

# Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

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## Abstract

Given the rapid degradation of indigenous knowledge due to outside pressure, there is a growing need to deepen understanding of how these knowledge systems are actively sustained, transformed, and transmitted within indigenous communities. This ethnographic study, through an etic approach, examined the traditional knowledge systems of ethnolinguistic groups in Surigao del Sur, Philippines, to analyze how these systems reflect and organize socio-political structures, sustain linguistic diversity, and shape fundamental cultural practices within their communities. Data was collected through documentary analysis, in-depth interviews, and field observations involving tribal elders, healers, and council members. Findings showed sophisticated application of traditional knowledge in governance structures, healthcare practices, linguistic expression, and mathematical reasoning. The Manobo governance system was centered on the Hawudun and Council of Elders, where leadership selection was based on community acceptance and knowledge of customary laws, and justice was maintained through restorative practices. The Mamanwa exhibited an organized democratic system led by a chieftain and supported by elders, with governance strongly influenced by their nomadic lifestyle and belief systems. Both groups relied heavily on customary laws and collective decision-making but differed in economic orientation. Linguistic analysis further showed that both tribes embedded spiritual beliefs and cultural values in language use. However, these knowledge systems were found to be increasingly threatened by modernization, environmental degradation, and weakening intergenerational transmission channels. Institutionalization of culturally responsive frameworks, the integration of indigenous knowledge into educational curricula, the documentation of traditional knowledge as part of national heritage, and the implementation of culture-sensitive development programs.

**Keywords:** traditional knowledge systems, indigenous peoples, ethnolinguistic groups, cultural preservation, Manobo, Mamanwa, Philippines

## 1. Introduction

The erosion of indigenous knowledge systems among indigenous communities in the Philippines has become a growing concern, particularly as younger generations become increasingly detached from their cultural heritage.

The influx of modernization, environmental degradation caused by mining and logging activities, and the lack of effective support systems for knowledge transmission have contributed to the abandonment of traditional practices (Radecki & Vishnu, 2025).

While there is increasing recognition of the importance of traditional knowledge for sustainable development and cultural preservation, there remains a significant gap in understanding how these knowledge systems operate within specific cultural contexts. In Surigao del Sur, limited research has been conducted to document and analyze the traditional knowledge systems of the Manobo and Mamanwa tribes, particularly in relation to their socio-political organization, healthcare practices, linguistic expression, and mathematical reasoning.

The Philippines, as a nation rich in cultural diversity, is home to many indigenous communities who have preserved their traditional knowledge systems despite centuries of colonization and modernization pressures (Candelario-Aplaon, 2025). In 2020, the National Commission on Indigenous Peoples (NCIP) reported that Indigenous Peoples numbered about 9.84 million, representing 9.1% of the total household population of 108.67 million (PSA, 2023). The indigenous communities continue to practice knowledge systems that have sustained their communities for generations, which includes environmental management, healthcare practices, governance structures, and cultural expression. However, these knowledge systems still face unprecedented challenges from globalization, environmental degradation, and shifting socio-economic conditions.

Surigao del Sur, located in the Caraga Region of Mindanao, hosts significant populations of indigenous communities, particularly the Manobo and Mamanwa tribes (Ilagan et al., 2022; Jamera et al., 2020). The Manobo and Mamanwa are two indigenous groups in Mindanao, Philippines, distinguished by their cultural heritage and ways of life. The Manobo, the largest indigenous group in Mindanao, are traditionally river-oriented agricultural communities who have preserved their culture, ancestral domains, and intergenerational medicinal knowledge despite various challenges (Dapar et al., 2020). In contrast, the Mamanwa are among the oldest and smallest indigenous groups in the country, characterized by their nomadic lifestyle, small settlements, and reliance on subsistence farming and forest resources, often using herbal medicine due to economic constraints while maintaining their enduring cultural traditions (Ilagan et al., 2022).

Indigenous Peoples have developed distinct worldviews over many generations, resulting in complex knowledge systems that guide their interactions with nature, social structures, and cultural traditions. Indigenous knowledge or traditional knowledge refers to the locally developed and culturally embedded systems of understanding that communities use to guide their daily lives (Hossain & Ballardini, 2021). It provides practical solutions that are often context-specific, low-cost, and sustainable because they are grounded in local realities. Examples from different contexts show its effectiveness: in Mozambique, customary laws guided land redistribution and refugee resettlement after civil war, enabling rapid social recovery; in Nepal, local transport systems and community participation improved the efficiency and transparency of food distribution programs; and in Senegal, community-led dialogue supported by local empowerment led to the abandonment of harmful practices such as female genital mutilation (Gorjestani, 2004). Safeguarding TK requires recognizing its dynamic nature and supporting mechanisms that enable its ethical integration into education, policy, and sustainable development without undermining indigenous ownership and cultural integrity.

This study sought to map the indigenous knowledge systems of the ethnolinguistic groups in Surigao del Sur, particularly the Manobo and Mamanwa tribes. This examined their socio-political systems and cultural practices as expressions of localized governance and identity. The study investigated the application of indigenous knowledge in key domains such as healthcare practices, numerical reasoning, and spatial cognition, highlighting how these knowledge systems function in everyday survival and decision-making. Lastly, it identified the challenges that threaten the preservation and continuity of traditional knowledge, including external influences, modernization, and limited institutional support.

## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

Such analysis could be helpful in strengthening the understanding of how indigenous knowledge systems operate as integrated frameworks that link culture, environment, and community governance. It could also inform the development of culturally responsive educational programs that recognize and value local epistemologies alongside formal curricula, thereby promoting inclusive learning environments.

### 2. Literature Review

Traditional Knowledge Systems are the accumulated wisdom, knowledge, and practices of indigenous and local communities developed through generations of interaction with their environment. These systems involve various domains, including agriculture, healthcare, natural resource management, and cultural expression (Barman et al., 2025; Nwankwo, 2025).

Scholars have emphasized the holistic nature of traditional knowledge, which integrates ecological, social, and spiritual dimensions (Hossain & Ballardini, 2021). The relationship between traditional knowledge and biodiversity conservation has been a significant area of research. Frainer et al. (2020) argue that human cultural and linguistic diversities serve as pillars of biodiversity, suggesting that the preservation of indigenous cultures is intrinsically linked to environmental conservation. This perspective challenges the conventional separation of culture and nature, recognizing the interdependence between human societies and their ecosystems.

In the Philippine context, the National Commission for Culture and Arts (NCCA) has recognized that cultural wealth of indigenous peoples is intricately linked to the biodiversity of their ancestral lands. However, the loss of biodiversity caused by mining, logging, and other environmental activities has significantly impacted traditional practices. This environmental degradation not only threatens livelihood systems but also erodes culturally embedded practices such as traditional healing, resource management, and ritual life, which depend on specific flora, fauna, and landscapes. Consequently, the disintegration of ecological integrity accelerates the fragmentation of intergenerational knowledge transmission, making cultural preservation increasingly difficult.

Traditional governance systems in indigenous communities are characterized by structured mechanisms for leadership selection, collective decision-making, and dispute resolution, often sustained through oral traditions that preserve cultural memory, history, and knowledge transmission (Hankins, 2011). Among the Manobo, leadership is embodied in the Hawudun, whose authority is established through succession, appointment, or communal selection, and is continuously validated by the community and the Council of Elders (manigaon), ensuring participatory governance and accountability (Tomaquin, 2013).

Indigenous healthcare systems similarly reflect culturally grounded worldviews that integrate herbal medicine, environmental resources, and spiritual beliefs, where health is understood holistically in relation to customs, life, and cosmology (Ramcharan & Sinjela, 2005). While these traditional practices remain deeply embedded in indigenous lifeways, there is an increasing tendency among community members to access modern medical services when available, indicating a gradual interaction between traditional and biomedical systems.

In terms of ethnomathematics, indigenous communities demonstrate implicit mathematical reasoning through everyday practices such as games and material culture. Activities like crafting baskets and hats reveal the application of estimation, symmetry, geometry, and pattern recognition, highlighting that mathematical knowledge is culturally situated and embedded in lived experience rather than formal terminology (Mosimege, 2012).

UNESCO (2001) emphasizes that cultural diversity is a fundamental component of good governance and sustainable development, as it contributes to socioeconomic progress by harnessing local knowledge, skills, and capacities. However, despite the acknowledged value of traditional and indigenous

knowledge systems, formal education in the Philippines has largely remained disconnected from indigenous epistemologies and cultural perspectives. As a result, many Indigenous Peoples who undergo formal schooling often experience challenges in maintaining or clearly articulating their ethnic identity, as dominant educational frameworks tend to privilege standardized and Western-oriented knowledge systems. While some educators have attempted to integrate local and indigenous knowledge into classroom instruction, these efforts are frequently constrained by curriculum limitations, lack of institutional support, and insufficient training in culturally responsive pedagogy (UNESCO, 2001).

### **3. Methodology**

#### ***Research Design***

This study employed a qualitative ethnographic research design using an etic approach. Ethnography is a method in anthropology that involves the systematic study of cultural groups, focusing on their beliefs, practices, and social structures within their natural settings (Taylor & Francis, 2013). Specifically, the etic approach was applied to analyze cultural phenomena from an external or researcher-centered perspective, using established analytical frameworks to interpret behaviors, beliefs, and social patterns across cultural contexts. This enables the identification of cultural practices and cognitive patterns that may not be explicitly recognized by members of the community themselves (Taylor et al., 2006).

#### ***Participants of the Study***

Purposive sampling was utilized to select participants with extensive knowledge and experience in the traditional knowledge systems of ethnolinguistic groups in Surigao del Sur. Participants included tribal elders (manigaon), healers, council members, and community members involved in governance, healing practices, dispute resolution, traditional crafts, and cultural activities. Using the criteria from Bodunde (2013), participants were selected based on their age (65–75 years old), lived experience, and ability to clearly articulate indigenous practices and knowledge systems relevant to the study.

#### ***Data Gathering Procedure***

Data collection involved multiple methods to ensure comprehensive documentation and triangulation of findings. Documentary analysis of existing bodies of knowledge, including historical accounts, previous research, and documented cultural practices, was conducted to establish the historical and cultural context of the study communities.

Semi-structured interviews were conducted with key informants to gather detailed information about traditional knowledge systems. The interviews covered topics including governance structures, leadership selection, customary laws, healthcare practices, linguistic expression, and mathematical reasoning.

Field observations of cultural practices, community activities, and material culture were conducted to supplement interview data and provide contextual understanding. With the consent of participants, interviews were audio-recorded and videotaped to ensure accurate transcription and documentation.

#### ***Ethical Considerations***

Prior to conducting the research, an approval from the NCIP Office in Surigao del Sur was secured. Meanwhile, permission from tribal leaders and community elders was also obtained. Participants were fully informed about the purpose, procedures, and significance of the study, and their voluntary participation was ensured through informed consent.

The autonomy, cultural values, and traditional practices of the participants were respected by ensuring that their knowledge and experiences were treated with confidentiality, dignity, and respect. Measures were undertaken to prevent the exploitation of indigenous knowledge, particularly information related to cultural practices, healing traditions, governance systems, and community beliefs. Participants

## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

were given the freedom to decline participation or withdraw from the study at any stage without consequences.

Assistance from the NCIP Office for research processes was sought. They provided a knowledgeable staff member who was proficient in both the local language and the dialects of the participating ethnolinguistic groups. This support helped ensure accurate interpretation, minimize cultural misunderstandings, and strengthen the ethical engagement between the researcher and the indigenous communities.

### *Data Analysis*

Data analysis involved thematic analysis of interview transcripts and observational notes. Interviews were transcribed verbatim from audio recordings, and participants were given the opportunity to verify and adjust the data after transcription to ensure accuracy and cultural appropriateness.

Transcripts were coded to identify themes and patterns related to traditional knowledge systems. Codes were organized into themes corresponding to the study objectives, and data from interviews, observations, and documentary analysis were triangulated to ensure credibility and validity of findings.

To ensure trustworthiness and rigor, the study employed strategies recommended by Macnee and McCabe (2008). Multiple engagements with participants, triangulation of data sources, and member checking established the credibility of research findings. Thick description of the research context and participants enabled assessment of transferability to other contexts.

Documentation of the research process enabled others to replicate or assess the research, and reflexivity and documentation of researcher assumptions and biases ensured that findings reflected participant perspectives rather than researcher biases.

## **4. Results and Discussion**

### **Manobo and their Community Governance**

The Manobo governance system is centered on the Hawudun (tribal leader) and the Council of Elders (manigaon), where leadership is determined not only by lineage but also by competence in customary law, communication, conflict resolution, and the ability to provide manggad as part of traditional obligations, with authority continuously validated by the community.

Governance operates through a participatory and collective decision-making system grounded in customary laws, emphasizing accountability and communal oversight. Conflict resolution is carried out through restorative mechanisms such as magtampuda, where disputes are settled through compensation (manggad) and shared responsibility to maintain social harmony. The aggrieved party plays a key role in determining acceptable resolutions, while the Hawudun, elders, and community collectively participate in reconciliation processes, including rituals like Kahimunuan, reinforcing swift dispute settlement and social cohesion.

#### *Theme 1: Leadership Selection*

The study revealed that the Manobo tribe operates under a sophisticated governance structure centered on the Hawudun (tribal leader) and supported by the Council of Elders (manigaon).

Leadership selection follows predetermined standards, including appointment, succession, or tribal selection. The selection process ensures that only qualified individuals assume leadership positions, with candidates required to pass through a screening process with the village's council of elders and receive their permission.

Significantly, the study found that leadership is not solely determined by lineage. A potential leader must possess specific qualities, including traditional knowledge and understanding of customary

practices, oratory abilities for effective communication and negotiation, the ability to negotiate settlements to conflicts, and the capability to pay “manggad” (items given as payment or to appease for wrongdoing).

As one elder explained, it was crucial that the candidate get the support of the community and the manigaon (elders’ council), emphasizing that rather than just being the son of a datu, someone will hold a position of power if they possess the traits of a leader.

#### *Theme 2: Governance*

The Manobo governance system reflects a culturally embedded framework of leadership and justice grounded in collective responsibility, accountability, and customary laws.

The authority of the Hawudun is not absolute but continuously evaluated by the community and the Council of Elders (manigaon), ensuring that leadership remains responsive to the needs and values of the tribe. Decision-making follows a shared leadership model, where major concerns such as peace agreements (manggad) require consultation and collective judgment.

The administration of justice is guided by customary laws, where conflicts are resolved through community-based mechanisms (magtampuda), supported by the council and spiritual beliefs. The practice of compensation or payment of damages (manggad) puts emphasis on restoring harmony, maintaining social balance, and preserving relationships within and among communities.

#### *Theme 3: Conflict Resolution and Justice*

The study found that the party feeling aggrieved has the choice of whether the family will accept manggad or the victim’s death as a resolution. This presents commitment to restorative justice that considers the preferences and well-being of victims.

The hawudun, council of leaders, and community members are all essential to the administration of justice, particularly when pooling resources to pay for damages (manggad). The study revealed a strong emphasis on promoting harmony within the community.

As one informant noted, the Manobo tribes are interested in promoting harmony, and as a result, the concept of splitting the cost of damages is widely used. The Kahimunuan rite, performed by the hawudun, council of elders (manggad), and community members, serves as a mechanism for rapidly resolving disputes.

These findings align with the broader literature on indigenous governance systems, which emphasizes the integration of spiritual, social, and communal dimensions in decision-making processes (Hankins, 2011). The Manobo system demonstrates how indigenous communities have developed sophisticated mechanisms for maintaining social order while ensuring community participation and restorative justice.

### **Mamanwa and their Community Governance**

The study reveals that the Mamanwa socio-cultural system is shaped by three interrelated processes: lifestyle, governance, and traditional economy.

Their nomadic lifestyle is deeply rooted in cultural beliefs, particularly practices surrounding death and perceived misfortune, which require the community to relocate after a member dies. This mobility is also influenced by historical experiences of conflict, disease, and external pressures, resulting in limited permanent settlement and subsistence-based resource use.

In terms of governance, the Mamanwa exhibit an informal but structured democratic system led by a chieftain (Tambayon) and supported by a council of elders and the Kamalas-an, a trained group of elders serving judicial functions. This system emphasizes consensus, moral authority, and communal accountability in maintaining social order.

## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

Economically, the Mamanwa rely on a subsistence lifestyle characterized by hunting, gathering forest products, trapping, weaving, labor contracting, and limited root crop farming, with activities varying seasonally based on resource availability.

### *Theme 1: Lifestyle*

The socio-political organization of the Mamanwa tribe is significantly influenced by their nomadic way of life, which is deeply embedded in their cultural beliefs and worldview. Based on accounts from the tribal chief, their continued movement from one place to another is associated with traditional beliefs surrounding death and misfortune.

For example, when a member of the community dies, the tribe is expected to abandon the settlement, even when agricultural resources, such as root crops and other sources of livelihood, remain unharvested. Death is perceived as a negative spiritual occurrence that requires immediate relocation to protect the community from potential harm.

Other accounts suggest that the Mamanwa's mobility is also shaped by historical experiences and perceived threats, including external conflicts, diseases, and the expansion of industrial activities (Summer Institute of Linguistics Databank, 1991). These cultural and historical factors have influenced their economic practices, settlement patterns, and resource utilization, limiting the establishment of permanent settlements and long-term agricultural systems.

Consequently, their nomadic lifestyle represents not only an adaptive response to environmental and social conditions but also an expression of their collective identity and traditional belief system.

### *Theme 2: Democratic Governance*

The Mamanwa socio-political system reflects an informal yet structured form of democratic governance grounded in respect for elders and traditional norms. Leadership is primarily vested in a chieftain—typically an elder—who serves as the central authority in maintaining social order, harmony, and mediation within the community.

This system is reinforced by a council of elders who collectively define acceptable behavior, uphold customary laws, and determine appropriate sanctions for violations. Judicial responsibilities are further extended to a specialized group of trained elders known as the *Kamalas-an*, who function as a form of tribal jury after undergoing extensive cultural and experiential preparation.

The role of the chieftain, also known as *Tambayon*, combines leadership, oratory skill, advisory functions, and arbitration, reflecting a governance structure that values consensus, moral authority, and communal accountability over formal hierarchy or coercive power.

### *Theme 3: Traditional Economy*

The Mamanwa practices a subsistence economy, living a hand-to-mouth existence. They are primarily food gatherers who travel from one location to another based on food availability.

Their economic activities include gathering honey, nuts, tubers, orchids, and rattan poles; hunting using various traps including lit-ag (for wild pigs), gahong (pit traps), bayatik (spear traps), and bayod (traps for mice); weaving exceptional rattan hammocks, winnowing baskets, and other domestic items; and labor contracting, particularly hauling logs such as falcata for compensation.

Hunting activity increases during the rainy season from November to April. Many Mamanwa men and women still engage in labor contracting, and farming of root crops constitutes a significant economic activity.

## Linguistic Expression and Knowledge Transmission

The study hypothesized that the Manobo and Mamanwa languages can be linguistically analyzed through the interaction between lexical verbs and syntactic structures, wherein verb types play a central role in determining sentence construction. This assumption is grounded in valency grammar theory (Tesnière, 2015), which posits that verbs possess inherent valency properties that govern the number and type of arguments they can syntactically combine with. In this framework, valency refers to the capacity of a verb to co-occur with specific structural elements within a sentence, thereby shaping its grammatical configuration.

The analysis revealed the presence of apostrophic or vocative expressions, characterized by direct address as a form of metaphorical language. This linguistic feature reflects the speakers' conscious engagement with supernatural entities, which are invoked in discourse as sources of guidance, protection, and blessing.

The prayer to the supreme God Tahaw demonstrates this linguistic feature through its direct address and supplication:

*"O Tahaw, dawat sikang sa kahaway-hawayan, Ajaw sikan tagae kabalatian sa paraiso, Yakami pag-antos sa kalibutan human di, Kan ibtang idun impyerno, Dagae ka madajaw nga kinabuhi, Lugar nga walay kasakit."*

This translates to a plea that the deceased be allowed no more sufferings in paradise, that their tribulations on earth have come to an end, that they not be led to the fires of hell, and that they be brought to life in a place where pain is felt no more.

Another example demonstrates the use of vocative expression in traditional lullabies:

*"Matuug na si igi kay wada si inay dinhi, maturog kaw kay wada sa si ina mo ngadi, diri maghaja impisay..."*

which serves as a lullaby telling a baby to sleep because the mother is not around and not to cry.

As presented in **Table 1**, the linguistic features reflect the integration of spiritual beliefs and cultural values into everyday language, demonstrating the intimate connection between language and worldview among these communities. The oral transmission of knowledge through these linguistic forms underscores the importance of language as a vessel for cultural preservation and intergenerational knowledge transfer.

**Table 1.** Summary of textual excerpt for linguistic expression and knowledge transfer

| Textual Excerpt                                                               | Context/ Genre                                | Linguistic Feature                                                           | Function                                                                                                   | Interpretation                                                                                                                                                                  |
|-------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>"O Tahaw, dawat sikang sa kahaway-hawayan... Lugar nga walay kasakit."</i> | Ritual prayer / supplication for the deceased | Vocative expression ("O Tahaw"); apostrophic address; supplicatory discourse | Direct invocation of a supreme being; request for mercy, peace, and relief from suffering for the deceased | Reflects spiritual worldview where language serves as a medium of communication with the divine; demonstrates belief in afterlife and moral cosmology (heaven/hell distinction) |



## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

|                                                                           |                                  |                                                                   |                                                                             |                                                                                                                                                |
|---------------------------------------------------------------------------|----------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>"Matuug na si igi kay wada si inay dinhi... diri maghaja impisay."</i> | Lullaby / child-care discourse   | Vocative and directive speech; soothing imperative structure      | To calm and comfort the child; encourage sleep in the absence of the mother | Use of language for emotional regulation and caregiving; reflects family structure and attachment practices                                    |
| Combined pattern across texts                                             | Ritual + everyday oral tradition | Apostrophe, vocative address, metaphorical and directive language | Transmission of cultural values, spirituality, and social norms             | Integration of belief systems into everyday communication and highlights language as a carrier of indigenous knowledge and cultural continuity |

### Traditional Healthcare Systems and Healing Practices

The study identified distinct healthcare practices among the Manobo and Mamanwa tribes, which are shaped by their cultural belief systems, environmental contexts, and varying levels of exposure to biomedical healthcare services. Indigenous health practices are closely linked to the availability of medicinal plants, ecological resources, and culturally embedded taboos and belief systems, all of which significantly influence health-seeking behaviors and perceived health outcomes within both communities.

Consistent with Ramcharan and Sinjela (2005), both tribes maintain culturally grounded healing systems governed by customary norms that prescribe appropriate responses to illness and wellbeing, and which are expected to be observed by all community members. A key finding of the study indicates that health issues within indigenous communities cannot be adequately addressed through biomedical interventions alone, as modern healthcare systems, technologies, and clinical practices often fail to align with indigenous expectations, worldviews, and explanatory models of illness. This reflects the broader understanding that indigenous conceptions of health, disease, treatment, life, and death are culturally situated and highly diverse, shaped by distinct cosmological and sociocultural frameworks.

As a form of traditional healing, both tribes primarily rely on available environmental resources, particularly medicinal plants and other natural materials. Their health practices are guided by long-established customs and belief systems that address the health needs of individuals, families, and the broader community. In addition, spiritual dimensions are incorporated into the healing process, as they seek the assistance and favor of spiritual entities to enhance the efficacy of their remedies.

#### *Healthcare System of Mamanwa*

The healthcare practices of the Mamanwa remain largely grounded in traditional systems that combine the use of medicinal plants with culturally embedded belief systems. Illnesses are often understood within a spiritual framework, wherein diseases may be attributed to displeased deities or unseen supernatural forces influencing human well-being. This cosmological understanding significantly shapes their health-seeking behaviors, with traditional and home-based remedies commonly employed for the treatment of minor ailments such as toothache, abdominal pain, and fever.

The study further found that government-initiated healthcare services have received limited acceptance among the Mamanwa community. This limited utilization may be attributed to cultural differences in conceptualizing health and illness, as well as perceptions that biomedical or Western healthcare systems are insufficiently aligned with their traditional beliefs, practices, and contextual needs.

#### *Healthcare System of Manobo*

The Manobo community demonstrates a more integrated approach to healthcare by selectively engaging with modern medical services depending on the severity of illness. While traditional and home-based remedies are generally preferred for common ailments, more serious or life-threatening conditions prompt recourse to biomedical healthcare facilities.

This pattern of selective utilization reflects a pragmatic health-seeking behavior, wherein traditional practices are maintained alongside the adoption of modern medical interventions when deemed necessary.

In **Table 2**, the observed variation in responses to modern healthcare between the Manobo and Mamanwa communities suggests differing levels of exposure to external sociocultural influences, as well as distinct perceptions regarding the efficacy of traditional and biomedical health systems. The stronger reliance of the Mamanwa on traditional healing practices may be associated with their more mobile and relatively isolated lifestyle, alongside deeply rooted spiritual interpretations of illness. Conversely, the greater openness of the Manobo to biomedical healthcare may be attributed to their comparatively settled way of life and increased interaction with non-indigenous or lowland populations, facilitating greater exposure to and acceptance of modern health services.

**Table 2.** Similarities and differences in healthcare system

| Aspect                                 | Similarities                                                                                                                                            | Manobo                                                                                                                               | Mamanwa                                                                                                                            |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Basis of healthcare practices          | Both systems are culturally grounded and shaped by indigenous belief systems, environmental contexts, and customary norms governing health and illness. | Health practices are guided by tradition but are selectively integrated with biomedical healthcare depending on severity of illness. | Health practices are primarily grounded in traditional beliefs, with strong reliance on indigenous explanatory systems of illness. |
| Use of natural resources               | Both rely heavily on medicinal plants and natural/environmental resources for healing and treatment.                                                    | Uses herbal and home remedies for minor illnesses, along with modern medicine when necessary.                                        | Heavily dependent on herbal plants and natural remedies as primary mode of treatment.                                              |
| Spiritual beliefs in illness causation | Both integrate spiritual and cultural belief systems in understanding health and illness.                                                               | Spiritual beliefs exist but are less dominant in health-seeking decisions compared to pragmatic considerations.                      | Illness is strongly attributed to supernatural forces or displeased deities, shaping treatment practices.                          |
| Health-seeking behavior                | Both demonstrate culturally patterned health-seeking behaviors influenced by traditions and worldview.                                                  | Exhibits selective integration of biomedical healthcare, especially for severe or life-threatening conditions.                       | Reluctant or limited use of biomedical healthcare services due to cultural misalignment.                                           |
| Use of modern healthcare services      | Both interact with biomedical healthcare to varying degrees.                                                                                            | More open and adaptive; actively utilizes government and                                                                             | Limited acceptance and utilization of government or Western healthcare services.                                                   |

## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

|                                    |                                                                                                      |                                                                                  |                                                                                    |
|------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                                    |                                                                                                      | modern healthcare when needed.                                                   |                                                                                    |
| Cultural interpretation of illness | Both view health and illness as culturally constructed and embedded in indigenous knowledge systems. | More pragmatic interpretation combining traditional and biomedical perspectives. | Strongly rooted in cosmological and spiritual explanations of illness and disease. |

### Mathematical and Spatial Reasoning in Material Culture

There is extensive application of mathematical concepts in material culture, demonstrating sophisticated numerical and spatial reasoning despite limited formal education. The study found that traditional artifacts such as baskets, hats, and miscellaneous objects incorporate mathematical principles in their construction.

The construction of bukag (basket) and buwa (hammock) demonstrates understanding of patterns, geometry, and symmetry. The creation of traditional hats incorporates mathematical concepts of estimation and spatial reasoning. Plaited rope used for binding demonstrates understanding of sequences and patterns.

Significantly, the study found that while most villagers had only grade-level formal education or none at all, they were nonetheless engaging with mathematical concepts like estimation, patterns, geometry, and symmetry.

Although they may not always be familiar with the vocabulary used in mathematics literature, it is obvious that they frequently employ such mathematical concepts and expertise in their work. However, they are adept at using such ideas and can go into great detail when describing them.

Mosimege (2012) investigated traditional games and their underlying mathematical concepts and highlighted the presence of complex mathematical reasoning within indigenous communities. Likewise, the utilization of body parts as units of measurement and estimation from the indigenous people reflects an embedded form of mathematical thinking grounded in practical experiences and everyday problem-solving. Such practices demonstrate how indigenous communities adapt to limited access to standardized measurement instruments while maintaining functional accuracy and reliability in their activities.

Furthermore, the construction of community structures and cultural artifacts necessitates advanced spatial reasoning, involving the application of mathematical principles such as congruence, sequencing, proportion, and geometric patterns.

Mathematics is not merely a formalized academic discipline but a cultural construct that emerges from human interactions, environmental contexts, and socio-economic practices. The integration of mathematical knowledge into activities such as weaving, basketry, and construction illustrates that mathematical cognition is deeply embedded in indigenous ways of knowing, creativity, and resource management.

Consequently, these findings emphasize the potential of indigenous knowledge systems as valuable pedagogical resources in mathematics education, particularly in promoting culturally responsive approaches that enhance learners' understanding, engagement, and appreciation of mathematical concepts within indigenous communities.

### Challenges of Traditional Knowledge Preservation and Benefit Sharing

#### Problem 1: Environmental Degradation

The preservation of traditional knowledge among the Manobo and Mamanwa communities is significantly affected by environmental changes resulting from mining, logging, and other extractive activities. The influx of mining companies has limited indigenous communities' ability to sustainably utilize their ancestral lands, resulting in a shift from traditional resource management practices toward extractive economic activities introduced by migrants and settlers. Since indigenous knowledge systems are closely connected to biodiversity and ecological resources, the degradation of the environment weakens the relevance and applicability of traditional practices that depend on these natural resources.

#### Problem 2: Economic Transition

The expansion of external economic systems has transformed indigenous livelihood patterns. As traditional access to ancestral lands becomes restricted, community members increasingly engage in mining and logging activities as alternative sources of income. This transition represents a disruption of indigenous economic practices, affecting not only livelihood sustainability but also the continuity of cultural practices and knowledge associated with traditional land use, agriculture, and resource stewardship.

#### Problem 3: Cultural Disconnection

Lifestyle changes, displacement from ancestral territories, and increased exposure to modern systems have contributed to the weakening of cultural identity and traditional knowledge transmission. Younger generations are becoming increasingly detached from indigenous practices as formal education and contemporary lifestyles influence their values and orientations. The reduced participation of youth in traditional activities threatens the continuity of cultural knowledge, skills, and practices that are traditionally passed down through generations.

#### Problem 4: Inadequate Support

The sustainability of indigenous knowledge systems is challenged by the absence of strong mechanisms for documentation, preservation, and integration of indigenous knowledge into formal education and community programs. Although some educators attempt to incorporate local knowledge into academic settings, limited institutional frameworks and support systems hinder the systematic transmission of indigenous knowledge. This lack of structured preservation strategies contributes to the gradual erosion of traditional practices.

#### Problem 5: Indigenous-led Knowledge Protection

The combined effects of environmental degradation, cultural displacement, and weak knowledge preservation systems create a critical threat to the survival of indigenous knowledge. The findings highlight the need for interventions that recognize indigenous communities as legitimate custodians of their knowledge. Sustainable preservation requires mechanisms for documentation, cultural revitalization, and benefit-sharing arrangements that ensure indigenous peoples receive recognition and tangible benefits from the use of their traditional knowledge in research, education, and development initiatives.

Traditional practices among indigenous communities are increasingly threatened by sociocultural transformations resulting from displacement from ancestral territories and the absence of sustainable mechanisms for intergenerational knowledge transmission. The findings revealed that younger generations are becoming increasingly disconnected from traditional knowledge systems as exposure to formal education, external cultural influences, and modern lifestyles reshape their cultural orientations.

Indigenous individuals who have undergone formal education may experience challenges in maintaining a strong connection with their ethnic identity, which consequently affects their engagement with traditional practices. This cultural detachment has profound implications for the continuity of

## Mapping Indigenous Knowledge Systems on Governance, Health, and Epistemology among the Manobo and Mamanwa of Surigao del Sur, Philippines

indigenous knowledge, as younger members of the community may have limited opportunities to acquire the skills, values, and practices necessary for sustaining traditional ways of life.

Furthermore, the study identified the insufficiency of institutional and community-based support systems that facilitate the documentation, preservation, and transmission of indigenous knowledge. Although some educators have attempted to integrate indigenous perspectives and local knowledge into tertiary-level curricula, various structural and pedagogical constraints hinder the systematic incorporation of these knowledge systems into formal education. The lack of comprehensive frameworks for safeguarding indigenous knowledge contributes to its gradual decline and diminishes opportunities for future generations to access and sustain these cultural resources (Putri et al., 2026).

Environmental degradation, cultural displacement, and inadequate knowledge preservation mechanisms create a complex and reinforcing challenge to the continuity of indigenous knowledge systems (Faiz, 2026). Without intentional and culturally responsive interventions aiming to document, revitalize, and transfer indigenous knowledge, there is a substantial risk of losing valuable cultural practices and ecological wisdom within succeeding generations. In this context, the principle of benefit sharing becomes increasingly significant, as indigenous communities must be recognized as the legitimate custodians of their knowledge and should meaningfully benefit from its utilization in academic research, policy development, and other applications.

The findings highlight the urgent need for inclusive mechanisms that protect indigenous knowledge systems while ensuring that indigenous peoples retain ownership, recognition, and equitable benefits from their preservation and application.

### 5. Conclusion

The ethnographic study of the Manobo and Mamanwa communities in Surigao del Sur highlights the richness and complexity of their indigenous knowledge systems, while also identifying emerging threats to their continuity.

The Manobo community demonstrates a structured political organization centered on the Hawudun and Council of Elders, with leadership grounded in wisdom, communication skills, and restorative justice practices through the *manggad* system. This reflects a collectivist orientation that prioritizes harmony and communal stability.

Similarly, the Mamanwa exhibit an adaptive governance structure influenced by their nomadic lifestyle, with authority shared among a chieftain, elders, and the Kamalas-an jurors. Despite its informality, this system effectively maintains social order and reflects democratic principles and strong respect for elder leadership.

Both communities also show deep integration of cultural values into language, spirituality, and daily practices. Their linguistic expressions, particularly in prayers and oral traditions, reveal a worldview where communication is closely tied to spiritual belief systems. In terms of healthcare, both rely on traditional healing practices, herbal medicine, and spiritual interpretations of illness, although the Manobo demonstrate a relatively higher openness to modern medical systems compared to the Mamanwa.

Their knowledge systems also extend to mathematical reasoning, evident in traditional crafts, weaving, and construction, which apply geometric patterns, symmetry, and spatial logic.

However, these indigenous knowledge systems are increasingly under threat due to environmental degradation, particularly mining activities, which restrict access to ancestral lands and disrupt traditional resource-based practices. At the same time, sociocultural changes and limited intergenerational transmission are leading to a weakening of cultural continuity, especially among younger members who are becoming detached from traditional practices. This combination of ecological disruption

and cultural transformation poses significant risks to the long-term sustainability of indigenous knowledge systems.

## 6. Recommendations

Several recommendations are proposed for government agencies, higher education institutions, indigenous communities, and future researchers. Government agencies are urged to create culturally responsive policies, support community-led documentation, and ensure indigenous control over knowledge resources. Higher education institutions should integrate indigenous knowledge into curricula and develop collaborative Indigenous Studies programs. Indigenous communities are encouraged to document their traditions, strengthen intergenerational knowledge transfer, and advocate for cultural rights. Future research is recommended to compare indigenous groups, examine knowledge transmission, study benefit-sharing mechanisms, and assess the long-term effects of modernization and environmental change on indigenous knowledge and well-being.

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