

# The Impact of Indigenized Practical Tasks to Higaonon Students' Learning Behavior and Mathematics Performance: A Case Study

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**Abstract** This study explored the impact of indigenized practical tasks on the Higaonon students learning behavior and mathematics performance. Employing a qualitative exploratory case study, data were gathered through observation of students' behavior and performance in the mathematics classroom. Thematic analysis was utilized to identify the themes related to students' responses to the integration of indigenized practical tasks in mathematics instruction. The results revealed a positive impact on Higaonon students learning behavior and mathematics performance. The students displayed heightened engagement, enjoyment, learning progress and understanding of mathematics, and application of knowledge in real life. In addition, the indigenous students appreciated the cultural relevance of the lesson through the integration of practical tasks in mathematics instruction. These findings highlight the impact of incorporating indigenous knowledge and practical tasks to create a more meaningful and culturally relevant learning experience for Higaonon students.

**Keywords:** *indigenized practical task, learning behavior, mathematics performance, case study*

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## 1. Introduction

Globally, mathematics is a fundamental part of school curriculum. As it will be used as an instrument for the development of all areas of knowledge. Knowingly and unknowingly, we are using mathematics in every facet of our life [1]. However, mathematics is known to be one of the most hated and even feared school subjects even among teenagers. Students hold the idea that a fast recall of mathematics facts means that you are strong in Mathematics. They become stressed, causing them not to use their full capacity of thinking especially when being tested. Thus, teens are feeling a disconnection between mathematics and the real world. According to survey conducted [2], mathematics was ranked as the least popular subject among high school students in United States, with 46% of students saying they disliked it.

The Department of Education of the Philippines has set a target of at least 75% proficiency in mathematics for all students [3]. However, there were concerns that some schools and regions were struggling to meet this target. For instance, in the Northern Mindanao region where Baliguian Integrated School is located, there were reports of low mathematics proficiency among indigenous students. Considering the performance of the Grade 10

students, their periodical grades at Baliguian Integrated School for the first two quarters of the school year 2022-2023 were a cause for concern. Although there was a slight improvement in the second quarter, the mean percentage score for mathematics was still below the Department of Education's target of 75%. These results highlight the need for targeted interventions to improve mathematics performance of this school and the region as a whole.

In recent years, there has been a shift in the way mathematics was taught, moving away from traditional rote memorization and towards more student-centered and inquiry-based approaches [4]. These approaches emphasized problem-solving, critical thinking, and collaboration, with a focus on developing students' mathematical reasoning skills rather than simply teaching them how to solve equations [5]. Research has shown that these approaches can lead to higher levels of student engagement and achievement in mathematics.

However, it is important to note that the effectiveness of these approaches can vary depending on the context in which they are implemented. Factors such as cultural beliefs, teacher training, and available resources can all play a role in shaping the teaching and learning of mathematics in a particular setting [6]. In the case of Baliguian Integrated School, it may be necessary to consider localized strategies and cultural considerations in the teaching of mathematics. Incorporating indigenous

knowledge and cultural practices into mathematics lessons may help to make the subject more relevant and engaging for indigenous students [7]. Similarly, the learning of mathematics seems to be influenced by learners' cultural background [8] and how they connect mathematics to day-to-day life through games, plays, and artifacts [9]. Therefore, mathematics should enable learners to perform operations of mathematics in their cultural milieu [10].

It is commonly acknowledged in literature that social interactions rooted in learners' cultural frameworks cannot be separated from meaningful teaching and learning [11]. [12] claimed in particular that teachers must dismantle the remnants of colonial influences that still permeate the practices of indigenous teachers if they are to ensure the educational success of indigenous children. Therefore, it may be said that a competent teacher is one who is culturally aware of the context in which they work [13].

Numerous studies and curriculum changes have recognized the context in which mathematics is used in various cultures [14]. All of these scholars agree that it is critical to implement culturally sensitive pedagogies in the teaching of mathematics and other subjects. An examination of one country from 1987 and 2004 curriculum revisions reveals a focus on incorporating indigenous knowledge systems into the country's formal education system [15]. The Ghana Education Service has since sponsored worldwide participation in related contests and promoted indigenous tasks through competitions in schools to help with the reform need: for teachers in charge to include native tasks in mathematics classes, these reform aims have so far proven to be difficult to implement [16]. According to [17], the use of indigenous tasks to teach mathematics is novel and distinct, and if applied inside a certain culture and civilization, would produce excellent results. When learners' backgrounds and experiences are considered, word problems are learned.

Indigenous tasks in mathematics contributed novel and energizing insights to the field of mathematics education, not only regarding local or ethnic mathematical knowledge but also in terms of the historical, philosophical, and political perspectives related to mathematics and its education. According to [18], inclusion of practical tasks in mathematics is the method by which various cultural groups applied; that is, how they can count, measure, relate, sort, compare, infer, formulate hypotheses, pose problems, generalize, communicate, gather and process data, predict, analyze, record, evaluate, verify, and construct. In order to survive, marginalized cultural groups apply mathematical tools situated in the context of their actual circumstances [19].

Department of Education (DepEd) recognized the failure of state-administered education to provide a kind of education that is non-alienating and sensitive to the needs and aspirations of Indigenous peoples. DepEd issued Department Order 62 (D.O. 62), adopting the National Indigenous Peoples Education Policy Framework. In this important document, basic education is seen as an enabling right that will allow IPs to "claim their other rights, exercise self-determination, and expand the choices retrieved to them" (D.O. 62, p. 6).

Knowing the importance of the integration of the

practical tasks in teaching mathematics to the indigenous students put the researcher in the best position to explore this teaching strategy. Thus, this study aimed to provide empirical evidence to the impact of indigenized practical tasks in mathematics classroom to Higaonon students' learning behavior and mathematics performance.

## 2. Methods

The study used the exploratory case study approach to explore the impact of indigenized practical tasks in mathematics classroom to Higaonon students' learning behavior and mathematics performance. Through this approach, the participants' responses towards the inclusion of indigenized tasks in the mathematics classroom were identified [20]. The paradigm in qualitative case study was employed to generate concepts from data and identify relationship between the context and process that stood as basis for the development of the themes.

It is the case's special attributes that are of interest, sample sizes are generally small. Inquiry in this type of study focuses largely on their defining case features and the differences they exhibit from other individuals/events in the larger population. The overall idea is to tease out what makes them so different [21].

This qualitative case study design has mechanisms needed to conduct the study. Thus, the in-depth discussion on the learning experiences of the participants using this approach would give an abundant and holistic insights to the learning experiences of students.

### 2.1. Research Setting

The study was conducted at Baliguihan Integrated School (BIS), which is located in Sitio Baliguihan, Barangay Eureka, Gingoog City, Misamis Oriental, Philippines, and is administered by the Department of Education - Division of Gingoog City. The school was renamed Baliguihan Elementary School in 2015. In 2020, the school changed its name to Baliguihan Integrated School. Currently, the school offers primary education as well as junior secondary education. The school currently enrolled one hundred five (105) students and employs seven (7) faculty members with four (4) classrooms. The figure below shows the location of Baliguihan Integrated School in the Gingoog City Division.

### 2.2. Participants of the Study

This qualitative case study employed a small sample size to accurately assess and comprehend participants' learning experiences with homogeneous participants. Because of this, it will be anticipated to have a rich and descriptively deep analytical process. Thus, the participants in this study were ten grade 10 students who had difficulty in learning mathematics and most of them are overage like 18, 19, 20, 21 and 22 years old. The participants belong to the advisory class of the researcher from Baliguihan Integrated School in Gingoog City, Misamis Oriental, Philippines, for the academic year 2022–2023.

### 2.3. Sampling Design

"It is essential that all participants have [similar lived] experience of the phenomenon being studied [22]. Thus, the purposive sampling technique was used specifically. Purposive sampling is a non-probability sampling method in which the researcher relies on sound judgment when choosing members of a population to participate in the study [23]. This technique may prove effective when limited numbers of people can serve as primary data sources due to the nature of research design, aims, and objectives. Total population sampling is a type of purposive sampling technique where you choose to examine the entire population (i.e., the total population) that have a particular set of characteristics. The researcher chose purposive sampling due to the limited number of indigenous students in the selected area where the researcher served as the mathematics teacher.

### 2.4. Research Instruments

The researcher utilized an observation guide to observe the behavior of the students. The researcher developed an observation guide for the students and was used while watching video-taped recorded by the researcher from the different episodes of learning she made during the process of teaching and learning which focused on the impact of indigenized practical tasks in mathematics classroom to Higaonon students' working behavior and mathematics performance. Another instrument in this study was the lesson plans on all the topics covered in this study and these were validated by the 3 experts.

### 2.5. Data Gathering Procedure

The researcher submitted a request letter to the office of school head asking permission to conduct the study. After the approval of the request, the identified participants were given orientation on data gathering procedure, confidentiality, and voluntary participation. After the participants approved voluntarily, the researcher sent an informed consent and assent form to participants' parents for their children's involvement in the research study highlighting that the interview will be recorded with their permission and can use vernacular language to express their experiences freely. This permission of the participants were needed since some of the participants were of minor age.

The study was conducted during the 3<sup>rd</sup> Quarter of SY 2022-2023. Topics covered were Fundamental Counting Technique, Permutation, Combinations, and Deriving the Formula for Finding the Number of Combinations. The study lasted for 4 weeks. Below is an example of the activities during the first week of implementation of the study incorporating the indigenized practical tasks in mathematics instruction. The lesson during the first week of the study was about Fundamental Counting Technique:

At the start of the session, the teacher conducted a review of the previous lesson to make sure that the students understood the lesson before presenting the new lesson. Motivation was also given for the students to be excited to listen on the new lesson. Indigenous materials were used in this part. The materials used were materials found in the IP community. When the students finished

the task, the teacher introduced the new lesson. Sample practical problems were presented using indigenous materials for the students to easily relate and understand the problems. Practical problems were given for the students to solve. When the students got the correct answer, the teacher asked them to explain their solutions and how they arrived at the correct answer. The students were encouraged to share their techniques and strategies they used in finding the correct answer.

For the students to comprehend well the lesson presented, the teacher gave them another practical problem solving exercise related to their culture like finding the many possible pairs they can have when selecting a sinabaang during the celebration of Adaw ku Sayuda. The teacher selected a student to demonstrate the pairing of sinabaang in front of the class. The teacher showed the students the step-by-step process of solving the problems.

To develop the mastery of the learners, the teacher let the students get the five different colored pieces of abaca that the teacher asked them to bring to make an abaca wallet. Each student needs to find a different combination of colors and have the freedom to select the arrangement of colors they want to make a unique and beautiful abaca wallet. When the students were done with their practical task, the teacher gave them an individual evaluation to check their knowledge using an indigenous evaluation sheet. After getting the scores of the respective students, the teacher asked the learners to give generalizations and abstracts about what they have learned in the lesson. The students gave authentic examples and explanations related to their culture. Before the session ends, the teacher gave the students assignment for them to really master the lesson for the day.

During the recording of each learning session, the main focus was the execution of the indigenized practical tasks which was included in each lesson plan. There was a prepared lesson plan for every session. After the session, the researcher transcribed the recorded videos from the episode of her teaching. She took notes of the students' reactions, the way they did the tasks, their learning behavior and their mathematics performance including how they answered questions from the teacher. From here the researcher would be able to get some ideas that could be used to analyze the responses of the participants on the intervention introduced in class. Field notes contained information about the students, the classroom environment, overall atmosphere in the school that may affect the teacher's decision-making, and information about students' behaviors and mathematics performance, as well as notes about what the teacher presented that should not be recorded, such as written or projected examples on the chalk board or interactive white board.

### 2.6. Data Analysis

This study used the qualitative case study approach to explore whether the intentional inclusion of indigenized practical tasks in the teaching of mathematics to indigenous students will improve the indigenous students working behavior and mathematics performance. The data that could answer the research questions were collected from video recordings during lesson presentation and activities. The data were transcribed and the researcher conducted thematic

analysis. Six phases of thematic analysis were followed which involved familiarization with the data, coding, searching for themes, reviewing themes, defining and naming themes and creating the report [24].

### 3. Results and Discussion

This study aimed to explore the impact of indigenized practical tasks to Higaonon students' working behavior and mathematics performance. To meet this objective, qualitative case study specifically exploratory case design was used. The researcher collected data from the observation of the student's behavior and mathematics performance in the mathematics classroom. The study was conducted for four weeks. The recorded and transcribed data were coded using the thematic analysis. It is a method for identifying, analyzing, organizing, describing, and reporting themes found within a data set [25].

This study was guided by the following questions;

1. How do Higaonon students respond towards the indigenized practical task in terms of their working behavior?
2. How do Higaonon students respond towards the indigenized practical task in terms of their mathematical performance?

The case results are the themes for this study that represent the recurring patterns that cut across the participant results. Developing themes are necessary for building understanding. In this study, the themes were identified through a holistic analysis of the narrative and interpretative descriptions across each of the categories and are elaborated upon in this section as a means to answer the research questions.

- A. Emerging themes on the participants' response towards the integration of indigenized practical tasks in terms of learning behavior.

#### 1. Engagement and Participation

It was observed during the first week of class that participants were not actively participating in class activities. Some did not pay attention. The teacher encouraged the students to participate and she started integrating indigenized practical tasks. As the weeks passed by and by being consistent in applying this strategy, the engagement and participation of students improved.

According to the study of [26], students who understands the relevance for learning a particular concept, and what that learning implies for their everyday living, will generate interest. When students are interested in the activity, they may show signs of engagement such as taking notes and smiling when successful. Research suggests that high participation is useful when accompanied by interesting and challenging mathematics [27]. Teachers connect learning to the personal world of their students by making learning tasks more relevant through relating instructions to students' experiences [28].

Participants have a courage to participate because the task is related to real-life situation that makes it easier to do. The participations are influenced by their interest in the activity, which can lead to leadership behaviors, laughter, and confidence in sharing thoughts during the lesson. Research in mathematics education suggests that high participation is useful when accompanied by

interesting and challenging mathematics [29]. Students are more likely to participate when they see the relevance of the mathematics they are learning to real-life situations. This can lead to increased engagement with the subject, as students enjoy learning and value the relevance of mathematics in their lives.

#### 2. Motivation and Enjoyment

In the first week, the learners were not motivated in the class; they kept glancing at our clock, looking outside the classroom, being silent, easily disturbed, and being physically present but mentally absent. The teacher integrated the practical task to engage the learners in discussion and let everyone participate. As the week passed, the learners slowly enjoyed and actively participated in the discussion because they could relate it to their culture. The students were laughing while doing the tasks, comparing their output with their classmates, appreciating others work, and being proud of their own. The students didn't notice the time because they were engaged, enjoying themselves, and knew what they were doing. Employing practical tasks for learning that are related to their culture will make the learners motivated and enjoy themselves.

Introducing practical tasks into Grade 10 mathematics classes led to increased motivation and enjoyment among students. This is supported by the study of [30] which identified that teaching mathematics in real life contexts enhanced students' enjoyment of mathematics lessons.. In the study of [31], students who were taught in a traditional manner viewed mathematics as a collection of procedures. In contrast, those students who were taught in a context viewed mathematics as an active and inquiry-based discipline. Research results of [32], indicated the enjoyment in mathematics, and also the enjoyment of the teaching method had a significant effect on students' mathematics anxiety. Students developed understanding when they engaged in classroom activities to solve problems. Finally, practical tasks fostered feelings of personal achievement, which can be a powerful motivator for students.

#### 3. Appreciating Cultural Relevance

When the teacher integrated the practical tasks into everyday lessons, the students were proud to talk about their culture, norms, and tasks. The students shared the importance of upholding the essence of connecting with nature, appreciating the handmade and unique products from their respective tribes, and showing how hardworking they are. The students were complimenting the task that the teacher gave them; they were not just doing it simply, but finishing the task creatively. According to [33], historically, mathematics was deeply rooted in culture through symbols, operational processes, and representations in arts, crafts, and literature. Therefore, mathematics is inseparable from culture and the evolution of cultures. In this sense, there is no difference between using mathematics and doing mathematics. The learning of mathematics seems to be influenced by learners' cultural background [34], and how they connect mathematics to day-to-day life through games, plays, and artifacts [35]. Thus, mathematics enabled learners to perform operations of mathematics in their cultural milieu [36]. Additionally, an effective mathematics teaching must include active learning strategies, aiming to involve students intellectually, socially, and physically, in solving

tasks that lead them to think, make decisions, solve problems, and be critical. Overall, creating a culturally relevant learning environment, using culturally responsive teaching, and incorporating active learning strategies can enhance students' understanding and engagement with mathematics.

A. Emerging themes on the participant's response towards the inclusion of indigenized practical tasks in terms of mathematics performance.

### 1. Learning Progress and Understanding

Before the implementation of the intervention, most of the indigenous students found mathematics difficult. They were not interested of mathematics subject. They found hard following instructions. When the indigenized practical tasks were introduced, there was progress in their learning. The students enjoyed the activity and they were able to relate the tasks to their culture. They easily understood the concepts in mathematics taught by their teacher and understood the problem solving process. The students' learning progress and understanding were significantly enhanced when lessons involved practical tasks.

According to the study of [37], by incorporating real-life contexts into mathematics instruction, students developed a deeper understanding of mathematical concepts and improve their problem-solving skills. Moreover, teaching mathematics through real-life applications can help students build critical thinking skills and problem-solving strategies necessary for tackling complex mathematical challenges [38]. By connecting mathematical concepts to practical tasks, educators can create a more meaningful learning experience that empowers students to apply their knowledge in various contexts and develop a deeper conceptual understanding of mathematics [39]. This approach fosters independence in students by equipping them with the skills needed to analyse, interpret, and solve mathematical problems effectively.

### 2. Application of Knowledge in Real Life

The teacher/researcher emphasized the practical relevance of mathematical concepts in everyday situations. With this, she integrated indigenized practical tasks in teaching mathematics to Higaonon students. With this inclusion of indigenized tasks in instruction, the students performance in problem solving were improved and they can easily relate the application of mathematics in their daily life. Higaonon students understood the practical significance of mathematics beyond the classroom. According to [40], problem-solving activities that provide such opportunities for students to engage in 'doing mathematics' are so-called 'good problems.' 'Good problems' are problem-solving tasks that foster meaningful discussions around rich mathematics. Also according to [41], students must be provided opportunities within an authentic high-end learning environment where they can apply relevant knowledge and skills to solve real world problems. Real problems include problem-solving and also entails problem-finding, or in other words, formulating and answering their own problems.

## Conclusions and Recommendations

The results of the study revealed emerging themes which were Higaonon students' responses to the

integration of indigenized practical tasks in mathematics instruction. These were students' engagement and participation, motivation and enjoyment, appreciating cultural relevance, learning progress and understanding, and application of knowledge in real life. Based on the findings of this study, it can be concluded that the use of indigenized practical tasks as an intervention in teaching mathematics has a positive impact on the indigenous students' learning behavior and mathematics performance.

This study has several implications for practice and future research. First, mathematics teachers may consider incorporating indigenized practical tasks in their instructional practices to make learning more engaging and relevant for Higaonon students. Second, future researchers may explore the impact of indigenized practical tasks in other contexts and with different populations. Third, researchers may investigate the impact of indigenized practical tasks on students' long-term learning behavior and mathematics performance. Finally, policymakers and curriculum developers may consider the integration of indigenous knowledge and practical tasks into the mathematics curriculum to promote cultural diversity and inclusive education.

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