

Available online at ijci.wcci-international.org

IJCI
International Journal of
Curriculum and Instruction

International Journal of Curriculum and Instruction 17(2) (2025) 486–500

Pagkakasupeg Framework on Bridging Indigenous Peoples Education to MATATAG Curriculum

John Vincent Jalimao Bucal a & Greg Tabios Pawilen b

^a College of Public Affairs and Development, University of the Philippines Los Baños
^b College of Human Ecology, University of the Philippines Los Baños

Abstract

This paper provides a comprehensive analysis of the MATATAG Curriculum's strengths and features, which are a breakthrough to the Philippine Education System, and how its features can transcend to the Indigenous People's Education. Pagkakasupeg Framework was the product of this paper, bridging Indigenous Peoples Education and MATATAG Curriculum. The framework contains two key stages that highlight Indigenous Peoples' inclusion in the design and development of an IP-fit curriculum, empowering them to preserve their culture while educating their young community members and providing them with a sense of belongingness. The proposed framework will make the curriculum truly relevant and responsive to the needs and context of the learners. It utilizes a pedagogy that is empowering and creative. Thus, this paper aspires to adhere to the principle that no student (regardless of race, gender, and ethnicity) should be left behind.

Keywords: curriculum model; curriculum design; Indigenous people's education; MATATAG Curriculum

Introduction

The need for the installment of an education curriculum that is best suited for indigenous people has already been supported by a legal basis before. The 1987 Constitution reiterates the need to "recognize, respect, and protect the rights of indigenous cultural communities to preserve and develop their cultural structures, traditions, and institutions" (Article XIV, Section 17), which includes their learning systems. Article 14.1 of the United Nations Declaration of the Rights of Indigenous People (UNDRIP) also framed the authority of indigenous groups to set up their own education and learning systems that can provide "education in their languages appropriate to their cultural methods of teaching and learning" (Art. 14.1, page 7). This legal background led to the creation of Republic Act 8371 or the Indigenous Peoples' Rights Act of 1997 (IPRA), which is one of the first of its kind in Asia that recognizes the rights and needs of indigenous people (AITPN, 2008, as cited in

Cornelio & de Castro, 2016). The law's mandate to the State when it comes to upholding the cultural integrity of indigenous people includes the recognition of their right to take charge of their learning system as adapted from the provisions of UNDRIP, as it states that indigenous people and communities must enjoy access to cultural opportunities with the use of the education system that is suited for them (IPRA, Section 30).

It was evident that the implementation of provisions and actions that are needed to further support indigenous education has not progressed significantly after the passing of IPRA in 1997 (Delfin, 2012). A prominent move was made about seven years later when the Department of Education released DepEd Order No. 42 s. 2004 which allowed indigenous communities to manage their learning initiatives and set forth criteria for recognizing their schools as private schools if they are interested, especially those that are managed by nongovernment organizations and other groups. The order allowed them to adjust their school calendar and have more focus on learning their own culture if it is still aligned with the national standards and competencies outlined in the national school curriculum set by DepEd. Further improvements were made years later in response to the Education for All movement as the Bureau of Alternative Learning Systems released the Alternative Learning System Core Curriculum for Indigenous Peoples to put more attention to their needs at the lower levels. It was also in 2010 when DepEd highlighted the inclusion of indigenous people in implementing the Basic Education Sector Reform Agenda.

1.1. Indigenous Peoples Education in the Philippines

Currently, with the 110 identified indigenous ethnolinguistic groups (NCIP, 2013) found in 65 provinces across the country (Carino, 2012), about 2.5 million learners from indigenous communities have been served by IPEd since its institutionalization in 2011.

The landmark move happened in 2011 when DepEd finally released the Department Order 62 s. 2011 or "Adopting the National Indigenous Peoples (IP) Education Policy Framework" on August 8, 2011. It combines the standards and perspectives of the government and indigenous communities on a national scale as reflected in the policy objectives directed toward the indigenous learners (Victor & Yano, 2015). This comprehensive framework promotes the use of their native language through mother tongue-based multilingual education, along with the focus on learning the culture that is more appropriate for them, and the adaptation of different modes of instructional delivery (Victor & Yano, 2015). In line with this, the Indigenous Peoples Education Office (IPsEO) was formed to ensure that a specific office will focus on the improvements of indigenous education, as the creation of the framework is the fruit of the three-year dialogue of indigenous communities with DepEd for a more comprehensive national policy that truly upholds their right to enjoy and

implement education initiatives in their communities that are appropriate with their culture, which ultimately adopts the term IP education (IPEd) to reflect such initiatives.

The purpose of the curriculum was really to reinforce the existing K-to-12 curriculum as reflected in some of the main features of the curriculum enumerated in DepEd Memorandum no. 54 s. 2023 that include the decongested curriculum, reduced number of learning areas, and a clearer articulation of the twenty-first-century skills (DepEd, 2023).

1.2. MATATAG Curriculum

The MATATAG curriculum¹ is the new curricular reform set forth by DepEd that reflects the educational agenda of the administration and responds to the challenges and improvements needed in the K-to-12 curriculum. The education agenda behind the creation of the new curriculum has four agendas that were highlighted in the General Shaping Paper as it forges the path of the education sector moving forward, which are to "make the curriculum relevant to produce competent and job-ready, active, and responsible citizens; take steps to accelerate delivery of basic education facilities and services; take good care of learners by promoting learner well-being, inclusive education, and a positive learning environment; and give support to teachers to teach better." The focus of the MATATAG curriculum is based on the development of foundational skills, peace competencies, and inclusive education and learning for students while advocating for added benefits and professional development of teachers (DepEd, 2023).

The conception and development of the curriculum stemmed from the assessments done on the basic education system and the K-to-12 curriculum, where the formulation of policies and interventions was based on the data generated from those assessments (DepEd, 2023). These system assessments include the Early Language, Literacy, and Numeracy Assessment (ELLNA) for Grade 3 students, and the National Achievement Test (NAT) for Grades 6, 10, and 12. The Basic Education Exit Assessment (BEEA) was also introduced in 2018 to assess twenty-first-century skills among senior high school graduates. All assessments have observed a trend of low proficiency levels on the multiple facets being tested by those assessments (DepEd, 2023). The results of the Program for International Student Assessment (PISA) in 2018 and 2022 also echoed the results of the national assessments conducted by DepEd. These reasons, along with the mandate of Republic Act 10533 or the Enhanced Basic Education Act of 2013 to conduct a curriculum

¹ See discussion on Page 9

review to accurately assess its components and identify gaps and other areas of concern (DepEd, 2023). The findings of the curriculum review were the inputs used as the basis in the recalibration and enhancement of the K-to-12 Basic Education that resulted in the MATATAG curriculum, which includes the sheer amount of learning competencies that do not fit the amount of time to teach all of it, the prerequisite knowledge and skills mismatch in lesson competencies, and the alignment of system assessments with the intended curriculum content (DepEd, 2023).

1.3. Purpose of the Study

Given that a new curriculum is on its way to implementation, focusing on its applicability to IP Education is of equal concern, especially as the MATATAG agenda also incorporates the promotion of inclusivity in its curriculum. But a proper mediation between the two curriculum frameworks must be considered as the "national standards set by the State may be easily perceived as threats to local cultural integrity" (Cornelio & de Castro, 2016), since apprehension may arise if a sudden push for IPEd schools to comply with national standards will happen, which can compromise the collaboration of education agencies and indigenous communities (Trinidad, 2012). Also, there is a conflict between the nature and content of the two curriculum frameworks, where the national curriculum standard aims for globalization while IPEd focuses more on the local cultural knowledge, which is mediated by the efforts of non-government organizations, groups, and agencies (Cornelio & de Castro, 2016). The MATATAG curriculum still maintains the global outlook and perspective of its content as it aims to be at par with international standards, which can conflict with the local cultural knowledge content of IPEd if a negotiation and delicate balance between the nature and content of the two frameworks will not be discussed thoroughly, and to resolve the "concerns for the cultural integrity of IPs that may be in contradiction with other interests of the State" (Cornelio & de Castro, 2016).

Moreover, the main purpose of this study is to bridge the existing IPEd Framework to the MATATAG curriculum through secondary sources analyses that include existing department orders, department releases, memoranda, and administrative orders. Further, this paper seeks to provide a guiding framework for more inclusive curricular revisions for indigenous peoples and schools addressing the academic needs of the minority.

2. **Methodology**

This study proposes an IP-fit framework anchored on the MATATAG Curriculum, tagged as Pagkakasupeg Framework that aims to bridge the existing curriculum to the provisions provided. This study focuses on the following research questions:

- 1. What are the key variables valuable in the design and development of an IP-fit framework to bridge the curricular transition?
- 2. What phases are essential for the development of an IP-fit MATATAG Curriculum Framework?
- 3. What framework can be developed to bridge the current IPEd framework to the MATATAG Curriculum?

3. Results and Discussion

The result of the study is presented qualitatively based on the three research questions. The discussion provided vital insights and principles valuable in the design and development of an IP-fit MATATAG curriculum.

3.1. What are the key variables valuable in the design and development of an IP-fit framework to bridge the curricular transition?

The results of the rigid documentary analysis provided the researchers with a clearer identification of key variables needed in the framework to bridge the curricular transition. These variables are presented in Table 1.

Table 1. Variables valuable on the design and development of an IP-fit MATATAG Curriculum Framework

- Assessment of existing IPEd Framework
- Indigenous Community Leaders Involvement
- Designing an Indigenous People-fit MATATAG Curriculum
- Capacity Building
- Community Inputs
- Goals and Objectives
- Curriculum Standards
- IPEd based standards
- Alignment of IPEd to MATATAG Curriculum
- Validation with IP Community Leaders and DepEd
- Subject Matter and Content
- Learning Experiences
- Implementation
- Evaluation

The identified variables are crucial aspects as they encapsulate key components of an inclusive and effective framework that would secure Indigenous Peoples Education's smooth transition to the new curriculum.

3.2. What phases are essential for the development of an IP-fit MATATAG Curriculum Framework?

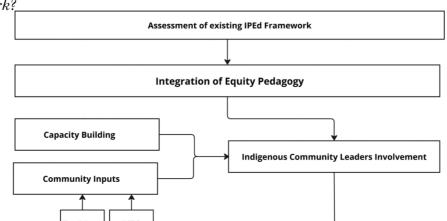


Figure 1. Inclusion of Indigenous People on Curriculum Designing Framework

There are four key phases highlighted in this framework that ensure empowerment for Indigenous Communities who will primarily benefit from the Proposed IP-fit MATATAG framework: Assessment of Existing IPEd Framework; Integration of Equity Pedagogy; Indigenous Community Leaders Involvement; and Designing an Indigenous People-fit MATATAG Curriculum.

Phase 1. Assessment of Existing IPEd Framework

DepEd Order 62, s. 2011 or "Adopting the National Indigenous People Education Policy Framework" was released on 8 August 2011 provided in Section 15 (b)) "appropriate basic education pedagogy, content, and assessment through the integration of indigenous knowledge systems and practices (IKPs) in all learning areas and processes." This order became the backbone of DepEd Order 32, s. 2015 or "Adopting the Indigenous Peoples Education Curriculum Framework" released on July 29, 2015, which stood as the springboard of IPEd implementation on the Philippines education system. However, as the department transitions to a new curriculum, the implemented orders need to be assessed as they will provide key inputs on the curricular revisions IPEd should have. The department could use Provus, M. (1966) Discrepancy Evaluation Model which emphasizes 4 major concerns of a curriculum: Determining the program standards, Determining the Program Performance, comparing performance with standards, and determining whether a discrepancy exists between performance and standards.

Assessing the existing IPEd Framework also adheres to Section 30 of the Indigenous Peoples Right Act of 1997 (RA 8371), stipulating that the State shall "provide equal access to various cultural opportunities to the Indigenous Cultural Communities/ Indigenous Peoples (ICCs/IPs) through the education system, public or private cultural entities,

scholarships, grants and other incentives without prejudice to their right to establish and control their educational systems and institutions by providing education in their language, in a manner appropriate to their cultural methods of teaching and learning."

Phase 2. Integration of Equity Pedagogy

Integration of Equity pedagogy addresses the inclusion of teaching strategies that help students from diverse groups acquire the knowledge and skills necessary to function effectively. Thus, this helps them to create and perpetuate humane democratic characteristics (McGee Banks and Banks,1995). Restoule desOrmeaux (2023) argued on creating an equity education where there are no barriers for indigenous and non-indigenous students, teaching strategies should be inclusive and culturally responsive and learning environments should enable indigenous students to better engage in discourses.

Equity pedagogy may work if the education reform's core features include a focus on a learning environment that includes collaboration spaces, embedded equity pedagogy in curriculum contents and coherence among program elements. (Cleovoulou, Y., et al., 2022).

Phase 3. Indigenous Community Leaders Involvement

Involving indigenous community leaders in the design and development enables them to provide inputs that are essential to their learning preferences.

a. Capacity Building

Prepares community leaders for their vital role of providing inputs on curriculum design. Seminar workshops, short training, and team building can be conducted to engage and enable their trust in the partnership that needs to be strongly established and the leaders' confidence to mingle and contribute.

b. Community Inputs

Inputs from the community include the community's beliefs, traditions, and indigenous knowledge practices and systems.

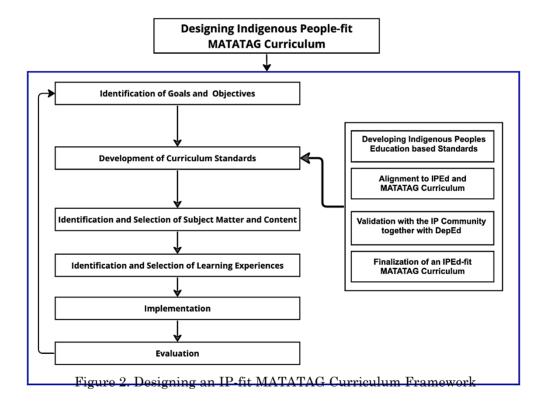
A series of data gathering is essential for identifying the community's philosophical perspectives that should stand as an anchor in crafting an IP-fit curriculum. Under their community's practice and knowledge systems were their ways of doing things daily; rituals to various events; the games played by kids, teens, and elders; dances, music, and literary practices; food preparation and processing; ways of curing illness with traditional

medicine; birth giving and burial practices; hunting, including the creation of hunting tools and schedules of hunting; planting; and more. Note that these practices and knowledge systems vary in every community.

Phase 4. Designing an Indigenous People-fit MATATAG Curriculum

After assessing the existing Indigenous Peoples's Education implemented for the past years of its existence assuring the involvement of indigenous community leaders, comes the designing of an IP-fit MATATAG Curriculum framework.

Contextualizing the inputs is the most challenging part of this phase. Curriculum designers and developers need to work closely with indigenous community leaders as they interpret and translate the data gathered into the actual curriculum.



There are six key subphases identified for the Designing of an IP-fit MATATAG Curriculum, these are Identification of Goals and Objectives, Development of Curriculum Standards, Identification and Selection of Subject Matter and Content, Identification and Selection of Learning Experiences, Implementation, and Evaluation.

Subphase 3.1. Identification of Goals and Objectives

This stage sets the main goals and objectives of the IP-fit MATATAG Curriculum. The goals adhere to cultural inclusion toward the preservation and transmission of indigenous knowledge and practice systems to generations of learners. Goals must provide a clear focus on what learners need to develop over time, and understand their grade level, and attitudes to be developed as they pursue learning.

As to the objective's formulation, it is crucial to consider cultural integrity in the contextualization or indigenization of materials to be created as this must lead to measurable learning outcomes demonstrated by learners.

Subphase 3.2. Development of Curriculum Standards

Curriculum standards provide learners with a clear roadmap to what they are supposed to achieve per grade level. DepEd provides curriculum guides for schools to have a standard set of learning objectives that students must attain after a grade level.

Since in the previous key phase, we empowered indigenous community leaders to participate in the design, they should understand the task, and they also must make sure that the curriculum standards per grade level are achievable to the context of their constituents.

Aligning the crafted curriculum to the changes brought by the MATATAG Curriculum is another crucial phase where the designers need to knit the two seamlessly.

*MATATAG Curriculum pinpoints the importance of the mastery of foundational skills. It's an abbreviation of 4 major components: Make the curriculum relevant to produce competent and job-ready, active, and responsible citizens; Take steps to accelerate delivery of basic education facilities and services; Take good care of learners by promoting learner well-being, inclusive education, and a positive learning environment; and Give support to teachers to teach better.

After carefully crafting the curriculum standards, validation of these standards should commence with the Indigenous Community Leader and the responsible unit of the Department of Education. This is to make sure that the curriculum does not deviate from nor affect any cultural aspect of any indigenous community. This stage also ensures the crafted curriculum alignment to the objectives and goals discussed.

More than that, validation ensures the quality of curriculum content, learning objectives, instructional strategies, and assessment strategies which are all key aspects of the learning process.

Finalization follows a thorough validation.

Subphase 3.3. Identification and Selection of Subject Matter and Content

This subphase builds the entire learning process embedded in the curriculum. Identification includes the learners' demographics such as background, ethnicity, including learning styles as this is to be used to identify the content of every subject and how the curriculum designers can incorporate the cultural underpinnings of the community.

An efficient and effective subject matter and content identification contains focus and depth of subject contents. This emphasizes the length per topic and its ranges. Coherence that adheres to logical progression, on the other hand, should cover topics that are essential in the next stage of the learner. Lastly, the relevance of content and topics that are interesting for the indigenous community are reliable and valid.

Subphase 3.4. Identification and Selection of Learning Experiences

Learning occurs if students find the lessons fun and engaging. Learning experience makes learning happen, which is a challenge for all teachers—transform learning objectives into content with various engaging activities so that learners will not feel bored, and that transfer occurs.

Bloom's taxonomy, on the other hand, can help teachers improve their learning experiences by making sure that a variety of activities are conducted. Thus, for the design and development of the IP-fit MATATAG Curriculum, doable learning experiences are necessary to be considered as IP learners are characterized as happy and playful learners, which can be used to effectively deliver subjects' learning competencies.

Subphase 3.5. Implementation

After carefully designing the IP-fit MATATAG Curriculum, implementation takes place. This is when the curriculum was delivered by teachers. It is suggested that before classes start, teachers should undergo training together with the IP leaders so that teachers are fully aware of the community's customary laws. Equipping them with an ethical approach to designing instructional material for their classes.

During implementation, teachers were expected to take note of the challenges they encountered so that they could contribute to the evaluation of the curriculum designers for further improvements.

Subphase 3.6. Evaluation

Evaluation of the implemented IP-fit curriculum may take place annually. This is to urgently address emerging and current problems of the curriculum. Aside from that, evaluating the curriculum reveals its effectiveness in attaining the goals and objectives under the MATATAG Curriculum.

Experts will make sure to scrutinize curriculum content, learning objectives, learning experiences, instructional strategies, and assessment strategies to recalibrate the curriculum.

As shown in Figure 3, on the actual evaluation, experts may use a tool that's readily available from the department or they may use the common evaluation pattern following the 5 stages: Develop a framework that clearly defines the evaluation goals specifically for the developed IP-fit Curriculum; Data gathering from examinations, surveys, survey questionnaires, and interviews of stakeholders; Data analysis from the gathered and/or retrieved data; Reporting of results from data analysis for clearer; and Implementation of recommendations. Evaluators may opt to create their evaluation tool as deemed easier or necessary.

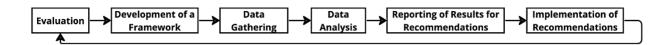


Figure 3. Evaluation Diagram for Curriculum Development

1.3. What framework can be developed to bridge the current IPEd framework to the MATATAG Curriculum?

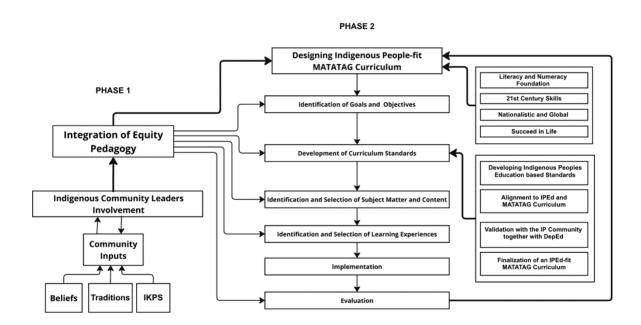


Figure 4. Pagkakasupeg Framework: Proposed IP-fit MATATAG Curriculum Framework

The Pagkakasupeg framework for a proposed IP-fit MATATAG Curriculum Framework highlights 2 phases: Integration of Equity Pedagogy and Designing an Indigenous People-fit MATATAG Curriculum.

This proposed framework focuses on the Integration of Equity Pedagogy by empowering the IP community's leader through their careful and in-depth involvement in the entire process of creating a curriculum that would embody their culture, indigenous knowledge, and practice systems, beliefs, and traditions. Community leaders would work together with the department to ensure an accurate and relevant subject matter is chosen carefully.

To bridge Indigenous Peoples's Education while adhering to the MATATAG Curriculum, the Pagkakasupeg Framework features the four key expectations among students as a product of its implementation based on the targets embedded in the MATATAG Curriculum. These expectations are then transliterated to the Pagkakasupeg Framework so that IP learners will also be adhering to these goals, helping them become resilient to the vastly changing paradigm of education and development.

4. Conclusion

Shifting the curriculum to a new one poses challenges to the minority, particularly the indigenous communities. Frameworks are created to pave a clear path for our policymakers to bridge the current to the future while no one is left behind.

The product of this paper is a holistic framework for the design and development of the Pagkakasupeg Framework: an IP-fit MATATAG Curriculum would bridge the existing IPEd framework to the MATATAG curriculum. As observed in the framework, the workload for IP Community leaders was heavier than before. They are to help the department with each step of the curriculum's design and development. Salaries for these community leaders were necessary for them to work properly while ensuring they were still providing for their families and communities. This also poses a timely phase of implementing each step. While they are contributing, the researchers wish that the department makes sure to provide and assure security and respect remain as one of their key concerns so that they can encourage other IP communities to contribute. The proposed framework will make the curriculum truly relevant and responsive to the needs and context of the learners. It utilizes a pedagogy that is empowering and creative. Thus, the framework safeguards inclusivity and empowerment on the side of education to minority groups, fostering their long-time dream of preserving their culture through an embedded education to their identity.

Acknowledgments

The researcher wishes to acknowledge Dr. Greg Pawilen for his encouragement and support to pursue this study and to help indigenous learners. Also, to the Manide Tribe of Camarines Norte who stood as my major source of inspiration on the fulfillment of this study. The term "Pagkakasupeg" means "Pagkakaisa" or Oneness which embodies the community's identity.

References

- 1987 Constitution. Article XIV, Section 17. Official Gazette. Retrieved from https://www.officialgazette.gov.ph/constitutions/1987-constitution/
- Carino, J. (2012). Country technical note on indigenous peoples' issues: Republic of the Philippines. International Fund for Agricultural Development.
- Cleovoulou, Y., Iznardo, M., & Kamani, F. (2022). An examination of equity pedagogy during program coherence building in teacher education. *Teaching and Teacher Education*, 120, 103866. https://doi.org/10.1016/j.tate.2022.103866
- Congress of the Philippines. (1997). Republic Act No. 8371, "An Act to Recognize, Protect and Promote the Rights of Indigenous Cultural Communities/ Indigenous Peoples, creating a National Commission on Indigenous Peoples, Establishing Implementing Mechanisms, Appropriating Funds Therefor, and for Other Purposes." Official Gazette. Retrieved from www.gov.ph/1997/10/29/ republic-act- no-8371/.
- Cornelio, J. S. & de Castro, D. F. T. (2016). The State of Indigenous Education in the Philippines Today. In J. Xing & P. Ng, *Indigenous Culture, Education and Globalization: Critical Perspectives from Asia* (pp. 159-179). Springer.
- Delfin, C. (2012). Living on the mountain top, Dumagats finally connected to world of letters. *GMA News Online*. Retrieved March 5, 2024, from http://www.gmanetwork.com/news/story/ 261580/news/regions/living-on-mountain-top-dumagats-finally-connected-to-world-of-letters
- Department of Education. (2004). Department Order 42 s 2004, "Permit to Operate Primary Schools for Indigenous Peoples and Cultural Communities." Retrieved from www.deped.gov.ph/sites/default/files/order/2004/DO_ s2004_042.pdf.
- Department of Education. (2011). Department Order 62 s 2011, "Adoption of the National Indigenous Peoples Education Policy Framework." Retrieved from www.deped.gov.ph/sites/default/files/order/2011/DO%20No.%2062%2C%20 s.%202011.pdf
- Department of Education. (2023). DepEd Memorandum no. 54 s. 2023, "Pilot Implementation of the MATATAG Curriculum". Retrieved from https://www.deped.gov.ph/wp-content/uploads/DM_s2023_054.pdf
- Department of Education. (2023). MATATAG Curriculum General Shaping Paper. https://www.academ-e.ph/wp-content/uploads/2023/09/GENERAL-SHAPING-PAPER-2023.pdf
- McGee Banks, C. & Banks, J. A. (1995). Equity Pedagogy: An Essential Component of Multicultural Education. *Theory Into Practice*, 34(3), 152–158. http://www.jstor.org/stable/1476634

- *Matatag:* **Producing** Strengthened **Education** System. (2024,January 10). 15. 2024, https://medium.com/. Retrieved April from https://medium.com/@calungsod12/matatag-producing-a-strengthened-educationsystem-2c784ce55d27
- NCIP. (2013). Indigenous peoples of the Philippines. National Commission on Indigenous Peoples. Retrieved May 03, 2013, from http://www.ncip.gov.ph/indigenous-peoples-of-thephilippines.html
- Restoule des Ormeaux, T. (2023). Creating equity education for First Nation, Métis, and Inuit students in Ontario provincial classrooms. *The Organizational Improvement Plan at Western University*, 385. https://ir.lib.uwo.ca/oip/385
- Trinidad, A. R. (2012). Learning to be indigenous: Education and social change among the Manobo people of the Philippines. PhD: University of Manchester.
- United Nations. (2007). United Nations Declaration of the Rights of Indigenous People. Retrieved from https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP E web.pdf
- Victor, M. L. & Yano, B. (2015). Actualizing the Inclusion of Indigenous Peoples' Rights in Education: A Policy Initiative in the Philippines. In *Human Rights Education in Asia-Pacific Vol.* 6 (pp. 133-161). Asia-Pacific Human Rights Information Center.

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the Journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (CC BY-NC-ND) (http://creativecommons.org/licenses/by-nc-nd/4.0/).