools could not be sufficiently maintained due to a lack of experienced teachers and funding (Ishida, 1995) resulting in a lack of quality material resources and infrastructures (Bai, 2023). However, due to the insistent demand of the local communities for secondary education and the pressing need to improve access to education in remote areas, barangay high schools continued to operate and increased in number.</p> <p>Teacher shortage is a critical issue in many rural areas around the world. This shortage is magnified in barangay high schools which serve as entry employment for inexperienced teachers who at the same time are forced to teach out-of-field subjects due to teacher shortages or limited class sections to handle in remote schools. Covid 19 exposed the challenges of the digital divide and students in barangay high schools were further disadvantaged because they had no access to materials and tools needed for remote and independent learning (Gutierrez and Bilefsky, 2021). These challenges continue this post-pandemic as DepEd schools continued cancelation of face-to-face classes or shortened class periods during extreme weather conditions.</p> <p>Self-regulated and independent study is vital in cases where teachers are not available to facilitate learning. Effective learning materials significantly support independent learning since resources that can be learned without needing the assistance of a teacher can empower students to take control of their studies, learn at their own pace, and develop self-discipline and independent thinking. Research shows that supplemental printed materials significantly facilitate successful learning of math concepts (Brown and Gilmer, 2009) and self-instructional worked examples are effective in the development of both conceptual and procedural knowledge (Sheldon, 2013).</p> <p>In 2021, we initiated a multi-dimensional approach to respond to the challenges that emerged from the urgent educational adaptations driven by the pandemic through material and technology tools development. Our project introduced teaching innovations that utilized interactive elements, visual features, storytelling, and manipulable representations. Various studies have shown that these features and tools enhance learning (De las Peñas & Bautista, 2008), facilitate visualization (Taka, Taka, & Budinski, 2010), and develop creativity (Shelomovskiy &</p>	



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improved image of barangay high schools can offer a solution to the continuous overcrowding of municipal and national high schools.

Overall, this extension project aims to strengthen education in barangay high schools through development of quality material resources for independent study of mathematics thereby improving access to quality education among marginalized communities.

2. Objectives (State specific objectives based on Knowledge, Skills, and Attitude/Practice (KSA/P))

This project aims to enhance the mathematics education received by students in barangay high schools in DepEd Cotabato with the use of carefully designed and validated self-instructional learning materials.

Specific objectives:

1. Strengthen math teachers' capability to develop representation-based self-instructional materials.
2. Engage teachers in collaborative work of developing research lessons and Learning Activity Pages (LAPs).
3. Validate, pilot-test, and refine LAPs to efficiently facilitate independent learning of mathematics concepts and skills.
4. Enhance mathematics performance and numerical literacy among barangay high school students through implementation of LAPs

3. Expected Output/s (State in quantifiable form)

1. Teachers are empowered with knowledge and skills in designing and developing material resources that are effective for students' self-guided study.
2. A professional learning community is sustained where teachers and experts will continue to work collaboratively and share pedagogies for improved learning quality.
3. LAPs are created that are tailored to mathematical abilities and needs for independent study of target clients.
4. LAPs are validated, pilot-tested, and packaged and/or lesson exemplars are implemented for online uploading.
5. LAPs are used to supplement learning of important mathematics content and skills for improved numerical literacy among students in barangay high schools.
6. Students in barangay high schools improved in terms of mathematics performance and numerical literacy.
7. Final versions of LAPs are copyrighted.

4. Major Activities (Enumerate in chronological order the series of activities to be undertaken)

Development Phase:

1. Gathering of baseline data

- Use researcher-made mathematics achievement test and standardized (if available) numerical literacy test to gather data on current mathematics capabilities of students in Barangay High Schools.
- Conduct ocular visit and interview with teachers and school heads about existing



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materials/learning resources available in barangay high schools

- Use available secondary sources to describe the performance of barangay high schools in division/nationwide evaluations.
- Survey on the number of school graduates who continued to the next level of education (ex. junior to senior HS) or admission rate of graduates to universities.

2. Needs assessment

- Conduct diagnostic or pretest to identify specific needs of students that can be addressed through material development.
- Interview teachers to identify weaknesses of students that should be considered when designing the LAPs.
- Site visit to the target school and interview with school heads to identify other contextual factors that may be considered during project implementation.

3. Brainstorming, initial planning and training

The PhD and MST math programs in coordination with the Department of Mathematics and Statistics have already organized the activity and established collaborative partnership between teachers who prepared research lessons on some topics and developed. However, this activity will be furthered as the project will engage barangay high school teachers in the collaborative work so that their perspective can be integrated in the final version of LAPS and more learning materials may be developed based on the result of needs assessment. For this development phase, we will

- Conduct an orientation on the goals of the project and the specific learning needs that should be addressed in material development, and on how the material development activities may proceed. Participants will include the teacher in-charge and teachers from the target high school.
- Schedule a meeting to brainstorm on topics or skills that may require development of additional LAPs; or how the needs of students may be addressed in the developed learning materials. Participants will be faculty of Math & Stat Dept., graduate students and invited teachers from the target barangay high school.
- Prepare plan of activities to include review and critiquing of developed materials, validation and pilot testing, and lesson study schedules in case of additional materials to be developed.
- Conduct a training on representation approach, scaffolding techniques, and other topics to address teachers' needs in relation to material development. The resource persons will be the faculty of Math & Stat Dept. while the participants are graduate students and invited teachers from the target barangay high school.

4. Validation, pilot-testing, and refinement of developed LAPs



The PhD and MST Mathematics graduate students have already developed Learning Activity Pages (LAPs) in collaboration with DMS faculty through a series of lesson study. There are two types of LAPs currently developed based on purpose: 1) to improve learning of specific mathematics content; 2) to enhance mathematics skills or literacy (such as number sense, measurement, pattern recognition). The developed materials are not grade-level specific, but the presentation is anchored on what the developers



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- Improved quality of education in barangay high schools
 - Improved access to quality education in remote areas.

7. Estimated Budget			
PS	MOOE	Partner/agency counterpart	TOTAL
10,000	50,000		60,000

8. Literature Cited

De las Peñas M.L.A., & Bautista, D.M (2008). Understanding and developing proofs with the aid of technology. *Electronic Journal of Mathematics and Technology*, 2(3), 261-273.

Gutierrez, J., & Bilefsky, D. (2021). With schools closed, Covid-19 deepens a Philippine education crisis. Retrieved October 19, 2021, from <https://www.nytimes.com/2021/09/13/world/asia/philippines-students-remote-covid.html>

Sheldon, C. (2013). *Developing conceptual and procedural knowledge in addition of signed integers through self-instructional worked examples*. Learning and Instruction, 29,176-190.

Taka D., Taka A., & Budinski N. 2010. On visualization problems using the GeoGebra and Scientific Workplace packages. *International Journal for Technology in Mathematics Education* 17(4): 191-196.

9. BRIEF PROFILE OF PROPONENT/S (Add tables if necessary)			
1. Name:	Leorence C. Tandog		
2. Education			
Name & Address of Educational Establishment	Degrees Obtained & Area of Specialization	Month / Year	
		From	To
UP Diliman	PhD Science Ed - Math	June 1993	June 1997
Notre Dame University	MA in Math Education	June 1987	March 1992
Notre Dame University	BS Mathematics	June 1983	March 1987
3. Work Experience/s			
Position Title	Company	Inclusive Dates (mm/dd/yyyy)	
		From	To
Mathematics Instructor/Professor	University of Southern Mindanao	1988	present
4. Publications and Research Experience/s			
Usman, B., Usman, M., & Tandog, L. (2023). The Potential of Self-learning modules to develop mathematical representations and connections in distance learning. <i>International Journal of Advance Research and Innovative Ideas in Education</i> , 9(4)			