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Two Eyes, One Vision: Evaluating the Etuaptmumk/Two-Eyed Seeing Framework in Bridging Scientific and Indigenous Knowledge for Climate Solutions

Nicole Li

Abstract: Canada's colonial legacy has long marginalized Indigenous peoples and their knowledge in academia and policy-making. To bridge this gap, Mi'kmaw Elder Albert Marshall introduced the Etuaptmumk/Two-Eyed Seeing (E/TES) framework, aiming to optimize Indigenous knowledge (IK) and Western science. While E/TES is applied in research on fishery management and healthcare, its role in climate research remains underexplored in a cross-cultural context. Using a three-round Delphi study, this study identifies challenges in applying E/TES and strategies for fostering culturally respectful research environments. Findings reveal that common obstacles include the superficial inclusion of IK, the power imbalance between researchers, and difficulties reconciling opposing worldviews. To address these challenges, experts recommend abiding by the research protocols of Indigenous communities, establishing advisory bodies, and providing institutional support for Indigenous-led research. By scrutinizing the operational model of E/TES climate research, this study hopes to guide more inclusive, sustainable, and culturally appropriate research practices and environmental solutions.

Keywords: Etuaptmumk/Two-Eyed Seeing, Indigenous knowledge, Delphi study, cross-cultural research, climate research

1. Introduction

Climate change is reshaping coastlines, ecosystems, and entire ways of life—yet its impacts are only expected to intensify. Recent studies predict that the number of people at risk from sea-level rise will grow five-fold by the end of this century (Schechter et al., 2023). In particular, Indigenous communities are disproportionately affected by these devastating consequences given their deep, intergenerational relationship with the land. However, their profound cultural, spiritual, and practical experiences with the Earth equip them with holistic place-based environmental insights that are missing in scientific methods (Berry & Schnitter, 2022). Despite its significance, Indigenous knowledge (IK) largely remains undervalued in Canadian environmental politics due to the country's colonial past (Comberti et al., 2019; Datta et al., 2024; Deranger et al., 2021). To amplify Indigenous voices, academia has begun increasingly exploring how IK informs climate adaptation strategies, including land stewardship, seasonal ecological monitoring, and community-led conservation programs (Petzold et al., 2020; Vijay Kumar, 2019).

One major approach is the Etuaptmumk/Two-Eyed Seeing (E/TES) framework, which empowers Indigenous perspectives in environmental research (Bartlett et al., 2012; Deloria, 1999). However, Roher et al. (2024) note that much of the existing E/TES research oversimplifies its guiding principles and lacks a detailed description of its application. To address these gaps, this study will draw upon expert opinions, including those who have participated in E/TES climate research, to investigate the following question: How does adherence to the four E/TES principles affect the operation model of E/TES climate research projects in Canada? Based on the literature, it is hypothesized that E/TES research following the four guiding principles is more likely to yield culturally appropriate environmental solutions, as corroborated by Datta et al. (2024) and Whitney et al. (2020). Conversely, research that treats IK as supplementary knowledge may be less effective due to the risks of misinterpretation (Latulippe & Klenk, 2019). By comparing the experiences and insights of participants, this study will identify recurring challenges (i.e. delegitimization of IK and unequal power dynamics) and practices that contribute to a meaningful E/TES application.

2. Literature Review

The E/TES framework demonstrates high potential for fostering inclusive and effective environmental solutions (Datta et al., 2024; Latulippe & Klenk, 2019; Whitney et al., 2020). This literature review will explore the underlying factors behind IK's exclusion from Canadian environmental policy and research, detail the development of integration frameworks, and identify the gap this study aims to address.

2.1 The Exclusion of Indigenous Knowledge

While IK offers rich perspectives on climate adaptation, systemic barriers in Canada hinder its inclusion in research and policymaking. According to the report *Decolonizing Climate Policy in Canada*, "[Indigenous Peoples'] knowledge and approaches to climate change are systematically excluded from the creation and implementation of climate policies" (Deranger et al., 2021, p. 9). This epistemological marginalization is rooted in Canada's colonial legacy that dismisses IK as superstitious, undermining its credibility (Comberti et al., 2019; Mach et al., 2020). As a result, Western science has been consistently prioritized as the most trustworthy source in Canadian climate research (Comberti et al., 2019). Corroborating this claim, Teena Starlight (2024), a Tsuut'ina First Nation professor at Mount Royal University, and her colleagues interviewed Elders of the Blackfoot First Nation in Western Canada. Their findings, similarly, reveal that the delegitimization of IK is a direct consequence of Canada's colonial history.

The historical and systemic marginalization of IK is further compounded by the West's fixation on scientific knowledge, which prioritizes analytical and reductionist methods (Reid et al., 2022). This emphasis on scientific knowledge originated during the Scientific Revolution in the 17th-century, which promoted the ideas of experimentation and empirical observations (Mazzocchi, 2006; Brooks, 2020). Conversely, IK focuses on experiential intergenerational observations passed down through storytelling and ceremonies (Reid et al., 2022; Whitney et al., 2020). Due to these fundamental differences, Latulippe and Klenk (2019) contend that IK is often viewed as "supplementary knowledge," solely analyzed for its consistency with science or to fill scientific research gaps. Notably, this results in confirmation and selection biases that, when combined with pre-existing cultural and linguistic differences, prevent policymakers and researchers from understanding the nuances of IK (Latulippe & Klenk, 2019; Reid et al., 2022).

2.2 Etuaptmumk/Two-Eyed Seeing

Although less technical than scientific knowledge, IK offers profound insights into climate patterns and ecosystem dynamics through place-based wisdom passed down through generations (Datta et al., 2024; Filho et al., 2022; Whitney et al., 2020). The practice of planting the Three Sisters (i.e., corn, squash, and beans) exemplifies Indigenous agricultural knowledge, where each crop facilitates the growth of another, thereby optimizing harvest yields (Agriculture and Agri-Food Canada, 2021). Acknowledging the value of IK, Darlene Sanderson (2015), a professor of Cree descent at Thompson Rivers University, and her colleagues advocate for its inclusion in policymaking. They believe that it can expand researchers' understanding of climate change beyond the scope of Western science, a position supported by Datta et al. (2024) and Latulippe and Klenk (2019).

Indigenous scholars have developed multiple approaches to bridge the gap between Indigenous and Western knowledge systems (Smith et al., 2023). One of the earliest frameworks, Two Ways of Knowing, was designed by Indigenous activist Vine Deloria Jr. (1999) to differentiate between the teachings

of IK and Western science. In 2004, Mi'kmaw Elders Albert and Murdena Marshall, along with Tier 1 Canada Research Chair Cheryl Bartlett, extended Deloria's (1999) ideas by introducing the concept of Etuaptmumk/Two-Eyed Seeing, illustrated in Figure 1 (Peltier, 2018). In Marshall's words, "[E/TES] refers to learning to see from one eye with the strengths of Indigenous ways of knowing and from the other eye with the strengths of Western Ways of Knowing and to using both of these eyes together" (p. 335), symbolized by the tabs of the puzzle in Figure 1 (Cape Breton University, 2007).

Rather than solely distinguishing between knowledge systems, Bartlett et al., (2012) envisioned E/TES to reduce the clash between them, enabling researchers to optimize the value of all information. However, as Smith et al. (2013) emphasize, the purpose of E/TES is to empower IK and support Indigenous self-determination. Hence, this framework should be centred on IK, followed by the integration of scientific knowledge (p. 122). This order is critical to decolonizing Western research, allowing IK to challenge preconceived notions (MacRitchie, 2018).

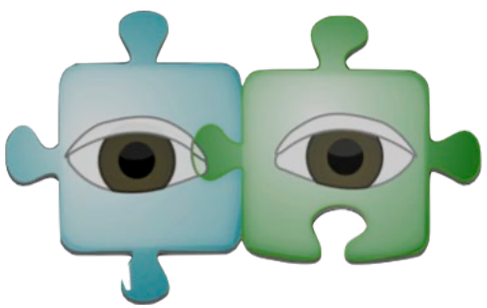

Figure 1
Visual representation of the Etuaptmumk/Two-Eyed Seeing framework (Cape Breton University, 2007).

2.3 Applications of Etuaptmumk/Two-Eyed Seeing

E/TES has been effectively applied across various areas of research, particularly in the fields of coastal management and healthcare. For instance, Denny and Fanning (2016) utilized this framework to re-examine salmon conservation in Nova Scotia. Similarly, Marsh et al. (2016) combined Indigenous and Western health practices to enhance treatments for substance use. These examples highlight E/TES's strength to adapt to different research objectives and contexts (Roher et al., 2024).

Regardless of variations in its application, Bartlett (2017) emphasizes that all E/TES-based research should abide by four key principles. These include 1) "i'l'oqaptmu'k" (co-learning): collaborative learning from all knowledge systems, 2) knowledge scrutinization: evaluating the strengths and weaknesses of each system, 3) knowledge validation: ensuring the participation of professional scientists and IK scholars, and 4) knowledge gardening: fostering opportunities for knowledge exchange (p. 37-64). However, after reviewing 83 health studies from 2004 to 2023 that employed E/TES, Roher et al. (2024) discovered that not all studies adhered to these principles. The team identified two main shortcomings: 1) an insufficient description of how E/TES was specifically applied during the research, and 2) an oversimplification of the framework's four guiding principles. This finding highlights a pervasive flaw in E/TES application, demonstrating the importance of adhering to the principles to ensure the authenticity of this framework.

2.4 Gap Analysis

Despite the growing recognition of E/TES in the scholarship, few studies apply this framework in climate research or assess its application process, indicating an empirical and knowledge gap. To address this limitation, this study gathered insights from professionals with relevant expertise regarding their experiences and understandings of E/TES research. To collect data, a Delphi study was conducted with Indigenous and non-Indigenous participants who hold expertise in environmental fields and/or have participated in E/TES climate research initiated by the government and/or independent organizations. This approach also addresses a methodological gap as it is rare to facilitate asynchronous discussions between professionals from fundamentally different knowledge systems.

3. Methodology

To address the identified research gaps, this chapter outlines the study's design and the data collection process utilized to investigate the hypothesis, including anticipated challenges and ethical concerns.

3.1 Design and Approach

3.1.1 The Delphi Method

This study employed the Delphi method, a qualitative research design that aims to obtain a reliable consensus among a panel of experts (Landeta, 2006; Taghipoorreyneh, 2023). According to its creators, Olaf Helmer and Norman Dalkey of RAND Corporation (1963), this is achieved through "a series of intensive questionnaires interspersed with controlled opinion feedback" (p. 458). The Delphi method is defined by four key characteristics: 1) iterative data collection featuring at least two survey rounds, 2) anonymity of participant responses, 3) controlled feedback, and 4) statistical response that generates a consensus on a disputed topic (Nasa et al., 2021; Shang, 2023). However, later applications of Delphi have eliminated the requirement for a full consensus, searching instead for a reliable group opinion supported by the majority of expert panelists (Landeta, 2006). Khodyakov (2023) argues that Delphi studies generate accurate prognoses because a group perspective is more reliable and objective than the viewpoint of one expert. As such, the Delphi method is a valuable tool for forecasting and policymaking (Bataller-Grau et al., 2019; Green et al., 2007). Additionally, this approach eliminates the psychological biases—such as the halo effect[1], groupthink[2], and bandwagon effect[3]—and intra-panelist animosity that is common in face-to-face group discussions (Bataller-Grau et al., 2019; Nasa et al., 2021).

3.1.2 Justification and Applicability

Delphi studies have been widely utilized in social science research (Landeta, 2006), with approximately 20,000 mentions in peer-reviewed journals (Khodyakov, 2023). According to Jandl et al. (2009), a Delphi study is particularly useful when dissecting complex social challenges where well-established knowledge is scarce. Additionally, qualitative methods are ideal for examining topics involving underrepresented populations (Creswell & Creswell, 2018; Morse, 1991). As this study investigated the application of E/TES in climate research, an underexplored area involving Indigenous scholars—a historically marginalized group—a qualitative Delphi design was better suited than a quantitative approach.

3.2 Data Collection

3.2.1 Sampling and Recruitment

Purposive sampling was employed to select an expert panel, choosing participants "that [were] most likely to yield appropriate and useful information" (Kelly, 2010, p. 317). The sampling population consisted of Indigenous and non-Indigenous scholars with experience in E/TES climate research, expertise in the environmental field, and/or background in conducting research with Indigenous communities. This study recruited a total of five participants, a number that served as an appropriate sample size while allowing a thorough exploration of each participant's opinions. Participants were identified through credible institutions, such as colleges, universities, and renowned climate organizations. Their participation was confirmed through email.

3.2.2 Survey Design

As Fish and Busby (2005) observed, a three-round Delphi study was sufficient to reach a reliable expert opinion. Studies exceeding three rounds showed

1 Cognitive bias in which one trait of an individual is used to make an overall judgement of that person

2 A phenomenon in which a group of individuals reach a consensus without critical reasoning

3 Phenomenon where people adopt certain behaviors and beliefs because other people are doing the same

minimal changes in perspectives and led to increased survey fatigue among respondents (Beiderbeck et al., 2021; Mahajan et al., 1975). Following this recommendation, participants in this study completed four questionnaires: one focusing on their professional background and the remaining three dedicated to the Delphi rounds.

3.2.3 Contextual Survey

The first questionnaire asked participants to detail their affiliated organization, years of experience in their field, and the number of environmental E/TES research studies they participated in. Participants also provided a professional description, only disclosing information of their choosing. This helped establish their qualifications as an expert and gauged the viewpoints they brought to the discussion.

3.2.4 Three-Round Delphi Survey

In the first round, participants answered open-ended questions about each of the four E/TES principles. They shared their understanding of the framework and described any challenges they encountered or foresaw in the research process. The second round extended upon these responses, including follow-up questions that explored emerging themes and subthemes. In particular, participants were asked to propose strategies to overcome the identified challenges. In the third round, they detailed the extent to which they agreed with the strategy by rating it on a 7-point Likert-scale and justified their decision. To mitigate the bandwagon effect, participants were not informed of other panelists' ranking of each solution (Barrett & Heale, 2020). Simultaneously, the controlled feedback in rounds two and three did not disclose identifiable information about the experts. Furthermore, Barrios et al. (2021) highlighted that the ability of panelists to change their perspective is critical to generating a reliable opinion. Accordingly, participants were allowed to revise or clarify their viewpoints after each round, as shown in Figure 2.

3.2.5 Synthesis

Through three iterative rounds, the challenges associated with upholding each of the four guiding principles were assessed. In addition, participants were allowed to vote on proposed solutions, allowing them to be ranked from most to least important.

3.3 Ethics

To ensure confidentiality, participants were referred to by pseudonyms, with a brief description of their affiliated organization and professional experience to establish their credibility. These descriptions were authored by the panelists, allowing them to choose the information they wished to disclose. All responses remained confidential and were stored in a password-protected file, only accessible to the researcher and her supervisor. All data will be deleted one year after the completion of this study. Additionally, the questionnaires invited participants to reflect on personal or professional conflicts. To respect their comfort level, none of the questions were mandatory, and participants could skip anything they preferred not to answer. This research was approved by the school's Internal Ethics Review Board.

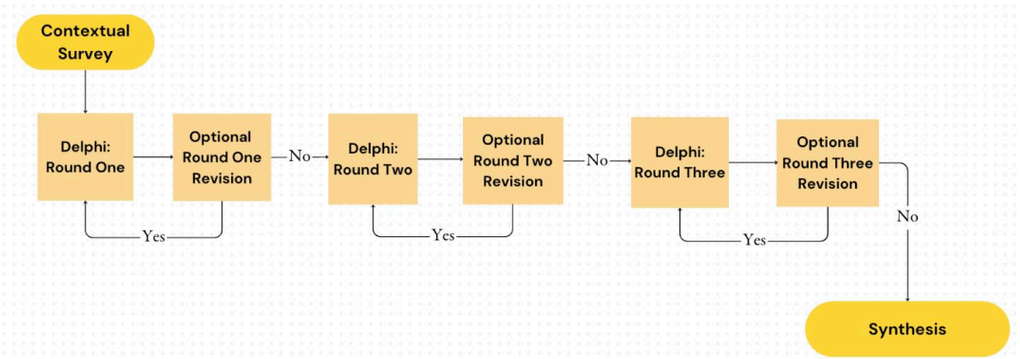

Figure 2
Flowchart showcasing the three-round Delphi process.

Participant Pseudonym	Professional Description	Number of Years Working in Field
Riley	Environmental Law and Policy Consultant	20
Parker	President and CEO of BG Gold (Nunavut-focused exploration company)	5
Skyler	Doctoral Student in Geography & Environment at Western University	3
Jesse	Professor Emeritus in Environmental Studies	55
Harper	Professor in the Departments of Human Geography and Physical and Environmental Sciences, University of Toronto Scarborough	7

Table 1
Table displaying the self-authored professional description of all five expert panelists.

4. Findings

The Delphi study gathered five expert panelists with diverse backgrounds, research experiences, and education levels (Table 1), forming a forum with multiple perspectives. Notably, several panelists provided personal insights from prior experiences leading an E/TES application and/or conducting research with Indigenous communities. For instance, Riley co-led the first E/TES research initiated by the Canadian government to study Boreal Woodland Caribous in 2017, while Harper conducted research with Anishinaabe peoples in the Great Lakes. As Khodyakov (2023) mentions, this range of expertise equips participants to engage in profound discussions that generate complex analyses and robust prognoses.

Over three weeks, participants responded to a contextual survey and three rounds of questionnaires featuring open-ended and Likert-scale type questions (Figure 3). The questions in the first round assessed participants' understanding of E/TES principles developed by Cheryl Bartlett (2017). The second and third questionnaires extended upon panelists' insights from previous rounds, refining the discussions based on new and recurring ideas. To avoid jeopardizing panelist anonymity, individual opinions were rephrased into generalized statements when incorporated into subsequent rounds. This chapter outlines the findings regarding the four E/TES principles (Figure 4), and subthemes that emerged throughout the three-round Delphi study.

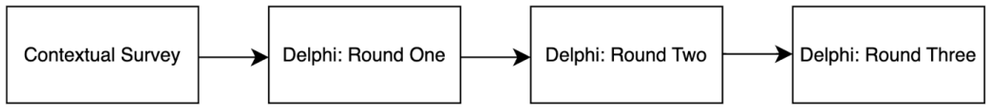

Figure 3
Simplified flowchart showcasing the data collection process.

4.1. Understanding of the E/TES Framework

All participants demonstrated a shared understanding of the E/TES framework, highlighting its purpose in weaving together IK and Western science to develop the most effective climate solutions. Responses underscore the idea of utilizing the framework for "the benefit of distinct but connected communities" (Harper), including Indigenous and non-Indigenous peoples and "current and future generations" (Parker). Specifically, Parker believes that adopting this framework enables researchers to acquire a holistic understanding of the environment and better address complex challenges.

However, disagreements emerged regarding the operational model of E/TES research. Conventionally, Indigenous and non-Indigenous researchers would conduct the research collaboratively, interchanging knowledge throughout the process. However, to meaningfully advance reconciliation, Riley contended that each knowledge stream should conduct research independently with adequate funding. Subsequently, the "decision-maker should receive the two conclusions simultaneously and be tasked with appropriately integrating [them]." Jesse supported this approach, emphasizing that each party should recognize their priorities and collectively reach a middle ground, noting that "the goal is not sameness." While the degree of

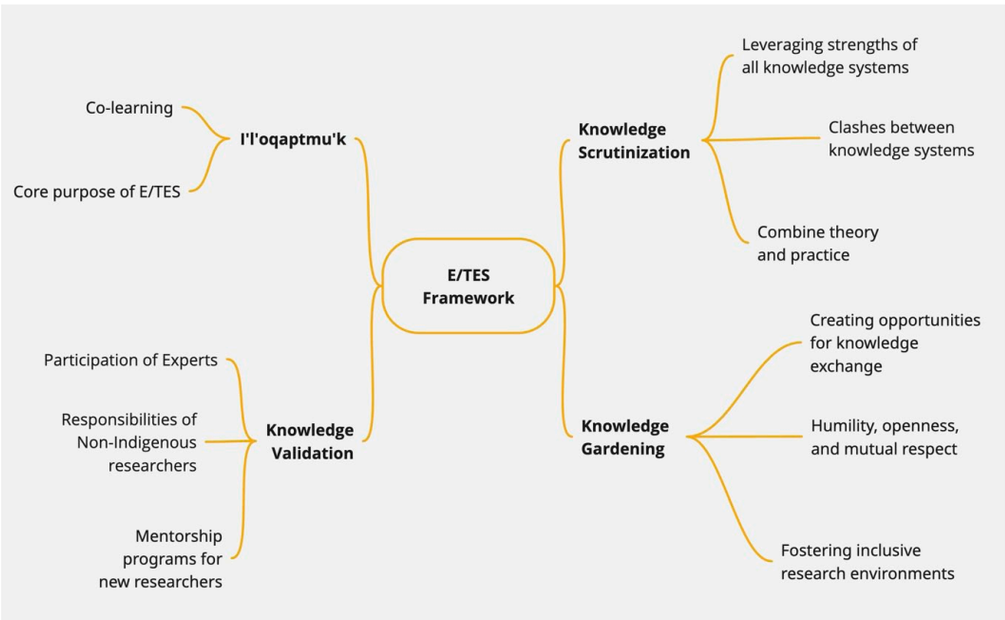

Figure 4
Mind map summary of key themes under the four E/TES principles.

agreement to this idea varied (see Table 2), most panelists possessed an open mind. For example, Harper, who disagreed, nevertheless recommended that "the decision-maker should be made aware of the respective strengths of the knowledge system to assist in evaluating the significance of the conclusions."

Participant Pseudonym	Level of Agreement
Riley	Strongly Agree
Parker	Agree
Skyler	Disagree
Jesse	Somewhat Agree
Harper	Somewhat Disagree

Table 2
Levels of agreement to the statement: In an E/TES research, Indigenous and non-Indigenous scholars should first conduct separate, independent research using their respective knowledge systems. Afterwards, researchers will seek to appropriately integrate the two conclusions rather than weaving together the two knowledge systems from the start.

4.2. E/TES Principle One: I'l'oqaptmu'k

Responses highlight that i'l'oqaptmu'k—collaborative learning—is central to the purpose of E/TES. Parker, who worked with Indigenous communities in Nunavut, described E/TES as a "strong guiding principle" for cross-cultural collaboration. Particularly, survey responses proposed three techniques to facilitate co-learning: 1) establishing advisory bodies (i.e., academic ethics boards or community advisory boards), 2) forming Special Operating Committees to oversee cross-cultural engagement, and 3) following the protocols of the Indigenous communities involved. When asked to rank these strategies, all five panelists unanimously placed the third option first, with the Special Operating Committees viewed as slightly more effective than advisory bodies.

Recommended Solutions	Number of First Ranks	Number of Second Ranks	Number of Third Ranks
Implementing Advisory Bodies	0	3	2
Utilizing Special Operating Committees	0	2	3
Following Indigenous Protocols	5	0	0

Table 3
Participant rankings of recommended solutions to foster collaborative learning.

In her justification, Harper emphasized that "following [Indigenous] protocols is far above the others. It is an expression of respect for Indigenous self-determination, laws, and rights. It embodies meaningful partnership and can have the most meaningful, far-reaching, holistic, and sustainable impacts."

4.3. E/TES Principle Two: Knowledge Scrutinization

The second principle, knowledge scrutinization, entails critically evaluating the strengths and limitations of both IK and Western science, as well as addressing conflicts that arise between the two systems. All panelists agreed that leveraging the strengths of both knowledge systems is crucial for addressing climate challenges, with Parker emphasizing the need to combine theoretical discussions with practical implementations. However, disagreements remain regarding which knowledge source should take precedence during knowledge clashes. Two strategies were proposed to resolve this challenge: 1) clearly outlining the conflict and allowing the end user to decide which knowledge is more appropriate, and 2) prioritizing IK, with non-Indigenous researchers first reflecting on their biases or potential misinterpretation of IK.

Participant Pseudonym	Level of Agreement
Riley	Strongly Disagree
Parker	Somewhat Agree
Skyler	Disagree
Jesse	Neither Agree nor Disagree
Harper	Somewhat Agree

Table 4
Levels of agreement to the statement:

When Indigenous knowledge clashes with Western science, Indigenous knowledge be prioritized instead of leaving the end user of the information to decide.

Responses varied when participants ranked the two solutions, as depicted in Table 4. Riley, who was not in favor of the default prioritization of IK, argued that "the pursuit of truth suggests that each knowledge system should [have] its opportunity to present and explain its unique conclusions." This would allow the decision-makers to truly understand and appreciate different perspectives, making more context-sensitive decisions. Conversely, Harper contended that IK "almost always leads to more holistic, long-term, sustainable, and transformative solutions than Western approaches to ecological problems." Panelists who shared this view echoed Smith's (2013) argument, detailing that the goal of E/TES is to honor IK as it has been systemically marginalized. Nevertheless, there was consensus that IK should be prioritized in research about traditional ecological territories (Table 5), underscoring the importance of respecting Indigenous sovereignty and traditional lands in research.

Participant Pseudonym	Level of Agreement
Riley	Somewhat Agree
Parker	Agree
Skyler	Strongly Agree
Jesse	Agree
Harper	Neither Agree nor Disagree

Table 5

Agreement levels to the statement: When conducting research relating to traditional ecological territories, Indigenous knowledge should be prioritized over science.

4.4. E/TES Principle Three: Knowledge Validation

The involvement of both Indigenous and non-Indigenous scholars is imperative to facilitate a reliable exchange of knowledge throughout the research process. To strengthen collaboration, Skyler suggests that non-Indigenous scholars unfamiliar with E/TES should participate in mentorship programs or cultural training to ensure that they engage in the research with appropriate awareness. Without such preparation, the risk of Western researchers dominating the process increases, treating IK "as ornamental, optional, and not as 'rigorous' as science" (Skyler). Given that IK embodies an "entirely [distinct] worldview" (Riley), these practices help ensure that the nuances of IK—which Reid et al. (2022) highlighted as a critical component in E/TES research—are fully understood. In particular, Jesse posits that IK offers an opportunity for non-Indigenous researchers to "re-set [their] values" and learn to cultivate a harmonious relationship with nature by shifting away from the Western perspective rooted in resource extraction and exploitation.

4.5. E/TES Principle Four: Knowledge Gardening

All panelists emphasized that opportunities for knowledge exchange largely depend on researchers' attitudes and willingness to "make space for Indigenous knowledge" (Jesse). Core characteristics like openness, humility and a genuine willingness to comprehend the teachings of a different culture were identified as critical traits for E/TES researchers, especially those who are non-Indigenous (Skyler, Jesse, and Harper). This mutual respect helps prevent IK from being treated as supplementary or peripheral knowledge, where it is commonly integrated artificially or only analyzed for consistency with Western science in the status quo (Latulippe & Klenk, 2019).

While opportunities for knowledge exchange differ across projects, most panelists highlighted that an open mind fosters the most effective exchange of information. To foster an inclusive environment for knowledge change, participants suggested three different approaches: 1) host regular in-person meetings to build trusting relationships; 2) implement research training across undergraduate, graduate, and professional levels; and 3) practice through test cases to help researchers familiarize themselves with the operation model of E/TES research.

Recommended Solutions	Number of First Ranks	Number of Second Ranks	Number of Third Ranks
In-Person Meetings	3	1	1
E/TES Research Training	2	1	2
Practice in Test Cases	0	3	2

Table 6

Participant rankings of recommended solutions to foster knowledge change.

While there was no full consensus (Table 6), in-person meetings were most highly valued, with three participants identifying them as their first choice. The rank is followed by researching training and practice in test cases. When justifying their views, four of the five panelists argued that cultivating personal relationships within the research group fosters a more comfortable space and facilitates a smoother research process. As Skyler noted, "Meeting in person is… great. [It] builds personal and trusting relationships that can be leveraged in many unique ways."

5. Discussion

Together, the four principles offer a holistic overview of the intent and application of the E/TES framework. By scrutinizing emerging themes, this chapter effectively addresses the empirical and knowledge gaps, thereby identifying strategies that contribute to an effective E/TES implementation, common challenges to applying the framework appropriately, and approaches to resolving clashes between knowledge systems. It also discusses the implications of the findings in Chapter 4 and detail the limitations of this study.

5.1. Research Context and Interdependency Between E/TES Principles

As demonstrated in the previous chapter, the four guiding principles are deeply interconnected and collectively essential to E/TES research. For instance, co-learning cannot occur without opportunities for knowledge exchange. These principles also highlight that operational methods should be flexible, as they vary depending on the research context, suggesting that rigid, standardized procedures are not necessary or advisable. This aligns with the findings in Chapter 4.2 that effective co-learning is best achieved by following the guidance of Indigenous communities, since each community possesses distinct knowledge systems and traditions. As Riley remarked, "Context is so important. It's…not very helpful [to generalize]; each situation is different."

5.2. Common Challenges in E/TES Application

Undoubtedly, a significant barrier in cross-cultural research is understanding "differing worldviews and methodological approaches" (Riley). Specifically, non-Indigenous researchers often overlook the "values and relational side of Indigenous knowledge systems" (Jesse). These philosophies emphasize shifting away from the Western mindset of overconsumption and cultivating harmonious relationships with Mother Earth—principles crucial to addressing the climate crisis. Notably, the quality of climate E/TES research relies on the attitudes of researchers and their openness to explore the richness of another culture. In addition, there is a "lack of meaningful and sustained funding for Indigenous leadership [in] research projects," with "Indigenous communities and peoples [often] included late in the research project and/or superficially" (Parker). Corroborating the epistemological marginalization pinpointed by Deranger et al. (2022) and Datta et al. (2024), Harper contends that this misunderstanding stems from "500+ years of racial capitalism and settler-colonialism" that delegitimized IK.

5.3. Key Strategies for Successful E/TES Application

In the context of E/TES research, securing adequate funding for research and Indigenous leadership is paramount. Skyler recommends "[investing] in programs that support and foster Indigenous leadership and training programs for E/TES." She further highlights the importance of institutional mechanisms, such as community advisory boards, to ensure that Indigenous voices remain central in the decision-making process. At the same time, these official bodies can help obtain funding and facilitate the flow of the research process. In accordance with Carolyn

Smith's (2013) perspective, Skyler stresses the need to uphold Indigenous leadership: "We have to accept that Western science has been 'exalted'…we need equitable (not equal) and intentional investments and support for [IK]."

Nevertheless, non-Indigenous researchers should abide by the protocols of the Indigenous communities involved, familiarizing themselves with the place-based IK. This ensures that IK is respected during research, reinforcing Indigenous knowledge and sovereignty. When these recommendations are neglected, IK risks being treated as supplementary knowledge, as warned by Latulippe and Klenk (2019). To prevent the domination of one knowledge system, all parties should aim to foster an inclusive research environment where all opinions are valued and freely expressed.

5.4. Clash of Knowledge Systems

There is consensus that E/TES should optimize IK and scientific knowledge to produce the most effective climate solution. However, participants differ on strategies for conflict resolution. In his response, Riley proposes that decision-making power should rest with the information user. Opposing this viewpoint, Harper argues that IK and science already exist in an "unequal relationship of power," as acknowledged by Comberti et al. (2019) and Latulippe and Klenk (2019). This imbalance indicates that non-Indigenous information users may lack the cultural competency to assess IK, often prioritizing scientific findings over Indigenous teachings. Therefore, in cases of conflict, non-Indigenous researchers need to first reflect on their biases, as Canada's colonial history has positioned Western science as the most credible source in academia (Harper). Given that this conflict is unresolved, the addition of an Indigenous panelist would provide valuable perspectives because, ultimately, E/TES was designed to honor IK—as corroborated by MacRitchie (2018) and Smith (2013).

5.5. Limitations

Firstly, non-response bias was a significant challenge during data collection. Despite contacting 30+ relevant organizations, professors, PhD students, and environmental experts by email, only five opted to participate in this study. Consequently, not all perspectives on the E/TES framework were gathered, especially as no Indigenous panelists were successfully recruited. To mitigate this effect, the researcher sent follow-up emails in an effort to recruit Indigenous scholars and ensured that most non-Indigenous panelists had prior experiences working with Indigenous communities.

Secondly, as this Delphi study involved three questionnaires lasting 10 to 15 minutes each, survey fatigue may lead to high drop-out rates and low-quality responses, compromising the validity of the findings (Beiderbeck et al., 2021). To address this challenge, the surveys were kept succinct to minimize time demands and participants had a one-week break between each round. Additionally, follow-up emails were sent out as reminders.

6. Conclusion

From rising sea levels to unprecedented climate patterns, the consequences of climate change are felt globally. As this crisis intensifies, the need for effective and sustainable environmental solutions becomes increasingly urgent—Western science alone is not enough to address the complexities of climate change. A promising resource is Indigenous knowledge (IK), rooted in generations of place-based understanding of the world (Datta et al., 2024; Filho et al., 2022; Petzold et al., 2020; Whitney et al., 2020). Given Canada's colonial legacy that marginalized Indigenous voices in academia and policymaking (Comberti et al., 2019; Deranger et al., 2021; Mach et al., 2020), Mi'kmaw Elder Albert Marshall developed the Etuaptmumk/Two-Eyed Seeing (E/TES) to encourage cross-cultural collaboration between IK and science.

This study highlights the key factors shaping the quality of E/TES application in environmental research and provides suggestions to overcome the mentioned structural barriers. Through a three-round Delphi study, panelists identified the primary obstacles in E/TES research as a lack of sustained research funding, tokenization of Indigenous knowledge and researchers, and clashing worldviews that hinder co-learning. The fundamental challenge is the failure of non-Indigenous researchers to grasp the essence of IK—a worldview centered on cultivating deep, reciprocal relationships with nature and fostering an intrinsic responsibility to care for Earth. This philosophy contrasts sharply with the Western paradigm that prioritizes resource extraction and exploitation, only retroactively addressing the environmental harms as an afterthought. As such, panelists stress that non-Indigenous researchers should approach E/TES research with openness and humility, thereby creating space for IK and deepening their understanding of its principles. Individuals unfamiliar with the framework should undergo training or mentorship programs before participating in such collaborative studies. Furthermore, establishing more robust institutional support, such as academic and community advisory boards, ensures that Indigenous insights are included meaningfully throughout the research process.

6.1. Future Research

The insights gathered from this Delphi study can inform policymaking, guide research funding, and contribute to the development of ethical guidelines in E/TES research that amplifies Indigenous voices. When utilized appropriately, E/TES can optimize IK and Western science, leading to more holistic, sustainable, and culturally appropriate climate solutions. Notably, future research can assess the quality and impacts of policies generated from E/TES research. To further the understanding of E/TES application, subsequent studies should also perform a Delphi study with Indigenous and non-Indigenous researchers from various E/TES programs and inquire them about how workplace relations, power dynamics, and advisory bodies impacted their research experience and team dynamics. This would allow researchers to compare different application strategies and identify the best practices for equitable collaboration. In addition, ethnography can provide direct observations of the E/TES research environment, reducing reliance on secondary participant recounts. Such an approach helps mitigate social-desirability biases, enhancing the accuracy and authenticity of the data.

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