

Decolonizing Engineering Education: A Systems Approach to Global Accreditation and Indigenous Knowledge Integration

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ABSTRACT

Engineering education is increasingly shaped by global accreditation frameworks that influence curricular design, assessment standards, and graduate competencies. While agreements like the Washington Accord promote the mutual recognition of engineering qualifications, they often embed Western-centric norms that risk marginalizing Indigenous Knowledge Systems (IKS) and context-specific approaches. This review critically examines how international accreditation structures interact with efforts to decolonize engineering education, focusing on the integration of IKS and cultural competence within globally benchmarked curricula. Using a systems approach and a PICO (Population, Intervention, Comparison, Outcome) framework, the study synthesizes peer-reviewed literature drawn from major databases, prioritizing works on accreditation reform, Indigenous engagement, and culturally responsive pedagogy. Findings reveal that although frameworks such as ABET and EUR-ACE advance outcome-based education, they frequently lack mechanisms to accommodate local knowledge systems. Regional initiatives from Canada, South Africa, New Zealand, and Southeast Asia demonstrate promising models that embed IKS into curriculum and assessment; however, widespread adoption is hindered by limited legal mandates, inconsistent faculty development, and insufficient feedback loops between communities and institutions. The review argues that meaningful decolonization requires systemic transformation across global, national, and institutional levels. Key strategies include revising accreditation criteria to recognize IKS as a legitimate form of knowledge, mapping core engineering courses to cultural competencies, and investing in faculty development that supports decolonial pedagogies. By highlighting leverage points for reform, this study contributes to the growing discourse on making engineering education more inclusive, context-sensitive, and socially responsive.

Keywords: Global accreditation frameworks; decolonization; indigenous knowledge systems; curriculum reform; systems approach

INTRODUCTION

Engineering education operates within a complex, globally interconnected system influenced by international agreements, accreditation frameworks, institutional policies, and socio-cultural dynamics. As globalization intensifies, agreements such as the Washington Accord have played a crucial role in establishing mutual recognition

among signatory bodies responsible for accrediting engineering programs (Aoudia 2022; Alarifi 2021). For instance, the Philippine Technological Council (PTC) represents the Philippines, while the Engineering Accreditation Council (EAC) serves as the signatory body in Malaysia. These agreements are often implemented through national accreditation frameworks aligned with outcome-based education (OBE), such as those developed by ABET in the United States or EUR-ACE in Europe.

These frameworks and agreements have enhanced the global comparability and mobility of engineering graduates by promoting standardized educational outcomes across borders (Yan et al. 2022). However, they may also reflect Western-centric assumptions that privilege Euro-American knowledge systems, industrial norms, and pedagogical models (Andrade et al. 2023; Munro et al. 2023). This presents challenges for postcolonial and non-Western contexts where local epistemologies and community-grounded practices may not align with dominant accreditation expectations.

Recent scholarship in South African design and engineering-related education argues for the inclusion of “appropriate knowledges” that respond to local cultural, social, and ecological realities rather than relying solely on globally standardized educational models (Adelabu & Campbell 2020). This perspective highlights the importance of contextual responsiveness in curriculum development amid increasing globalization and technological transformation.

A key challenge, then, lies not in opposing global accreditation but in ensuring that international standards evolve to better reflect and support diverse knowledge systems. While accreditation enhances institutional prestige and global employability, it may inadvertently marginalize Indigenous Knowledge Systems (IKS), locally contextualized engineering practices, and community-driven innovations (Cabling et al. 2020). A more balanced approach can strengthen accreditation frameworks by embedding cultural responsiveness and epistemic inclusivity into their core quality indicators.

This study employs a systems approach to critically examine how an engineering education was shaped by the interconnected forces of international agreements, national accreditation structures, institutional policies, and local socio-cultural systems. Rather than treating these layers as isolated components, the framework conceptualizes them as dynamically interacting subsystems within a broader ecosystem of influence, negotiation, and feedback (Banerjee & Linstead 2001; Meadows 2008).

At the highest level, international agreements such as the Washington Accord establish mutual recognition among signatory accreditation bodies, guiding countries in ensuring the comparability of engineering qualifications across borders (International Engineering Alliance [IEA] 2021). While the Accord is not an accreditation framework itself, it shapes national systems such as ABET in the United States, EUR-ACE in Europe, PTC-ACBET in the Philippines, and EAC in Malaysia (IEA 2021). These national bodies apply outcome-based standards to assure graduate competencies, but their criteria often reflect dominant Western paradigms that can unintentionally

sideline Indigenous perspectives (Andrade et al. 2023; Munro et al. 2023; Fomunyam 2020).

National policy agencies and institutional actors then translate these global benchmarks into local frameworks, often through curriculum redesign, faculty development, and program assessment processes. However, this adaptation frequently emphasizes compliance over innovation, limiting flexibility to integrate place-based knowledge and culturally grounded pedagogies (Cabling et al. 2020; Owusu-Ansah & Mji 2013). As such, institutional policy becomes a site of negotiation between international requirements and local aspirations.

At the local level, Indigenous Knowledge Systems include vernacular engineering methods and culturally situated pedagogies that offer underutilized yet valuable contributions to engineering education. Shaped by ecological, social, and historical contexts, these systems promote sustainability, intergenerational responsibility, and ethical innovation (Sharma & Kumari 2021; Jaichand & Sampaio 2013). Emerging Afrikan design scholarship similarly positions Indigenous and culturally grounded approaches as pathways toward sustainability and socially responsive innovation (Campbell & Rapitsenyane 2023). Participatory curriculum development and community engagement provide critical mechanisms through which IKS can inform institutional and national educational strategies (Bamba et al. 2021; Jordan et al. 2019).

This model reveals that educational influence is multi-directional, where global standards exert top-down pressure on curriculum and policy, while bottom-up feedback from community-based initiatives, institutional advocacy, and policy reform can reshape broader accreditation practices (Forrest & Cicek 2021; Dimayuga et al. 2023). These feedback loops enable systemic transformation through iterative negotiation and localized innovation.

The inclusion of IKS in engineering education is not merely a cultural or political imperative, as it is a practical, ethical, and educational opportunity. IKS often embody principles increasingly valued in global engineering, such as environmental stewardship, resilience, and community accountability (Dei 2011; Battiste 2013). Integrating Indigenous perspectives supports culturally relevant education, strengthens social equity, and prepares engineers to serve diverse communities more effectively (Chahine & Holmes 2019; Leigh & Gurr 2020).

Figure 1 presents the Systems Approach to Accreditation and Decolonization, illustrating the nested relationships among global frameworks, national agencies, institutional policies, and local knowledge systems. The diagram shows how top-down influence from global agreements flows through national and institutional channels while emphasizing the importance of bottom-up feedback from Indigenous communities, inclusive

pedagogies, and community partnerships. These interactions highlight that meaningful reform must engage all levels of the system.

This review seeks to contribute toward the development of accreditation systems that are both globally credible and locally meaningful by examining decolonization within engineering education. Specifically, the study aims to: (1) critically examine the evolution of global accreditation standards and their systemic influence on engineering education; (2) synthesize regional and institutional approaches to integrating Indigenous Knowledge Systems (IKS) within engineering curricula; and (3) propose systems-level policy recommendations that align accreditation frameworks with culturally responsive and context-sensitive educational practices. Through these objectives, the review explores pathways for integrating Indigenous knowledge within existing accreditation structures and fostering engineering education that remains technically rigorous while becoming culturally inclusive and socially transformative.

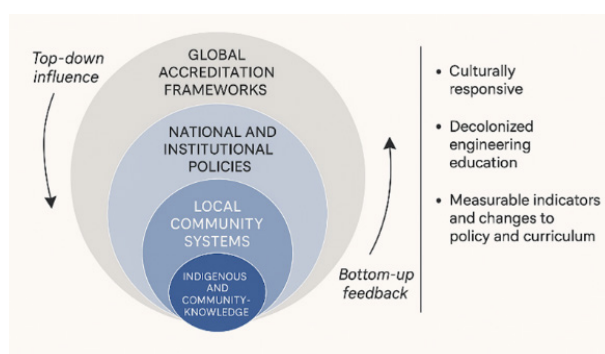


FIGURE 1. Systems Approach to Accreditation and Decolonization

METHODOLOGY

This study adopts a structured literature review using a systems approach to examine the complex, layered interactions among global accreditation frameworks, national and institutional policies, and local decolonization efforts in engineering education.

SEARCH STRATEGY AND KEYWORDS

The search strategy was systematically designed to identify peer-reviewed literature aligned with the study's three objectives: examining the evolution of global accreditation standards, analyzing regional and institutional practices for integrating Indigenous Knowledge Systems (IKS) in engineering education, and exploring policy reforms that

support decolonization. Searches were conducted across four major academic databases, such as Scopus, Web of Science, IEEE Xplore, and ERI are selected for their strong coverage of engineering education, accreditation, curriculum development, and interdisciplinary scholarship.

To complement these sources, Google Scholar was used to capture regionally specific and emerging studies, including relevant grey literature and publications from local or non-indexed journals. This approach was particularly important for identifying research from underrepresented regions and Indigenous contexts that are often absent from major indexing platforms.

Boolean search strings and clustered keywords were employed. Accreditation-related terms included combinations such as "Washington Accord" AND "engineering accreditation," "ABET" AND "outcome-based education," and "EUR-ACE" AND "curriculum reform." Decolonization-focused searches used terms such as "Indigenous knowledge systems" AND "engineering education," "culturally responsive pedagogy," and "Indigenization" AND "STEM." Theoretical lenses were captured using keywords including "postcolonial theory," "critical pedagogy," "decolonial frameworks," and "social justice in engineering education."

The search covered literature published between 2000 and 2025 to reflect both the consolidation of global accreditation regimes and recent decolonial initiatives. Regional filters prioritized contexts with documented engagement in Indigenous knowledge integration, including Canada, South Africa, Nigeria, India, the Philippines, Malaysia, and Brazil. Studies were included if they focused on engineering education and addressed accreditation structures, Indigenous or local knowledge integration, or policy-level interventions related to equity and inclusion.

This multi-source, regionally inclusive strategy yielded a thematically robust corpus suitable for the systems-level analysis undertaken in this review.

DATA COLLECTION AND SCREENING PROCESS

The screening process followed a structured, multi-stage approach to ensure alignment with the research objectives. Titles and abstracts were first reviewed to eliminate studies unrelated to global accreditation, decolonization, or Indigenous knowledge integration. Eligible articles were then subjected to full-text review, focusing on theoretical framing, methodological rigor, and relevance to system-level analysis.

Priority was given to studies that examined the evolution of accreditation frameworks, documented institutional or regional integration of IKS, or proposed

policy reforms supporting decolonization in engineering education. Studies were excluded if they lacked methodological rigor, direct relevance to engineering, or systems-level focus.

The process was tracked using the PRISMA framework (Figure 2), which outlines the number of records identified, screened, excluded, and included, along with reasons for exclusion at each stage.

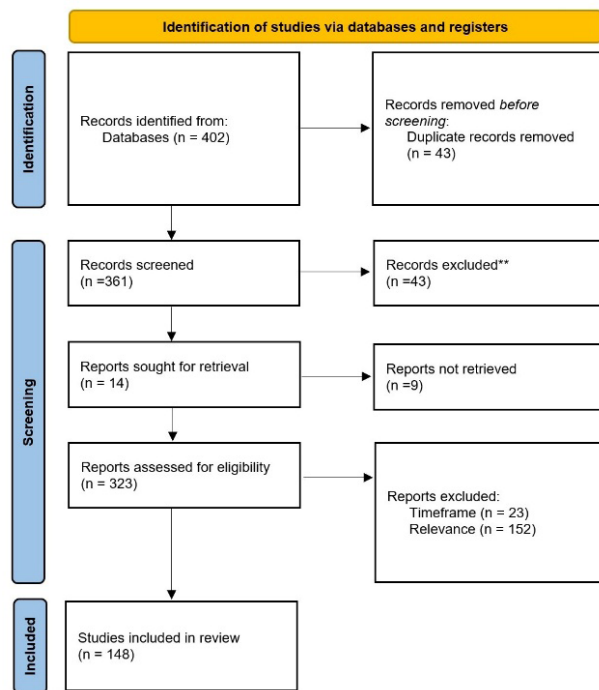


FIGURE 2. PRISMA Flow Diagram

DATA EXTRACTION AND SYSTEMS-BASED SYNTHESIS

To ensure alignment between the review process and the analytical structure of the study, the literature synthesis focused on three systems-level elements corresponding to the study objectives and subsequent result sections. First, the review examined the evolution of global accreditation standards and their influence on engineering curricula, educational outcomes, and institutional practices. Second, the analysis explored institutional and regional approaches for integrating Indigenous Knowledge Systems (IKS), including curriculum practices, community engagement mechanisms, and culturally responsive pedagogies. Third, the review evaluated policy and accreditation reform strategies intended to support decolonization and contextual responsiveness in engineering education. These analytical elements guided data extraction, and synthesis and served as the organizing framework for the Results and Discussion sections.

Given institutional diversity across countries, findings may not be universally applicable, particularly in established or elite programs. Variations in institutional capacity, policy environments, and faculty development affect the feasibility of implementation.

Table 1 summarizes how the PICO framework was used to organize and analyze literature across the three research objectives within the systems approach.

TABLE 1. PICO-Based Organization of Literature Included in the Systems Review

Research Objective	Population(P)	Intervention(I)	Comparison(C)	Outcome(O)
1. Analyze the evolution of global accreditation standards	Engineering education systems influenced by global accreditation	Application of accreditation standards (e.g., ABET, EUR-ACE)	Historical vs. current accreditation practices	Systemic influence on curricula, assessment, and institutional policy practices
2. Evaluate regional/institutional approaches to integrating Indigenous Knowledge Systems	Engineering institutions implementing Indigenous Knowledge Systems	Integration of Indigenous knowledge, community engagement, and participatory curriculum	Programs with vs. without Indigenous knowledge integration	Effectiveness in fostering culturally responsive engineering education
3. Develop policy recommendations to support decolonization	Accreditation bodies and policy frameworks in postcolonial contexts	Reforms and policy recommendations for aligning accreditation with decolonization	Current accreditation policies vs. proposed reforms	Feasibility and impact of policy shifts toward inclusive and decolonized standards

RESULTS AND DISCUSSION

EVOLUTION OF GLOBAL ACCREDITATION STANDARDS AND THEIR IMPACT ON ENGINEERING EDUCATION

The evolution of global accreditation standards in engineering education reflects sustained international efforts to enhance academic quality, ensure cross-border recognition, and promote graduate mobility. The foundations were laid with the establishment of the Accreditation Board for Engineering and Technology (ABET) in the United States in 1932, which later championed Outcome-Based Education (OBE). Similar developments occurred in Canada through the Canadian Engineering Accreditation Board (CEAB) and in Europe through the European Network for Accreditation of Engineering Education (ENAE), which developed the EUR-ACE label to ensure quality across European institutions (Thandapani et al. 2013; Sackey et al. 2014).

The landmark Washington Accord, signed in 1989, marked a significant shift toward international alignment. This agreement, now with over twenty signatories including Engineers Australia, the National Board of Accreditation (India), and the Engineering Accreditation Council of Malaysia, facilitates mutual recognition of engineering degrees and harmonizes accreditation practices globally (Aoudia, 2022; Kamran et al. 2020). National agencies align their accreditation policies with international standards, enhancing institutional comparability and graduate employability.

While ABET and EUR-ACE emphasize technical competence and measurable learning outcomes (Kamran et al. 2020; Patil et al. 2023), newer initiatives such as the Commission on Accreditation for Sustainability in Engineering Education (CASEE) and reforms by the Engineering Council of South Africa signal a growing focus on sustainability, ethical responsibility, and decolonization (Anwar & Richards, 2015; Truslove et al. 2021). Table 2 summarizes studies analyzing these frameworks using the PICO method in postcolonial and developing contexts.

TABLE 2. Summary of Accreditation-Focused Studies in Engineering Education Using the PICO Framework

Citation	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)
Ab-Rahman et al. (2022)	Malaysian EE graduates	Mapping Programme Educational Objectives (PEOs)	PEOs across institutions	Identified demand for leadership, ethics, entrepreneurship, and soft skills
Alarifi (2021)	Saudi mechanical engineering faculty & students	ABET and NCAAA accreditation	ABET vs. NCAAA	Insights on dual accreditation impacts on curriculum and readiness
Andrade-Arenas et al. (2023)	Peruvian engineering students	Model linking research and accreditation	Traditional non-integrated models	Improved curriculum-research alignment and quality assurance
Anwar & Richards (2015)	Global programs with IKS focus	Implementation of global standards (e.g., ABET)	Pre/post curriculum changes	Impact of global standards on IKS inclusion in curricula
Aoudia (2022)	Saudi engineering programs	Alignment with WA and EUR-ACE	Local vs. global frameworks	Enhanced recognition and graduate mobility
Bello & Onyeocha (2023)	Nigerian TVET polytechnics	Web-based NBTE/COREN accreditation	Manual vs. digital, public vs. private	Increased efficiency, diversity, and quality improvement
Chen et al. (2023)	Chinese undergrad engineers	Accreditation-aligned curriculum design	Unaccredited programs	Better outcomes and resource optimization
Ekwue (2020)	UWI engineering students	UK-based accreditation	UK vs. Caribbean models	Better global recognition, employment outcomes
Fishbein (2009)	Canadian engineering programs	Engineers Without Borders' global model	Traditional technical curricula	Supported CEAB outcomes and social awareness
Gallego et al. (2023)	Pakistani engineering institutions	PEC/NAVTTTC accreditation process	With vs. without accreditation	Improved quality indicators and policy recommendations

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Gautam (2024)	Indian HEIs	NAAC accreditation	Non-accredited institutions	Better accountability, quality, and institutional growth
Gupta & Gupta (2023)	Indian diploma programs	OBE/NEP-aligned quality reforms	Existing low-accreditation rates	Enhanced program quality and Industry 4.0 alignment
Gutierrez-Bucheli et al. (2023)	Civil engineering in Australia & Colombia	Accreditation-driven sustainability integration	Colombian non-accredited curriculum	Highlighted gaps and the need for progressive integration
Isa et al. (2021)	Malaysian engineering students	OBE via IDP & FYP projects	Other institutions' OBE strategies	Stronger Programme Outcomes (PO) attainment and learning facilitation
Jadhav et al. (2020)	Indian faculty	OBE implementation	Traditional education	Better curriculum, delivery, and evaluation
Jaffar et al. (2009)	Malaysian Engineering Students	IMechE accreditation via UK-SPEC	Other accredited institutions	Increased quality, recognition, and student confidence
Jain & Mishra (2020)	Indian engineering programs	NBA's OBE with CO/PO assessments	Traditional models	Stronger SAR prep and NBA alignment
Kamran et al. (2020)	Pakistani engineering programs	OBE alignment with WA	Teacher-centered system	Improved CO (Course Outcomes), PO (Programme Outcomes) achievement, and global compliance
Kandakatla et al. (2023)	Indian undergraduates	Service-learning integration	Traditional programs	Better ethics, teamwork, and sustainability awareness
Khelifi et al. (2020)	Tunisian engineering programs	ABET-inspired national framework	Current "habilitation" process	Proposed standardized, internationally aligned model
Mane (2015)	Indian engineering institutions	NAAC vs. NBA accreditation	Institutional vs. program-based	Identified process differences and preferences
Nyembwe et al. (2023)	South African engineering programs	Online accreditation using CHAT	Pre-COVID models	Better tech integration and quality alignment
Pauline et al. (2017)	Malaysian UTHM graduates	EAC-led direct and indirect PO assessments	Other programs	Achieved POs and identified improvement areas
Sumathi et al. (2023)	Tier-1 Indian institutions	Curriculum Compliance Improvement Model (CCIM)	Non-CCIM users	Better PO attainment and curriculum alignment
Vega-Valenzuela et al. (2023)	Chilean industrial engineering students	Curriculum redesign to match WA	Traditional instruction	Closed competency gaps via PBL and alumni input
Zhang et al. (2023)	Chinese & UK ship engineering students	Comparative curriculum review	China vs. UK programs	Identified shared strengths and gaps in module design

Global frameworks such as those promoted by the International Engineering Alliance (IEA) have significantly shaped engineering curricula, institutional strategies, and graduate attributes in countries like Malaysia and Saudi Arabia (Basri et al. 2004; Aoudia, 2022; Isa et al. 2021). These reforms have resulted in improved alignment between academic programs and international labor markets. Europe's EUR-ACE accreditation, for example, emphasizes interdisciplinary competencies such as ethics and lifelong learning (Thandapani et al. 2013), while Engineers Canada advocates for graduate attributes that include leadership, communication, and global citizenship (Sackey et al. 2014).

Over time, accreditation models have evolved from institution-centered evaluation criteria (e.g., faculty credentials, laboratory facilities) to competency-based

models that focus on Program Educational Objectives (PEOs) and Program Outcomes (POs). These changes reflect a broader shift influenced by the Washington Accord and EUR-ACE, toward graduate preparedness in ethical reasoning, sustainability, and global responsibility (Truslove et al. 2021; Gallego et al. 2023). As shown in Table 3, engineering programs across several Washington Accord signatory countries commonly incorporate project-based curricular approaches such as Integrated Design Projects (IDPs), Final Year Projects (FYPs), capstone projects, and experiential learning components to promote interdisciplinary learning, teamwork, and the application of engineering knowledge to real-world contexts (Isa et al. 2021; Engineers Canada, 2020; Male et al. 2015; Winberg et al. 2015).

TABLE 3. Implementation of Capstone and Design Projects Among Selected Washington Accord Signatories

Country	Accrediting Body	Common Project-Based Implementation Approach	Purpose	Citation
Australia	Engineers Australia	Professional Engineering Practice (PEP), Final Year Project	Apply engineering theory in practical and professional contexts	Male et al. 2015
Canada	Canadian Engineering Accreditation Board under Engineers Canada	Capstone Design Project	Team-based project addressing industry or community problems	Engineers Canada, 2020; Fishbein, 2009
India	National Board of Accreditation (NBA)	Final Year Project (FYP), Mini Projects	Support design competency, problem-solving skills, and Outcome-Based Education implementation	Kamran et al. 2020; Jadhav et al. 2020; Jain & Mishra, 2020
Malaysia	Engineering Accreditation Council under the Board of Engineers Malaysia	Integrated Design Project (IDP), Final Year Project (FYP)	Support interdisciplinary learning and workplace readiness	Isa et al. 2021; Pauline et al. 2017; Ab-Rahman et al. 2022
New Zealand	Engineering New Zealand	Industry-linked design projects and authentic engineering practice experiences	Support professional competencies, sustainable engineering practices, real-world problem-solving, and application of graduate attributes	Engineering New Zealand, 2024
South Africa	Engineering Council of South Africa	Capstone Project, Experiential Learning Module	Promote design thinking and community-responsive engineering	Winberg et al. 2015; Sackey et al. 2014

Nevertheless, regional disparities persist. The Caribbean, through CACET, continues to develop regionally aligned accreditation standards, though gaps in international recognition remain (Ekwue 2020). Meanwhile, countries like Palestine, Russia, and Nigeria face challenges in fulfilling the extensive documentation and resource requirements of global accreditation bodies (Pokholkov et al. 2004; Sam et al. 2012; Gallego et al. 2023; Jaffar et al. 2009). These burdens can unintentionally disadvantage Indigenous-serving institutions and those with community-engaged pedagogies. Without adaptation, rigid frameworks risk excluding local epistemologies due to administrative, not academic, limitations (Anwar & Richards 2015).

At the same time, global standards continue to influence curricular enhancement and innovation. For instance, India's NAAC system and models like the Curriculum Compliance Improvement Model (CCIM) have promoted curriculum responsiveness and improvement tracking (Sumathi et al. 2023; Paramasivam et al. 2013). Experiential learning and service-learning approaches have become key tools for embedding ethical and sustainable thinking in engineering education, as shown in the work of Kandakatla et al. (2023).

Recent reforms also show a growing interest in broadening the concept of a “competent” engineer to include intercultural competence and social inclusion.

Accreditation frameworks increasingly expect graduates to demonstrate ethical awareness, sustainability consciousness, and community engagement—moving beyond technical skillsets alone (IEA, 2021; Truslove et al. 2021; Ab-Rahman et al. 2022). However, while these competencies are frequently framed in global language, studies from Canada (Desjarlais, 2022), the Philippines (Bamba et al. 2021), and Africa (Owusu-Ansah & Mji 2013) emphasize that Indigenous Knowledge Systems (IKS) offer additional, underrecognized pathways to achieving these same goals. The integration of IKS is associated with higher student engagement, improved contextual relevance, and community-responsive innovation.

Despite these advances, the review highlights persistent gaps in the formal recognition of IKS and locally grounded competencies within dominant accreditation frameworks. These findings suggest that greater structural flexibility is needed to support curricular pluralism while maintaining global comparability. As summarized in Table 4, evolving accreditation models must balance global benchmarks with regional realities to ensure that engineering education not only prepares graduates for international careers but also enables them to serve and sustain their own communities.

TABLE 4. Summary of Major Global Accreditation Frameworks and Their Characteristics

Country	Accreditation Body	Key Features	Citation
Australia	Engineers Australia (EA)	Outcome-based education, graduate competencies, and international recognition	Engineers Australia, 2023
Canada	Engineers Canada (EC)	Graduate attributes, accreditation of regulators, and emphasis on quality assurance	Engineers Canada, 2022
United States	Accreditation Board for Engineering and Technology (ABET)	Outcome-based, industry-relevant competencies, lifelong learning	ABET, 2023
United Kingdom	Engineering Council UK (ECUK)	UK-SPEC competency framework, professional registration path	Engineering Council UK, 2022
Malaysia	Engineering Accreditation Council (EAC)	Compliance with Washington Accord standards, POs, and curriculum alignment	EAC Malaysia, 2023
Philippines	Philippine Technological Council (PTC)	National implementation of Washington Accord standards, local quality assurance	PTC Philippines, 2022
India	National Board of Accreditation (NBA)	Outcome-based education, industry relevance, lifelong learning	Gautam, 2024
China	China Engineering Education Accreditation Association (CEEAA)	Curriculum design focused on applied engineering, outcome-based	Yan et al. 2022

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Japan	Japan Accreditation Board for Engineering Education (JABEE)	Outcome-based, global recognition and lifelong learning	JABEE, 2021
South Africa	Engineering Council of South Africa (ECSA)	Engineering standards with a focus on transformation and equity	Sackey et al. 2014
Germany	Accreditation Agency for Degree Programs in Engineering, Informatics, Natural Sciences, and Mathematics (ASIIN)	Focus on discipline-specific standards, quality assurance	ASIIN, 2023
France	Commission des Titres d'Ingénieur (CTI)	Integration of academic and professional standards, research-led	CTI France, 2021
Saudi Arabia	National Commission for Academic Accreditation and Assessment (NCAAA)	Quality assurance across higher education, graduate attributes	NCAAA, 2023
Nigeria	Council for the Regulation of Engineering in Nigeria (COREN)	Standards for accreditation and licensing, quality control	COREN, 2020
New Zealand	Engineering New Zealand (ENZ)	Accreditation of engineering programs, recognition under the Washington Accord	ENZ, 2022
Ireland	Engineers Ireland	Graduate competencies, professional accreditation framework	Engineers Ireland, 2021
Mexico	Consejo de Acreditación de la Enseñanza de la Ingeniería (CACEI)	Outcome-based education, regional and global mobility	Ekwue, 2020
Pakistan	Pakistan Engineering Council (PEC)	Curriculum standards, professional engineering competence	PEC, 2021
Singapore	Institution of Engineers Singapore (IES)	Accreditation of local engineering degrees, lifelong learning	IES Singapore, 2022
Brazil	Conselho Federal de Engenharia e Agronomia (CONFEA)	Technical and professional regulation, sustainable development	CONFEA, 2023

SYNTHESIS OF INSTITUTIONAL APPROACHES TO INTEGRATING INDIGENOUS KNOWLEDGE SYSTEMS IN ENGINEERING EDUCATION

Indigenous Knowledge Systems (IKS) are understood in this review as cumulative, place-based bodies of knowledge, practices, and values developed through long-term interaction between Indigenous communities and their social, ecological, and spiritual environments (Dei 2000; Chilisa 2012). These systems encompass technical practices, ethical frameworks, environmental stewardship, and relational modes of learning, and are increasingly recognized as epistemologically distinct from, yet complementary to, Western scientific traditions (Santos 2007).

From a systems perspective, the integration of IKS in engineering education is not a discrete curricular intervention but a multi-layered process shaped by interactions among accreditation frameworks, national policies, institutional cultures, pedagogical practices, and community partnerships. Evidence across regions indicates that IKS integration is most beneficial when these layers are aligned, allowing Indigenous epistemologies to be embedded not only in course content but also in governance, assessment, and professional practice.

Table 5 shows the PICO framework and how culturally grounded interventions such as Indigenous-led design, participatory research, and place-based curricula compare with conventional approaches, producing outcomes related to sustainability, student engagement, and contextual

relevance. For example, Indigenous engineering knowledge associated with the Ifugao rice terraces in the Philippines demonstrates sophisticated systems of hydrology and communal resource management (Bamba et al. 2021),

while Ubuntu-informed approaches in South Africa emphasize collective responsibility and ethical infrastructure development (Bajet et al. 2023).

TABLE 5. Summary of Regional Case Studies Using PICO Framework

Study	Population	Intervention	Comparison	Outcome
Adelabu & Campbell (2020)	South African industrial design programs	Incorporation of “appropriate knowledges” into curricula	Conventional industrial design curricula	Greater contextual responsiveness and alignment with local socio-cultural realities
Aditya & Al-Fatih (2023)	Indigenous communities in Southeast Asia	Protection of Indigenous rights and knowledge amidst globalization	Policies that favor industrialization over Indigenous rights	Highlights the risks of cultural erosion and the need for protective measures
Bamba et al. (2021)	Indigenous communities in the Philippines	Culturally sensitive community organizing (focus groups, photovoice, Indigenous-led involvement)	Traditional organizing techniques without active Indigenous involvement	Greater community ownership and engagement in development projects
Cln, Cln & Okpanachi (2022)	Indigenous communities in Nigeria	Indigenous knowledge transfer for sustainable agriculture, health, and ecology	Standard, Western-based approaches to sustainability	Highlights the cultural and environmental benefits of Indigenous practices
Desjarlais (2022)	Indigenous engineering students and practitioners in Canada	Indigineering (integrating Indigenous knowledge in engineering)	Conventional engineering curricula	Increased engagement and cultural relevance in engineering education
Dimayuga et al. (2023)	Engineering research practices in Canada	Relationality and Two-Eyed Seeing (integration of Indigenous and Western worldviews in research)	Sole reliance on Western empirical research methods	Enhanced respect, relevance, reciprocity, and responsibility in research, fostering inclusivity
Forrest & Cicek (2021)	Engineering students in Manitoba, Canada	Multi-perspective thinking and Traditional Ecological Knowledge (TEK) in engineering design	Western-centric design approaches without Indigenous perspectives	Improved problem-solving through diverse perspectives and holistic thinking
Gwimbe (2014)	Engineering and environmental programs in the Chad Basin, Africa	Recognition of Indigenous erosion control (terracing techniques)	Traditional erosion control and land management techniques that do not involve Indigenous knowledge	Highlights the effectiveness and sustainability of Indigenous erosion methods
Jaichand & Sampaio (2013)	Indigenous communities affected by dams in Brazil	Advocacy for Indigenous consultation in development	Development projects implemented without Indigenous consultation	Highlights rights issues and the need for inclusive development policies
Mashford-Pringle, Fu, & Stutz (2023)	Engineering and architecture in Toronto	Indigenous-informed architecture to address environmental and health challenges	Conventional architectural practices without Indigenous insights	Increased environmental sustainability and holistic well-being
Mawere (2015)	Education programs for Indigenous African children	Integration of Indigenous knowledge in educational curricula	Curricula focused solely on Western knowledge systems	Promotes cultural continuity and relevance in education

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Onwuegbuzie et al. (2022)	Indigenous communities in Africa	Indigenous knowledge applications in global markets	Conventional products/services in global markets	Shows cost-effectiveness and environmental benefits of Indigenous solutions
Owusu-Ansah & Mji (2013)	Indigenous communities in Africa	Indigenous research methodologies (experiential knowledge, collective ethics, focus groups, oral traditions)	Standard research methodologies that may lack cultural relevance	Culturally sensitive research methods improve engagement and respect for Indigenous worldviews
Oyenuga (2021)	Development agencies and Indigenous communities in Ghana	Indigenous technology transfer for ecosystem protection	Development projects lacking Indigenous input	Reduces harm to ecosystems and cultures while promoting sustainable solutions
Sharma & Kumari (2021)	Indigenous communities in India	Indigenous knowledge systems promoting SDGs (biodiversity, poverty alleviation, ecosystem health)	Non-Indigenous frameworks for sustainable development	Demonstrates Indigenous knowledge's role in achieving SDGs and enhancing resilience
Tapiero et al. (2024)	Indigenous artisan communities and design programs in Latin America	Decolonial community engagement and knowledge co-production	Traditional university-led models	Supports pluriversal knowledge systems and reciprocal curriculum development

Institutional cases further illustrate operationalization within accredited programs. At the University of British Columbia, land-based learning, Indigenous guest instruction, and community-driven design projects have reframed engineering problems around stewardship and reciprocity, with reported improvements in ethical reflection and sustainability awareness (Cherian & Jacob, 2021; Desjarlais, 2022). This remains an institution-specific model rather than a uniform national practice.

Across regions, varied levels of coherence are evident. Canadian initiatives such as Two-Eyed Seeing and Indigineering (Desjarlais 2022) align with the “ecology of knowledges” (Santos 2007) and are supported by institutional governance and faculty development (Dimayuga et al. 2023; Forrest & Cicek, 2021). In the Philippines and Southeast Asia, community engagement and legal support (Bamba et al. 2021; Aditya & Al-Fatih 2023) contrast with curricula shaped largely by international accreditation benchmarks. Studies in India and Nigeria highlight the practical value of IKS in sustainability and resource management (Sharma & Kumari 2021; Cln, Cln & Okpanachi 2022), yet document limited formal recognition within accreditation and curriculum structures.

In Brazil, Indigenous consultation is procedurally mandated (Jaichand & Sampaio 2013) but weakly connected to engineering pedagogy.

A systems evaluation (Table 6) shows that where accreditation bodies, curriculum planning, faculty development, and community partnerships function in isolation, IKS integration remains fragmented. Conversely, aligned systems are associated with measurable benefits, including stronger student engagement, enhanced ethical reasoning, and improved relevance of engineering solutions to Indigenous contexts (Dimayuga et al. 2023; Forrest & Cicek, 2021; Mashford-Pringle, Fu & Stutz 2023).

These patterns suggest three leverage points for inclusive engineering education: adaptive accreditation criteria (Anwar & Richards, 2015; Gutierrez-Bucheli et al. 2023), institutional structures that support decolonial pedagogy (Bamba et al. 2021; Cln, Cln & Okpanachi 2022; Forrest & Cicek, 2021), and community-engaged engineering practices (Owusu-Ansah & Mji 2013; Desjarlais, 2022). Together, they indicate that IKS functions not only as a cultural resource, but as a source of ethical, resilient, and contextually grounded engineering practice.

TABLE 6. Institutional Approaches to Integrating Indigenous Knowledge Systems

Region/Country	Integration Approach	Systemic Enablers	Systemic Barriers
Brazil	Policy-mandated Indigenous consultation in large-scale engineering projects; focus on regulatory inclusion rather than curriculum integration	Policy mandates for Indigenous consultation; regulatory protections	Minimal curricular embedding and focus on policy, not education

continue...

Canada	Two-Eyed Seeing; Indigineering programs; formalized Indigenous partnerships and curriculum integration	Formal partnerships; curriculum integration; faculty development; policy support	Global standards alignment and faculty training demands
India	Sustainability-driven integration of Indigenous practices with a focus on achieving SDGs; limited institutional embedding	Recognition of Indigenous sustainability practices; focus on SDGs	Insufficient formal curriculum integration and global standards pressure
New Zealand	Integration of Te Ao Māori and mātauranga Māori into engineering education and professional practice through initiatives such as Kimihia Rangahaua, and culturally responsive engineering programs	Institutional commitment through Engineering New Zealand initiatives, professional development programs, community engagement, recognition of Māori perspectives, and partnerships	Continued dominance of Western epistemologies, limited representation and institutional capacity, and challenges in systematic curriculum-wide integration
Nigeria	Sustainability-driven Indigenous practices in agriculture and health; localized impact; limited systemic adoption	Community-driven sustainability initiatives; limited policy alignment	Institutional marginalization of Indigenous knowledge and limited policy integration
Philippines	Grassroots, community-led projects, participatory development, and the Indigenous Peoples Rights Act (IPRA) supporting inclusion	Legislative support (IPRA); community participation; grassroots curriculum projects	Global accreditation dominance and institutional inertia

POLICY AND PRACTICE RECOMMENDATIONS: DECOLONIZATION IN ENGINEERING EDUCATION

Findings from the regional synthesis point to three systemic leverage points for embedding Indigenous Knowledge Systems (IKS) into engineering education:

1. **Global Accreditation Reform:** Several studies underscore the limitations of rigid, universal accreditation models that prioritize standardization over contextual responsiveness. Scholars such as Anwar and Richards (2015) and Gutierrez-Bucheli et al. (2023) call for accreditation frameworks that formally recognize cultural competence, community engagement, and IKS as valid indicators of program quality. Evidence from Canada and South Africa shows that it is possible to align global benchmarks with local epistemologies through flexible assessment models (Desjarlais 2022; Dimayuga et al. 2023).
2. **Institutional Support and Pedagogical Transformation:** Institutional structures, including faculty development programs, governance mechanisms, and curriculum design, play a crucial role in sustaining IKS integration. The reviewed cases from Nigeria, New Zealand,

- Philippines, and Canada reveal that when institutions invest in decolonial pedagogies and collaborative curriculum development with Indigenous partners, IKS becomes more than an add-on; it becomes structurally embedded (Bamba et al. 2021; Cln, Cln & Okpanachi 2022; Forrest & Cicek 2021; Tsang & Eizadirad 2023).
3. **Community-Engaged Engineering:** Engineering programs that collaborate directly with Indigenous communities through participatory research, community-based capstone projects, and co-designed curricula demonstrate stronger student engagement, contextual relevance, and ethical responsiveness (Owusu-Ansah & Mji 2013; Desjarlais 2022). These practices also generate feedback loops that inform institutional policies and enrich teaching practices from the ground up.

Table 7 synthesizes selected studies through the PICO framework to evaluate how decolonization interventions influence engineering education. The table highlights a range of approaches, including land-based learning, ethical curriculum reform, and accreditation adaptation, and compares them with traditional models. These cases demonstrate positive outcomes, including enhanced graduate attributes, greater local relevance, and increased faculty and student engagement.

TABLE 7. PICO Analysis of Studies on Decolonizing Engineering Education

Study	Population	Intervention	Comparison	Outcome
Chihota et al. (2021)	Engineering students and community stakeholders.	Promote community engagement and involvement of Indigenous elders in curriculum development.	Contrast programs that incorporate community input with those that do not.	More relevant and culturally sensitive educational experiences that empower Indigenous communities.
Campbell & Rapitsenyane (2023)	African design and educational contexts	Integration of Afrikan sustainable design principles	Conventional sustainability approaches	Strengthened cultural relevance and locally grounded sustainability perspectives
Enaifoghe (2019)	Engineering programs in postcolonial settings.	Re-evaluate curricula to ensure accurate portrayal of historical events and contributions of Indigenous cultures.	Assess the accuracy and inclusivity of current curricula against best practices in decolonization.	Development of curricula that authentically reflect Indigenous histories and contributions.
Fomunyan (2020)	Accreditation bodies and engineering institutions are focusing on decolonizing the mindsets of future civil engineers.	Promote decolonization initiatives within curricula that challenge colonial narratives.	Contrast current curriculum approaches with decolonized frameworks that include Indigenous perspectives.	Engineers are better equipped to recognize and address societal realities, enhancing their contribution to national progress.
Jordan et al. (2019)	Civil engineering educators and accreditation bodies in the Philippines.	Incorporate diverse cultural perspectives and Indigenous knowledge into curriculum design.	Compare traditional teaching methods with those that engage Indigenous voices and practices.	Enhanced cultural inclusivity and respect for Indigenous contributions in engineering education.
McClure (2021)	Higher education institutions offering civil engineering programs.	Shift focus from Eurocentric perspectives to a broader global context in engineering curricula.	Evaluate existing curricula against frameworks that integrate global intellectual history and Indigenous knowledge.	More inclusive narratives that reflect diverse cultural contributions and perspectives.
Owuor (2007)	Students in civil engineering programs with a focus on sustainable development.	Implement educational methods grounded in local, indigenous knowledge and sustainable practices.	Compare traditional educational methods with those that emphasize sustainability and local relevance.	Graduates who understand the ecological and cultural significance of engineering projects within local contexts.
Tsang & Eizadirad (2023)	Faculty and educators in civil engineering.	Professional development programs focused on culturally responsive teaching and decolonization.	Evaluate existing faculty training against programs that prioritize decolonization and Indigenous knowledge integration.	Faculty equipped to deliver a more inclusive curriculum that respects Indigenous perspectives.

Table 8 consolidates actionable policy and practice recommendations drawn from the reviewed literature. It presents a matrix linking stakeholder groups, accreditation bodies, universities, faculty, and communities to corresponding interventions such as revising graduate

attributes, funding decolonial training, integrating IKS into program outcomes, and creating mechanisms for community feedback. These strategies reinforce the systems-level insight that lasting change requires alignment across all levels of the educational ecosystem.

TABLE 8. Policy and Practice Recommendations for Decolonizing Engineering Education

Policy and Practice Domain	Specific Recommendations	Role of Accreditation Bodies
Accreditation Reform	Incorporate Indigenous Knowledge Systems (IKS) in accreditation criteria; require historical and cultural inclusivity	Revise graduate attributes to value cultural competence, sustainability, and community engagement
Curriculum Assessment	Redefine assessment models to include community-based projects, participatory learning, and Indigenous-led capstone experiences	Accept alternative assessment strategies that validate social and cultural outcomes
Faculty Development	Require professional development in decolonial pedagogies and Indigenous knowledge integration	Set standards for faculty training in culturally responsive teaching and inclusive language practices
Global-Local Balance	Allow curricular flexibility for national and local priorities alongside global benchmarks	Develop adaptable accreditation pathways that honor Indigenous rights and local policies
Linguistic Inclusivity	Promote regional language use in engineering education	Encourage multilingual instructional practices to support sociolinguistic equity
Community Partnership	Mandate Indigenous community involvement in curriculum and infrastructure projects	Require evidence of Indigenous partnerships and co-designed projects in accreditation processes

DISCUSSION

Decolonizing engineering education requires systemic reconfiguration across accreditation structures, institutional policies, and epistemological frameworks. Using a systems approach, this review examined how international agreements, national mandates, and Indigenous Knowledge Systems (IKS) interact across educational levels, revealing that decolonization challenges are not solely curricular concerns but are embedded within broader governance structures and knowledge hierarchies. Rather than functioning independently, accreditation systems, institutional cultures, and Indigenous perspectives operate as interconnected elements whose interactions may either reinforce or constrain reform processes. This systems perspective suggests that educational transformation cannot be achieved through isolated curriculum revisions alone but requires changes across multiple institutional levels.

Global accreditation frameworks such as the Washington Accord and EUR-ACE have significantly shaped engineering education by advancing outcome-based education, international graduate mobility, and standardized quality assurance practices (Kumar & Vemuri, 2021; Truslove et al. 2021). These frameworks have strengthened accountability mechanisms and enabled institutions to align engineering programs with internationally recognized standards. However, the review suggests that the pursuit of standardization may also generate unintended epistemic consequences. Existing frameworks frequently emphasize measurable technical competencies and professional outcomes largely grounded in Western assumptions about engineering knowledge and practice (Munro et al. 2023;

Andrade et al. 2023). Such orientations may inadvertently marginalize Indigenous worldviews and contextual pedagogies that do not conform to dominant frameworks of assessment and evidence.

This tension becomes evident within international accreditation structures themselves. Although the Washington Accord facilitates comparability among graduate outcomes, it provides limited mechanisms for contextual adaptation across different cultural and regional environments (Kumar et al. 2020). Likewise, the CDIO framework emphasizes industrial systems thinking and engineering processes that may inadequately reflect relational, community-centered, and land-based epistemologies associated with Indigenous knowledge systems (Crawley et al. 2014). Consequently, accreditation systems intended to promote educational quality may unintentionally reproduce dominant knowledge hierarchies by privileging universal models over localized approaches.

Beyond epistemological concerns, implementation is further complicated by the operational demands associated with accreditation processes. Contemporary engineering programs frequently manage extensive requirements related to outcome mapping, documentation, assessment matrices, and continuous quality improvement procedures. While such mechanisms strengthen accountability and institutional monitoring, excessive compliance requirements may create unintended pressures on instructional practice. Faculty members often operate within environments where procedural responsibilities compete with pedagogical innovation. The administrative intensity of accreditation processes may reduce opportunities for instructors to implement critical pedagogies associated with

decolonization, including community immersion, reflective practices, and culturally responsive teaching strategies. Under such conditions, instructional practice may become increasingly oriented toward procedural compliance rather than transformative educational engagement.

At the same time, experiences from multiple contexts demonstrate that these structural limitations are not fixed and may be mediated through localized adaptation. In Canada, educational approaches such as Indigenengineering and Two-Eyed Seeing have integrated Indigenous ethics and land-based learning into curricula with support from national policies and institutional leadership (Desjarlais, 2022; Cherian & Jacob, 2021). South Africa similarly aligns Ubuntu principles with engineering education through approaches emphasizing communal responsibility and relational perspectives (Bajet et al. 2023). In Aotearoa New Zealand, efforts to incorporate mātauranga Māori into engineering and sustainability practices illustrate how Indigenous knowledge and scientific approaches may function as complementary systems supported through community engagement and culturally responsive frameworks (Engineering New Zealand, 2025). These examples suggest that sustainable implementation is not achieved through curricular additions alone but emerges when accreditation flexibility, institutional culture, leadership commitment, and faculty development operate coherently within broader educational systems.

In contrast, countries such as India, Nigeria, and the Philippines demonstrate more fragmented implementation patterns, often characterized by isolated pilot initiatives and reliance on individual faculty efforts rather than institutionalized systems of support (Isa et al. 2021; Cabling et al. 2020; Flores, 2025). Malaysia presents a similar situation. Although the Engineering Accreditation Council aligns with the International Engineering Alliance Graduate Attributes and Professional Competencies framework, Indigenous Knowledge Systems integration remains largely exploratory (Ab-Rahman et al. 2022). Structural barriers, including rigid documentation systems, English-language dominance, and faculty preparation rooted primarily within Eurocentric traditions, continue to constrain broader implementation efforts.

Globalization introduces an additional layer of complexity within these contexts. International accreditation systems and global educational standards have expanded professional opportunities and enhanced graduate mobility. However, they may also reinforce aspirations toward international employment pathways and external career opportunities. Within many postcolonial societies, global careers increasingly function as markers of educational and professional success. Although such opportunities provide important benefits, they may unintentionally weaken commitments toward local problem-solving and

community engagement. This creates tensions with broader objectives of decolonization, which emphasize service to local communities, responsiveness to grassroots needs, and the development of engineering solutions grounded within local realities.

These findings reinforce arguments that decolonization requires more than diversification of curriculum content. Instead, it necessitates a critical examination of the structures through which educational legitimacy is established. Recent scholarship argues that decolonization in engineering education requires fundamental reconsideration of whose knowledge systems are legitimized and how educational institutions determine legitimate forms of knowledge production and dissemination (Masta et al. 2025).

Nevertheless, proposed revisions to accreditation criteria offer promising pathways for addressing these tensions. Scholars recommend expanding accreditation indicators beyond technical competencies toward broader dimensions such as sustainability, cultural competence, and community engagement (Anwar & Richards, 2015; Ab-Rahman et al. 2022). Empirical findings from Canada, Africa, New Zealand, and Southeast Asia indicate that Indigenous knowledge integration can strengthen ethical awareness, student engagement, and the societal relevance of engineering education (Owusu-Ansah & Mji, 2013; Bamba et al. 2021; Engineering New Zealand, 2025). These findings suggest that global accreditation standards and Indigenous knowledge systems need not function as competing paradigms. Rather, accreditation structures may serve as enabling mechanisms through which Indigenous perspectives become embedded within curriculum design, graduate outcomes, and professional competencies.

The findings further suggest that accreditation reform should not solely involve expanding existing requirements but should also create greater flexibility within quality assurance systems. Current accreditation frameworks often assume that increased standardization and procedural intensity necessarily lead to improved educational quality. However, localized engineering programs operating within distinct cultural and social contexts may require alternative pathways that prioritize contextual responsiveness rather than uniformity. Accreditation systems may therefore benefit from creating space for institutions to develop locally responsive curricular models that address community-specific needs while maintaining essential professional competencies.

Figure 3 illustrates these dynamics through a systems flowchart that maps interactions among policy structures, curriculum, faculty practice, and community engagement. The model reinforces the idea that decolonization should not be interpreted as a linear transition from global to local systems. Rather, it represents a multidirectional and

ongoing process involving negotiation, adaptation, and reciprocal influence among interconnected educational actors.

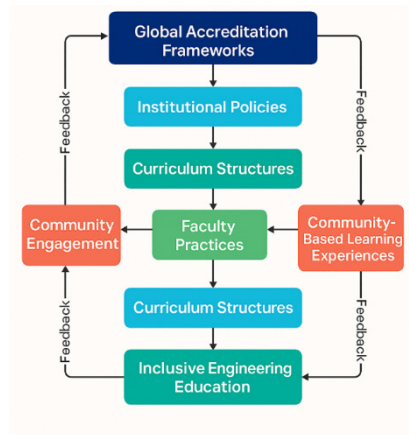


FIGURE 3. Policy Integration Pathway for Decolonizing Engineering Education

This study contributes a systems-level perspective to the decolonization discourse by extending analysis beyond curriculum content toward broader structural conditions influencing educational reform. Recent decolonial scholarship increasingly advocates movement toward a “pluriversity,” emphasizing reciprocal knowledge production and coexistence among multiple epistemologies rather than dependence on singular knowledge traditions (Tapiero et al. 2024). This perspective aligns closely with the systems framework advanced in this review and reframes the discussion not as a conflict between global and local systems but as an opportunity for alignment. Existing accreditation systems have facilitated mobility and international recognition; however, future reforms require greater flexibility and responsiveness if engineering education is to avoid reproducing epistemic exclusion while maintaining international quality standards.

CONCLUSION

This review critically analyzed the evolution of global accreditation standards and their systemic influence on engineering education. It demonstrated that while international agreements such as the Washington Accord and frameworks like ABET and EUR-ACE have facilitated graduate mobility and institutional benchmarking, they have also reinforced Western-centric paradigms. These paradigms shape curriculum development, assessment practices, and faculty training, often at the expense of Indigenous epistemologies and locally relevant engineering approaches.

In synthesizing regional and institutional strategies for integrating Indigenous Knowledge Systems (IKS), the review identified promising practices in countries such as Canada and South Africa. These cases highlight the importance of policy coherence, institutional commitment, and sustained community engagement in embedding IKS within engineering curricula. However, such efforts are isolated and lack alignment with national accreditation systems or international policy mechanisms. A key structural gap in the absence of binding conventions, enforceable legal mandates, or standardized mechanisms requiring the recognition of Indigenous knowledge in engineering education. Without these, integration often relies on short-term initiatives or individual champions, limiting the scope and sustainability of decolonial reforms.

This synthesis also examined the epistemological assumptions embedded in engineering education, which tend to privilege Euro-American scientific worldviews while marginalizing Indigenous modes of knowledge. As demonstrated in the reviewed studies, integrating IKS can enhance environmental sustainability, social relevance, and student engagement. Culturally responsive teaching, inclusive language use, and the interrogation of colonial legacies in curriculum design emerged as necessary components of inclusive and equitable engineering education. The goal is not only to include Indigenous knowledge in content, but also to transform pedagogy and assessment to reflect relationality, community accountability, and diverse ways of knowing.

To support decolonization within the constraints and opportunities of global accreditation, this review proposes systems-level policy recommendations. These include: (1) Revising accreditation criteria to explicitly recognize IKS and cultural competence as indicators of educational quality; (2) Redefining assessment models to include community-based learning and participatory evaluation practices; and (3) Strengthening faculty development in decolonial pedagogies, Indigenous epistemologies, and inclusive teaching strategies.

Notably, the International Engineering Alliance (IEA) Graduate Attributes already emphasize ethical reasoning, sustainability, awareness of social sciences, and social impact, offering a conceptual bridge for the integration of cultural competence and IKS. Building on this, institutions could develop structured curriculum mappings that align IKS with relevant core courses through reflections. Such mappings would enhance both local relevance and alignment with international accreditation requirements.

Decolonizing engineering education involves systemic and sustained efforts to balance global comparability with cultural specificity. A systems-based approach enables institutions and accreditation bodies to reconceptualize quality not as uniformity, but as responsiveness to local

knowledge, equity, and educational justice. Rather than serving as a barrier, accreditation has the potential to become a dynamic and context-sensitive tool that fosters both international excellence and Indigenous participation in engineering education.

Our positionality as scholars from the Philippines and Malaysia, both countries with deep-rooted colonial histories, grounds this review in lived experience and critical reflection. We approach this work with a shared commitment to examining how global accreditation frameworks shape, and at times constrain, culturally grounded engineering education. We recognize the persistent influence of colonial legacies in our respective educational systems and believe in the importance of integrating Indigenous knowledge, linguistic diversity, and community-based educational practices. This positionality frames our inquiry and reinforces our goal to identify actionable pathways that honor local relevance while engaging with the realities of globalization and international accreditation.

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DECLARATION OF COMPETING INTEREST

None.

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