

DISSERTATION

THE EXTRAORDINARY HOPE OF THE IM_POSSIBLE DREAM: AN
AUTOETHNOGRAPHY AND PARTICIPATORY ACTION RESEARCH DESIGN OF
INDIGENOUS WOMEN LIVED EXPERIENCES AND VALUES AS STEM FACULTY

Submitted by

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ABSTRACT

THE EXTRAORDINARY HOPE OF THE IM_POSSIBLE DREAM: AN AUTOETHNOGRAPHY AND PARTICIPATORY ACTION RESEARCH DESIGN OF INDIGENOUS WOMEN LIVED EXPERIENCES AND VALUES AS STEM FACULTY

This study explores the narratives of Indigenous women in STEM higher education, illuminating how their lived experiences and values shape the “Im_Possible Dream” of navigating, transforming, and thriving within STEM and academia. With Indigenous faculty representing less than 0.5% of educators, the pathway from graduate education to academic careers remains constrained by structural, cultural, and epistemological barriers. Through the stories of the Indigi Sisters, this research demonstrates how Indigenous values sustain hope, resilience, and success despite these challenges.

Grounded in sociocultural and constructivist perspectives, the study critiques STEM’s historical reliance on positivist approaches that have marginalized Indigenous ways of knowing. It introduces *Cassandra’s Wayfinder*, a conceptual framework integrating Two-Eyed Seeing, Both-Ways Learning, and hope to reimagine STEM as a more inclusive, interdisciplinary, and humanizing STEAM environment that values multiple epistemologies.

Using qualitative methods, including photovoice, storyboarding, and focus groups, the study reveals how Indigenous women experience invisibility and undervaluation while drawing strength from an interconnected Indigenous Ecosystem of Values rooted in mind, body, spirit, emotion, creativity, and reciprocity. This portable cultural foundation enables contributors to

transform STEM spaces by fostering collaboration, innovation, and holistic approaches to knowledge.

Despite systemic barriers, participants bridge Indigenous and Western epistemologies through creative expression, cultural identity, and reciprocal relationships. As knowledge weavers, they integrate art, science, culture, and community to create inclusive learning environments and challenge dominant knowledge systems.

Ultimately, this study argues that Indigenous women in STEM are transformative agents whose values and ways of knowing expand the possibilities of STEM education. Their experiences illuminate pathways toward more equitable, culturally responsive, and interdisciplinary futures while inspiring future generations to pursue the “Im_Possible Dream.”

ACKNOWLEDGEMENTS

With all my heart, I acknowledge and honor every person who helped create the first Cassandra Puletapuai, PhD. I was named after Cassiopeia, the constellation who points to the North Star. However, I could not wayfind across the sea of my educational journey without your guiding light. No matter the nature of our connection or the path that brought us together, you have become my kin. You all helped me believe, dream, and reach extraordinary hope. Your support, love, and presence have shaped this journey in ways words cannot fully express. I carry deep gratitude to each of you. For I now know who I am and who I wish to become – a dancer, artist, researcher, educator, and vulnerable human who unapologetically dreams. Much alofa (love) to you all.

AUTOBIOGRAPHY

Cassandra Puletapuai recently earned her PhD from Colorado State University, where she focused on STEAM education and worked at the McNair Scholars Program. She completed her B.S. at the University of Missouri–Kansas City and her M.S. in Technology at Pittsburg State University before starting her doctoral studies.

Her research focuses on autoethnography and participatory action research, aiming to create value through collaboration and human-centered methods. She studies Indigenous science, creative STEAM, science storytelling, and performative research, with an emphasis on teaching practices that foster hope and help improve people's lives.

Her creative dissertation focused on Indigenous women in STEM faculty roles. It was approved without any committee revisions and received the 2025 Graduate Research Winner award from the Advancing Indigenous Science and Engineering Society (AISES). Cassandra performed the public portion of her dissertation as well.

As a leader in interdisciplinary STEAM, Cassandra was chosen as a National Mentor for the Aspen Institute's Our Future Is Science (OFIS) initiative. Her dedication to mentorship and building inclusive opportunities in science and engineering earned her the 2026 OFIS Mentor of the Year award.

Outside of her academic work, Cassandra is a tap, modern, and hula dancer. Her experience as a dancer shapes her interdisciplinary research, storytelling, and her efforts to connect science, culture, creativity, and community.

DEDICATION

With all my heart, I dedicated this work to the many people who walked alongside me, supported me, challenged me, believed in me, and helped me imagine what was possible.

To my ancestors, my family, my communities, my friends, my mentors, my committee, my advisor and former advisors, my mentees, my students, my colleagues, scholars, dancers, leadership, and all those whose love and wisdom shaped this journey at CSU. You are the foundation on which this work can transform my life as well as others'. Through every conversation, every act of encouragement, and every moment of connection, you became kin in this journey of extraordinary hope in Colorado.

This dissertation is a reflection of the collective care, knowledge, stories, and dreams that have been shared with me. It honors the relationships that remind us that learning is not only an intellectual pursuit, but a human and relational practice.

To the Indigenous women in STEM whose stories, resilience, brilliance, and leadership inspire this work: this is dedicated to your presence, your contributions, and the futures you continue to create.

To everyone who helped bring the first Puletapuai, PhD, into being, an enormous (fa'afeti) thank you. No matter the role you played or the distance between us, your impact is carried within these pages.

With deep gratitude, love, and hope, I dedicate this work to you all. We are the hopes and dreams of our ancestors. Let the next chapter begin!

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Chapter 1 - Why Indigenous Women Dream the Im_Possible Dream?

Extraordinary Hope: Stories Shaping My Research Positionality and Values

Throughout my experiences, I could not ignore the absence of those not participating in STEM, particularly Indigenous women. While I have been fortunate to reach this point, many others do not have the same opportunities. Furthermore, I have been molded into what a scientist is or how a scientist acts. There were parts of me that I valued and others I had to leave behind. I saw the world differently, but it did not align with the Western Science concept. I became someone I was not, and I was quite unhappy. When I started this PhD journey, it became a search for who I am and who I wish to be, a question my advisor asked me that I could not answer at the time. This question, along with the lack of other Indigenous women, inspired this dissertation to view others' truths.

To my knowledge, this study is among the few that center on the lived experiences and values of Indigenous women in higher education STEM. Our numbers are declining what faint presence exists Data collection within Indigenous populations presents layered and complex challenges. Too few of us are represented in these spaces. The only way I know to bring these stories to light is through storytelling. Capturing the depth, humanity, and lived experiences of each individual is vital. These stories are meant to inspire new ways of thinking, encourage pluralistic epistemologies, and honor diverse ways of understanding the world.

This work reflects a belief that we need one another to build a world that serves all of us. Looking ahead, I will explain how this research will continue to shape my future work with Native and non-Native communities. I am ecstatic and honored to continue and grow this work

with my advisor, committee members, and academic and non-academic communities. These stories provide direction and continuity beyond the dissertation. They help create shared co-learning pathways with lived experiences. Curriculum structures will center on joint value creation and uplifting, humanizing STEAM (Science, Technology, Engineering, Arts, Mathematics) educational spaces.

In the spirit of self-reflexivity, I recognize certain intersections of my identity contain privileges and power compared with others in a similar setting. These privileges and power may shape my interpretation, consciously and unconsciously, and dictate how I function in an environment. Unintentionally, others may be aware of and affected by these privileges in any given setting. The course of life events, grand or humble, has crafted my lived experiences. It drives how I envision and dream about the world. Though these acts shape the present-day me, they are boundless, evolving, and hold many contexts. The influences of relationships, human interactions, culture, education, lived experiences, ways of knowing, emotions, and the arts transform my perspective over time but gently nestle within the rose-tinted outer layers of extraordinary hope. These elements comprise my living knowledge and positively magnify the goodness, complexity, and colorfulness in this world. In other words, the direction and course of my positionality continue to develop in line with my desire for the betterment of my future self.

Therefore, as a contemporary multicultural Indigenous woman, I gift this dissertation with a collection of my stories that have shaped who I am, how I see the world, and how I navigate it, guided by my values as a Northstar. I wish to honor these Indigenous women who shared their stories in this study by sharing why I decided to pursue this study and what inspires my scholarship. Most importantly, I wish to inspire the next Indigenous scholar to hold onto their hopes dearly as they dare to dream. I share my poem “The Totality of I” (Puletapuai, 2025; see

Figure 1.1) that I wrote thinking about my doctoral journey, the study, and these incredible Indigenous sisters. My hope and promise are to live, love, laugh, and tell stories unapologetically.

This poem (see Figure 1.1) is situated in contrasting statements, but it is what makes me human. Science and art, STEM and STEAM, Western and Indigenous worldviews stand in opposition to each other. We see this in academia with stark boundaries and fragmented curricula. Similarly, I represent this with values and vulnerabilities in each statement. However, the conjunction “and” gives me hope. The conjunction links values and vulnerabilities to have balanced importance. This is what I think about for Indigenous and Western concepts becoming interdisciplinary through the arts. I love dance and science. Having an interdisciplinary space began my journey into a new way of communicating science through dance, by bringing my Indigenous views into the mix.



Figure 1.1

How I see my AutoE story as a multicultural Indigenous woman scholar, artist, dancer, and storyteller in the reflection poem the "Totality of I". Own work using Canva.

The Totality of I

I am light and darkness.

I am happy and sorrowful.

I am brave and frightened.

I am proud and ashamed.

I am hopeful and pessimistic.

I am accomplished and a failure.

I am loved and loathed.

I am a STEM scholar and a tap and modern dancer.

I am Indigenous and non-Native.

I am a being embracing their vulnerability and imperfections,

Moreover, I am whole.

I am finally free (Puletapuai, 2025).

This poem reflects my current state as I head into the next chapter of my life. Littered with diametrically opposed statements, this puzzles many, if not all, readers. It is essential to know that these statements play a role in shaping and understanding the complexity of who I am. I find myself engaging in autoethnography, PAR (Participatory Action Research), creative outlets (such as dance and theatre), and supportive communities and leaders. This section expands on my journey as a doctoral student, researcher, scholar, and leader at Colorado State University. The evocative approach aligns with autoethnography's structure by amplifying the "I" of my story, thereby increasing its visibility. These subsections center on the "I" narrative and later weaves layers of consciousness and voice with those of the other women participants. The purpose of the "I" in autoethnography serves as the foundation that my story supports agency,

deepens relational connectedness, and humanizes research. With styles of writing in autoethnography varying, a common theme focuses on highlighting the uniqueness of a single story. These subsections contain many twists and turns, as well as highs and lows. To fully appreciate my story, a reader must understand both the light and dark moments. A wise historian once told me, "How do you know where you're going if you don't appreciate where you came from?" From that point I ask, "How do you know who you are if you do not know what your values are?"

The Sacrifice

I entered the Northern landscape of Fort Collins with monumental pain and grief from the struggles of being a first-generation student. I will not pull the stitches of this wound too much. Let us say that my passage to this point in the doctoral journey equated to a shipwreck, marked by dreaded, prolonged uncertainty and waves of bad luck tearing at my soul. I pled and begged Creator (the lifeforce) not to let despair devour me. Creator heard me but asked for sacrifice in return, for it is the price of restoring balance and to live a dream. The stinging pain of hot tears rolled down my cheeks, and wrath washed over me. I yell, "You ask too much. I cannot give you more. Why does my price appear more than those around me?" Creator responds, "Because you demanded a dream, not a wish." I closed my eyes and stepped into the darkness as the Creator took away my offering at its request.

When I opened my eyes, I saw a shining version of Camelot. My makeshift raft of life's occurrences gently washed on the bank of Colorado State University. Grateful but wounded, I flung my hand toward the aura of warmth and sparkling hues of gold. I collapsed from exhaustion, impairment, and fell into a peaceful slumber. I made it, or did I dream it? I will decide when I wake up. For now, I head back into the darkness to be reborn like the stars.

However, grief continued to linger, which I later learned, helped remind me of the good this life offered.

My Indigenous Lived Experiences in STEM – A Tiny Glimpse.

Although I am a scholar, various aspects of my identity intersect with every facet of my personal, academic, and professional life. While some of these human components may be considered irrational in STEM fields, I carry them with me everywhere because they influence many aspects of my life. They are my values which are the heart of me. STEM often draws a boundary on cultural, spiritual, social, and emotional aspects. Other researchers assert that rejecting one's unique views creates an inhumane STEM environment and is uninviting to those historically invisible (Yao et al., 2023). Hence, STEM should center on an individual's humanity by supporting the physical, emotional, spiritual, and mental well-being of its community. As STEM purports to be interested in its members' engagement with real-world challenges, it must consider the full range of actual circumstances, including the problem-solver and others' humanity. If not, STEM education "remains far removed from most people's lived experiences and is detached from the real-world social, political, and economic contexts in which it exists" (Imad et al., 2023, p.1). Furthermore, the concept of human experience and condition involves creativity, imagination, and empathy to navigate the elaborate world (Imad et al., 2023).

Although I agree with the previous insights on integrated STEM, it is not without its challenges. I am a scholar; however, I am also a scientist, a dancer, and part-Indigenous. To many, I am an enigma, but I am human. It is one of the most significant values I hold. Yet, from this vantage point, STEM education may often leave out qualities of a human's whole being connected to spiritual, physical, mental, and emotional aspects. In geology, I surveyed land and tested water for clients and corporations (which are given legal personhood status). Indeed, my

STEM career provided a much-needed service, but did I ever acknowledge the land's history or the cost to those displaced from it? For example, did my service help commission a sacred Native land that forced the removal of an entire lifestyle to a strip mall? One of many experiences that lacked the immersive human quality connection. Similarly, in higher education, I am taught problems, equations, and theories, but never how these components impact humanity. Hence, the artistic influences of creativity and self-reflection may induce the qualities of humanity as in STEAM education.

I detail in later Chapters the issues that arise with Indigenous knowledge and STEM. I add a layer of the arts to promote STEAM (Science, Technology, Engineering, Arts, Mathematics), especially for Indigenous populations who often view integrated STEM as incorporating the arts.

The Impossible Dream

The exclusion of art and culture from STEM education, the devaluation and incapacitation of Indigenous knowledge, the universalization of women of Color terminology and research, the objective stripping of human worth, isolated higher education journeys, and minimal support systems made higher education attainment improbable for Indigenous students. The literature from the previous section highlights the significant underrepresentation of Indigenous women in STEM faculty positions. Moreover, the faint presence implies severe limitations on conjuring Indigenous women lived experiences in STEM education and how they blend creatively womanhood and Indigeneity. These sights tell the tale of the impossible dream for Indigenous women seeking to enter the academy. Everything starts with a dream propelled by hope. Cochrane (2007) shares:

Weaving together a series of reflections on hope in the midst of despair - hope that sees clearly the horrors of our world without finally succumbing to them, hope that calls us to go beyond what is broken in active anticipation of what shall be whole, hope that is about embodying the spirit of life in the face of death (pp.23-24).

From my lived experiences as a woman who is partly Indigenous, the thought of pursuing higher education appears forlorn with unfavorable odds stacked against me. The year is 2025, I am the first in my family to earn a Bachelor of Science in Geology, a Master of Science in Technology, and soon, a PhD in Education. Thinking of this experience of what I have been gifted to live my dream, many Indigenous people will consistently confront the death of their dreams. This positionality statement perfectly captures the basis of my resolve: extraordinary hope.

A Pure Indigi Prologue

In March 2025, I voyaged to American Indian Science and Engineering Society (AISES) Canada National Gathering for a conference. Though March marked the beginning of spring warmth, Canada appeared to be experiencing its fourth round of winter. Canada refers to this time period as the spring of deception. The heavy snowfall made the indoor conference a need for survival beyond the acquisition of knowledge. Therefore, the breaks with no sessions occurring found several groups in thumb-twiddling contests, as only so much thumb scrolling could be done on the phone with the limited wifi connection.

As I wandered the halls, I heard the most beautiful chanting. There stood a room of Elders speaking, hugging, and laughing with some of the attendees. The scene with the music gave rise to a lump in the back of my throat, and a stream of hot tears began to roll down my cheeks. I became overwhelmed with emotion, and an Elder woman came to me.

Elder woman: (Places her hand on my arm and wipes my face with the other.) My child,

why do you cry?

Me: The music has made me miss something. The percussion caused my heart to beat and called to my spirit. I feel lost and broken sometimes. They are shattering my heart with their disregard for the feelings of others and attempts to bait me with their arrogance. They want me to be something I cannot be. I am seeking a healing truth. I no longer know where I belong. Am I Indigi? Am I non-Native? (I am half Indigi and mixed with non-Native cultures.) I am so lost. I feel my spirit dying.

She took me to the corner of the room, and she offered her heartfelt advice on keeping in touch with Native culture and ways to incorporate spiritual strength. Afterwards, an Elder man walked over, and I shared the heaviness of my heart, struggles of being a “contemporary Indigi”, the happiness of dancing/creative arts, and possible dissertation work. I spoke about the ideas of fusing art, science, and culture. To me, I do not see a separation. He gave me the best advice and the crux of my current and future work in creative sciences.

Elder man: Use your gift of creativity that Creator gave you. How do you think animals navigate a forest?

At that moment, I began to use creativity as the catalyst to uphold the value of how I see myself as a whole multicultural contemporary Indigenous woman. This wisdom from my Elder taught me to go around the system using my gift of creativity instead of trying to begin transformation within the institution. I wondered if others shared the same thoughts and defined values that complete who we are. This was a discovery I made with this study in Chapter Four.

Problem Statement

Indigenous students in higher education and science professionals endure great disparities across STEM's landscape. From 2011 to 2021, with the National Center for Science and

Engineering Statistics (NCSES; 2021), Native Hawaiians, Pacific Islanders, American Indians, and Alaskan Natives struggle to fortify visibility with less than one percent of the STEM workforce (NCSES, 2021). The number of science and engineering degrees for Alaskan Natives and American Indians hovers at a regretful 0.4 percent. Bachelor's degrees from 2016 to 2018 of Alaskan Natives and American Indians spiraled downward from 2,930 to 2,844 (NCSES, 2021). However, Indigenous women outpace men in obtaining degrees related to agricultural, social sciences, biological, and psychology sciences (NCSES, 2021). In 2016, Pacific Indigenous and Native Hawaiians fluttered at 0.3 percent of all bachelor's degrees, with 0.2 percent of all engineering and science (NCSES, 2019). In higher education, students of Pacific Island descent continue to remain severely underrepresented (Mayeda et al., 2014). In the number of doctorate degrees from 1992 to 2012, Black, Asian, and Hispanic populations grew with the exception of American Indians, Alaskan Natives, and Whites (Patel, 2014). Whites fell from 84.3 percent to 73.5 percent, while American Indians and Alaskan Natives dropped from 0.5 percent to 0.3 percent (Patel, 2014). The percentages of diminutive participation in the STEM field architect the challenges and lack of support Indigenous students in higher education face that contributes to the erasure of their voice and experiences, eradicates their presence, and suppresses their right to a culturally and holistically infused science education. Furthermore, the chances of students crossing into faculty roles appear to dwindle.

The confirmation of low Indigenous participation from student to faculty demonstrates a narrative not seen under the women of Color umbrella or the understanding of Native experiences and values and how it may connect to our small involvement in STEM. Gazing at previous research, Indigenous women STEM faculty face several challenges with dominating groups in understanding our values and experiences contributing to low participation, women of

Color generalization, little research on Indigenous worldviews, and contrasting values mixed with poor experiences (Auxier, 2003; Bailey, 2016; Benjamin et al., 1993; Brayboy et al., 2012; Castagno et al., 2023; Deloria et al., 2018; Guyette & Heth, 1984; Houser, 1991; Kohout & Kleinfeld, 1974; Kirkness & Barnhardt, 1991; Malin & Maidment, 2003; Miles et al., 2022; Mohamed & Beagan, 2018; NCSES, 2021; Patel, 2014; Pavel & Colby, 1992; Ruef et al., 2019; Shotton et al., 2013; Solym, 2014; Stevens & Matsaw, 2019; Thomas et al., 2022; Washington & Harris, 2001; Woodcock & Alawiye, 2001; Woodroffe et al., 2021; Wright, 1990). The topic's obscurity required a very in-depth look at several sources to be woven together.

Significance

Instructors play a vital role in a student's educational journey as educators and mentors provide emotional support, agency (Mainhard et al., 2018), positive academic outcomes, and achievement (Jimerson & Haddock, 2015). Indigenous educators offer students a unique learning experience. A study of students' perceptions when encountering Indigenous faculty revealed that " teachers' indigenous knowledge and cultural competency positively influences their learning outcomes in terms of cognitive, social, and interpersonal skills" (Suarta et al., 2022, p. 244). The presence of our ways of knowing challenges the dominating narratives by molding inclusive knowledge. Indigenous instructors push back by establishing science as a context-specific, social, and cultural construct (Johnson, 2024). Professors sharing an Indigenous identity with students show immense benefits as mentors and role models because these educators exhibit a vested interest in the success of Indigenous students (Anonson et al., 2008). Indigenous faculty may integrate Native knowledge into creating a responsive

curriculum, generating changes for an auspicious education for future students (Kitchen et al., 2013).

The introduction, background, problem, and significance of Indigenous women STEM faculty illuminate the issue of our experiences and values that remain obscure. Therefore, this study has substantial possible merits for the betterment of improving the experiences of current and future Indigenous women STEM faculty, adding to the obscure body of knowledge, creating co-creation of knowledge, enhancing Indigenous and non-Indigenous relationships/partnerships, and cultivating a joint value system in STEM spaces.

Purpose Statement

The purpose of this blended study of autoethnography (AutoE) and participatory action research (PAR) is to uncover the lived experiences of Indigenous women navigating the roles of STEM faculty in a manner that emphasizes a duty of care. Using the theoretical lens of two-eyed seeing (TES), both-ways learning (BWL), and hope, induces a co-creating learning journey to break through the cultural mechanism of silence to pinpoint the values of these Indigenous women and their connection with STEM experiences and science higher education culture. The study entailed a focus group session incorporating the activities of a self-narrative exercise, journal keeping, photovoice, and discussions to initiate reflection, dialogue, and action. Based on Indigenous women's sharing of their experiences in STEM, we hope to identify their key values to (1) address the knowledge gap, (2) enhance collective joint-value creation, and (3) improve current and future experiences through co-partnership strategies. Furthermore, it laid the groundwork for crafting interdisciplinary spaces similar to STEAM education for humanizing various ways of knowing and value systems. Providing a merger of the arts and sciences with

creative expression, similar to dance and musical theatre, offered an opportunity to help place sociocultural STEAM on pathways for Indigenous populations.

Research Questions

- (a) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?
- (b) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

Theoretical Framework: Cassandra's Wayfinder

Cassandra's Wayfinder (See Figure 1.2) respectfully speaks back to traditional research methods for often presenting a narrow, outsider lens on Indigenous communities. Instead, it champions Indigenous-led research, empowering Indigenous people to share their stories authentically and from their own perspectives. The dissertation is grounded in frameworks such as Two-Eyed Seeing (TES) and Both-Way Learning (BWL), as well as Paulo Freire's concepts of humanization and hope as tools for overcoming adversity. The central aim is to prioritize Indigenous perspectives and worldviews throughout the work.



Figure 1.3

The merging of various frameworks of Cassandra's Wayfinder. Own work created using Canva.

Limitations

Though the rigorous performance of the investigation aspires to superior execution, the study presents foreseeable limitations. First, the exploration of experiences may unveil sensitive topics inducing unintended emotional trauma. Second, recruiting participants identifying as Indigenous women faculty in STEM in higher education may prove challenging as previous research demonstrates a minuscule population. Third, the inquiry spotlights the category overlaps of women and Indigenous identities but does not incorporate other characteristics participants hold, for example, class, sexuality, geographic location, and more. However, these topics may come to light during the discussion of the study. Furthermore, racial and gender classifications draw intricacies. Within these groupings, the nature of the study may not capture

the expansive gender and racial viewpoints, for instance, transnational Indigenous or Native gender-fluid populations. Fifth, the essence of PAR involves stakeholder participation and consensus. The varying standpoints may cause a delay in the process or unintentional disregard of dissenting opinions. To mitigate seen and unseen limitations, the research work integrates etiquette and courtesy codes and a risk management plan. Lastly, limitations may arise with the knowledge collection types of the study of Indigenous STEM women faculty, which include transcribing, reflective journaling, semi-structured interviews, audio and visual recordings, emailing, photography, and photovoice. According to Creswell (2003), limitations comprise the researcher's presence influencing bias, restriction on articulation and perceptiveness, difficult interpretation, disruptions affecting responses, and technical issues.

Delimitations

The study contained a few delimitations. Decision one entailed some of the Contributors having faculty ties to land-grant public universities. The history of land-grant universities involved the expropriation of Indigenous lands. Some land-grant universities include Native land awareness or acknowledge Indigenous perspectives, struggles, and ties to stewardship. Private institutions not tied to land-grant institutions may find it more difficult to obtain participants. Moreover, private educational settings may offer experiences that differ from those at land-grant institutions. The next decision concerned Indigenous female-identifying participants. The Indigenous male-identifying populace carries a degree of privilege and power associated with gender that overshadows the inquiry into Indigenous experiences into an umbrella theme of a general women of Color experiences. The other decision required concerted efforts out of state, given the lack of viable participants in the local area.

Background

I outlined the findings of the Indigi Sisters (Contributors) who contributed their stories to creatively manifest the story arc of the "*Im_Possible Dream*" through their value systems. In Chapter One, I detail how these obstacles limited the advancement of current and future Indigenous women into faculty positions in STEM in higher education. While others may ascend into these positions more easily, Indigenous women faced substantial barriers in reaching higher education STEM faculty positions, which allude to an inconceivable path to obtain a faculty position in STEM. Given that the Indigenous faculty makeup is less than 0.5 percent of educators, the pathway from graduate student to faculty appears bleak and an impossible task (NCES, 2021). To me, these women's stories represent the hope that dreams are possible, especially to Indigenous populations considering faculty careers in STEM/STEM education.

Chapter Two highlights the layered challenges that make Indigenous women in STEM appear invisible and the journey to college and becoming faculty a nearly impossible feat. Additionally, I explore the history of STEM and its evolution within universities. The field's foundations are rooted in constructivist and sociocultural perspectives, yet it grapples with challenges such as unclear definitions and ambiguous approaches to integration. I show that its heavy reliance on positivist and fragmented systems has limited opportunities for exploration and experimentation. Progress has depended on interdisciplinary thinkers, emphasizing the importance of embracing multiple epistemologies, as seen in Indigenous ways of knowing. Incorporating Indigenous knowledge has opened the way for STEAM to become an integrated and inclusive space. The framework constructed based off the literature review is called Cassandra's Wayfinder with two-eye seeing (TES), both-ways learning (BWL), and hope. Chapter Three delved into how the frameworks operated.

After detailing in Chapter Three the study's methods for collecting, understanding, coding, and analyzing themes of experiences, I discovered the values that emanate from the heart which is the core of self. Indigenous educators' notion of "worth" becomes faint due to superficial visibility, a lack of genuine support, and Scientism, among other factors. The vessels used to capture the collection of stories consist of a storyboard with photos and some captions, and a recorded video of a focus group with a transcript. For a span of time, we tread the physical, spiritual, emotional, and mental worlds to conjure the past, present, and future. Ultimately, the voices of these participants and the themes from their stories indicate the veracities of the Indigi heart: their unwavering values nest in a reciprocal and ecological way to honor their mind, body, emotions, and spirit.

Chapter Four details the development of the Indigenous Ecosystem of Values. Through self-narratives and photovoice, Indigenous women in STEM faculty roles shared artifacts reflecting their core values. These values stemmed from a holistic self. The value of self-encompassed mental, physical, spiritual, and emotional dimensions that shaped their identities. The Indigenous Ecosystem of Values served as a portable heart, a culture these women carried into every environment. Their ecosystems included mentorship, cultural heritage, femininity, artistry, roles as STEM change agents, and relational community. Despite bringing these value systems into diverse spaces, the women received mixed responses within STEM culture, from students, colleagues, faculty, academic leadership, institutional culture, and the broader community. On one hand, they experienced co-learning and transformation; on the other, they faced opposing forces that disrupted their holistic well-being. Institutional barriers such as commodification of people, one-dimensional thinking, the scientist stereotype, federal defunding, value conflicts, overwhelming workloads, and both visible and invisible

vulnerabilities impeded their experiences. These barriers lie outside the Indigenous Ecosystem of Values. Instead, the values remained interconnected in a creative and reciprocal relationship, fostering moments of insight and realization.

In Chapter Five, I examine the Indigenous Ecosystem of Values and the dynamic, reciprocal connections among its core elements. Respect and responsibility permeated these values, manifesting in research practices centered on community benefit rather than extraction. Creativity was evident in the integration of Indigeneity and womanhood into STEM culture through beadwork, handmade earrings, and the application of traditional knowledge, such as tepee building, in engineering courses. Together, these agentic forces cultivated a quiet yet profound power that reshaped both academic and professional environments.

These Indigenous women spoke back to conventional perceptions by fully embodying their identities by wearing traditional attire, speaking Native languages alongside English in math classes, and visually bridging Indigenous and non-Native worlds through photography. Such practices fostered co-learning and shared understanding, enabling different value systems and epistemologies to coexist harmoniously. I observed this as a transformative, interdisciplinary space where art, science, and culture converged. The ability of these women to bring their authentic selves into educational settings did more than create shared experiences; it generated new knowledge and deeper meaning. This process was especially significant given their frequent status as the sole representatives of their communities. Additionally, these women acted as knowledge weavers. They connected self and identity, individual and community, community and research, Indigenous and Western science, art and science, and more. Their approach to STEAM education embraced pluralistic ways of knowing, humanized the learning process, and honored the inherent worth and values of all participants. Ultimately, I contended that their

presence and agency are indispensable for bridging knowledge gaps and illuminating pathways for others to dream the Im_Possible Dream despite all odds.

Definition of Key Terms

The following definitions framed the context of this research work:

Both-ways learning (BWL) or Two-way learning (TWL) - a philosophy that fosters the collaboration of various worldviews. The teaching outlook assists with the co-creation of knowledge (Coff & Lampert, 2019). In this study, I defined value as a living and liminal space for varying epistemologies to create new knowledge while tethering to its foundation. It opened my mind to view relational concepts.

Indigenous - the original inhabitants of the land and which the land belongs to them at the time of colonization or state boundary establishment (Sanders, 1999). With the utmost respect, the authors of this study acknowledged the complexity and continuously evolving definition of Indigenous within their nations. By no means did this definition encapsulate all Native populations. This study examined the populations of American Indians, Alaskan Natives, Native Hawaiians, Pacific Islanders, and other relevant Indigenous groups in North America.

Hope - a form of agency that allows for critical thinking, reflection, and futuristic outlooks (Bryant & Ellard, 2015; Janzen, 2018). In this study, I defined hope looking to past, current, and future selves. It encouraged creativity and reciprocity as transformative agents, connecting values into an Indigenous Ecosystem of Values, which kindled soft power to transform themselves and STEM culture.

Indigenous science/knowledge/way of knowing - science tied to the Indigenous cultural viewpoints. These perspectives shape the interpretation of the world (Snively &

Corsiglia, 2001). The authors understood the term contained various aspects and numerous meanings for differing Native populations. In this study, I defined Indigenous science/knowledge/way of knowing as rooted in Indigenous people and blending art, science, and culture. It incorporated mental, physical, spiritual, and emotional components that bring wholeness to an individual and humanized space.

Photovoice - a methodology using photography, knowledge, and critical dialogue in which participants reflect and discuss issues to empower social change (Sutton-Brown, 2014). In this study, I defined photovoice as an artifact to capture lived experiences and values. It became a value or point that was connected to other values. The photographs helped understand the relational concepts with each value within the Indigenous Ecosystem of Values.

STEM (Science, Technology, Engineering, Math) - The U.S. Bureau of Labor (n.d.) characterizes chemistry, computer science, engineering, environmental sciences, geosciences, life sciences, mathematics, and physics/astronomy as occupations connected to the STEM field. In this study, I did not define STEM because there is no agreed-upon definition, as I detailed in Chapter Two. I mentioned STEAM, which adds the arts to the traditional STEM acronym. I used it as a concept of an interdisciplinary space for Indigenous and Western knowledge, merging value systems between Indigenous women faculty members and STEM culture, and blending arts and science ways of knowing.

Two-eyed seeing (TES) - an approach encouraging knowledge creation not to assimilate or dominate. Instead, the process seeks to understand and build connections. Each side works together, creating an all-inclusive knowledge construction (Hatcher et al., 2009). In this study, I defined TWS as a guiding principle that identified commonalities across

several fronts, including shared values and experiences. It permitted the coalescing of values to a larger value without omitting individual uniqueness.

Women of Color (WOC) - the convergence of gender (female) and racial (non-white) identities.

Women of Color may encompass Black/African American, Latinas, Indigenous, and more (Miles et al., 2021). The authors recognized individuals who hold a collection of identities beyond the binary description that may factor into various facets of a person's being, values, beliefs, and more. Additionally, the definition did account for multiracial, partially shared White identities, or the full expansion of gender. In this study, I did not define the term woman of Color, but I did refer to it. I focused on the term 'Indigenous' or 'Indigi' to reflect a holistic perception of self. I noted in some chapters that this identity incorporated many other elements associated with sociocultural perspectives on lived experiences, values, sovereignty, holism, and mental, physical, spiritual, and emotional pieces. In other words, the term was complex as it infused an individual's inherent worth and state of being.

Chapter 2 Literature Review - Sitting on the Untraveled Margins of Experience

Introduction

Patiently this ingenue waits as my virile cohorts coin roll across their knuckles and flicks onto the Anubis-like scales resonating a metallic shrill of my worth. Kerplunk, clink, the metallic raucous imbued the air with uneasiness as every attribute must be weighed and measured. These ancient scales uncontrollably pivot from side to side, and all await its judgment. One side of the pan carries parts of my identity that the world of science holds dear - American, educated, and able-bodied. The other side bears charming womanhood draped in multiculturalism. Which will tip the odds in my favor? Which will serve as the garroter of my dreams? Womanhood and multiculturalism serve as a constant reminder in STEM. Unfortunately, these attributes act as a defect and a barrier that the world of science cannot work past. I am a woman who is part Indigenous. A part of me left underexplored and bound to silence.

This dissertation examines:

- (a) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?
- (b) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

Pulling from previous work, the statement stands as a reflection of one of the largest parts of my multicultural identity in STEM's culture. Unaware at the time, I demonstrated the clashing of STEM's value systems and their power to shape experiences. Though the experiences of faculty and women in STEM generously grace the research scene, women of Color experiences

mix into a lump sum suppressing hyper-invisible populations, in particular, Indigenous women (Kant et al., 2018; Luna, 2016; Miles et al., 2021). Chapter two reviews the literature to explore Indigenous women's STEM faculty experiences and values. The review examines the derivation of values from Indigenous knowledge and the divergence from Western approaches. Western knowledge not only deteriorates Indigenous ways of knowing, but it erroneously generalizes non-White experiences as women of Color occurrence (Miles et al., 2021; Washington & Harris, 2001). The generic label removes the characteristics and individualism of Indigenous women. Indigenous women experiences lodge alongside women of Color occurrences on the sidelines; however, the distinction and hyper-invisibility of Indigenous women express their experiences sink deep into the margins. The application of two-eyed seeing (TES), both-ways learning (BWL), and hope frameworks reveal the contrast between Indigenous and Western knowledge in STEM and academic spaces. Applying the frameworks to the relevant literature review reveals confrontation of Indigenous and Western knowledge and highlights a gap on non-Natives understanding Indigenous experiences and values. This literature review calls attention to the vital need to travel the marginality of Indigenous women's STEM faculty values and experiences in my dissertation.

Indigenous Knowledge Backdrop

The Indigenous populations of Africa, Latin America, Oceania, North America, and Asia deem Native knowledge as the way of knowing or Indigenous science (Cajete, 2000; Semali & Kincheloe, 1999). Indigenous communities perceive their knowledge as living entities guarded by their stewards with the utmost care and respect (Simonds et al., 2013; Whap, 2001). Indigenous knowledge permits us to comprehend our relationships/lived experiences with the natural environment (Semali & Kincheloe, 1999). The knowledge serves the interest of the

Indigenous community for our betterment by holding our ancestral ties to each other, the land, and the environment. We convey our knowledge through oration, the connectedness of relationships, totems, dance, songs, myths, stories, and events of our daily lives (Whap, 2001). Knowledge weaves the past and present to craft the foundation of our existence and the north symbol of the internal compass to steer through life. Knowledge lives within its people. Morris (2010) characterizes Indigenous knowledge as local, shared, empirical, informal, changing, and ethical. For Indigenous scholars, we add to the collection of knowledge with our life journey. We cannot explain all of life's mysteries and accept supernatural elements to integrate into the natural world (Whap, 2001). Knowing our stories, understandings, experiences, and viewpoints reflects a thousand lifetimes of our people's power, hopes, and dreams residing in our hearts.

As modern science culture waves off Indigenous ways of knowing into a category of hokum, Indigenous science contains a well-grounded track record. The Afar tribe of northeastern Ethiopia uses Indigenous science to predict the weather through the observations of constellations, winds, animals, trees, and the sky (Balehegn, 2019). For example, ants walking in a zigzag predicted rain or crossing a tiny ditch indicated a drought (Balehegn, 2019). Traditional medicine stands as the oldest form of healthcare, and the plant database for treatment derives from African Indigenous knowledge (Mangare & Li, 2018). Food preservation of sun-drying, fermentation, and salting stems from the influence of Indigenous women's knowledge in the domestic sphere (Ibnouf, 2012). Before the invention of oceanographic instruments, Pacific Indigenous sailed the vast oceans relying on wave patterns and trade wind swells (Genz et al., 2009). The palms tapping technique and the fermentation of rice produce delightful Indigenous knowledge in winemaking (Okereke, 2019).

The definitions and considerations of draconian STEM with one way of seeing need immense expansion to encompass alternative ways of knowing (Johnson, 2024). In particular, the acceptance, collection, and interpretation of lived experiences. Indigenous knowledge expresses the importance of linking the past to the present. Through various experiences, multiple generations formulate a philosophical bridge of maneuvering the natural environment. Lived experiences take center stage in the constitution and meaning making of knowledge (Cajete, 2004). It forges "the basis for our explanation of reality before we rationalize it into categories of facts and apply scientific principles. In other words, it is a subjective experience that forms the basis for the objective explanation of the world" (Cajete, 2004, p. 45). Lived experiences provide clarity to the question of understanding reality. How do we know what we know (Lewis, 1934)? Moreover, actions, material and mental processes, emotions, activities/events, and observations fuse into experiences (Farrell, 1950). These indissoluble strands fasten themselves to knowledge systems. Thus, grasping the complexity and richness of Indigenous life experiences requires the inclusion of other methods, such as instrumentation (mind, body, soul), experiment (lived experiences, art, dance, myths, celebrations, etc.), representations (birthmarks, stories, physical symbols, etc.), humans (stewardship, responsibilities), ceremony (creativity, life associations, balance/renewal), elders (knowledge keepers, wisdom), life energy (expression of knowledge), dreams and visions (relationships to the world), paths (patterns, searches, quests), objectivity (subjective first), unity (diversity, harmony), spirit (science and supernatural coalesce), interpretation (reflection), cosmology (ultimate connection to creation of the universe), place (harmony of the land) (Cajete, 2004).

Power determines the market value of knowledge; however, the mechanisms of control cannot hold indefinitely (McAteer & Flannery, 2022). Foucault (1980) expressed the inseparable

links between knowledge and power. The highly influential determines the participation and components of knowledge creation and, by default, the preservation of certain truths (Sheridan, 1977). Developing alternative knowledge and power relations nurtures a transformative doorway to challenging and changing power (Foucault, 1980). Hence, uncoupling an Indigenous population from their knowledge construction, experiences, and dissemination undermines their power. The universal, valid, and rational landscape of Eurocentric theorizing purposefully excluded Indigenous knowledge systems when fabricating "worldview" literacies (Semali & Kincheloe, 1999; Suarta et al., 2022). The Eurocentric body of knowledge preserves power through a reward of privilege for those who favor it (Semali & Kincheloe, 1999). Though Indigenous knowledge takes an enigmatic and permeable shape, it contains a transformative power. Indigenous ways of knowing cultivate justice and empowerment for its people as "this transformative power involves the exploration of human consciousness, the nature of its production, and the process of its engagement with cultural difference" (Semali & Kincheloe, 1999, p. 15). Embracing Indigenous knowledge in STEM spaces may offer transformative shifts against the traditional science cultures and systems of knowledge for Indigenous and non-Indigenous to co-participate in establishing inclusive truths (Reano et al., 2025; Semali & Kincheloe, 1999; Shachter, 2024; Shotton, 2008, 2018, 2019).

Shotton (2008, 2018) studied the experience of eight Indigenous women in doctoral studies which became a key influence in degree completion. Shotton (2019, p. 7) "found that reliance on spirituality, grounding and connection to their Indigenous cultures, and desires to give back were integral to their success". Shachter (2024) shared that the Indigenous Knowledges, Encouragements, Engagements, and Experiences ('IKE) Alliance was formulated to support Native American, Alaska Native, Native Hawaiian, and Pacific Islander (NANA-

NHPI) students in STEM. The group indicated that the severe underrepresentation of Indigenous STEM students derives from a traditional science that does not reflect their experiences of beliefs or culture. The goal of IKE is to protect, welcome, and encourage Indigenous students' perceptions and experiences of science in American STEM-serving institutions (Shachter, 2024). Reano et al. (2025) note that some non-Native leaders in higher education understood Indigenous people's experiences concerning challenges in STEM but were unsure how to address the issues or provide long-term solutions. Co-creating a knowledge framework reveals power imbalances between knowledge systems and creates opportunities for reflection that restore the transformative value of Indigenous ways of knowing. (McAteer & Flannery, 2022; Semali & Kincheloe, 1999).

Searching for STEM Experiences of Indigenous Women

The scarcity of Indigenous women is physically and intangibly evident. Searching for their experiences or any connection to their being becomes a quandary in its expression and in the ways to unearth it. Thus, the misconstrued historical captures or layered restrictions add to Indigenous women and their invisibility in research. Thus, my research centers on Indigenous women's experiences, honoring both womanhood and Indigeneity. The following sections demonstrate other factors contributing to the visibility of purely an Indigenous woman experience. Essentially, it will set my dissertation work to study:

- (a) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?
- (b) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

The term "women of Color" encases the social constructs of gender and race. Though the overlaps appear simple and neat, the term overshadows the complexity of what is and how one experiences and navigates as a woman of Color. Latina, African American, Asian American, and Indigenous women in "research and practice suggest that women who are members of these groups are likely to share experiences related to identity, culture, and inequality" (Moraga & Anzaldúa, 2022, p. 821). A space for diverse women and their insights provides a collective perspective but may fabricate a false generalization of experiences. A precarious position for higher education as they may formulate success initiatives, policies, practices, work cultures, and more with good intentions. However, these attempts do not tend to effectively address the needs of their hyper-invisible faculty populations (Henry, 2012). Washington and Harris (2001) indicate the term "women of Color" binds various concepts relating to experiences, research, activism, and literature, suggesting multiple layers within the construct. These levels demonstrate the degree to which power and invisibility flexes. The combination of the terms presents challenges as "woman" is defined by the White woman perspective, and "Color" is rationalized by men of Color viewpoints. The characterization of a "woman of Color" seeks to illuminate differing experiences in hopes of organizational transformation (Washington & Harris, 2001). Gutiérrez and Rogoff (2003) contend there is a tendency of dominant groups placing a learning style and underrepresented minority groups in a category of traits that shepherd overgeneralization. The classification of all members as homogenous inflates a false expectation of skills and behaviors. The general labeling of individuals undermines the variety within the group's experiences and practices (Gutiérrez & Rogoff, 2003). Thus, it is imperative that research and the academy tread with care not to dissolve the individual characteristics that compose the collective "women of Color" narrative.

Similar to a snowflake design, the experiences of women of Color do not share an identical nature though similar instances may emerge. The broadening of conceptual associations of women of Color may overlook the voices and experiences belonging to the smaller population subsets, in particular, Indigenous women. Additionally, the umbrella framing of women of Color may erroneously typecast the Indigenous women's experience and voice, as drawing parallels when, in fact, there may lie a notable divergence.

A review of literature on faculty experiences connotes an absence of "women of Color" STEM faculty experiences and voices. The work of Corneille et al. (2019), Hurtado and Figueroa (2013), Fox-Tree and Vaid (2022), Llyod-Jones (2011), Main et al., (2023), Strings (2021), and Turner et al., (2008) elucidate the experiences of women of Color barely pings on the higher education faculty radar of research. Though each study broaches the gap in the experiences of women of Color, the articles do not specify the Indigenous women's occurrences, which alludes to another larger void in research. The application of another magnifying lens within the "women of Color" content reveals a more disconcerting gap surrounding Indigenous women STEM faculty. A gap in research persists on STEM Indigenous faculty experiences (Bryant, 2021; Stevens et al., 2021). Not surprisingly, only a handful of empirical studies have been conducted on Indigenous faculty experiences because many national studies and data collecting efforts do not include Indigenous faculty (Brayboy et al., 2014; Brayboy et al., 2012; Shotton et al., 2023), especially from the perspective of women STEM faculty of Pacific Island/Native Hawaiian, Alaskan Native, and American Indian descent. Additionally, the lack of literature/research provides very little detail on the inclusion/exclusion of Indigenous ways of knowing and experiences in institutional spaces, the role of leadership in supporting the recruitment and

retainment of Indigenous STEM faculty, and the factors leading to declining participation of Indigenous females in STEM disciplines.

The Significance and Value of Lived Experiences

Lived experiences are important. Auxier's (2003) study of doctoral students and faculty members in counseling training rooted in experiential learning highlighted the role of experience in shaping identity development within the profession. Houser (1991) demonstrated that tribal colleges with Native faculty recognize the significance of culture, community, and language in the Indigenous college experience, which differs from the universal American college experience. Non-native students attending tribal colleges acknowledge their minority status as beneficial to their college experience, as it helps them forge a pathway to understanding Indigenous values and community (Houser, 1991). Kirkness and Barnhardt (1991) detailed lived experiences and real-world practices as vital informants for First Nations' knowledge. The value and meaning of knowledge directly connect to lived experiences (Kirkness & Barnhardt, 1991). Pavel and Colby (1992) illuminated that the goals of Indigenous education go beyond academics and emphasize cultural and philosophical contributions to the community. Placing values at the forefront, alongside community and culture, sustains the inherent worth of an individual, thereby magnifying a positive college experience.

Here's what we know from Indigenous lived experiences in higher education. Bailey (2016) revealed that Indigenous students and Indigenous faculty experienced numerous challenges in university systems. Indigenous students acknowledge the rarity of Indigenous faculty to guide and support (Bailey, 2016). Benjamin et al. (2022) highlighted the struggles of Native students attending college in balancing community obligations with the pressure to abandon their cultural values. Kohout and Kleinfeld (1974) reported gradual improvement

among Alaskan Natives in attending college but experienced much lower improvement than non-Native college-bound students, a finding that remains relevant today. Miles et al. (2022) noted that women of Color experienced silencing and invisibility due to the homogeneity of institutional experiences. Woodcock and Alawiye (2001) noted the potential of faculty as a valuable force in creating a welcoming experience for Indigenous higher education students. Wright (1990) found that Indigenous faculty risked tenure and promotion to serve their cultural and higher education communities. Indigenous faculty became overextended in participation in higher education activities as they represented the only voice to bring Indigenous challenges centerstage.

And here's what some studies have recommended based on certain Indigenous lived experiences. Brayboy et al. (2012) recommended culturally responsive practices that incorporate community well-being and sovereignty to improve Indigenous students' and faculty members' experiences in higher education. Guyette and Heth (1984) indicated that the Indigenous experience of low educational attainment rates, limited healthcare accessibility, and high unemployment speaks to educational institutions' lack of support for Indigenous learners. Malin and Maidment (2003) suggested the importance of an educational Indigenous experience that incorporates holistic and social components as they are strongly connected and invest in the long-term well-being of Indigenous people. Shotton (2023) highlighted Native college experiences to provide guidance for higher education in developing culturally relevant services based on those experiences.

Indigenous Values

Values influence worldviews and the connections within them. The meaning of life and core beliefs derive from values. These values connect to lived experiences through actions and

decisions. These elements shape lived experiences that create a self-narrative, form habits, and influence our future selves. Values influence worldviews and the connections within them. For thousands of years, Indigenous values defined culture and heritage from generation to generation (Topkok et al., 2020). Humans use value to see the individual and communal perception of shared beliefs and well-being (Gratani et al., 2016). Therefore, Indigenous values should be treated as human values (Gratani et al., 2016). However, a major gap arises in considering Native and non-Indigenous people's values (Arnold, 2023). This conflict of values speaks to the need for a systematic form of accountability; however, their quantifiable measures do not account for sharing, kinship, and holistic relationships (Greer & Patel, 2000).

Reflecting on education, Topkok et al. (2020) note that non-Native educators often do not recognize or seek to understand the value of Indigenous communities. Leaning into one's values provides comfort, but it is not ideal in education, where diverse values are common, as it does not promote a learning community. "The educators within that school do not get to define what the students' values or worldviews are. Therefore, we all should be shaping our school's values into the same values as the community and incorporating those values in the classroom daily" (Topkok et al., 2020, p. 60). Indigenous educational values include domestic skills, families, hunting, respect for living and non-living entities, hard work, respect for Elders/honoring Elders, collaboration, honesty, sharing, and love for children (Topkok et al., 2020). Indigenous women leaders highly regarded the values instilled by the community and family, as they shaped their leadership (Shotton & Minthorn, 2020). These values included community service, loyalty, mentorship, honesty, and humility (Shotton & Minthorn, 2020). Indigenous educators value their Native students' work because they believe it contributes to successful Indigenous student outcomes (Asmar & Page, 2009). Other values encompass respect, relevance, reciprocity,

responsibility, relationship, and representation (Tsosie et al., 2024). In sum, values provide the connection to many aspects of how Indigenous people navigate relationships with living and non-living entities. Values facilitate cultural continuity, which helps with adjustments to a complex and changing world.

The literature demonstrates a grand crevasse between Indigenous and non-Native values, which influence heart-breaking experiences with the elimination of Indigenous values and the turbulence of Indigenous knowledge in dominant academic environments. Deloria et al. (2018) voice STEM education holds Western approaches and American assimilation policies as the benchmark for standards subjecting Indigenous knowledge experiences to erasure, framing the ideal of Indigenous identity, racialization, power dynamics, and dominating narratives. Indigenous knowledge values trusting relationships, sovereignty, dialectical partnership between Indigenous knowledge and science, self-defined citizenship, reciprocal and ethical relationships, and language (Deloria et al., 2018). Woodroffe et al. (2021) express Indigenous knowledge undergoes stress as STEM removes the Indigenous identity and language while exposing Indigenous individuals to racism. Counter to traditional science, Indigenous knowledge validates lived experiences and storytelling to facilitate learning. As knowledge is living, it bears the obligation to enhance self-care, reciprocity, community, and transcends all aspects of life (Woodroffe et al., 2021). Anthony-Stevens and Matsaw (2020) communicate that resistance to Indigenous knowledge by placing Western ways of knowing on a pedestal condones a behavior of hierarchal and lateral violence inducing traumatic experiences. These incidents of trepidation exhibit the need for Indigenous-centered scholarship to nourish Indigenous perspectives of long-term, holistic, and co-created solutions (Anthony-Stevens & Matsaw, 2020). Ruef et al. (2019) spell out one-way seeing in STEM classrooms which elevates one rigid ideology, which

generates Eurocentric ideals. The heteropatriarchal culture belittles Indigenous knowledge of language, cultural links, family contributions, and lived experiences (Ruef et al., 2019).

The literature also hones into certain purveyors of Indigenous knowledge, Indigenous faculty experiences. Castagno et al. (2023) assert Indigenous faculty experience cultural, ethical, and spiritual conflicts as STEM standards force hegemonic values. Faculty treasure tribal practices and history, language, knowledge sharing, community members, identity, elders, addressing Native challenges, and lived experiences (Castagno et al., 2023). Mohamed and Beagan (2018) indicate Indigenous faculty endure epistemological racism and poor treatment as work environments exude dominating attitudes of rewarding citations, grants, patents, journal impact factors, and social media. Components that do not take centerfold as preferred achievements for Indigenous faculty. These work cultures downgrade Indigenous principles for transformative knowledge and practices, passion for equity work, service, community-engaged research, balance, and ancestors (Mohamed & Beagan, 2018). Thomas et al. (2022) remark the academy's Western science lens influences Indigenous faculty to encounter overwhelming responsibility, no support, lateral violence and aggression, jealousy by non-Natives, and little recognition of service accomplishments. Indigenous faculty hold in high regard research and teachings that focus on community and family, relationships and trust-building priorities, the importance of service, and cultural understanding and preservation (Thomas et al., 2022).

The two-eyed seeing (TES), both-way learning (BWL), and hope frameworks specify a clash of values and manufacturing unsavory experiences. Consequently, the literature review illuminates the gap between engaging and understanding the Indigenous perspective to dissolve the fallacious narratives of incompatible cultures between Indigenous and non-Native

worldviews. Additionally, the literature review call attention to the significance of our proposed study Indigenous women STEM faculty to contribute a gap closure of experiences and values.

The Epicenter of Indigenous Women's Experiences

Indigenous women's experiences contribute to the larger frameworks of women of Color relationships in academia. However, deepening our understanding of individual narratives drives empowerment of the artifacts Indigenous women hold dear while avoiding the minimization of broadening their experiences and sweeping any Indigenous association in women of Color "catch-all" solutions or assumptions. Highlighting the uniqueness of Indigenous women demonstrates how they see and interpret the world. Fredericks (2011) speaks of Indigenous women as an asset to higher education; yet, the academy does not establish a two-way dialogue as the institution constructs an unsafe environment for Indigenous women. The academy learns about Indigenous populations from a bird's eye view which promotes a superficial understanding draped in misleading postulations. Focusing on the individual outside, the social group elevates uniqueness versus succumbing to reductive and deficit perspectives (Gutiérrez & Rogoff, 2003). Therefore, it is critical for Indigenous women to talk back to the academy to convey "our issues, our history, our worldviews, and our different knowledge" (Fredericks, 2011, p. 2). The ability to speak back to the academy gently excavates a pathway for dialogue to levitate Indigenous women's experiences (Leong et al., 2020).

Moreton-Robinson (2021) reveals Indigenous women's experiences build upon the ancestral collective of memories, indicating generational interwoven narratives. The expression of the "Indigenous self" is viewed individualistically, and the Indigenous self connects to others and across generations. In a sense, the experiences interweave multivocality and various relationships deeply ingrained into the concept of the Indigenous self. Therefore, traditional

writing fashions attempting to detail the Indigenous self constrain the social relationships tied and fail to encapsulate the intricacy of Indigenous experiences (Moreton-Robinson, 2021). Lived experiences act as a binding agent for the many facets of life and are inseparable from Indigenous women. Our words and experiences are the foundation of Indigenous research. Thus, Indigenous women's experiences take center stage in their knowledge production and separate from the academy's long-standing classification of knowledge production with theorizing, paradigms, and epistemologies (Archuleta, 2006). The omittance of lived experiences in the academy's consideration of knowledge production acts as a bulwark toward Indigenous women in the ways we theorize or constitute knowledge. Writing and speaking of our lived experiences provides the landscape to educate, heal, empower, and survive. Indigenous experiences serve as a beneficial roadmap or the record of knowledge for other Natives considering similar pathways. These narratives showcase how we navigate our way through life's cosmos. The action calls on the significance of finding our "home" to ameliorate suffering, distribute democratic power, and self-preserve and educate future Indigenous generations (Archuleta, 2006). More importantly, it urges the academy's need for Indigenous voices to unfold their stories before the world to preserve, integrate, and reconstruct Indigenous knowledge.

Clashing Ideological Engagements

Indigenous science stands as a knowledge system intertwined with Native values that offer the opportunity for improvement of research that influences decision-making (Whyte, 2017). By reclaiming our Indigenous values, we recover from trauma and push for a better version of ourselves (Goeman & Denetdale 2009). Valuing our ways of knowing validates and legitimizes our existence and human essence, which establishes the importance of Indigenous knowledge integration in classroom settings (Brayboy & Castagno, 2008; El-Hani & Souza de

Ferreira Bandeira, 2008). Therefore, STEM education should highly value multiperspective ways of knowing versus defaulting to a single knowledge system (El-Hani & Souza de Ferreira Bandeira, 2008). Though Indigenous science may fill the holes in Western data, scientists exhibit little value with Indigenous knowledge as they already may describe the world in Eurocentric measures (Whyte, 2017). The cultural clashes between Western and Indigenous sciences coerce scientism that devalues other ways of knowing (Southerland, 2000). Scientism becomes the benchmark of superiority and hegemony, rendering Indigenous knowledge the albatross in science (El-Hani & Souza de Ferreira Bandeira, 2008; Southerland, 2000). The following works illustrate the struggle of co-existence between Western and Native knowledge.

Benjamin et al. (1993) remark that culture ties to academic persistence which help influence academic success. The predictors of success include HS GPA, rank in class, and SAT/ACT scores but it does not apply to Indigenous students as they are unique. The development of persistence to head toward academic success relies on family support, student support services, and pre-college preparation (Benjamin et al., 1993). The deterioration of persistence includes finances and cultural differences (Benjamin et al., 1993). Brayboy et al. (2012) state the academic success of Indigenous populations requires establishing dialogue between the academy and Indigenous communities. Kirkness and Barnhardt (1991) comment the academy stops the decline of the Indigenous populace by respecting their worldviews instead of demanding assimilation. Miles et al. (2022) assert STEM lacks the inclusion of Indigenous women's perspectives and cultural links to science. Woodcock and Alawiye (2001) communicate the hopeful impact universities have on Indigenous populations when the institutions actively seek culturally responsive practices. These research articles highlight the divide between culture, knowledge, and values that are often present between Indigenous and Western knowledge.

Too Often, We Walk Alone

Grant-Vallone et al. (2003) remark that underrepresented student populations undergo many transitions in academic environments that require an increase in support and intervention. Students with support systems experience an improvement with social and academic adjustments (Grant-Vallone et al., 2003). Furnishing a support environment for Indigenous students boosts successful completions, retention rates, and student experiences, leading to prosperous lives (Shah & Widin, 2010). Unfortunately, the cultural experiences students bring into the academy find very little support (HeavyRunner, 2009). Furthermore, the development of Indigenous student persistence meets a bulwark as the institution programs often exclude Native ways of knowing (Walton et al., 2020). The succeeding works expose the academy's underserving of Indigenous students to which they are alone in reaching their achievements.

Auxier (2003) discusses the struggles of South Pacific students in educational settings that derive from severing their communities and producing cultural gaps. Bailey (2016) reports Indigenous students experience anti-Indigenous climates in universities, with non-Natives undergoing little to no consideration of Indigenous students' interactions and perceptions, creating unsafe environments prompting hidden Indigenous identity, instructor ridiculing of Indigenous knowledge, social and academic isolation, ignorance of Indigenous beliefs, and limited resources. Guyette and Heth (1984) note the educational and support programs do not entirely meet the needs of Indigenous students. Houser (1991) demonstrates the hardships of non-Indigenous institutions, and tribal colleges answer the call to provide Indigenous students with a method of healing and restoration. Kohout and Kleinfeld (1974) mention the success of Indigenous increases with access to programs catering to their needs. Malin and Maidment (2003) express improvements in Indigenous education; however, the gaps between Indigenous

and non-Indigenous support systems remain vast. Pavel and Colby (1992) voice that community colleges' careful advising and understanding of Indigenous students make a difference in success. Shotton et al. (2013) articulate the importance of comprehending Indigenous students to move past academic challenges. Solyom (2014) indicates Indigenous students developing persistence as climate culture pushes them out of academia despite the diversity initiatives. Wright (1990) stresses the importance of the academy to grow the development of Indigenous programs as they serve the go beyond course knowledge and offer pillar of various support. Together, these studies highlight the ways in which the Indigenous student experience is often isolated through the silencing of their existing culture and ways of knowing.

Other Rising Challenges

Chapter One stated the issue of extremely low participation of under 0.5 percent in STEM which impacted the pool of potential of STEM faculty and information on their experiences. Other challenges contribute to the invisibility of experiences of Indigenous women in STEM faculty roles. As doctoral programs become natural feeders into the faculty workforce, very limited research pertains to women of Color doctoral experiences (Leong et al., 2020; Ramirez, 2014). Previous research spells out the struggles in doctoral training, which derails the interest of students of Color in pursuing faculty positions (Ramirez, 2014). The chances of Indigenous graduates transitioning into academic positions are low as Indigenous students walk their educational journeys alone (Leong et al., 2020; Pidgeon, 2014). The hope, passions, and dreams of Indigenous students begin to slowly extinguish, exposing them to a misery of the acutest kind. Entrenched in the dark side of academia, Indigenous graduates grapple to find mentorship and guidance since Indigenous faculty or allies understanding and supportive of Indigeneity are too few and far between (Pidgeon, 2014). The graduate experiences of crippling

neglect push Indigenous students to place any thoughts of pursuing a career in higher education in the rearview mirror after graduation (Leong et al., 2020). The doctoral students of Color experiences include overwhelming workloads destroying confidence, poor peer and faculty diversity creating alienation and isolation, and a traditional academic culture and graduate curriculum devaluing non-Eurocentric knowledge (Ramirez, 2014). These practices sustain one-sided knowledge production as the pool of heterogeneous faculty shrinks into obscurity.

Indigenous women's experiences may lean into feminism, highlighting women's perspectives but minimizing Indigeneity. It is imperative this dissertation work honors both Indigeneity and womanhood when interpreting these experiences. As this Smith (2005) describes some existing literature on Indigenous experiences filters through feminism, which refracts the stories. A portion of Indigenous women disagrees with the general labeling of feminism on their perspectives because it places a snippet of a narrative versus it exuding entirety. Indigenous women endure multiple encounters that simultaneously occur within one experience. Indigenous women may come across intertwined incidents within society and their communities (Smith, 2005), rendering various sub-elements into an overarching experience. For example, Indigenous women may encounter degrees of gender bias or discrimination in their communities, workplaces, and society that contribute to a larger experience of sexism. Additionally, Indigenous women faculty face criticism and rejection when their scholarship amends or drifts outside the establishment's consideration of valuable knowledge. As Icarus flies too close to the sun, we head toward a disastrous career faux pas when carving space for Indigenous purveyors of thought. We become labeled by non-Indigenous as overly fixated on Indigenous identity or unable to grasp the esteemed Eurocentric concepts (Leong et al., 2020).

Many datasets in the quantitative perspective of higher education of Indigenous populations remain insufficient, contain culturally irrelevant variables (Lopez, 2020) that are inconsistent and immaterial (Rainie et al., 2017). Quantitative studies overlook Native American populations in higher education because of the severely limited numbers present (Leong et al., 2020). The perforated data proves problematic as it fosters misconceptions, heightens invisibility (Lopez, 2020) and mistrust for Indigenous communities (Rainie et al., 2017). A disheartening prospect since the results of quantitative data collection may provide the basis for decision-making from communities to higher education (Lopez, 2020; Rainie et al., 2017). The sample size influencing statistical significance enables invisibility (Lopez, 2020). Consequently, the minuscule Indigenous populations wrestle with emphasizing extraordinary necessities in data or choices dependent on positivist-leaning research. For these reasons, I contend the importance of higher education to realize the extent of their efforts in increasing faculty diversity leaves Indigenous women populations on the sidelines with a finite amount of equitably amassed, context-specific, and accurate culturally induced information.

Additional Viewpoints from One STEM Field

As we zoom into one STEM field that has struggled to diversify, engineering education, we can see several overlaps with the themes above in Indigenous experience in higher education. Counter to the Indigenous women faculty experiences, an autoethnographic study of three non-Native women in engineering divulges a staunch sense of belonging, high value of work, and welcoming environment of other disciplines (Hladik et al., 2023). However, much like Indigenous students/faculty, the women struggled with bringing their entire identity into spaces (Hladik et al., 2023). Cicek et al. (2023) recognize the importance of decolonizing engineering education through Indigenous community involvement through partnerships for blending

Western and Indigenous ideologies while also recognizing these efforts have not been made on a large scale. Secules and Masta (2021) acknowledge the need for an increase in the examination of power dynamics by applying ethnography techniques to expand classroom equity. Secules and Masta (2020) detail the importance of not only theory but also practices that come into the fold of equitable engineering classrooms by faculty understanding of social cultural and critical learning, positionalities, and traditional and institutional barriers. Cicek et al. (2022) communicate the importance of an integrated course design for Indigenous and non-native students as it enhances problem-solving and benefits the discipline. Though some scholars in STEM fields propose steps in the right direction, in order to do this well, these steps warrant a deep exploration of Indigenous experiences, values, and the inclusion of Indigenous student/faculty voice through self-narratives to view the world through our eyes.

Why it Matters?

The literature review and previous research work cast light on the Native existence within the science margins, entailing several Indigenous struggling to make sense of the world and themselves dressed in Indigeneity (Macedo, 1999). The acceptance of Indigenous ways of knowing opens the door to fully encouraging appreciation and understanding that decolonizes classrooms and welcomes Indigenous student populations (Macedo, 1999). Furthermore, Indigenous knowledge embodies a transformative power across many cultural contexts (Semali & Kincheloe, 1999). "A key aspect of this transformative power involves the exploration of human consciousness, the nature of its production, and the process of its engagement with cultural differences" (Semali & Kincheloe, 1999, p. 15). Similarly, Freire and Faundez (1989) contend the richness of Indigenous knowledge as a justice instrument able to drive any social changes. The integration of Native and Western knowledge systems begins the pathway for

transformative science education through reflective and intuitive practices (Semali & Kincheloe, 1999). Indigenous knowledge stimulates dialogue with oneself and the relationships with the natural environment (Maurial, 1999). Dialogue fosters an intercultural education prevailing in Western challenges (Maurial, 1999) and looks beyond one universal and superior truth (George, 1999; Macedo, 1999). This advocates the call for the academy to improve STEM education and facilitate a strong Indigenous faculty base (George, 1999). The presence of Indigeneity in education offers a reclaiming and transformative process of Native identity (Hill & Wilkinson, 2014). Overall, reaching the height or claims of "transformative education" demands the inclusion of Indigenous cultural components by sharing and co-creating worldviews (Ball, 2004).

What is STEM?

In the 1990s, the National Science Foundation (NSF) generated the STEM acronym (Bybee, 2013). Soon, STEM emerged across the educational context. The words STEM education puzzled many, as it is unclear what it means. Beyond the representation of each discipline, misunderstandings arose about how the disciplines are integrated, and conceptions widely vary among the audience (Breiner et al., 2012). A 2010 survey found that many STEM professionals associated the acronym with stem cell research or plants (Keefe, 2010). Some think of STEM as historically more focused on math and science than on technology and engineering (Bybee, 2013). To some educators, STEM means integrating career experiences into the classroom or encouraging degree completion in STEM fields (Breiner et al., 2012). STEM has shaped policies and curricula from the national level down to the academy reform (Bybee, 2013). Thinking of the origin of STEM with WWII to now, the federal government perceives STEM as the answer to global competitiveness, from national defense to medical cures. The proof lies in federal funding for multiple STEM-related entities through STEM programming, which

demonstrates the influence of the federal government and spotlights the overall mission of STEM education. Breiner et al. (2012, p.3) share "programs with emphasis on STEM have been formed to tackle this initiative of transforming the current educational paradigm toward a STEM education perspective".

The Vast Definitions of STEM

STEM education suggests innovation and creativity; it also offers opportunities for interdisciplinary integration. Nevertheless, issues arise with its definition, which is ambiguous and dependent on the audience—the vagueness and lack of consensus affect goals, policies, and curriculum (Bybee, 2013). STEM draws out multiple perspectives that possess a call to action but lose translation in the finer points (Breiner et al., 2012). Bybee (2013) defines STEM by the related goals of STEM literacy, modern career competency development, and advancing innovation. Alkholy et al. (2013, p. 9) mention Indigenous and Western science as "the human endeavor to systematically explore and explain the natural world, through inquiry and pedagogy." The Indigenous connection of the human endeavor piece displays the Indigenous knowledge goal of refining life for the greater good. I take highlight the openness in Indigenous science for exploring this human endeavor as humans contain a sharedness and uniqueness.

Separating the STEM disciplines increases the uniqueness of definitions that outline the field's purpose. The "S" in science investigates the natural world (Burghardt and Hacker, 2004; Kelley & Knowles, 2016). The "T" in technology "meet human wants and needs" through design, manufacturing, and development (Hasanah, 2020, p.1). The "E" in engineering advances the betterment of humanity by harnessing the forces of nature and the properties of materials (Hasanah, 2020). The "M" in math bestows the precise language and patterns for STEM (Dugger, 2010). Combining STEM into an education discipline means it acts on initiatives that tie back to

their respective fields. Therefore, the integration of all four disciplines in STEM education is considered an initiative that addresses real-world issues (Hasanah, 2020).

With the term STEM defined by the perspective or purpose by diverse stakeholders, this explains the lack of agreement around it; furthermore, the constant contrast with knowledge holders, in particular, Indigenous ways of knowing. If STEM extracts multiple perspectives and definitions, then who is to say what, and who participates in the creation of STEM knowledge? Why does STEM frame a mindset around selective definitions or systems of knowledge? I note that placing limitations on STEM knowledge weaken innovation and stifle creativity, especially for Indigenous populations. To add, fields that attempt to reform STEM's one-dimensional mindset counter STEM's historical inflexibility in encouraging transformative thinking by any means.

The Integration of STEM Education

A Brief History

The seizure of Indigenous land paved the way for America's engineering foundation. Reynolds (1992) detailed that the Morrill Act of 1862 seized Native land to establish land-grant colleges and universities to enhance America's economic prosperity through programs in fields such as engineering. Although engineering existed before 1862, it relied on an apprenticeship model that produced quality engineers, but only on a small scale. The rising demand in a developing America and the opening of college engineering programs ushered in the engineering programs of today (Reynolds, 1992). ~~With the Morrill Act~~ About 47 percent of the top 50 engineering programs, 57 percent of PhD programs from the top 50 schools, 44 states ranked in the top 500 universities in the world, and 95 percent of the Nation's engineering population owe their learning opportunities to the Morrill Act (William, 2009). America experienced the growth

of academic disciplines and training that prompted numerous societal and individual benefits: economic stability, community engagement, health and life expectancy improvements, critical thinking skills, and more (Chan, 2016). Many STEM degrees have lower employment rates but higher compensation (Vedder, 2018). Ironically, the Morrill Act benefits come at the expense of Indigenous populations, and their negative impact strongly lingers.

The Industrial Revolution brought innovation and invention with a subtle hint of STEM. The eighteenth-century concept of science and technology practices lacked understanding of its application to the manufacturing process, in contrast to the development of civil engineering as a distinct discipline (Jacob, 2006). Mills (2021, p.75) conveyed "with a few notable exceptions, most inventions of the Industrial Revolution required little, if any, formal knowledge of the cutting-edge science of the day. And most of the inventors were not educated scientists but skilled artisans and craftsmen". Some inventions required scientific knowledge, as in Newton's three laws of motion; however, some historians of science argue that an artisan's trial-and-error process, without scientific rigor, was at work (Lipsey & Bekar, 2000). Hence, the connection between STEM and the First Industrial Revolution remained loose and subjective until WW II. In modern times, we find ourselves in the fourth industrial revolution, with a growing interest in integrating Indigenous knowledge as an ideal form of an innovative knowledge ecosystem (Mawere, 2024; Oguamanam, 2022). Until the fourth iteration, Indigenous knowledge was characterized by exclusivism (Bag, 2017). However, Indigenous people played an integral role in "knowledge extraction" for industrial development (Booth & Skelton, 2011, p. 685).

Winarni et al. (2016) illustrate the formation of STEM (Science, Technology, Engineering, Mathematics) education in response to the technological advances needed during World War II. STEM emerged through the collective efforts of the military and scientists. We see

the necessity of STEM in professional fields, but not educational institutions. In other words, STEM education does not appear to surface and operate as the well-known conglomerate until the Twentieth Century. In 1969, the strengthening of STEM education emerged with STEM research on the National Assessment of Educational Progress (NAEP) amid concerns about American students' science and mathematical abilities compared with those of other countries (Winarni et al., 2016). However, in the 1990s, STEM research breathed life into academic institutions as the forefront of innovative education (Widya et al., 2019; Winarni et al., 2016).

The early development of STEM (Science, Technology, Engineering, and Mathematics) was driven by necessity. Key events such as the Morrill Act, the First Industrial Revolution, and World War II highlight America's commitment to innovation and growth. Today, the pursuit of STEM innovation remains strong. Innovation leads to breakthroughs and solutions that enhance human welfare, expand collective knowledge, and maintain our competitive advantage.

In the following section, I will discuss the relationship between STEM innovation and an integrated learning process as opposed to a rigid knowledge system. The current perception of innovation within STEM tends to promote one-dimensional thinking, which undermines intellectual diversity, particularly the contributions of Indigenous women, and challenges traditional STEM's concept of innovation itself.

Integrating Innovative Learning

An overarching association with STEM centers on innovation, which in turn suggests creative mindsets or stepping outside the box. Looking into the history of STEM, many see how it has shaped the future we live in today. Today's people lay the groundwork for the next generation. Each generation should build on its knowledge to create a better world. STEM innovation includes artificial intelligence, improvements in disability, corporate modernization,

strengthening the economy, and more (Atkinson & Mayo, 2010; Daehn & Croxson, 2021; Hsieh et al., 2022; Leon et al., 2025). Additionally, Sternberg et al. (2003) detail creativity as part of the thought process for generating "creative contributions" (p. 159). Creative thinkers help generate new ideas and solutions to problems, thereby improving individuals and humanity. Sternberg et al. (2003, p.158) note:

Creativity is a topic of wide scope that is important at both the individual and societal levels for a wide range of task domains. At an individual level, creativity is relevant, for example, when solving problems on the job and daily life. At a societal level, creativity can lead to new scientific findings, new movements in art, new inventions, and new societal programs. The economic importance of creativity is clear because new products or services create jobs.

To think creatively, one must learn in a way that unleashes scientific imagination. Learning causes one to think, and thinking gives rise to learning (Lombrozo, 2019). Since the challenges of the world are complex, it may rely on not only explicit but also implicit knowledge. Mental stimulations "draw out implicit knowledge" (Clement, 2009, p. 694). I share the constructivist and sociocultural perspectives that encourage a learning that unearths implicit knowledge, opens a space for creativity and STEAM education, pushes innovative learning, and grants a voice to Indigenous science worldviews.

In line with the constructivist viewpoints on innovative thinking, students must learn beyond memorization when solving problems. Discovery undergoes engagement and grappling with ideas (Slavin, 2012). The perspectives of constructivism foster holistic thinking and a core of STEM education, which powers innovation as it guides one through various learning experiences, making the qualities of learning solid and pliable (Di et al., 2021). Constructivist

learning "advocates that there is no universal rule among different situations and the abstract concepts and rules are often unable to adapt to the changes of specific situations" (Di et al., 2021, p.64). Traditional learning places objectivism front and center; however, constructivism emphasizes that learners harness their lived experiences and existing knowledge to frame a way of knowing through active engagement with their surroundings (Di et al., 2021). Therefore, student-centered learning that empowers the mind requires students to create their own knowledge, with educators encouraging these learning opportunities (Slavin, 2012). On creativity, Jean Piaget (1952), a notable constructivist learning leader, agreed that learning arises from engagement with the environment. Piaget added that a sense of accomplishment motivated students' knowledge and was essential to creativity. Weaving constructivist thinking and innovation, Indigenous lived experiences often serve as generational knowledge they carry into the classroom or create to pass on to future community members (Wesley-Esquimaux, 2010). The continuous evolution and growth of knowledge are innovating the Indigenous perspective on a good life (Smylie et al., 2014). Creativity and Indigenous lived experiences embolden transformative learning, as they involve the negotiation of conventions and the exercise of inventiveness (Guntarik & Daley, 2017; Harding, 2010). Creativity combined with Indigenous lived experiences amplifies voice, empowers healing, erodes impediments, and models active listening in research (Brearley & Hamm, 2013; Harding, 2010; Tabor, 2023).

Constructivism exhibits strong roots in science education and learning (Di et al., 2021; Elstad & Davis, 2017; Widya et al., 2019; Winarni et al., 2016). However, "constructivism in education is a well-recognized approach to teaching science, but often fails to achieve its goals, especially among students who have not been inculcated with cultural norms that emphasize the importance of aggressive inquiry and the challenge of existing dogma" (Elstad & Davis, 2017,

p.1). On that account, I add the commonalities with sociocultural worldviews to strengthen innovative and creative learning in STEM education and for Indigenous populations bound for STEM disciplines. Sociocultural perspectives on learning occur through social, cultural, and historical interactions. Educators understand that learning transpires across a diverse spectrum of students and encourages unique development (Polly et al., 2017). Dewey (1938), one leader of the sociocultural movement, believed that learning was optimal through experiences enacted with the environment. Therefore, academic institutions should focus on learners' interests and connect with their everyday lives. This bridge provides a richer learning experience and builds layers of growth (Cote, 2011). Jerome Bruner (1966), a leading American educational theorist, stated that knowledge creation followed a narrative (creative) and paradigmatic (analytical) path.

Science claims its stance in "value-free, objective, and universal truth" (Carter, 2008, p. 165). This dissertation adds to other scholarly work that STEM knowledge leans into different forms of subjective learning, similar to constructivism and socioculturalism, with Indigenous overtones as "its coexistence with other various and multiple local/indigenous versions of science" (Carter, 2008, p. 165). Contemplating the Twenty-first Century's challenges, the complexities of human difficulties intersect with political, cultural, and social contexts. Therefore, STEM approaches must reciprocate in kind. The integration of sociocultural learning into STEM education enables researchers and educators to innovate their practices to provide students with a more authentic STEM learning experience (Carter, 2008). Socioculturalism excavates an innovative pathway for interdisciplinary understanding by connecting the sharedness of endless knowledge to magnify educator development and design progressive classrooms that dispatch innovative students into the community (Nieveen et al., 2010).

Indigenous knowledge aligns with sociocultural learning in that it is relevant to one's natural setting, which further the understanding of scientific knowledge (Zidny & Eilks, 2018). With the natural world shaped by local context and differing for everyone, the concerns of that area take an interdisciplinary approach but reveal meaning. This dissertation supports that Indigenous knowledge encourages innovative and creative thinking and learning. The innovation similar to the early intentions of STEM education. Oftentimes, a textbook solution does not present itself, or applying a broad explanation does not resolve the root of an issue. Consequently, "science education to be accepted as meaningful by students in a certain community must be based on their sociocultural identity" (Zidny & Eilks, 2018, p. 250).

I see the necessity of merging arts and science to solve real-world challenges, as the problem-solver draws on both pathways of knowledge creation. Drawing on constructivist and sociocultural concepts, educators serve as guides to facilitate learning and promote self-directed learning contains the potential for merging science and arts. In other words, the students interpret and contribute to knowledge creation that strays from generalizations and universal pathways and includes various knowledge systems. The overlap between sociocultural and constructivist perspectives in learning allows us to make meaning individually within a broader social and cultural context. Thinking about Indigenous knowledge, socioculturalism, and constructivism is an eb-and-flow process that heightens creativity and innovative reasoning in STEM education. Indigenous knowledge examines individual and whole components. I insist that constructivism is well-suited for individual Indigenous learning through lived experiences. Cultural, political, and social interactions shape some of those learning experiences and expand future learning. On that account, the merger of constructivism and socioculturalism finds an appropriate position for this

dissertation on Indigenous women in STEM to consider their lived experiences in STEM knowledge creation and problem-solving that may differ from traditional STEM approaches.

These viewpoints on learning in STEM hold water, as classroom instruction builds on the foundation of solving real-world problems. The problem-solving process of scientists and engineers calls for STEM education, which was seen as an interdisciplinary approach (Winarni et al., 2016). Historically, in US K-12 STEM education, the subjects found themselves isolated and subjected to isolated teaching approaches. However, the Common Core State Standards for Mathematics (CCSSM) and the Next Generation Science Standards (NGSS) call for stronger connections among the STEM disciplines (NRC, 2014). Other advocates assert, "teaching STEM in a more connected manner, especially in the context of real-world issues, can make the STEM subjects more relevant to students and teachers. This in turn can enhance motivation for learning and improve student interest, achievement, and persistence" (NRC, 2014, p. 1). The integrated approach to STEM removes stark divisions among subjects and offers the best approach to STEM education as the subjects overlap (Widya et al., 2019; Winarni et al., 2016). Nonetheless, integrating STEM education presents several pitfalls that ripple through higher education.

STEAM Education

The previous section details the unclear definitions of STEM. As anticipated with Indigenous points of view, our knowledge sets an expectation of bridging humanity in STEM inquiry. I am not alone. STEAM education contains the possibility to fold in Indigenous lived experiences and other subjective truths. A worldwide movement seeks to evolve STEM into STEAM education (Li, 2023). The reason stands on a worthy cause to "hoping to transform STEM into STEAM by means of educational reform, enhancing students' science knowledge and practical skills while emphasizing their humanistic and artistic cultivation" (Li, 2023, p. 46). The

birth of STEAM education facilitates the inherent worth of all. Without the arts, "STEM education itself is closely related to mathematics and science, it places too much emphasis on the guidance of rational and logical thinking and neglects the study of students' independent imagination, creativity and abstract thinking, which cannot fully adapt to the development of the times" (Li, 2023, p. 46). Similar to STEAM, Indigenous knowledge weaves arts, culture, and science. Indigenous STEAM cultivates context-specific problem solving, sharing narratives, multimodal and multilingual scientific communication, and healing (Barajas-López & Bang, 2018; O' Conner, 2020; Peters, 2023; Skyer & McKay-Cody, 2025). STEAM aids the Indigenous individuals which paves the way for other non-Natives or invisible voices in STEM.

Widya et al. (2019) and Winarni et al. (2016) agree that integrating STEM problem-solving would foster students' creative mindsets. However, I expand on the idea of creatively resolving challenges through the arts and open discussion for populations who see STEAM in their problem-solving and knowledge creation similar to Indigenous populations. In Korea, the blending of arts in STEAM found support among educators and students, as it fostered creativity, character development, and convergent thinking (Park et al., 2016). Firmansyah & Aslan (2025) claim the power of STEAM is highly relevant to preparing students for today's job market. STEAM encourages critical and innovative thinking beyond mere knowledge mastery (Firmansyah & Aslan, 2025). "The element of art in STEAM Education should not be overlooked, as art plays an important role in encouraging creativity and innovation. Art teaches students to think outside the box, explore different perspectives, and express their ideas in unique ways" (Firmansyah & Aslan, 2025, p.11). STEAM deepens exploration and connects the dots across several disciplines but opens a space for humanization with emotions and reflections to comprehend the social and cultural intricacies of the world (Catterall, 2017). Students involved

in STEAM demonstrated significant improvements in attitudes, skills, and knowledge (Yim et al., 2024). Furthermore, the arts nurture participation by all, increase accessibility for all STEM students, and expand pathways for underrepresented populations in STEM (Burnard et al., 2012; Leavy et al., 2023; Papavlasopoulou et al., 2019; Yim et al., 2024).

Grounding this work in STEAM allows art to propel a constructivist self-learning journey rooted in lived experiences. Art centers on creative self-interpretation and self-expression of knowledge, which forges self-learning in STEAM (Trisna et al., 2022). The educator may delegate instruction but cannot impose artistic meaning on students, as such an act would violate artistic license. Integrating sociocultural art concepts into STEAM grants enables students to bring multiple values and perspectives into the learning space, "for learners to bring spiritual, ecological, sociocultural, and humanitarian perspectives in STEM education" (Lamichhane, 2021, p. 47). Art inspires a student's self-reflection on their inner world. By examining our "cultural self-knowing", we understand the commonalities of "shared values, beliefs, emotionality, and spirituality work as a dorsal spine to learn and make their different identities and worldviews (Lamichhane, 2021, p. 48). Braiding STEAM and Indigenous learning, the arts harmonize Indigenous values with existing, contemporary, and future knowledge (Soeharyadi & Iskandar, 2024). Art positions a learner to discover self-value through self-exploration in a judgment-free zone. The topic of values is vast but closely tied to Indigenous self-worth.

Therefore, this study heartily supports the importance of STEAM, especially in higher education, as the future transformation of STEM education. Most significantly, increasing the threshold for Indigenous participation in STEM. The following subsections detail the connection between the arts and their importance for the visibility of Indigenous populations. Moreover,

chapters four and five will deepen the understanding of art, science, and culture for Indigenous women in STEM faculty positions at higher education institutions.

STEAM and Indigenous Science Storytelling

I contend that the Indigenous mindset is situated in STEAM. A study of Native students in South Dakota revealed that most will not consider STEM due to its portrayal of privilege rather than nurturing others (Kant et al., 2018). Indigenous high school girls interested in pursuing STEM degrees indicated that their motivation was to improve their home communities (Kant et al., 2018). After these girls participated in a STEAM program focused on culturally relevant activities, their positivity and attitudes about STEM increased (Kant et al., 2018). Decades of previous research and case studies reinforce the concept of STEAMM+D (science, technology, engineering, arts, mathematics, medicine, and design) that honors Indigenous knowledge by dissolving barriers to innovation and creativity, strengthening interdisciplinary thinking, supporting imaginative empathy and holistic approaches, and promoting cultural diversity (Diamond, 2019). The aspect of STEAM I emphasize is its capacity for Indigenous science storytelling of data. In this case, Indigenous women who story tell their lived experiences as STEM faculty members in higher education.

For over 30,000 years, humans have engaged in storytelling communication, while Natives have done so for tens of thousands of years (Lee et al., 2019). Indigenous cultural knowledge and teachings are rooted in storytelling and relationships, reminding Indigenous people that their knowledge is always tied to “inclusion, engagement, and relevancy” (Lee et al., 2019, p. 1). Additionally, neuroscience champions this form of communication as our minds process storytelling effectively, leading to greater understanding and retention (Gupta & Jha, 2022). Storytelling offers a dual learning system that integrates Western and Indigenous

knowledge, honoring both sides of the truth (Lee et al., 2019). Indigenous science storytelling proposes a space for Indigenous communities to translate their holistic language and concepts into STEM principles (Vogt et al., 2021). Stories create an active listener audience who become aware of the individual and their community with the teaching of their way of being (Marin et al., 2020). “On another level, through story, human people and communities create environments for each other’s learning (epistemological practices) and can make social dreaming – the joint orientation to a pursuit of new horizons — possible” (Espinoza, 2008, as cited by Martin et al., 2020, p. 2200). Namely, storytelling in STEM education becomes a lifeline that connects an Indigenous learner’s world to non-Native surroundings (Morrison et al., 2025). Therefore, the unique landscape of storytelling makes the deep fostering of cultural knowledge able to co-exist in STEM education. Reflecting the dual learning of storytelling, it may better inform solutions to aspects of challenges below the surface. My dissertation examines storytelling techniques to unearth the lived experiences of Indigenous women in STEM, honor deep cultural knowledge, and advocate for more STEAM in higher education. Most significantly, it humanizes their existence.

The Arts = Creatively Humanizing Education

The moral consideration of humanity as a bedrock of education fosters the idea of an enlightened society that collaborates across various groups. Elevating the human condition for all brings mindfulness, instills higher education qualities, optimizes the educator and student relationship, opens reflexive dialogue, elicits transformation that changes society, stimulates emotional learning, and forms creative development (Aberšek et al., 2023; Camangian & Cariaga, 2022; Revenko et al., 2023; Sabirova et al., 2019; Semyonov, 2001; Soares et al., 2024; Zhuravlyova & Zhuravlyov, 2015). The historical detriment suffered by Indigenous populations,

similar to the Morrill Act, speaks to their faint presence in academic spaces (Benally, 2020-2022; Reynolds, 1992). The atrocities illuminate the need for humanizing educational environments to empathize with the repercussions of generational agony instead of the stripping of their dignity (Benally, 2020-2022). To craft a humanizing higher education space, removes traditional wounding practices based on one-sided views. Stepping into a humancentric environment sustains a dialogic connection that shepherds co-creating with Indigenous knowledge (San Pedro & Kinloch, 2017).

The Cambridge Dictionary (2025) defines creativity as "the ability to produce original and unusual ideas or make something new or imaginative." Merriam-Webster (2025) characterizes creativity as "the ability to create or the quality of being creative." The American Psychological Association (APA; 2018) describes creativity as "the ability to produce or develop original work, theories, techniques, or thoughts. A creative individual typically displays originality, imagination, and expressiveness. Analyses have failed to ascertain why one individual is more creative than another, but creativity does appear to be a very durable trait." For Indigenous populations, creativity often serves as a spirit or force connected to our soul (Bhawuk, 2019; Whyte & Toll, 2023). No matter the descriptions of creativity, I view it as an inseparable and malleable strength carried into every space. Separating these entities within a person appears dehumanizing.

Humanity and creativity are intrinsically tied. One educational philosophy emphasizes art-based education as a means of developing creativity, thereby fostering humanization. The human pathway is contextual (Cote, 2011, p. 134). Cote (2011) describes the expansion of creativity as humanizing the "values of individual growth and enlightenment. This approach to learning is to develop the innate potential of every person." According to Abraham Maslow

(1968), a humanist theorist, the hierarchy of needs applies to all humans, and education becomes the driving force toward the highest level. From this peak, an individual reaches their most significant potential. Therefore, art provides a humanizing effect when creativity spurs the human essence of problem-solving, individual expression, and other ways of knowledge creation. I note the arts in STEAM aides in the humanization of STEM and its Indigenous members.

Theoretical Framework Through Our Eyes

The literature on experiences suggests predominating external forces but vaguely alludes to the connection of experiences with valuing and devaluing. To add, the mention of values does not consider the perspectives of Indigenous women. Therefore, the theoretical frameworks connect to the study inquiries of;

- (a) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?
- (b) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

The nature of traditional and non-Native research approaches beguiles the reader with a myopic view of any Indigenous associations. These practices underpin the equitable need for Indigenous-led and Indigenous-centered applications. We warrant "the right, the space, the voice to tell our own stories from our own perspectives" (Smith, 2019, p. xi). Hence, my dissertation draws upon two-eyed seeing (TES; Bartlett et al., 2012), both-way learning (Bat et al., 2014), and hope (Freire, 1995) as philosophical frameworks to guide this research. Please note Paulo Freire does not identify as Indigenous; however, Freire's work trends outside dominant research norms and

practices. More chiefly, Freire (1995) concepts of humanization engrained in hope aligns with Indigenous communities' priorities to embrace hope as their saving grace, muting adversity (Chew, 2019; Stewart-Harawira, 2005; Wood et al., 2018). This compilation, or Cassandra's Wayfinder (see Figure 2.1), seeks to catch sight of the world through our eyes.

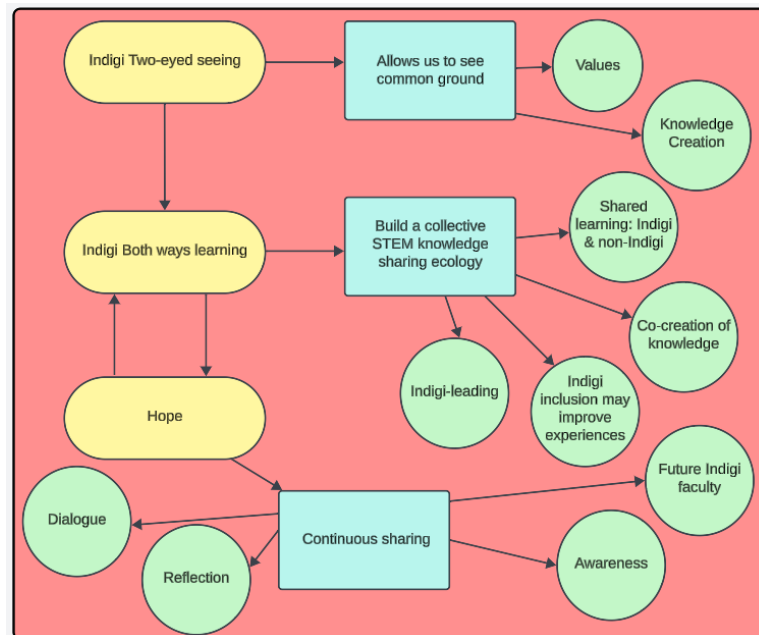


Figure 2.1

The merging of various frameworks of Cassandra's Wayfinder. "Indigi" stands for the word Indigenous. Own work created using Lucid Chart.

Two-eyed seeing (TES) combines the worldviews of Indigenous and Western scientific knowledge (Bartlett et al., 2012; Hatcher et al., 2009). The knowledge present in either sphere holds value and may co-exist regardless of their distinct nature (Roher et al., 2021).

Simultaneous relationships maintain a respectful balance of various viewpoints, finding collaboration versus diminishment (Bartlett et al., 2012; Berkes, 2017; Reid et al., 2021). TES teaches us to accept and respect multiple perspectives to gain a pluralistic understanding for context-specific decision-making (Bang & Medin, 2010; Cajete, 2000). The use of TES to

advocate for seeing the values of Indigenous and non-Native populations co-creates their experiences and values. However, TES alone affords a surface-level layer of insight. This framework is vital to utilize in this study because it honors Indigenous knowledge and creativity through affirmation, cultural continuity, connection, healing, holistic understanding, innovative problem-solving, and experiential learning. We enhance the use of this framework by combining the both-ways learning (BWL) framework.

Similar to TES, BWL is a process of sharing knowledge and philosophies or attempts to erode epistemology (Bat et al., 2014). Rather, BWL nurtures the diametric ways of knowing to coalesce new knowledge in a newfangled space (Ober & Bat, 2007a). BWL emphasis learning and teaching broadly while TES is specific to understanding and applying knowledge. The melting of two worlds constructs an educational journey fostering collaborative learning experiences with the connections of various members and instructional communities (Ford, 1993; Kunothe-Monks, 2006). As BWL amplifies learning, we perceive BWL as a necessary addition to a better understanding of Indigenous values and experiences. BWL may help with comprehending the extensions beyond values and experiences. For example, the relationships, journeys, and communities binding and shaping Indigenous values and experiences. Indigenous knowledge represents a living system connecting with daily activities, communities, and social systems (Zaman et al., 2013). Knowledge helps us understand our values, experiences, and interests. By creating new knowledge, we innovate new values (Zaman et al., 2013). Better yet, the life these values breathe into Indigenous experiences and, ultimately, their existence. Therefore, BWL assists in treating Indigenous living knowledge as a collective ecology for Indigenous leading, inclusion, sharing between Indigenous and non-Natives, and co-creation.

Lastly, affixing the hope framework enriches mutual values by architecting a space for sharing understandings and reflections. Using Freire's reflexive practice in educational settings, learners develop self-agentic tools (Sartorio & Thomas, 2019). Education energizes transformation and prevents the extinguishment of hope for the future (Freire, 1998). Moreover, hope grants individuals to become co-constitutive of the world (Sartorio & Thomas, 2019). By understanding ourselves, we understand our relationship with the collective being (Freire, 1998). Hence, knowing the depths of Indigenous women takes part in the collective essence. As education possesses the force for transformation, it contains the power to reconstruct knowledge through critical dialogue (Stewart-Harawira, 2005). We deem the hope framework as the catalyst for TES and BWL by inducing reflection, dialogue, and awareness to craft a transformative future for Indigenous women faculty. The actions emulsify and bind the compilation of the framework, concocting Cassandra's Wayfinder to gaze beyond the horizon and toward the celestial skies littered with Indigenous women's values and experiences.

At this point in the textual journey, the Indigenous backdrop conveys the ancient ties of Native knowledge and its importance with medicine, navigation, weather prediction, preservation, food preservation, and more. Indigenous knowledge bears inclusive concepts, methodologies, and practices not considered in Western Science. Dominating science perspectives contain power dynamics that set the market value of knowledge, which strongly suggests Indigenous ways of knowing appear worthless. Summoning the experiences of Indigenous knowledge to the surface encounters challenges. The experiences of Indigenous women face overgeneralization with women of Color labeling, obscure presence in previous work, clashes with Western systems, lack of various levels of support in the academy, and other issues. Using two-eyed seeing (TES), both-ways learning (BWL), and hope frameworks, this

section inspects relevant literature relating to Indigenous experiences to unmask further the vacancy in Native comprehension and the need for our proposed study.

Bridging the Gap

To reiterate, the homogeneity of the women of Color experience bespeaks to the bailiwick of Indigenous women's occurrence. Many studies elucidate the women of Color gap bereft of Indigenous women (Cole et al., 2017; Kachchaf et al., 2015; Ong et al., 2011; Turner et al., 2008). The literature from 1988 to 2007 reveals faculty experiences but not the aspect of women of Color (Turner et al., 2008). Well-documented research focuses on women's careers, but little exists, differentiating women of Color viewpoints (Ong et al., 2011). Furthermore, a vast gap arises in the STEM lived experiences of women of Color (Kachchaf et al., 2015). Women of Color literature on experiences lacks heterogeneous counterspace (Ong et al., 2018). The transition of students of Color to faculty of Color experiences consists of a void (Cole et al., 2017). Thus, the blanket of women of Color may seem appropriate, but it repeats the cycle of homogeneity of "women's experiences". Similarly, the branding of women of Color research appears to expunge the essence of Indigenous women's complexity.

Figure 2.2 spotlights the gaps in connection with the literature review with the conflict of values and experiences between Indigenous and non-Native groups. The persistence of standardizing STEM under Western ideologies and ostracizing Indigenous knowledge denotes the challenge for Indigenous faculty to promote Indigenous-led scientific scholarship. The literature brings about suggestions of reclaiming language, educational policy changes, workshops, critical conversations, language merging, improved diversity hiring policies, and self-advocacy (Castagno et al., 2023; Deloria et al., 2018; Mohamed & Beagan, 2018; Ruef et al., 2019; Stevens & Matsaw, 2019; Thomas et al., 2022; Woodroffe et al., 2021). However, it is

unclear the extent of Indigenous participation in the execution of the solutions to contrive scientific shared knowledge. Furthermore, the previous work does not present a perspicuous understanding of a joint values system forging new collective ways of knowing. The literature review exhibits the deficiency of joint value creation and the vitality of a shared learning journey. In this dissertation, I intend to investigate: (a) In this study, what are the values of Indigenous women and the institution, and how does it influence their experiences as higher education STEM faculty members? (b) How can the academy better understand the Indigenous experiences and values to enhance the support of Indigenous women as STEM faculty members?

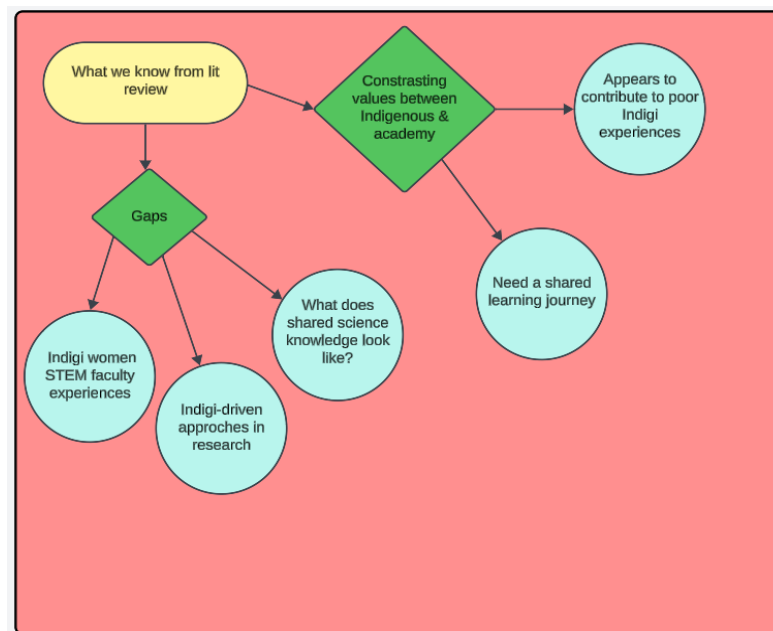


Figure 2.2

Highlighting the gaps from the literature review. Indigi” stands for the word Indigenous. Own work created using Lucid Chart.

Final Thoughts

Chapter two reviews the literature on the continuous dueling roles of Indigenous and Western knowledge. In addition, a lack of understanding in the academy of Indigenous women's STEM faculty experiences and values continues as research generalizes with the women of Color categorization. The challenges of little to no support, neglect, misrepresentation of data, and more add to the void of Indigenous women's experiences. In the midst of the academy developing a transformative mindset, it bears the duty to ensure the inclusion of all, especially the those sitting on the untraveled margins. In this study, I wish to bring forth these voices to not only contribute to the knowledge gap but also utilize Indigenous women's experiences to encourage transformation through joint value creation. If Indigenous women cannot bring their experiences and values into the limelight, then the inequitable frameworks of oppression and crimes against their humanity persist. How can we reach enlightenment when we are all not equitably a part of it?

Chapter 3 - Cultivating Indigenous Experiences and Values with Autoethnographic (AutoE) & Participatory Action Research (PAR) Methodology

Introduction

Chapter 2 divulged the gaps in Indigenous women's STEM faculty experiences.

Consequently, the previous literature raised questions and seeks to examine these self-narratives of lived experiences and values. This chapter is focused on outlining the research methodology and procedures employed for this study that sought to uncover Indigenous women's values and experiences, capture transformative shifts, address the knowledge gap, and, ideally, examine how these women reached these heights in STEM Higher education. Furthermore, the sharing of Indigi self-narratives through transformative methodologies, including autoethnography (AutoE), Participatory Action Research (PAR), and Creative expression (photovoice and more), informed and shaped the essence of Indigeneity, especially when engaging with the roles of femininity and faculty members in STEM spaces.

I outline the summary of the Indigi Sisters who contributed their stories to manifest the story arc of the "Im_Possible Dream", detailing the study's methods for collecting, understanding, coding, and analyzing themes of experiences to uncover their values. As mentioned in previous chapters, their notion of "worth" becomes faint due to superficial visibility, a lack of genuine support, and Scientism, among other factors. The vessels used to capture the collection of stories included a storyboard with photos and captions, and a recorded video of a focus group with a transcript. For a span of time, we treaded the physical, spiritual, emotional, and mental worlds to conjure the past, present, and future. The selected quotes supported the nature of the themes and, by extension, the analysis of our story. Ultimately, these

indicated the veracity of the Indigi heart: their unwavering values, which honor mind, body, emotions, and spirit. I discussed these heart-based values in grander detail in Chapter Five.

Study Aim

Indigenous storytelling engages PAR respectfully to reveal various ways of knowing and value systems. It empowers the retelling of relationships and examination of mobilization (Caxaj, 2015). Using PAR storytelling with Autoethnography (AutoE), participants were empowered to reflect on their stories within the group to drive social change. This collection of stories served as a record of social change in the unknown and as evidence of what has already transformed in their corner of the world. This participatory action research study addressed the gap in understanding the experiences of Indigenous STEM faculty by employing photovoice, focus groups, and informal discussions to capture the perspectives and values of both non-tenure-track and tenured Indigenous women faculty in higher education. The study aimed to deepen understanding of the values Indigenous women bring to STEM spaces, highlight incidents that devalue their contributions, and examine the coexistence of pluralistic value systems within these environments. Ultimately, the research sought to provide actionable insights to institutional leadership on ways to enhance, support, and expand Indigenous women's participation in STEM while honoring and integrating their value systems.

Research Questions

The literature review in Chapter Two revealed the obscurity on Indigenous women and their values with numerous challenges. The study examined the following questions to engage the values systems of Indigenous women serving in STEM higher education roles:

- (c) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?

- (d) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

Research Rationale

The Qualitative Paradigm

In this study of Indigenous women STEM faculty, it was of vital importance that we created respectful, fair, and trusting rapport between the researcher and the hyper-underrepresented participants. This relationship was essential in understanding the ways in which uncovered knowledge is contextual, with the researcher being respectful of the various perspectives, subjectivity, self-reflexivity, lived experiences, values, and positionalities that influence truths from the participants. Research in this subject area called for interactions between the researcher, ~~research team~~, and Indigenous women STEM faculty that advocate for participants. Given the nature of promoting empowering relationships between these factors, this study called for qualitative approaches in answering the questions of the study concerning the insights and understanding of these experiences.

Autoethnographic (AutoE) Perspective

Understanding the essence of the human experience traversing through life histories requires engaging in the stories of others (Butler-Kisber, L. 2018). However, understanding our life experiences helps with comprehending the journey of others. The approaches to autoethnography graced the scene in the 1970s to describe cultural practices, viewpoints, beliefs, and insider research (Adams et al., 2017; Goldschmidt, 1977; Hayano, 1979; Hieder, 1975). Researchers examined their positions inside and outside their intellectual pursuits but expunged personal experience from the equation. The 1980s illuminated the natural bindings of science and storytelling with behavioral and psychological experimentation (Adams et al., 2017; Bochner,

2016). An epiphany strikes some scientists or researchers as they realize the observation of the experience differs from the person living the experience. Inner thoughts, feelings, and motives are deeply rooted in the psychological process and demand the inclusion of an individual's story (Bochner, 2016). The 1990s ushered in the fusion of one's experience and reflexivity to explore cultural experiences (Adams et al., 2017).

Autoethnography functions as a zooming lens where an individual examines outwardly the social and cultural strands of personal experience and inwardly the "vulnerable self" (Denzin & Lincoln, 2000, p. 739). Autoethnography emerges from autobiography and ethnography (Adams et al., 2017). Auto means self or self-observation; ethno signifies culture or community; and graphy implies the documentation of the research process (Bunde-Birouste et al., 2018). Autoethnographic techniques range from traditional analytical to evocative methods (Anderson, 2006). In the autobiography, lived experiences, dialogue, photographs, journals, and memories conjure the reflection of the self (Adams et al., 2017). The ruminations conjure the elements of voice, emotions, conflicts, rising action, and meanings to develop an impactful story. The narrative contains the power to transport a listener to see and feel an experience as if it belonged to them (Ellis, 2010). The ethnography component investigates cultural experiences, sentiments, and perceptions of inside members through participation, observation, writing, visual images, and visual texts (Adams et al., 2017; Pink, 2007). Likewise, ethnography invites others to wear the shoes of the storyteller (Adams et al., 2017). Autoethnography unveils numerous layers of consciousness bridging the individual to culture.

Autoethnography sets out specific principles that demonstrate its purpose and practice. What is it that the researcher wishes to uncover or share? The first staple lays personal experience at the core of autoethnography (Adams et al., 2017). Boylorn (2014) describes that

individual experiences invite us to delve into the critical aspects of culture, dialogue, emotions, and intersectionality surrounding and influencing personal occurrences. Sharing personal experiences offers the opportunity to open other's minds and hearts as they think of our narratives, negotiating and differing from popular world views. The process of sharing personal encounters constructs a tool to speak up and talk back about an injustice (Boylorn, 2014).

Personal stories decenter the dominant narratives, assumptions, or gaps in research.

Generalization tends to overshadow individualism and the uniqueness of the human experience (Tillmann, 2009). Adams et al. (2017) detail that the second purpose of autoethnography involves unearthing insider knowledge within the cultural experience. As a member of the community, insiders provide a more accurate picture with powerful meanings compared with researchers on the outside looking into the occurrence. Hence, the insider does find they do not have as many constraints as the outsider, encouraging a more honest perspective (Adams et al., 2017). Since autoethnography affords an intimate affair of seeking knowledge, researchers gain a personal context of conversation not possible with other methodologies. The extrapolation of the inner workings of human experience becomes accessible to the public domain (Boylorn, 2014).

A worthwhile endeavor to merge and improve understanding among distinct perspectives. I will note autoethnography differs from ethnography. Rather than extracting knowledge from participants and positioning them as research subjects, the autoethnographer embraces vulnerability by examining their own lived experiences within their cultural context. In doing so, the researcher becomes both participant and observer, using self-reflection to explore the relationship between self, culture, and society.

PAR Perspective

Figure 3.1 demonstrates the traditions in the practice of the fifth perspective of PAR and the knowledge-constitutive interests that shape the study's PAR aspect (Denzin & Lincoln, 2000). In this study, the Indigenous women reasoned their association with a STEM person, academy, work culture, or more. Critical-emancipatory reasoning attempts to understand the circumstances derived from human choices to transform the future (Denzin & Lincoln, 2000). By exploring the current situation in STEM, Indigenous women may mull over and catch the light of the injustice that articulates the frameworks of oppression, which exposes their experiences to a broken heartedness of the acutest of kinds. Through this misery, a liberating consciousness emerges where individuals collectively overcome the monstrous state of affairs. The reflexive/dialectical outlook adopts a first-person meaning the researcher and participants become one as the subjects contribute to a continuous, malleable, and permeable construction and reconstruction of their settings (Denzin & Lincoln, 2000).

Traditions in the study of practice			Knowledge-Constitutive Interests
Perspective	Focus	View of practice	
Reflexive/dialectical view of relationships between subjective-objective and individual-social		(5) Practice as socially, historically, and discursively constituted by human agency and social action	Critical-emancipatory

Figure 3.1

Understanding the traditions and knowledge-constitutive interests in PAR's fifth perspective.
Adapted from the *Handbook of Qualitative Research* (2nd ed.) by N.K. Denzin and Y.S. Lincoln, p. 587. Copyright 2000 by Sage Publications, Inc.

Multivocality

PAR draws in a democratic approach for Indigenous women to become joint collaborators. Layering AutoE onto PAR empowers a single story into a collection of self-narratives. Thus, the united methodologies produce multivocality. Mizzi (2010) insists with AutoE, multivocality follows the ideas of (1) the singularity or fixation of voice does not exist, (2) when voice does not represent a linear fashion as it moves through multiple contexts, and (3) the inquiry of self transpires with contradictions between personal narrative and the social world. The tenets of AutoE contend voice expand with various inputs considering the exposure of silent tensions (Mizzi, 2010). The contrast whisks multiple consciousnesses and voices (Bakhtin, 1981). A concept reaching beyond the bounds of the researcher's voice alone excavates a pathway toward heterogeneity voice and by extension research (Wells et al., 2021). Poly-dialogue grants the researcher to release the habit of solely gazing at conventional methodology truths and consider the self as part of multiple-Is in union with various veracities (Hermans, 2012). The merging of poly-voice assembles a "harmony of voices" (Mizzi, 2010, p. 9). By delving into multivocality, the readers may view the intricacies of human experiences and the discovery of the hidden self (Mizzi, 2010). The study fused the common points of self-narratives, discussions, and reflections; however, the fringes outside the mutual boundary do not drop off. The variances remain attached, spurring the consideration of multiple voices

Ethical Knowledge Design

All procedures conducted in this study followed the guidelines and permissions of the Colorado State University Institutional Review Board (CSU IRB). The Indigenous knowledge stances remind researchers of the lingering and relevant questions: Whose knowledge and who decides (Battiste, 2016)? Ethical knowledge with Indigenous populations encompasses the voice

co-creation, multiple perspectives inclusion, and co-translation, which upholds respectful practices and processes (Jull et al., 2018). Additionally, transparency and equity become a part of the Indigenous conversation and supersede IRB instruments (Kelley et al., 2013). In other words, Indigenous scholarly work often defines its ethical oversight in terms of community protection, data sovereignty, and cultural respect. These differ from the risk properties of traditional non-Tribal IRB. Research works for the betterment of all involved by working and supporting each other. The study carried a collective responsibility to empower and acknowledge Indigenous intellectual ownership (Bull et al., 2020). Best practices ensue with the partnership of Indigenous and non-Indigenous engaging in innovative methods of research that honor Indigenous ways of knowing (Kwaymullina, 2016). Put differently, researchers cannot bind themselves to practice excluding or inflexible to co-partnering knowledge. Therefore, we prioritized and utilized two-eyed seeing (TES) and both-ways learning (BWL) in this study as they are created and developed from Indigenous knowledge. By applying the tools fashioned by Indigenous people, we championed appropriate compliance that heartily aligns with Native values versus perpetuating non-Native methods of "touring" Indigenous culture. Thus, we instilled the cultivation of ethical Indigenous knowledge. Hence, the study consistently monitored the prevention of diluting or eroding Indigenous knowledge with the Contributors' democratic participation.

Validating Connections.

With the accuracy of the contributor's standpoints, validation transpires (Creswell & Miller, 2000). Validation methods appropriate for the context of the study encompass member-checking, rich and thick descriptions, and clarifying researcher bias. Member checking implied conferring the knowledge obtained with the candidates. After the initial meeting and photovoice

training, focus group, and any discussion sessions, members received the entire Chapter Four to reflect and gauge accuracy. As this study took on deep exploratory and immersive efforts, I felt it was important that these Indigenous women could see the direction and grounding of their stories that created the Indigenous Ecosystem of Values. The partakers had the opportunity to contest and amend the statements or inquire about the work within a set amount of time. No Contributors felt the need for any changes to their statements or had questions about the entirety of Chapter Four.

Rich and thick descriptions captivate readers to share the experiences of the study (Creswell, 2003). The audio and visual recordings, journals, and transcriptions yield the possibility of accomplishing rich and thick descriptions. Some participants decided to add captions to their photos, while others did not. The journals provided a space for additional reflection but were not required for sharing. I chose to highlight participants' quotes in the discussions to illustrate key themes and perspectives that emerged from the process. group, emphasizing the diversity of their perspectives. The direct quotes from the audio and visual recording illustrated their experiences and spotlight specifics of the settings, interactions, events, and emotions during the study. Checking bias necessitates self-reflection (Creswell, 2003). I reflected on my positionality, role, and research perspective. Moreover, I intersected my self-narrative into this study. I spent several months immersed in the data to minimize my bias with drawing, writing, and shuffling the data points into a cohesive whole. However, the process required flexibility not only to view the points but also their relationships to each other. For example, the value of motherhood or a feminine perspective on leadership are different components but connected through femininity. I considered myself feminine leader but have yet

to experience motherhood. Therefore, looking at the relationships to each value helped coalesce the data points with reducing any untended influence.

Crafting the Transformative Lens of Hope

The researcher lens or perspective "is the viewpoint of a particular stakeholder in the relevant domain, which is adopted by a researcher as the, or a viewpoint from which to observe phenomena during the conduct of a research project" (Clarke & Davison, 2018, p. 484). The researcher's perspective angles the view of observing a phenomenon (Clarke & Davison, 2018). Positionality, the qualitative paradigm, the PAR perspective, multivocality, and Indigenous ethics formulate my research perspective (see Figure 3.2), a lens of transformation and hope. The outline consists of a permeable boundary to represent the influence of the aforementioned factors but to enable openness to other permeable characteristics. The lens takes the form of a star versus the traditional circle to exhibit the confluence of separate entities into one epicenter. The range of overlaps and influences immeasurably materializes; however, it modifies the point of view of the unit of analysis. The unit of analysis details the interest of the study to illuminate insights and the measurement of the study (Akremi, 2020; Babbie, 2016). It supplies the focus of the study (Akremi, 2020). The unit analysis incorporates various layers with a broad brushstroke to a context-specific aspect of analysis. This study explored STEM faculty, Indigenous women, and experiences. The final layer illustrated the unit of analysis, values, and the crux of this study.

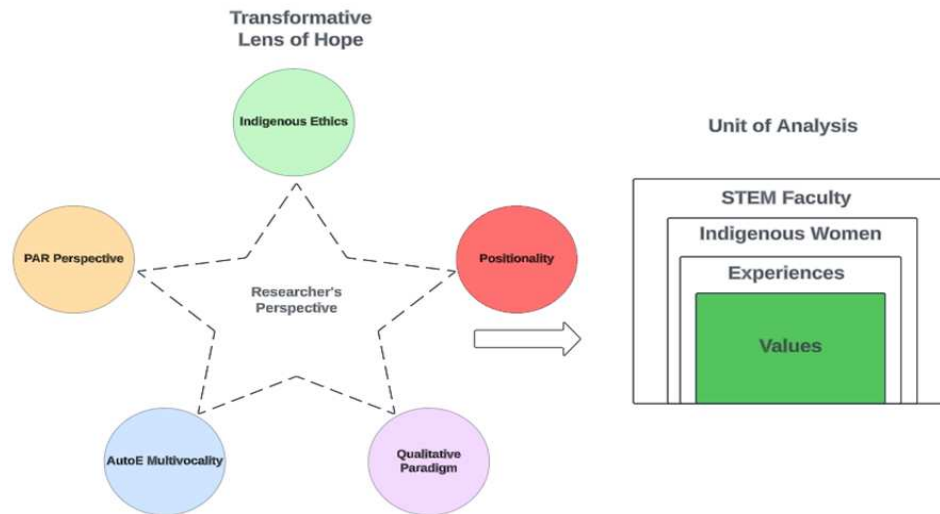


Figure 3.2

Unit of analysis for the study of Indigenous women. Modified from the *Research Perspectives: Through Whose Eyes? The Critical Concept of Researcher Perspective* by R. Clarke and R.M. Davison, p. 486. Copyright 2020 by the Journal of the Association for Information Systems.

Hope and transformation encapsulate my shimmering mirage and the ghost in the machine driving us to reach out arms in the promise of a euphoric future. Thus, the flashes of wondrous imagination lovingly push us forward while holding on to the past and present. Hope lies at the foundation of human consciousness and is a reflection of the genuine self (Eliott, 2005). Hope grows into vehement preludes for reaching objectives. The embodiment of hope compels trust, agency, and a positive outlook on the future, a necessity to overcome the cruelty of academia's landscapes (Gallagher & Lopez, 2018). More chiefly, hope turns into the counterbalance to the drudging of invisible open wounds spilling the surviving pieces of humanity. Interweaving hope induces healing (Stevens et al., 2014), coping, personal future (Cutcliffe, 1996), creation, the invention (Nweze et al, 2015), well-being (Keshoofy, 2023), and more. Hope ushers transformation in which the individual becomes inspired to rescind present circumstances. Hope shifts into a force to imagine the possibility of social change manifesting

into the purpose of human existence (Bazzano, 2019; Haran, 2013). Therefore, hope and transformation illustrate the breath into this living perspective apparatus.

Brief Research Design Overview

The experiences and values of Indigenous women STEM faculty required this study to use autoethnography (AutoE) and a participatory action research (PAR) approach, in which the research process allowed the participants to co-collaborate alongside the research team. AutoE and PAR promoted and provided necessary structures to empower participants to both reflect on their experiences and action steps to positively impact future experiences. Using AutoE and participatory action research (PAR) methodology with the photovoice method, focus groups, and individual discussions, the focus of this study examined the experiences and values of Indigenous women faculty in STEM. Figure 3.3 illustrated the amalgamation of AutoE and PAR methodologies, photovoice and focus group methods, and contextual relationship of the research questions summoning and tying the Indigenous personal experiences. The Auto or self related to the personal individual narratives becoming a collective with PAR. The ethno or culture where individuals reflected. The graphy or research process included an action. Dialogue floated between the reflection and action pieces. Applying AutoE and PAR to the study, Indigenous women used their personal stories to reflect in STEM culture as faculty members.

As we collaboratively analyzed these experiences and values, it uncovered and named shared values and relationships that illuminated Indigenous women faculty experiences with specific attention to overall Indigenous values within the faculty role, inclusion/exclusion of Indigenous values contributing to experiences in the existing culture of the university, and areas that need transformation to be more inclusive of Indigenous faculty values and experiences. Using photovoice, focus groups, and discussions allowed the group to both reflect on their own

experiences and values as well as formulate the next steps to crafting a living medium or the Indigenous Ecosystem of Values.

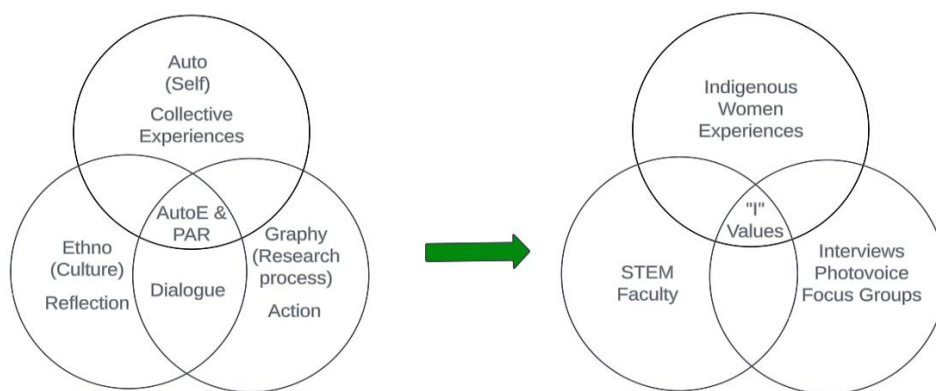


Figure 3.3

*Merging AutoE and PAR to reflect elements of this study. Adapted from *Leaning into autoethnography: A review of Heewon Chang's autoethnography as method* by M.M. Snyder, p. 94. Copyright 2015 by The Qualitative Report.*

Similarly, the individuals gathered for the focus group analyzed their identity as an Indigenous woman (self) intersecting into STEM settings as a faculty member (culture) and the experiences emerging with photovoice and discussions led by questions, discussions, and photovoice prompts (processes). Through AutoE's self-narrative, we engaged in a series of experiences surface a value system. With PAR, the single stories attach to one another to deliver a joint collective of Indigenous women's experiences and values as STEM faculty. The following subsections delve into the data collection process.

The gaps in the literature on comprehending the perspective of Indigenous women's values connecting to their experiences and the appropriate measures to gently extract those occurrences present a tailored approach in methodology. I highlight the following overlapping concepts from the selection of AutoE (autoethnography) and PAR (participatory action research) methodologies that aid in understanding the depth of Indigenous women's stories. The layering of the approaches delivers promising outlooks to incorporate transformative notions that

strengthen, empower, and appreciate these experiences to improve Indigenous women's STEM faculty participation in higher education.

Participants/Contributing Storytellers

The study focused on Indigenous women in STEM, including both tenured and non-tenured faculty, at four-year public land-grant universities. The sampling method used single-stage direct sampling and name accessibility with purposive sampling. The inclusion criteria included: identify as women, Indigenous, and are affiliated with the STEM field in higher education. Participants were notified by email. A follow-up email provided more details about the study, including the information session, training session, and focus group. The same email addressed any concerns, such as privacy, potential emotional distress, and the right to withdraw from the study, and included the consent form. If someone chooses not to participate, another Indigenous woman STEM faculty member was invited in their place.

The initial outreach started with 10 Contributors but gathered six participants to share their stories, which created a single narrative titled the "Im_Possible Dream." All Contributors identify as women, Indigenous, and are affiliated with the STEM field in higher education. I did not ask whether the participants were tenure-track or non-tenure-track. The tribes varied, as there was no single member of the same tribe across the US and Canada. Some were full or mixed but identified as Indigenous women. The years of experience in the STEM faculty ranged from three years to 24 years. Many held multiple roles within their department. They hailed from several places around the country and arrived at the agreed upon location for the focus group or sharing circle. Participant demographics did not provide more detailed information to maintain privacy and security. After all, the faint presence of Indigi (Indigenous) faculty at these levels may make their stories recognizable.

Story Collection

After these Indigenous women went through the screening process, we set aside time to discuss the study's overview and, most importantly, to build a relationship. Each Sister then zoomed with me to discuss their perspectives, histories, and current experiences. I shared the same but went into the struggles I faced and my hope that this study would help elevate Indigenous voices and improve the experiences for future Indigenous students. They signed their consent forms and I prepared them for the photovoice training session. The information collected in this initial meeting was for building a passionate connection and did not serve analytical purposes. The photovoice training session was an hour and went over the steps of the assignment and how it fed into the focus group. For the photovoice assignment, each Indigenous woman was tasked with taking photos in response to the photo prompts. I collected the photo prompts in a folder to later print out for the focus group. The focus group entailed Indigenous women assembling their AutoE on a storyboard using provided craft materials the day before the focus group session.

Some of the Indigenous women arrived early to our meeting place, where we enjoyed drinks at a beautiful spot and began forming connections. Our conversations ranged from politics to our hopes for the future. As more women arrived, we shared every meal together, deepening our bonds. The excitement was palpable, with the town's lively atmosphere and attentive waitstaff adding to our experience. We all agreed that gathering in this way, outside the confines of a conference, was a rare and meaningful opportunity to share our stories freely. Typically, our paths only cross at Indigenous conferences or Native ceremonies, so it was uncommon and special to come together as such a diverse group. Out of respect for myself, my community, and these remarkable Indigenous women, I chose not to approach our meals or conversations with an

analytical mindset. Engaging in data extraction during these moments would have felt disrespectful to them and their communities. Instead, I set aside my researcher's lens and focused on building genuine connections, opening my heart, and listening deeply. This part of the study was filled with joyful laughter and a sense of shared happiness. I enjoyed sharing my community and the place I called home with these Indigenous women whom I call Sisters.

The focus group or sharing circle served as the foundation source of research data. We shared breakfast before the big moment. Everyone commented on the town's beautiful landscape as they walked into the designated room. Everyone had completed their posters sometime before that moment. As my Indigenous Sisters finished her breakfast, I hung their posters on the wall and prepared the Zoom recording for an Indigenous Sister online. Once we got started, contributors revealed their artistic storyboard, depicting their lived experiences of embracing Indigeneity, womanhood, and their roles as STEM faculty members. We spent about 15 minutes looking at each other's posters. It was fascinating to see our uniqueness but commonalities. To construct this narrative, as previously mentioned, Contributors employed the photovoice technique (taking pictures) and followed a prompt that included a series of questions in the photovoice assignment prior to the focus group (see Table 3.1). Before the focus group, Contributors assembled and shared their stories. For example, a question asked about a photo that represented the self: an individual would have a picture of themselves on their storyboard and orate its connotation.

The first half of the morning session lasted about 90 minutes, during which I guided participants through a series of questions. I relied on intuition and followed the natural flow of conversation, allowing each Sister to help shape the direction. The level of participation varied. Some questions inspired longer, richer contributions than others, but each Indigenous woman

shared experiences that resonated with the group. While not everyone responded to every topic, most participants found a point of connection with one another. After the session, we enjoyed lunch together at a nearby café. We intentionally left research discussions behind, honoring our shared value of being fully present and fostering genuine community. The second half of the focus group also lasted 90 minutes, continuing the warm and open tone set in the morning. As the discussion progressed, participants engaged more deeply, sharing insights and interacting with one another in meaningful ways. To end on a hopeful note, I introduced an additional question, allowing us to conclude the session with optimism and unity.

The original photovoice prompt contained 17 questions. However, due to time constraints and the organic flow of the sharing circle, only 10 questions were engaged. Table 3.1 indicates the questions discussed in two 90-minute sessions. I will note that nine transpired from the original questions, while one materialized in the moment, asking which photo stood out. In addition, the storyboards display photos for all 17 questions. All elements from the storyboards and the recorded focus group were coded manually in Excel.

Table 3.1

10 out of 17 questions engaged during the photovoice focus group.

Photovoice Prompts		
2	☐	Take/Share a photo of something that represents you as an Indigenous STEM faculty member.
4	☐	Take/Share a photo of something that makes you the most comfortable or uncomfortable of who you are as an Indigenous woman in STEM.
5	☐	Take/Share a photo of something you value about your Indigenous culture and womanhood.
6	☐	Take/Share a photo of something you value about braiding Indigenous and Western science.
7	☐	Take/Share a photo of something how you help the Indigenous community in the STEM academy.
8	☐	Take/Share a photo of something that has positively or negatively influences your STEM faculty member experiences with Non-Indigenous people.
9	☐	Take/Share a photo of something that your university or department values.
11	☐	Take/Share a photo of something that you value as an Indigenous woman STEM faculty member.
16	☐	Take/Share a photo or photos of what you wish to share with the world.
Added		What photo stood out?

Note. Nine questions transpired from the original questions, while one materialized in the moment, asking which photo stood out. Own work.

Creative Presence on Photovoice Storyboards

Creativity manifested in diverse ways among Contributors to this study. Each contributor crafted their self-narratives using photos on oversized Post-Its and had the opportunity to decorate their storyboards with a variety of materials, such as scrapbooking supplies, decorative tape, stickers, glitter, rhinestones, and more. While artistic decoration was optional, Contributors approached the task in different ways: some carefully selected materials directly from the back of my Toyota 4Runner. In contrast, others preferred to have supplies bagged for later consideration. Despite the open-ended approach, every participant demonstrated a flair for artisan craft. One Contributor claimed not to be artistic, but the group countered this, highlighting the intentionality and care evident in their choices for decorating their self-narrative poster. All Contributors gathered their supplies and photos in advance, assembling their storyboards before the focus group session.

Once the focus group time arrived, each Contributor displayed their narrative on the wall. Visually, each poster featured a curated display of artistic pageantry. No poster looked alike, and photos were adorned with numerous decorations from colorful scrapbooking paper to gems. Some chose to display text, while others displayed only photos. With no directions for decorating the posters, these creative displays of their personal narratives demonstrate personalized expression through artistic arrangement. Although the Contributors were offered various art supplies, their unique choices for curating their personal stories demonstrate meaningful creativity. One that is connected beyond visual satisfaction but rooted in the meaning and agency of defining and exploring a sense of self. In this case, the meaning of womanhood, Indigeneity, and a STEM faculty member (see Figures 3.4-3.9).



Figure 3.4

Photovoice self-narrative of Indigenous Sister 1. The poster was created the night before and discussed at the focus group/sharing circle.

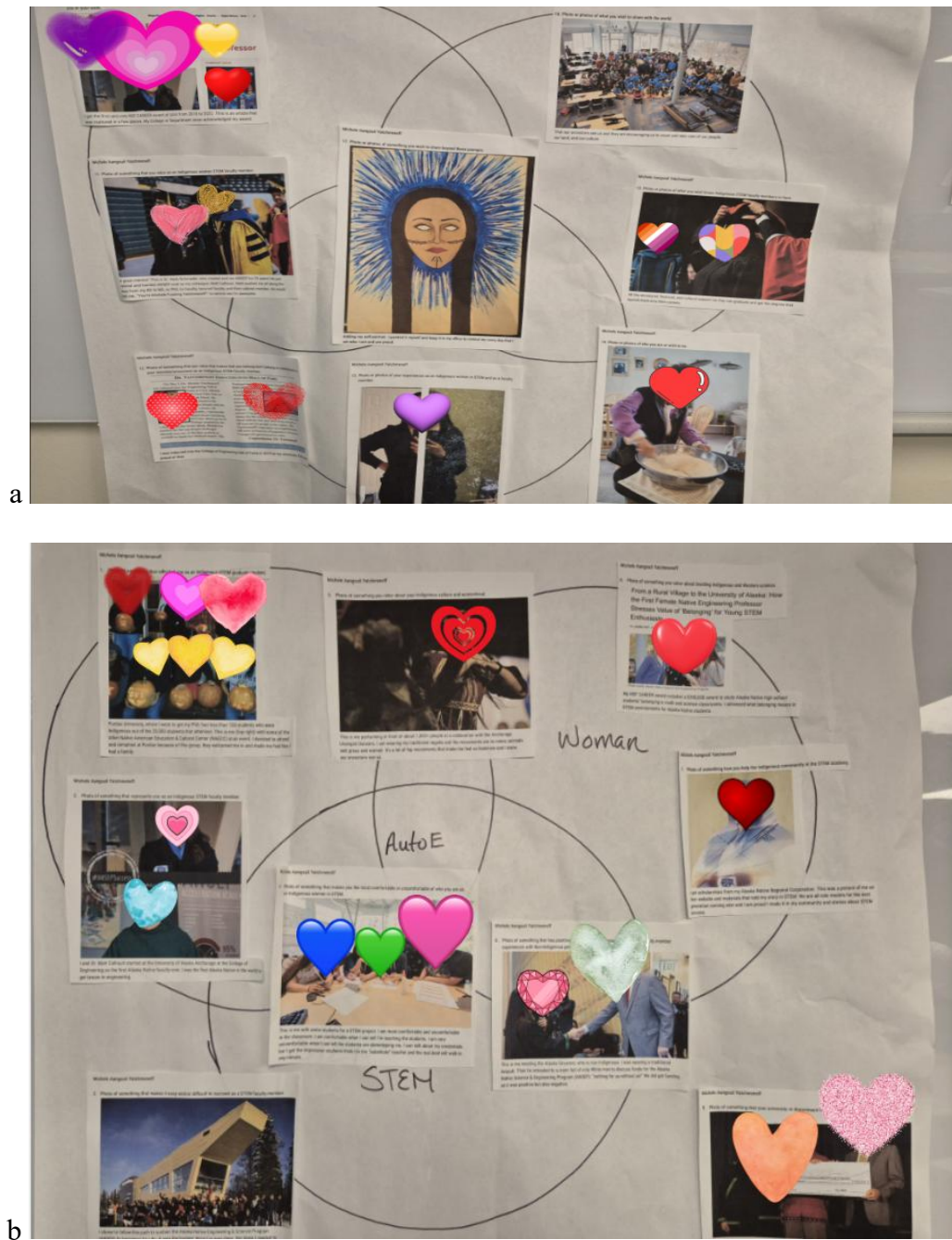


Figure 3.7

Photovoice self-narrative of Indigenous Sister 4. The poster was arranged physically by me as this Sister was online. Also, why there are no decorations.

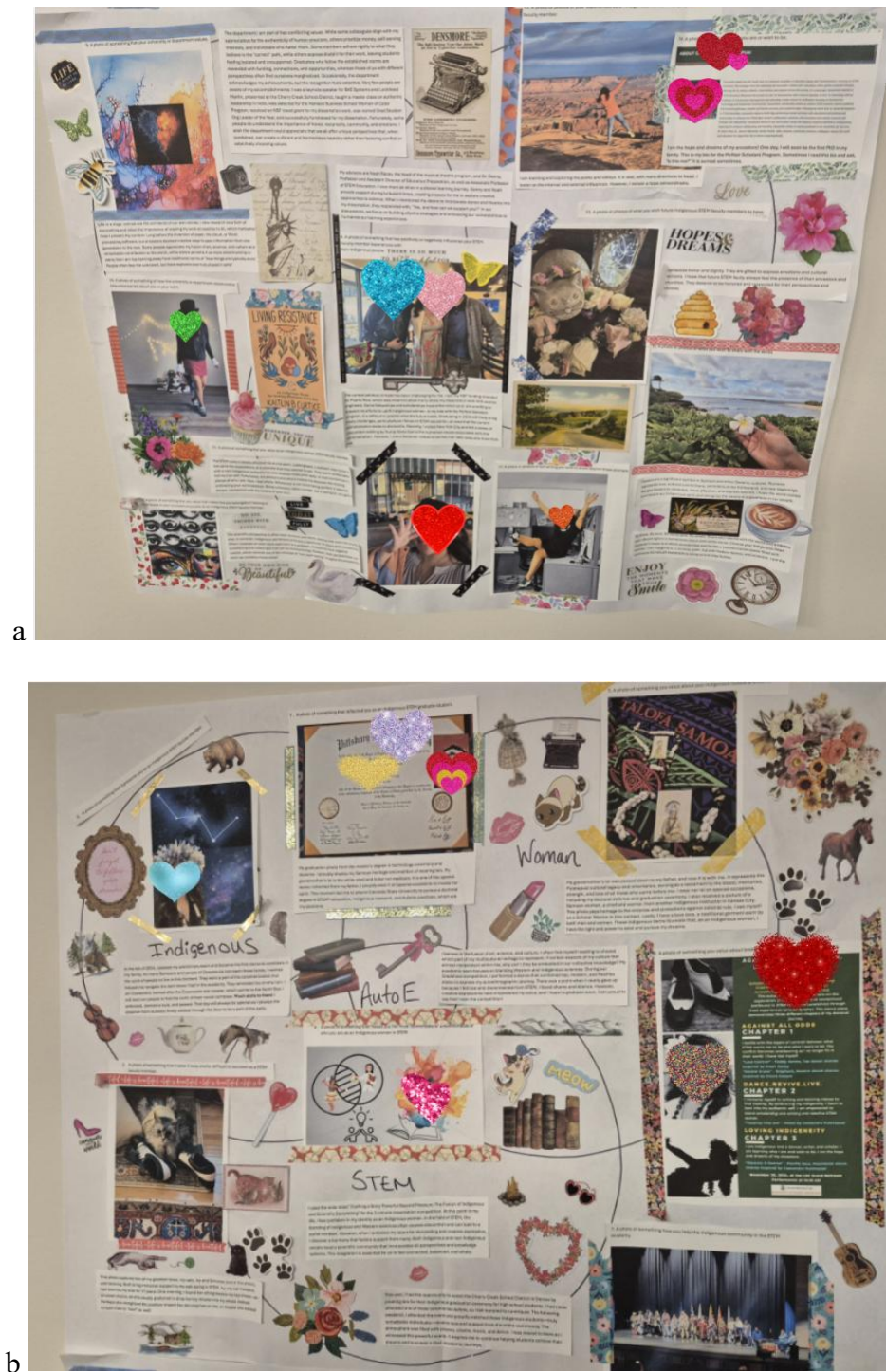


Figure 3.8

Photovoice self-narrative of Indigenous Sister 5. The poster was created the night before and discussed at the focus group/sharing circle.

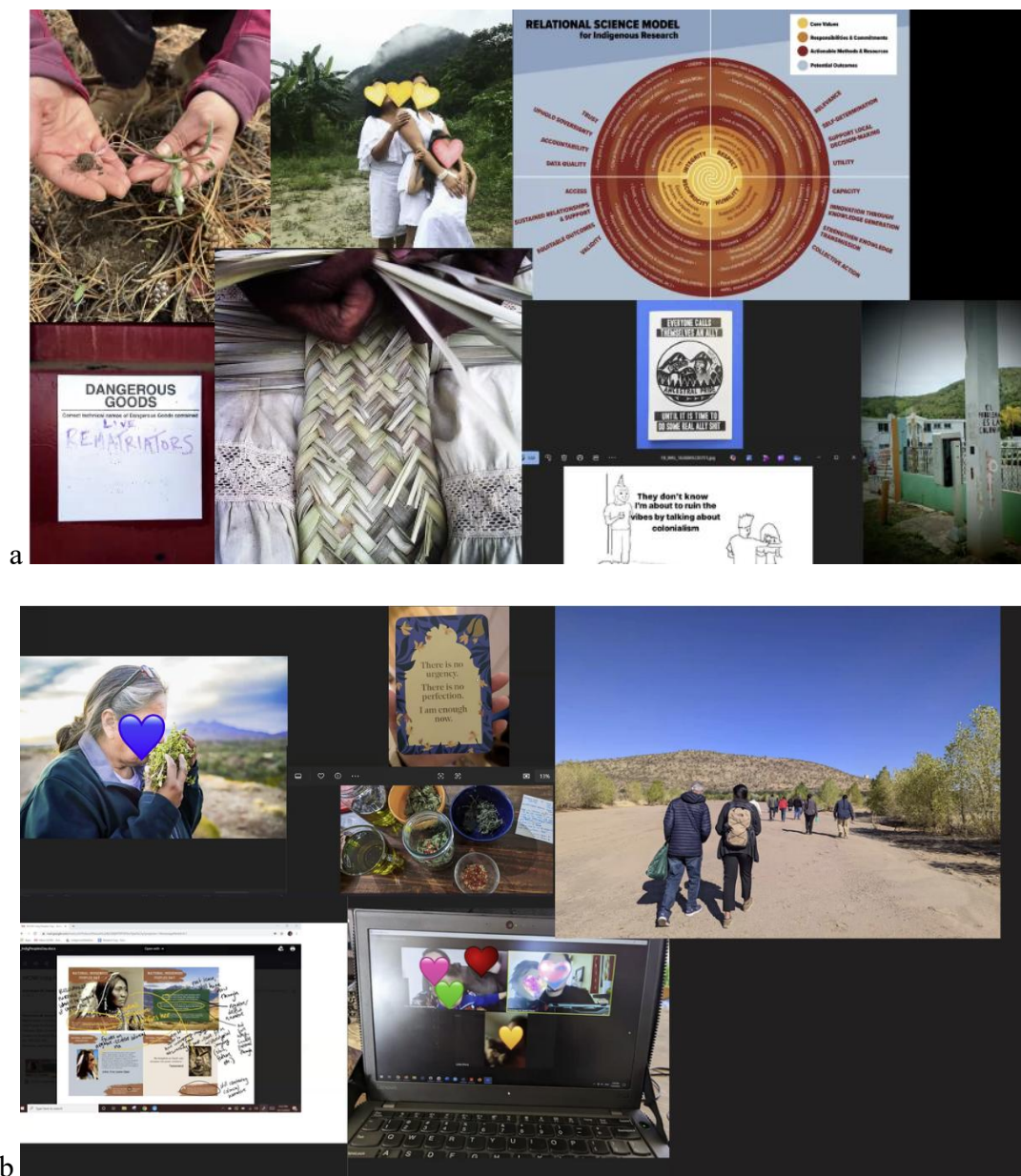


Figure 3.9

Photovoice self-narrative of Indigenous Sister 6. The poster was created the night before and discussed at the focus group/sharing circle.

At the beginning of the session, we did a short gallery walk to absorb each Contributor's storyboard. In casual conversations, I observed stronger connections for the decorative selections on Contributors within hearing distance. One Contributor selected a winter-themed paper with pine

trees because it reminded them of their home. Indigenous people are spiritually and culturally tied to their lands, which positions them as stewards. A second contributor, adorned with various nature-themed decorations, revealed they loved the outdoors, which led to a casual conversation about hiking. A third contributor decorated with items that connected to dance, literature, antique photography, and positive sayings. They shared a love of bringing these joys into every space. They loved expressing color as they felt a colorful life was the way to live. Interestingly, the poster decorations did not exhibit an explicit connection to science. Visually, the science connections were evident in the photos themselves. For example, wearing recognizable uniforms, the lab backdrops, or specific science instruments in their own or their students' hands. These visual representations, with their decorations, highlight a creative presence that they carry no matter the change of scenery or role. The creative expression spoke to the possibility of creativity as playing a leading role in their lives. Furthermore, they brought a sense that creativity served as an agentic force that supported their identities as Indigenous women. The focus group conversation revealed their values, but not how they creatively navigated STEM or how to bring Indigeneity and womanhood into the STEM space.

The Photovoice Storyboards Collaborative Values

Contributors decorated their photos with captions and a variety of craft supplies. Ornate pieces of art became the centerpiece of the sharing circle as each Indigi Sister offered their photo and meaning. Table 3.2 described the types of pictures and captions for visually viewing each art story; only four of the six participants composed text on their storyboards in addition to photos. The values consisted of motherhood/femininity, graduate student (self), graduation, artifacts of cultural identity, familial connections, tie to ancestral knowledge/Indigi scholarship, animals, nature/land, art, reconnection to Indigeneity, Indigi students/students, mentorship, advisors,

supportive colleagues/academic community, Indigenous leadership, and recognition/award. These merits radiated a positive light, though various depictions highlighted unsupportive spaces and elements within that misaligned with their values. Although the visual values provide vast insight, the coding of the conversation in the video recording adds more depth and a richness that encapsulates the essence of Indigi worth, nestled in femininity and science overtures.

Table 3.2

The visual values of the six storyboards.

Indigi Women STEM Faculty Values using Photovoice
Motherhood/femineity
Graduate student (self)
Graduation
Artifacts of cultural identity
Familial connections
Tie to ancestral knowledge/Indigi scholarship
Animals
Nature/land
Art
Reconnection to Indigeneity
Indigi students/students
Mentorship
Advisors
Supportive colleagues/Academic community
Indigenous leadership
Recognition/award
Misalignment with Values using Photovoice
Unsupportive spaces

Note. Indigi stands for Indigenous. Own work

Coded Values

AutoE and PAR methodologies forged a transformative understanding that unleashes and empowers Indigi stories of value through profound dialogue, reflexivity, and storytelling. In this study, a transformative sense of Indigenous women’s experiences guided the development of the

value codes that underlined their feelings, thoughts, and beliefs. The photographs on the storyboards captured the initial set of collective coded values. Displayed alongside the recorded conversations and transcripts, the storyboards offered a holistic, side-by-side immersion into the data. The use of “I” statements surfaced what truly mattered to these individuals, reflecting Indigenous women’s inner voices and lived realities, which were fundamental to their identities. The visual and text were combined into a single value for each question from the photovoice prompt. As more values emerged from the text and images, some researchers would start the process of data reduction. This is where I experienced a crisis of conscience: Indigeneity, especially within the TES and BWL frameworks, resists the erasure of uniqueness. A traditional thematic analysis felt ill-suited to the fluid, shifting nature of values. For example, the expression of artistic ability, whether as a creative thinker in academia or a crafter in Indigenous arts, could not be neatly categorized.

Figure 3.10 illustrates how my advisor and I tried to sort values into defined buckets and stark boundaries, but this approach failed to capture their complexity. In a pivotal moment, my advisor asked me about my values as both an Indigenous woman and a STEM faculty member. It struck me: why separate them? I realized that value coding in this context was limiting if it did not allow for a living, liminal space where values could move and intersect. Above all, every value was significant to these Indigenous women, carried with them into every space they inhabited. I needed an approach that honored their importance and demonstrated how smaller parts could unite to form a meaningful whole. The concept of an ecosystem ultimately offered the ideal framework, allowing values to coalesce without diminishing their distinctiveness. I elaborated in more detail in the Transcript Discussion of Values section.

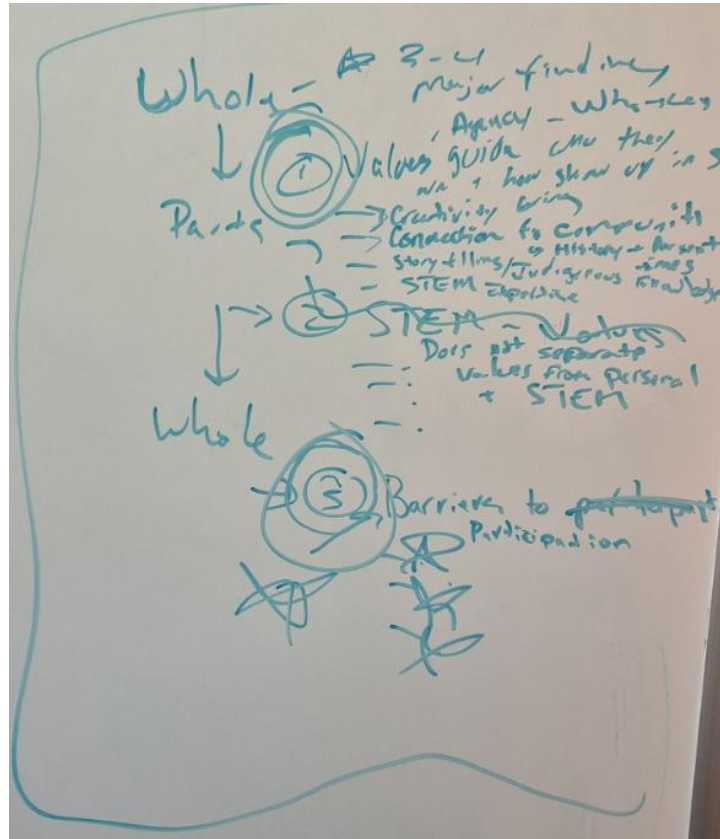


Figure 3.10

My advisor and I attempt to conceptualize Indigenous women values the traditional way – no luck! Own work.

As the storyboards provided an initial framework for value coding, with each photo representing a different aspect of the narrative. Each Sister customized her photo selection to reflect her story (AutoE), we collaboratively selected the first round of coded values (PAR). For instance, a picture of a loved one served as a value code representing family. These value codes then informed the coding of the focus group transcript, broadening the range of value codes. The transcript helped to construct values that coalesced into other values. The connection to each value was grounded in the relationship between creativity and reciprocity, which developed the Indigenous Ecosystem of Values, centered in the core of the holistic self, or who we are.

The Transcript Discussion of Values

In the dread of the summer heat, which reached over 110 degrees, the earth baked and fumed, releasing salty air mixed with steam. I am unprepared for the Oklahoma weather, having left the cool mountain air behind. From the parking lot, I raced into the First American Museum Building, gripping an umbrella to find relief in a more tolerable atmosphere. Once reaching the climate-cooled oasis, I wondered about the great halls envisaged with spirits. Historical artifacts, draped from wall to ceiling, set a mercurial temperament in their viewers. When I came across this photo (see Figure 3.11), I stood for quite some time thinking about our stories in this work. Then something struck perspicacious me, and I laughed - my father was right. I am, we are, warriors.

My father calls me the "Scholar Warrior." I do not possess a nifo'oti (spiked club) or tao (spear). The days of using these tools on the battlefield have evolved into decorative centerpieces or props for storytelling stages. This title reflects my father's cultural values and the various contexts in which I engaged. Circling back to the tools, time established the new instruments and space for a warrior. Nowadays, a warrior equips themselves with dialogue and academics. Gazing at Figure 3.11 on the historical significance of women warriors, the self-narratives of the Sister Contributors, and my story, we observed that some Indigenous people look to their women as leaders for social movements. These women led transformation from the heart. What lies at the heart of these Indigenous women? Our values.

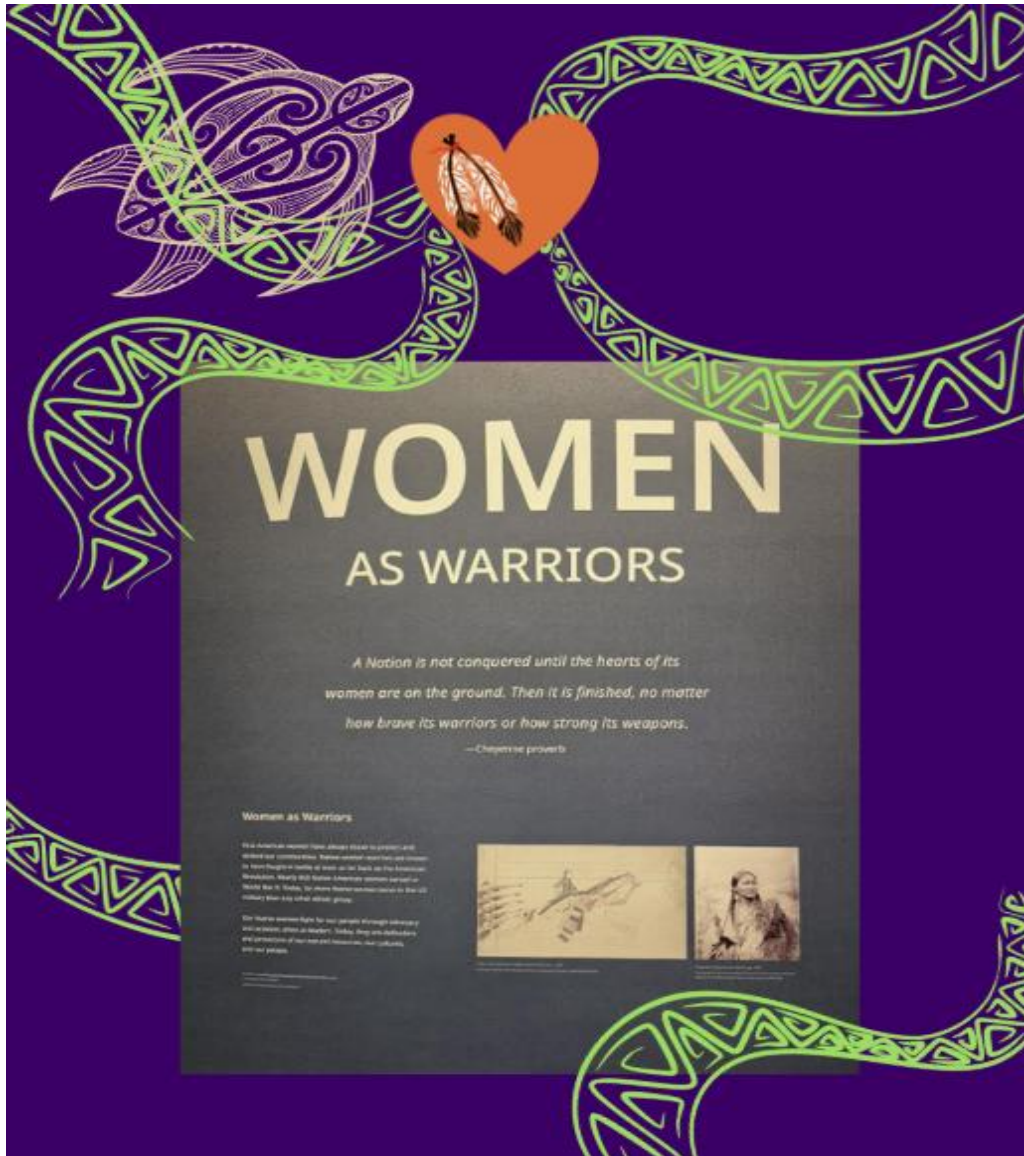


Figure 3.11

Women as Warriors wall from the First American Museum in Oklahoma, OK. Photo of Woman as Warriors designed using Canva graphics. Own work.

The value coding of the transcript is rooted in a heart-based process. By reaching the center of the heart, we unwound and explored the connections of values from the individual outward. Dialogue played a significant role in making value coding prominent, especially with phrases such as "I think," "I feel," "I love," "I hate," and "I wish." These statements expressed beliefs and frame of mind, supporting values within a cultural, gendered, and academic context.

Values and beliefs or attitudes influenced each other fluidly with the help of creativity and reciprocity.

In the second round of analysis, the value codes from the storyboards were expanded by coding the transcript (see Table 3.3) based on the questions posed. Once the coding cycles were completed, the value codes were identified and originally grouped into themes. As previously mentioned, the themes did not effectively display the relational connections as a living knowledge system. We attempted in Figure 3.10 but it was time to try again after more reflection passed. Pondering and immersion in the stories, with creativity and reciprocity, gave way to an ecological system of values. The ecosystem represented the most profound, creative, and loving way to deeply root in ancestral wisdom and embody the mental, spiritual, physical, and emotional aspects of life experience. Shifting to an ecological perspective provides the concept of coalescing values. Additionally, the themes imposed a hierarchy of values, contributing to another rigid knowledge system that disconnected lower values from the self. In contrast, ecosystems contain coalescing of natural processes that do not diminish, demonstrating that each component plays a vital role in maintaining balance. The photovoice storyboards and transcripts were developed from the Indigenous ecosystem of values. Figure 3.12 illustrated the co-learning process with my advisor as I knew using themes in the process did not suit these lived experiences. We drafted this together giant Post-It which was a very moving movement and relevant to this study as it represented what Indigenous and non-Native co-learning could be. Chapter Four contains the final version of the Indigenous ecosystem of values.

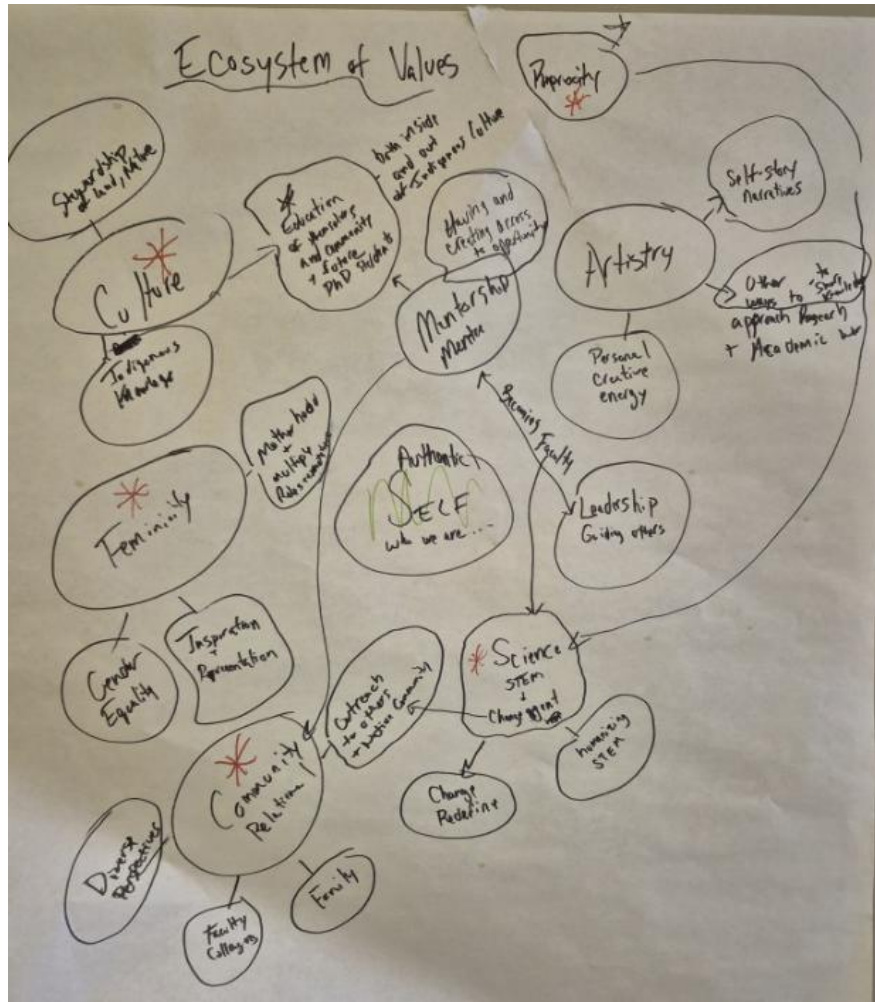


Figure 3.12

Our initial draft of the Indigenous ecosystem I created with my advisor in a co-learning process. Own work.

Table 3.3

A list of the questions discussed with the values crafted into an Indigenous ecosystem.

Guiding Questions	Values
<i>Representing you as an Indigi STEM faculty member</i>	Cultural identity Recognition/achievement Hope Stewardship Spirituality Community outreach Uniqueness Shared journey
<i>Something that makes you comfortable as an Indigi women in STEM</i>	Standing up for ethical Indigi-Faculty community Sharing IK Indigi PhD students Being Indigi self Family Mentoring/teaching students
<i>Something valued with your Indigi culture and womanhood</i>	Supporting the Indigi womanhood Family history Healing Reconnecting with lost culture Gender equality
<i>Braiding IK and Western Knowledge</i>	Sharing Indigi narratives/AutoE/Creative Research Understanding & Jumping around Academic Hurdles Embracing Emotions Redefining Science Guiding Indigi-Research
<i>How you help the community in STEM</i>	Storytelling/creativity Working together Supporting Indigi needs/education Humanizing science Becoming faculty Solving community issues College pathways Mentoring student research
<i>Positively influences STEM experience with Non-Native people</i>	Faculty supporters Indigi-pathways in curriculum Embracing cultural values Diverse cultural communities
<i>University or Dept. Values</i>	Increasing Indigi participation
<i>Value as an Indigi STEM faculty member</i>	Authentic self Motherhood/femininity Mentor/mentees Healing Reciprocity Indigi ways as a guide Various community support Community stake in research Native student leaders Wholeness
<i>Something you wish to share with the world</i>	Family Healing Emotionality, spirituality Connection to community Tie to the land/place Following your heart New beginnings Feminine inspiration Nature Creativity Food Visibility
Guiding Questions	Detracting Values
<i>Indigi STEM faculty member representation</i>	Managing political/ideological contrasts
<i>Something that makes you uncomfortable as an Indigi women in STEM</i>	Unethical Indigi research Poor treatment of Non-Indigi The only Indigi Sharing IK
<i>Indigi culture and womanhood</i>	Family history Losing culture Motherhood struggles Lost culture Unhappiness Invisibility Stereotypes Sexual assault
<i>Braiding IK and Western knowledge</i>	Academic Hurdles
<i>Negatively influences STEM experience with Non-Native people</i>	Unawareness to cultural STEM traditional perspectives & ways Political climate Program/Dept. instability Poor on-boarding
<i>University or Dept. values</i>	Conflicts Monetary Publishing Degree Output
<i>Something you wish to share with the world</i>	Balancing conflict

Note. Own work.

Through these conversations, I observed an erosion of values more clearly. The storyboard did not contain as much insight into value diminishment. The detracting of values themes includes institutional barriers and visible and invisible vulnerability. The negative instances were omitted from the ecosystem as it lessened their empowering and inspirational stories of hope.

Indigi Narrative Analysis

As storytelling emerged as a powerful means of expressing values and lived experiences, months of immersion in the data revealed that I first needed to unlock these narratives with another story, my methodology. This approach became the key, enabling me to interpret the dynamic interplay between scientific and Indigenous perspectives through cycles of reflection and practice. Scientific storytelling aligned naturally with the frameworks of two-eyed seeing (TES), both ways learning (BWL), and hope. Mastoras (2025) observes, “Science reveals how the world works, but without narrative, its discoveries can fade into noise. Therefore, science communicators must learn to tell stories that move both the heart and the mind” (para. 29).

Through TES, I recognized both the shared and unique values among Indigenous women, as well as the points of intersection and divergence with STEM culture. While BWL is often regarded as similar to TES, I experienced it as a vibrant, evolving concept with greater depth. TES, represented as two circles or puzzle pieces with eyes coming together, often felt two-dimensional. I found it helpful for identifying alignment or contrast but limited in conveying the movement and lived reality of values. I began to ask: How are these values connected? Some Indigenous women described values as taking on multiple forms and states in their experiences, prompting me to explore their dynamic nature more deeply. BWL thus became my lens for understanding the connections between values. It is illustrated by the mingling of fresh and salt

water in the intertidal zones of tropical coasts and estuaries, separate entities merging into something new and original. I found a similar convergence within the values themselves, which coalesced into a larger, interconnected knowledge system: the Indigenous Ecosystem of Values. Finally, the concept of hope allowed me to see creativity and reciprocity as agentic forces for Indigenous women in transforming STEM culture. Hope served as a binding force, connecting past, present, and future selves, and inspiring a vision for a promising future. Thus, the next subsection describes my approach as an Indigenous scholar with storytelling followed by a more analytical approach. I attempt to demonstrate a merging of Indigenous and Western Science and an interdisciplinary approach.

I Wove and Wore Their Stories with Alofa (Love)

Weaving and braiding hold significance for many Indigenous cultures, as we use these techniques to create cherished items. I found it appropriate, as a contemporary Indigenous woman mixed with other cultures, to weave together concepts from Indigenous and Western Science to create a holistic system of understanding and ethical collaboration. Leis or Samoan ulas, a symbol of love, friendship, and respect, with continuous connections. My ancestors wove lau'ie (pandanus or screwpine) to create exquisite, fine mats, among other items. These Samoan mats served both utilitarian and symbolic purposes. The most prized meaning of weaving lau'ie comes from our interconnected bonds to the individual, community, and nature. Reflecting on the gift of stories shared by my Indigenous Sisterhood, I am reminded of the honorable ways to incorporate and blend our collective inheritance from tradition into modern science. The metaphorical process of weaving and braiding facilitates the harmonious integration of Indigenous and Western Science. Therefore, I wove and wore their stories with much alofa, or love, through the knowledge of braiding Hawaiian (Maile) Ti Leaf Leis to describe the Indigi

science of coding, values coalescing into larger values, and their connections of relationship to each other. Figure 3.13 demonstrates a Maile Process of Coding, including a step-by-step process that shows an Indigenous woman researcher interpreting scientific code talking to both worlds. As a multicultural contemporary Indigenous researcher, my hands represent the instrument that wove the data/stories together. My hands represented human history, human presence, and the bridge of different worlds.

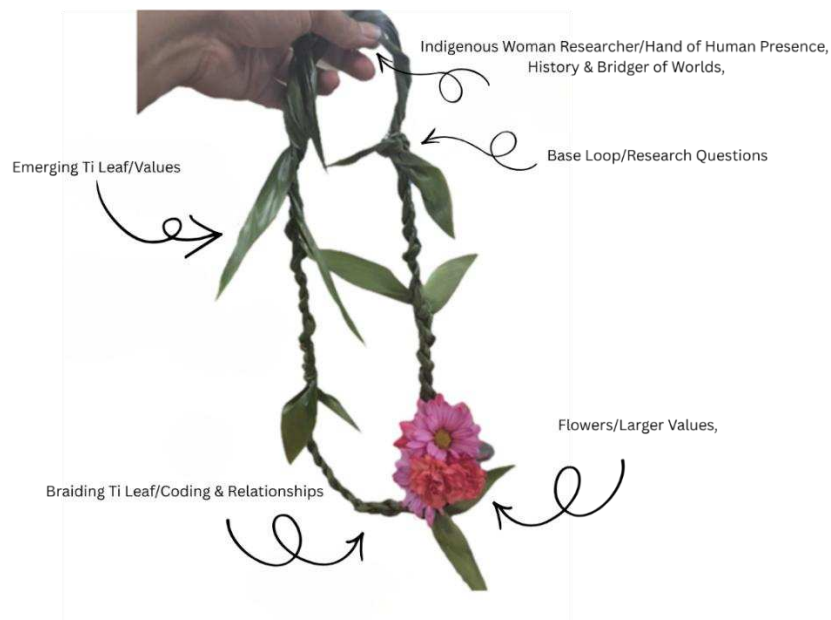


Figure 3.13

Cassandra's Maile Process of Coding. I compare the construction of a ti leaf lei to honor Indigi narratives and demonstrate how we take a part in academic scholarship while keeping our beloved collective inheritance with a lei I made. Own work.

The Cassandra Maile Process of Coding (as I think of Indigi and Western Sciences together)

Indigi speaker: Step one – I gathered the ti leaves to prepare for softening, shaping, and braiding.

Code talker: The ti leaves represented the pieces of the storyline, which I coded in the transcript line by line. In the Coded Values section, I give greater detail to the code process in a more

Western context. In addition, I incorporated strands of Cassandra's Wayfinder that embody frameworks of Two-Eyed Seeing (TES), Both-Ways Learning (BWL), and Hope. As described above, the frameworks helped me in merging the values into a living and relational concept. The foliage of theories and narratives sprawled across my desk, featuring striking colors, edgy patterns, and stripes. The leaves of data possess a firmness that cannot yet assume a desired shape. The initial codes require smaller and more meaningful labels. To soften the data, I immersed myself in cycles of reflective iteration by examining the live video, the transcript, and storyboards to refine the codes in Excel. For months and months, I immersed myself in the data to soften my rigid mind and open myself to the voices of these Indigenous women

Indigi speaker: Step two – I created a base knot by twisting softened leaves into a loop. Then I began to twist leaves one over the other with at least one end of the ti leaf outside the braid. I made sure to use tension to braid another ti leaf where the end of another ti leaf is out. Once completed, tie the end of the braid in the base loop to transform it into a lei.

Code talker: The methodologies of AutoE, PAR, creativity, and reciprocity represent a force of tension holding each new ti leaf or value in place. The braid symbolized the relationship or connection to each emerging ti leaf or value. The smaller values started to emerge from the ti leaf braid. The ti leaf sticking out of the braid was smaller value, which resulted from several codes twisted together. The smaller values/emerging ti leaves coalesced into larger values or flowers. The base loop serves as the foundation for the research questions, which the end of the braided data circles back to and ties into.

Indigi speaker: Step three – I placed flowers in places where several emerging ti leaves gathered.

Code talker: The flowers represented larger values. Similarly, a beautiful and unified narrative arises. Likewise, building this lei resulted in highlighting relational thinking and living concepts to create the Indigenous Ecosystem of Values that I described in Chapter Four and Five.

Chapter 4 - An Ecosystem of Relational Values from the Indigi Heart

This chapter summarizes the analysis conducted in alignment with the conceptual framework of Cassandra's Wayfinder with Two-Eyed Seeing (TES), Both Ways Learning (BWL), and Hope theories, which together help to answer the research questions which are as follows:

- (e) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education?
- (f) What behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

Furthermore, the sharing of Indigi self-narratives through transformative methodologies, including autoethnography (AutoE), Participatory Action Research (PAR), and Creative expression (Photovoice and more), informs and shapes the essence of Indigeneity, especially when engaging with the roles of femininity as experienced by faculty members in STEM spaces. Findings suggest that creativity, reciprocity, and values intertwine in a symbiotic relationship. Creativity acts as a force that ties values relationally and fluidly operate to sustain, grow, or change the value systems of the self and the overarching institutional value system. Values exist in physical and non-physical artifacts and play out in multi-faceted roles. I emphasize that reciprocity is a value and a force that defines Indigenous relationships. In this case, reciprocity strengthens connections to creativity and how these values are next in a respectful exchange to fulfill one's purpose and responsibilities as stewards. Most significantly, how these Indigenous women assert their ecosystem of values as a soft power that helps them creatively navigate and transform larger value systems.

Similarly, habitat ecosystems, the Indigenous value ecosystem, face challenges to thrive. I highlighted the clash between Indigenous experiences and academic settings. In Chapter Four, the values that the Indigenous Contributors' prize reside at the center of their hearts and coexist in reciprocity with creativity. Together, these elements can exert a powerful and soft influence, transforming us, others, and the institutional value system as a whole. In other words, Indigenous values hold promise for humanizing STEM education, which dignifies the values of all.

Values Revealed

This study captured heart-based values deeply rooted in our core to who we are as we negotiated through the academy. Additionally, values exist in various contexts, ranging from the individual to the community level and cultivated an ecosystem of values connected in a reciprocal manner. The themes of value formulated two categories: enhancement or detracting of values that make their ecosystem thrive or collapse. Regarding question one: (a) In this study, what are the Indigenous STEM values of Indigenous women serving as STEM faculty members in higher education? The study identified numerous values that led to the emergence of themes such as holistic epicenter, woven IK (Indigenous knowledge) and relational worldviews, and transformative and cultural STEAM education, cultural integrity, and inspiring Indigi wholeness.

This work promotes an understanding of values at one's core, their creative ways of connecting in reciprocal ways, and the cultivation of an ecosystem grounded in values. It has the potential to transform the rigidity of institutional value systems into permeability with other ecosystems of value and a willingness to inclusively and respectfully evolve into an ecotone. In other words, two different ecosystems integrate to produce a transitional area. However, value systems can coexist symbiotically (thrive) or clash (erode). Knowing each one's values helps us understand the significance of another's values, uncovering the heart or core of who we are and

the North Star that guides our purpose. Values naturally stem from innate cognitive frameworks that attach to various aspects of one's life. "Values have played an important role not only in sociology, but in psychology, anthropology, and related disciplines as well. Values are used to characterize societies and individuals, to trace change over time, and to explain the motivational bases of attitudes and behavior" (Schwartz, 2009, p. 1). I detail the themes of our Indigi STEM values, as exemplified by Indigi women in faculty roles in higher education. I hope that non-Native and Indigenous communities coalesce around a shared educational journey grounded in shared values or a collaborative ecosystem that navigates what is important together.

The Value of Holistic Self

Oftentimes, human knowledge is parceled into specialized systems to some degree. The practice of fragmentation forms the habit of the "compartmentalization of knowledge as whole that we tend to lose sight of the very foundations on which it all rests or may rest" (Scheler, 2012, p. XII). I contend that values, especially self-values, operate in a relational context that counters a segmented perspective and a linear understanding. For example, the value of healing through self-value may include taking part in a smudging ceremony (spiritual), meditation (mental), art therapy (physical), and/or creative expression (emotional). The complexity of self-values may overlap and serve more than one function, supporting the whole system and relational comprehension rather than just parts of a system. Scheler (2012, p. XXVII) states that humans engage in a functional relationship with values.

Additionally, "human beings experience an infinite number of shades of value during their lifetimes, and the question is whether all values can, nevertheless, be reduced to a basic order of values" (Scheler, 2012, p. XXVII). The attempt to rank in a higher order proves challenging, as lived experiences change individuals, and noting "lesser" values appears

counterintuitive. Therefore, I illustrate the Indigenous medicine wheel (see Figure 4.1) to represent the value of self and guide the reader into non-linear thinking. The medicine wheel demonstrates how the core of self (the heart) interacts and links with every aspect. In this case, how these values radiate in all directions from and into who we are. “Without first valuing oneself or one’s self, as the theory goes, one cannot learn to value other things” (Kristjánsson, 2010, p. 180). The medicine wheel represents the value of self and points to the unfolding of other dimensions of value in accordance with the Indigenous holistic perspective.

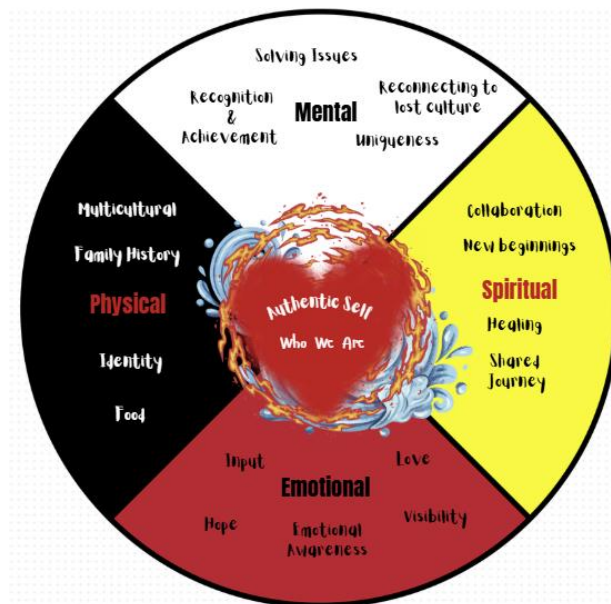


Figure 4.1

The center of the ecosystem which is Self (the heart) with the Indigenous medicine wheel. These smaller values coalesce into the sense of Self. They did not coalesce into the larger values; however, it was important to mention their existence to honor inherent worth. These values are represented in the image of the medicine wheel, which connects all values and the core self in a holistic manner. Own work created using Canva.

The Contributors shared the values of multiculturalism, family history, identity, food, giving input, hope, emotional awareness, love, visibility, healing, a shared journey, new beginnings, collaboration, uniqueness, solving issues, recognition and achievement, and

reconnecting to lost culture. These values shone with vibrancy in the group conversation and clustered into the medicine wheels as building blocks of self-value. The medicine wheel teaches us to develop ourselves holistically in the mental, physical, and emotional aspects (Bell, 2014). Likewise, these values coalesce into a self that resembles the physical, spiritual, mental, and emotional nature. The use of the medicine wheel symbol signifies values such as wholeness rather than fragmentation, balance rather than hierarchical ranking, a relational connection to self, and centering on lived experiences that develop the whole person. Hence, the holistic experience with values emphasizes all dimensions of self-value and values extending outwards.

Ecosystem of Values

As humans, we possess many values. Some values may take priority over others, and some may overlap or influence each other. No person holds only a single value. Therefore, a holistic approach to understanding these values is appropriate for uncovering how they connect within a natural system. Natural resources, for example, ecosystems, appropriately reflect Indigenous identity, culture, and spiritual values, as nature is tied to Indigenous well-being (Sangha et al., 2015). Reflecting on the Indigenous perspective, “ecosystems–indigenous values and capabilities–indigenous well-being, indeed, provides much-needed in-depth knowledge to guide future policy decisions on well-being” (Sangha et al., 2015, p. 198). An ecosystem draws parallels to Indigenous holistic thinking, values, and beliefs (Harmsworth & Awatere, 2013). Additionally, values are born of human-centered inquiry, affirming the use of natural systems. These systems socially adapt over the duration of lived experiences.

Figure 4.2 artistically illustrates the ecosystem emerging from the focus group’s photovoice and conversation. At its center is a heart, symbolizing the core self - who you are. What shapes this core, if not, in part, our values? Radiating outward, clusters of values support

and merge into larger values. The larger cluster includes culture, femininity, STEM change agent, relational community, mentorship, and holistic. This clustering does not suggest that any one value outweighs another. I envision droplets of water coalescing into a greater pool. The relationships among these values, much like those in an ecosystem, sustain them. In this study, creativity and reciprocity serve as the bonds linking these values. I represent creativity and reciprocity as water and fire. These elements are often sacred in Indigenous perspectives, reflecting a vital balance. Fire renews life, while water sustains it. This ecosystem of values affirms the contributors' intrinsic worth, interwoven with womanhood and Indigeneity. Below, I provide an overview of a cluster of values and its development with pictures (see Figures 4.3-4.8) and conversations. I reiterate that the values do not follow any ranking of importance. The starting value starts with holistic self and extends to the other cluster of values in the ecosystem.



Figure 4.3

Photovoice self-narrative of Indigenous Sister 1. The poster was created the night before and discussed at the focus group/sharing circle.



Figure 4.5

Photovoice self-narrative of Indigenous Sister 3. The poster was created the night before and discussed at the focus group/sharing circle.

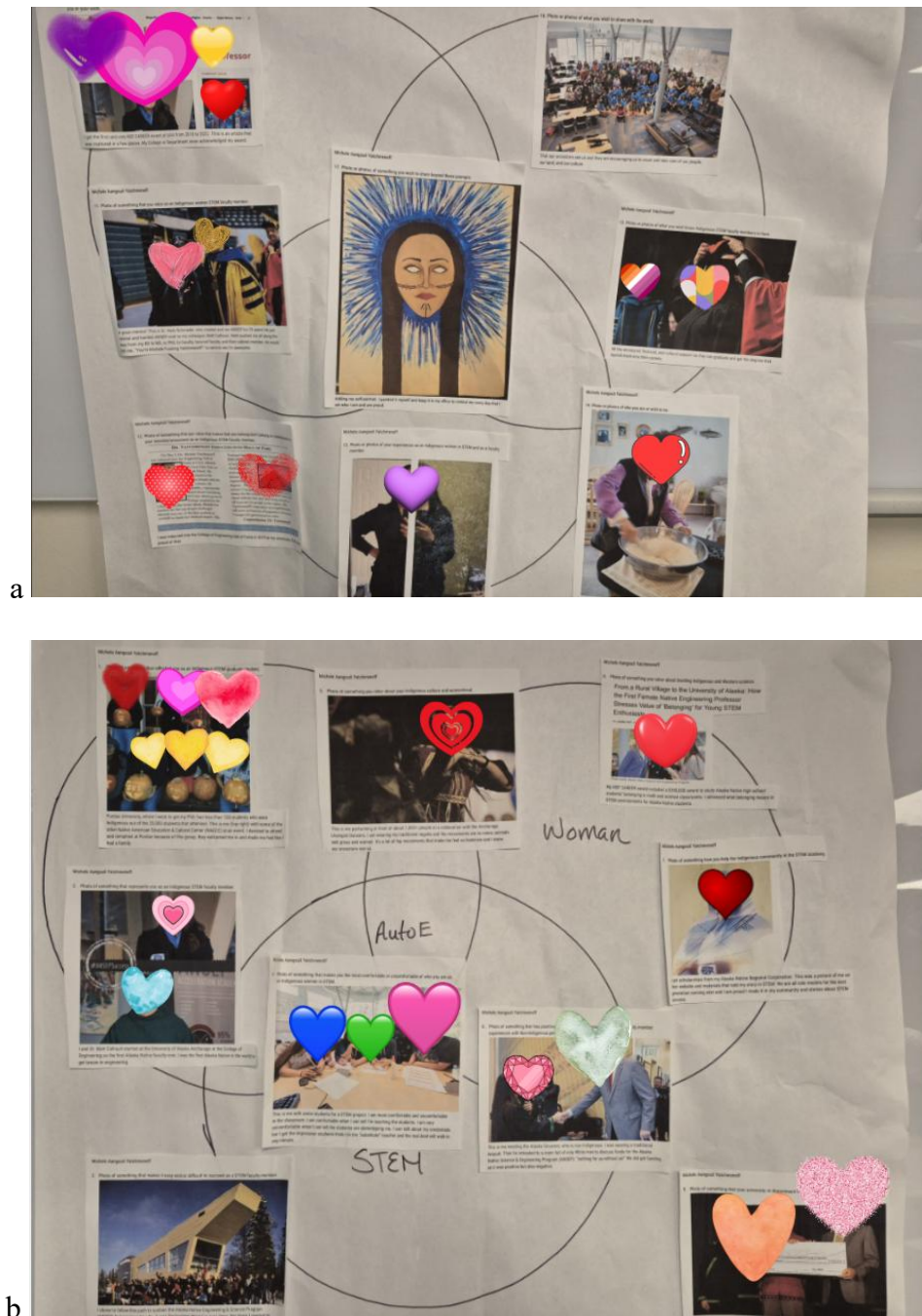


Figure 4.6

Photovoice self-narrative of Indigenous Sister 4. The poster was arranged physically by me as this sister was online. Also, why there are no decorations.



Figure 4.7

Photovoice self-narrative of Indigenous Sister 5. The poster was created the night before and discussed at the focus group/sharing circle.

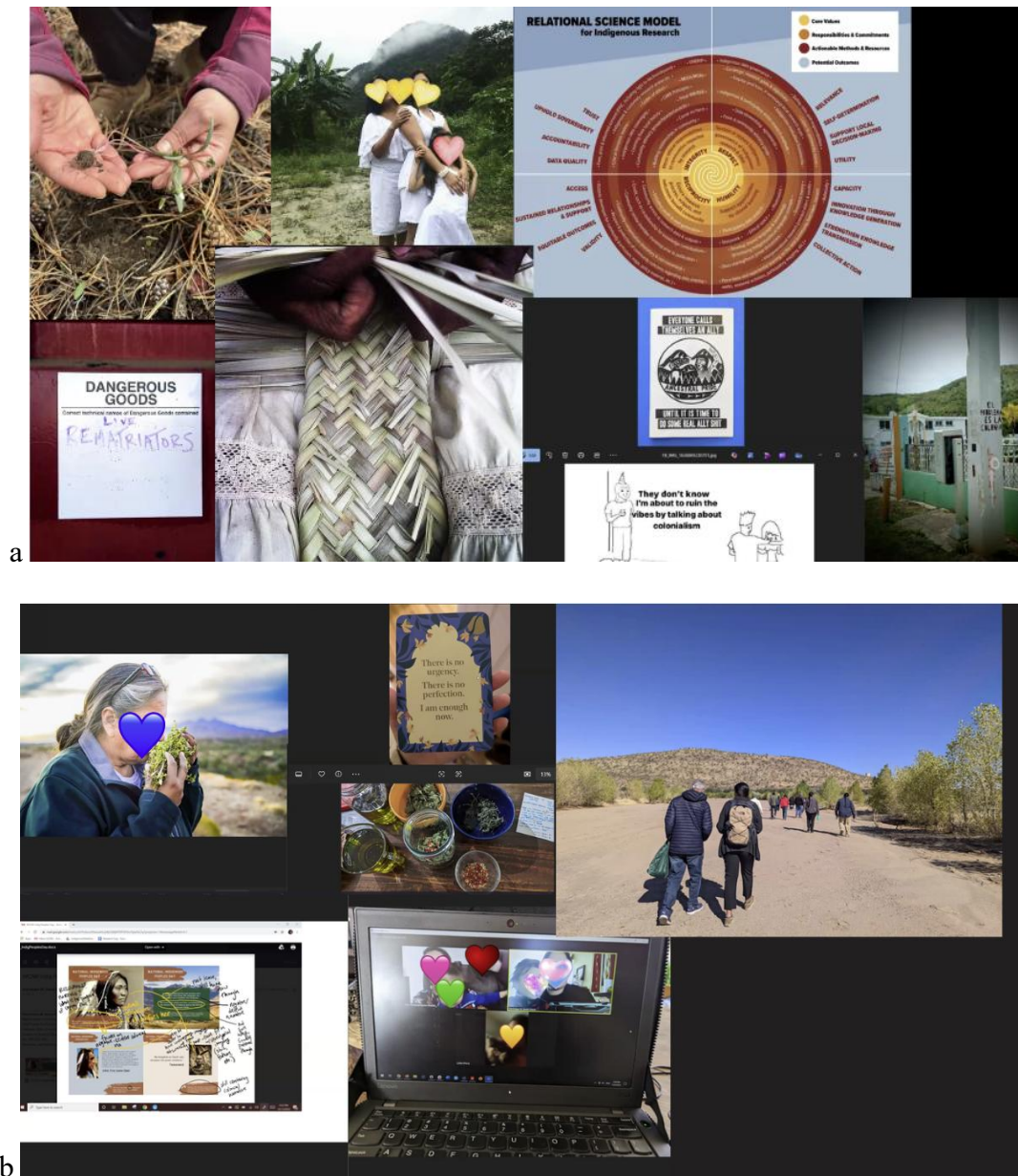


Figure 4.8

Photovoice self-narrative of Indigenous Sister 6. The poster was created the night before and discussed at the focus group/sharing circle.

Mentorship.

The definition of mentorship: the direction, influence, or guidance given by a mentor (Merriam-Webster, n.d.). Figure 4.9 symbolizes the values of mentorship. The value of mentorship lies in the roles of mentor and mentee. The values of becoming faculty and having

access to opportunities coalesced into mentorship. As a value, mentorship defines a relationship of trust and empathy that facilitates personal or professional growth, empowering both the mentor and the mentee in various ways.

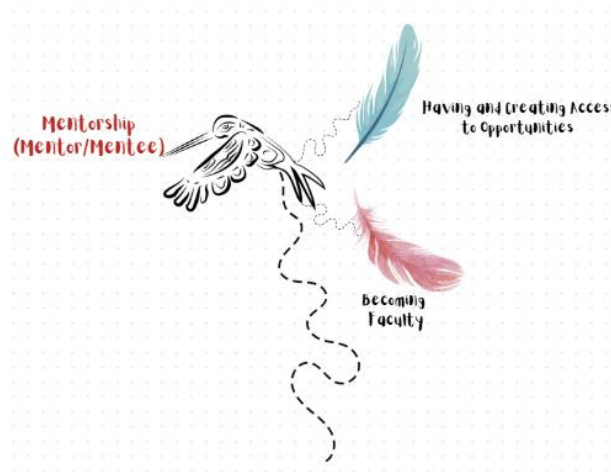


Figure 4.9

A bird with feathers symbolizing the mentorship value cluster. Own work created using Canva.

The mentorship value in this experience took the form of relational support from peers, the institution, and community continuity. In the academy mentorship often comes across as professional advising. However, this Indigenous Sister's experience demonstrates mentorship as communal, culturally sustaining, and relational.

We belong to many communities. However, the absence of the Indigenous community may weaken our connection with them. The presence of another Native person supplied support and reinforced the tie to the community. This experience reflects mentorship as an empowering cultural affirmation from an Indigenous peer. The presence of another Indigenous doctoral student as a peer mentor in the program created a shared mentorship experience that reduced isolation, provided emotional and relational grounding, and increased a sense of belonging in the STEM program.



Figure 4.10

Photo of Native peer mentor and colleague in STEM program. Both are Indigenous faculty now from photovoice storyboard.

One Sister commented (see Figure 4.10) on the appreciation of attending higher education with another Native from the community while obtaining a doctorate. Additionally, the university sought to support collectively Indigi doctoral students in transitioning successfully to faculty positions in the larger non-Native community. Mentorship has the power to shift from individual responsibility to a community-supported developmental pathway. The institutional mentorship occurred by recognizing the systemic barriers faced by these two Indigenous doctoral students, creating supportive pathways in higher education and into their desired careers as faculty. Faculty

positions enable us to foster the empowering relational ties of support that our communities, Indigenous students, and others value holistically.

"Both of us [are] coming in at the same semester, and at the time [we were] thinking...the university was very behind...our...PhDs. [We had] support from the university to go back and get our PhDs. [It was a] ...congratulatory moment [to become] faculty...[and]...making that milestone happen."

The institutional and peer mentorship generated celebratory emotions with validation and investment in Indigenous academic and career success. Mentorship indicated achievement of milestones and academic success, helping strengthen professional legitimacy and Indigenous identity

Too often, we find ourselves as the only, or among the first, individuals in STEM spaces. The contributor's ability to find an Indigenous peer mentor helped counter the typical isolation in STEM and act as a stabilizing force in underrepresented environments and serve as a protective. Mentorship restores a relational equilibrium that isolation can fragment and distort balance. This experience underpins mentorship as a collective effort to flourish, as individual advancement stifles. While experiences may differ, it is crucial to feel that one represents a broader community, as this can negatively impact on our ability to maintain a balanced perspective. However, having others around us reinforces our shared responsibility for each other's well-being and balance. A heartwarming moment occurs when the academic community recognizes and takes action to support its two Indigenous doctoral students. The supportive relationships among these students and the wider academic community reaffirm a shared commitment to holistic cultural continuity. Culturally grounded mentorship builds a relationship of individual success as community

obligation values carry across generational communities and emphasizes relational accountability.

Mentorship becomes not only relational but also cross-cultural and reciprocal. When an academic advisor decided to lean into a mentorship role, they became a relational ally and a protective intervention. This experience detailed the incredible mentorship relationship between a non-Native advisor and an Indigenous advisee. The advisor demonstrated reciprocity by becoming an ally in their mentorship role to address certain Indigenous needs.



Figure 4.11

Native self in traditional wear with Non-Native mentor and advisor on graduation day from photovoice storyboard.

In addition to an institution providing a space for braiding Indigenous knowledge, the holistic process was enhanced by the respectful mentoring of non-Native individuals, particularly those in positions of influence. Non-Natives share interconnection to us and part of life IK empowered reciprocal relationships, as one Sister recalled the impact of her advisor's support in helping not only her but also the community to find a pathway in STEM (see Figure 4.11). The

mentorship of this advisor extended beyond technical supervision and individual career guidance into the creation of a STEM pathway. This advisor established the notion that mentorship should construct community impact by opening STEM access to invisible populations, reinforcing collective advancement, and undertaking the role of structural agency. "I think that's the legacy that I bring... I'm [going to] continue this... I know the only reason I ended up getting my PhD was because of [my advisor]". She continued, "I'm looking forward to helping other students achieve their goals that they might not even know exist." This Sister's quote also revealed the reciprocal relationship of mentorship, where the mentee transitioned into a mentor, support became a continuous practice of legacy, and advancement embedded responsibility

In underrepresented spaces, the non-Native advisor took the initiative to act as the vital starting point for Indigenous mentorship. This action highlighted the importance of increasing cross-cultural mentorship; a non-Native advisor was key in sharing academic and career experiences and in supporting retention and advancement in higher education. As Native educators are sparse, Indigenous STEM professors holding doctorates in advising roles drastically dwindle. Therefore, many Indigenous students receive mentorship from non-Native advisors, particularly with land-grant institutions. From personal experience, I hear the land grant statement read. It helps with the acknowledgment portion, but I often wonder about the actions needed to activate and sustain reciprocity. In this case, the non-Native advisor created a mutual relationship by supporting an Indigenous graduate student in achieving her goals, which became his motivation. In other words, I distinguish between symbolic recognition (land grant statements) and active reciprocity (intentional mentorship and advocacy). The example of an advisor mentor exceeds the land acknowledgement for an Indigenous advisee with tangible support, shared motivation, and mutual investment in growth. Ultimately, mentorship empowered mutual transformation.

Mentorship continued to operate on cultural and relational levels. The experience highlighted the mentoring relationship as a source of courage and shared growth. This point prompted the idea of advisors moving away from a supervision model toward committed co-learning. Another Sister expressed her appreciation for her non-Native advisors to attempt to understand, support, and become involved in her world (see Figure 4.12). Advisor mentorship involved cultural humility, willingness to enter unfamiliar spaces, effort to understand lived experiences, and emotional investment.



Figure 4.12

Advisors and Indigenous mentee from photovoice storyboard.

Advisors all saw past the labels and cared about each other's growth. Consequently, it led a Sister to take charge of her educational journey. Their mentorship mirrored identity-affirming support rather than reducing this Sister to institutional characteristics (Indigenous, woman,

underrepresented, etc.). The advisors' recognition of her as a whole person aligns with holistic development and honors her inherent worth. Mentorship empowers humanization, de-labeling, and centering on relationships. "There are individuals that I have to remind myself, like my advisors. They're my cheerleaders. [We are] building this space. [They are] advocating for me to be able to study what I want to study." Mentorship strengthened this Indigenous woman's empowerment through advocacy within the academy, protection of intellectual autonomy, and expansion of scholarly freedom. In this example, advisors used mentorship to protect her agency by increasing her self-efficacy, confidence, and sense of ownership in her educational journey. Mentorship facilitated relational building in a new intellectual space. The advisee and advisors considered mentorship collaborative and co-constructed for knowledge creation.

To this point, cultural integrity forms organically through shared experiences. It takes courage to immerse oneself in the unknown. It is not perfect, but it demonstrates a commitment to co-learning and supporting each other. Given the complexity of lived experiences and who we are, mentorship is about striving for progress. It is imperfect with risk-taking but intentional. With mutual commitment from the advisee and advisor, mentorship constituted reciprocity, shared development, and growth on both sides. Overall, the value of mentorship with non-Native advisors and Indigenous advisees, Indigenous peers, or the academy suggested the importance of the Indigenous perspective of valuing mentorship: 1) not only performed professional advising, but also a relational and communal shared connection; 2) protected cultural affirmation and Indigenous identity support; 3) portrayed community investment in success versus individual achievement; 4) held higher education as a responsible partner and advisors as the key to structural mentorship; 5) functioned cross-culturally; 6) incorporated peers; 7) guarded agency and advocacy; 8) stood as a cyclical and legacy responsibility; 9) supported the whole person;

and 10) involved co-learning and mutual growth. The value of mentorship lies in protecting, empowering, and cultivating an intellectual community. I spotlight mentorship as a force that helps Indigenous scholars navigate and redefine STEM.

Culture.

The definition of culture: the beliefs, customs, arts, etc. of a particular social group, place, or time (Merriam-Webster, n.d.). Figure 4.13 symbolizes the values of culture. Stewardship (land, nature, animals), education inside and outside of Indigenous culture (self, community, future PhD students), and Indigenous knowledge (IK) coalesced into the culture. As a value, culture defines a holistic and relational way of life, encompassing living and non-living entities to create, learn, and engage our lived realities.

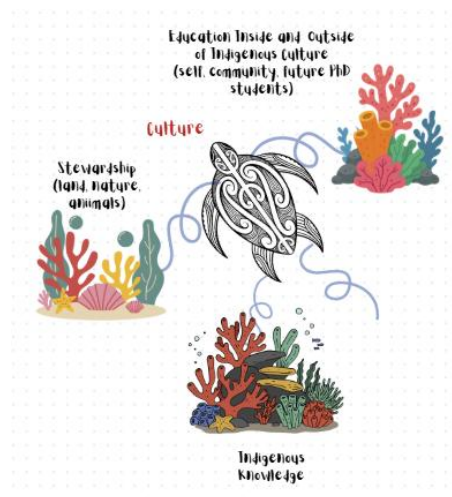


Figure 4.13

A turtle with coral reefs symbolizing the culture cluster. Own work created using Canva

IK signals creativity and collaboration, encouraging innovation and pushing back to the rigidity of traditional knowledge usually ingrained into STEM culture. In this example, the cultural value foretold of co-responsibility and co-learning as factors for empowering participatory knowledge creation. The weaving of IK requires creativity in co-designing and co-teaching, as no

instruction manual exists. However, one needs a space open to experiential, place-based, and community learning. The center of education connects to lived experiences, community, and land. The cultural value of embodied experience and places teaches us to be respectful stewards of all that is linked to them (plants, animals, people, earth, etc.). A Sister spoke of resisting the pressure to view science in a singular light (see Figure 4.14). She discussed creating STEAM spaces that foster experimentation with the concept of cultural science.

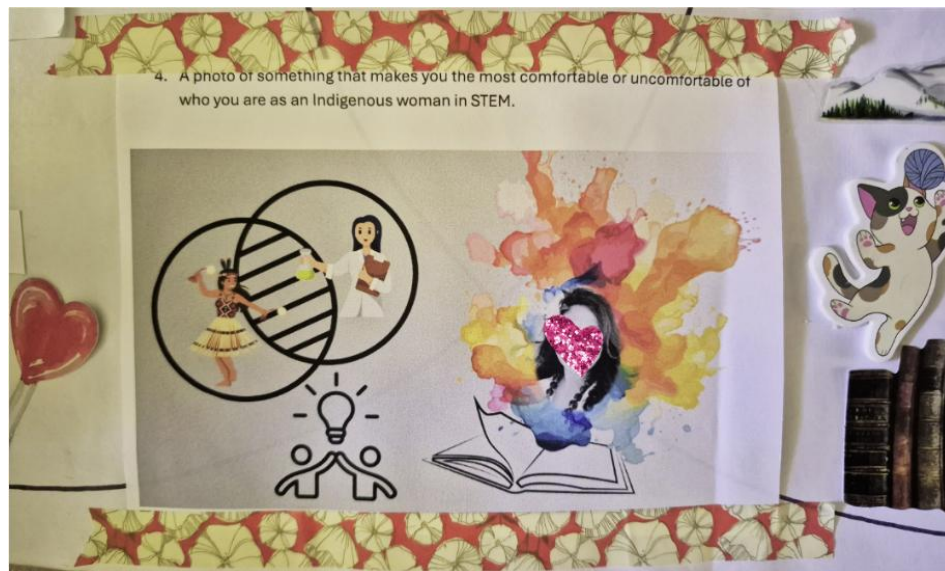


Figure 4.14

Self-storytelling of a world where Indigenous and Western science coexist from photovoice storyboard.

Indigenous culture welcomed Western science into pluralistic knowledge systems. The cultural value of holistic integration inspired diverse perspectives to coexist and inform each other. She stated, "I'm working to integrate these two perspectives, and I'm grateful for the space I have to do so. I feel empowered to assert that this is how we will approach things. It's now up to us, as individual researchers, to interpret and navigate these lenses." Researchers bear the responsibility for navigating knowledge with the utmost care. Indigenous culture champions researcher agency

so long as they follow relational and ethical guidelines. Cultural values contain the boundaries of ethical frameworks and accountability. The practice of integrating IK highlights the Indigenous researcher's reciprocal relationship with the community's cultural knowledge. Indigenous knowledge requires reciprocity with knowledge. The cultural value of sharing co-created knowledge is core to cultural practice. Indigenous culture refuses approach to knowledge that exploit. The cultural value of interactions emphasizes respect, reciprocity, and equity. The extraction of knowledge sets a template for one-sided relationships, in counterintuitive Indigenous relational perspectives.

More importantly, Indigenous researchers find a willing environment for experimental braiding. When we experiment, we make discoveries and redefine knowledge. Indigenous knowledge seeks a dynamic relationship to enhance understanding. The cultural value of innovation and tradition facilitates the adaptation and evolution of knowledge systems. Imagine the power of knowledge with multiple ways of knowing working together versus a singular component. Holistic and blended worldviews are more powerful and complete than one-dimensional methods. Cultural value encompasses all worldviews.

Historically, objective science removes the human element, which promotes a culture of knowledge extraction. Taking without giving undermines the Indigenous relationships of respect and reciprocity. Indigenous ethics require the sharing of knowledge. The cultural values of ethics and reciprocity provide balance for knowledge exchange. Learning is relational in that all students, educators, and institutions participate with mutual respect. The cultural value of relational accountability dictates that co-learning is a shared responsibility among all learners. Another Indigi Sister added that IK promoted reciprocity with students, educators, and the systems of learning and teaching (see Figure 4.15). "We are doing this cultural science. We are

learning, and it's not perfect. There's a relationship there...[for them to] tell us what to bring".

Scientific knowledge emerges through critical dialogue, humility, and ongoing relationships. The cultural value of relational knowledge creation demonstrates openness and shared inquiry.

Therefore, Western Science needs to instill a reciprocal relationship to become harmonious with IK. Entertaining reciprocity and other cultural concepts humanize science.



Figure 4.15

Indigenous woman faculty mentoring a student on a research project in Costa Rica from photovoice storyboard.

The cultural value of balance and harmony across diverse knowledge systems elicits mutual respect and transformation. Combining Indigenous cultural concepts with the dimensions of STEM restores subjective, emotional, and relational cultural values. The cultural value of holistic understanding includes lived experience, emotion, and community in comprehending the STEM context. It helps transform science inquiry to include subjective matters.

A hopeful mindset nourishes wholeness. Hope represents a shared optimism in a community-centered collective. The cultural value of healing and growth promotes collaborative resilience and interconnected well-being. Hope and wholeness work together to overcome challenges and picture a dazzling future. In Indigenous culture, plumerias symbolize transformation, renewal, and continuity in the journey of life, including in science. The cultural value of cyclical growth and regeneration, symbolized by nature, honors transitions, milestones, and pivotal points in life. Another Sister reflected on the power of hope as an agent for wholeness, as she saw it in the act of overcoming adversity together (see Figure 4.16).

"Plumerias represent a new beginning. That is something that I was thinking about at this point...just even being here. Some of the things that you're still chasing, and what you're learning from this space and bonding in this community. It gives me so much hope that things are getting better than they were before. And yes, we do have certain challenges that we still have to unite together [to solve them]...There is so much more hope that I'm seeing [as] a lot of us who are starting [to ask] at undergrad, or even in high school [levels]...what is science? Gifting the plumeria is love, honor, but also in the sense [a] new beginning. [That is] my story [in science]...there is hope."



Figure 4.16

Plumeria on the beach in Oahu, HI from photovoice storyboard.

This example illuminates many other details about the value of culture, including how community connection fosters a sense of belonging, hope, and shared purpose within educational and scientific spaces. Indigenous culture empowers youth, enabling younger generations to question and engage with science, signaling a transformation of STEM culture. The cultural value of intergenerational responsibility sustains Indigenous continuity in STEM educational pathways. Practices not common in STEM culture, such as the gifting of a plumeria, indicate Indigenous peoples' ability to attach emotional, cultural, and relational meaning within their academic and STEM journeys. The cultural values of relational accountability, honor, and respect serve as a North Star for learning and knowledge creation.

Practicing cultural traditions reinforces cultural and community identity. Carrying the ability to practice IK in the classroom permits Indigenous educators to uphold their whole identity, Indigeneity, and womanhood. One Indigi Sister honors wholeness by passing on knowledge of the traditional sheep butchering to her science students when examining animal tissue samples (see Figure 4.17). It demonstrates a way of life connected to land and its people's traditions. "Did a butchering party to get sheep tissue, but it was a mix of community people, people from different universities, students. Many people [are] together trying to do something positive. I like modeling that for students who are now doing that...really awesome". The Indigenous and non-Native students gained greater insights into the lesson on animal tissues by understanding the tie and significance of sheep to a local Indigenous community. The elder's stories on the history of the land and everything connected to it honored and respected the sheep's life given or its part within the whole. Consequently, the students viewed a portion of the educator's identity that made her whole.



Figure 4.17

STEM field trip for ceremonial sheep butchering and gathering tissue samples from photovoice storyboard.

The cultural value of engaging, learning, and creating a holistic and relational lived reality entails: creativity and collective innovation, experiential, place-based, and community learning, multiple and holistic ways of knowing, ethics, reciprocity, and relational accountability, humanizing STEM, experimental practice, hope, wholeness, and community resilience, intergenerational responsibility and empowerment, love, honor, and relational meaning making. Supporting the Contributors' value of culture in STEM: 1) Created a flexible and adaptive STEM knowledge system; 2) built the foundation of knowledge on relationships, lived experiences, and stewardship; 3) endorsed pluralistic ways of knowing to enrich holistic understanding; 4) prevented exploitation and restoration in research; 5) allowed for human and community connections to embolden STEM inclusivity; 6) Evolved space for intergenerational knowledge exchange; 7) promoted the aspects for community well-being, relationships, and emotions for resilience; 8) ensured the empowerment of youth through cultural persistence; 9) expanded STEM knowledge to include layers of emotional, relational thinking, and ethics. The value of culture transforms the way knowledge is applied, shared, and creative, making STEM inclusive, respectful, and connected to lived realities.

Femininity.

The definition of femininity: the quality or nature of the female sex; the quality, state, or degree of being feminine or womanly (Merriam-Webster, n.d.). Figure 4.18 symbolizes the values within femininity. The values of motherhood and multiple roles, inspiration and recognition, and gender equity coalesced into femininity. As a value, femininity defines a connection to matrilineal practices, relational selfhood, and reclamation of power.

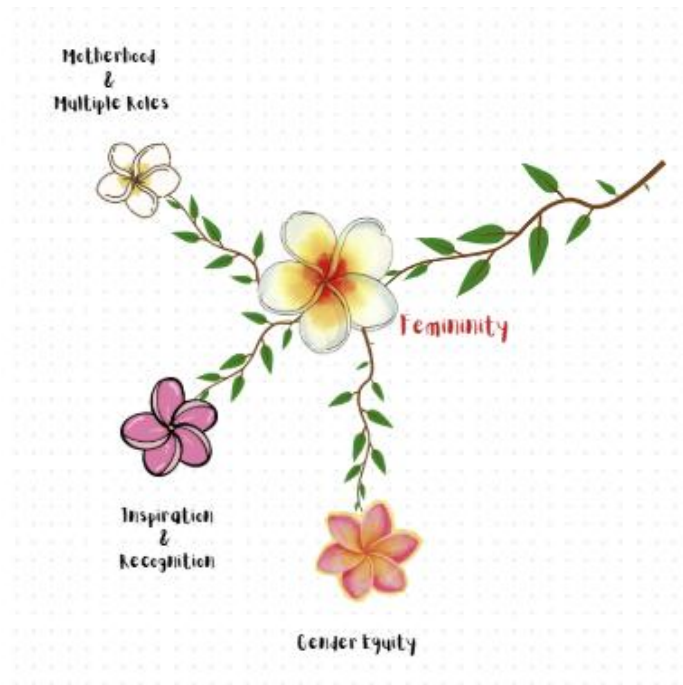


Figure 4.18

Flowers symbolize the femininity value cluster. Own Work using Canva.

Indigenous womanhood is marked by considerable complexity, ranging from appreciation to recovery. Womanhood appeared incomplete without its counterpart of Indigeneity. Although some previous literature examines gender and culture independently, we viewed Indigi womanhood as a merged identity, reinforcing intergenerational healing and advocacy. Gender and cultural heritage remain inseparable as each identity empowers the other. The value of femininity interconnects gender and culture in a holistic and relational selfhood. Indigenous women are defined through interactions and relationships with others. The femininity value of self arises from social and ecological systems.

Indigenous femininity transmits generational wisdom, resilience, and strength through the storytelling of family history. The value of femininity honors matriarchal knowledge through community-focused care and intergenerational responsibility. A Sister shared the hardships of past women relatives, a source of inspiration to overcome adversity (see Figure 4.19). "My grandma,

[whom] I just drew lots of strength...[went through] boarding school...had tuberculosis...and survived all that...so wise...so strong." The same transmission of femininity underscores the responsibility to pass down creative expression, stewardship, and cultural practices, despite the challenges that disrupt. The value of femininity sustains knowledge and cultural continuity and supports creative practices in the community.



Figure 4.19

Self with Indigenous matriarchs of the family (mother, auntie, etc) from photovoice storyboard.

Another Sister remarked on her love for beading and the skills she learned from YouTube as a result of her father's forced removal to a boarding school (see Figure 4.20). She details her experience with the severance of beading knowledge from the Indigenous matriarchs, but with a powerful desire to learn and pass the knowledge to her daughters. "How do I reconnect? I don't have an auntie to teach me how...I don't have my grandma to teach me. But I have YouTube, right?

Also, I have these two beautiful daughters. How do I teach them how to be Indigenous women in this world as well?" Some Indigenous individuals face reconnecting to their Indigeneity as generational knowledge becomes disrupted. Indigenous women often find themselves combining tradition and modern technology to maintain cultural continuity. The value of femininity, steeped in relational and cultural responsibility for future generations, influences innovative learning, adaptability, and resilience.

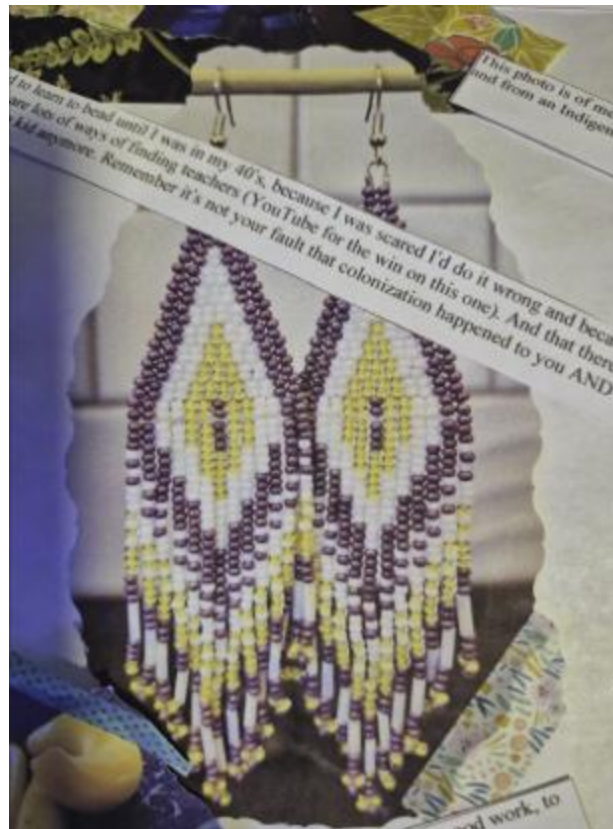


Figure 4.20

Beaded earrings made after watching YouTube to learn how to bead as some Indigenous are disconnected from culture for various reasons from photovoice storyboard.

Indigenous femininity comprises self-determination, self-agency, and the ability to shape one's identity within an ecological value system. The value of femininity empowers Indigenous women's autonomy and self-definition when maneuvering through several cultural contexts. As a

woman of mixed heritage, I was raised in a modern light, and I consider myself a contemporary Indigenous woman on a path to define what Indigeneity is. Similarly, this Sister lost the ability to bead. She used modern Western technology to learn to bead, reviving the relational concept of passing wisdom, culture, and skills to the next generation—her daughters. This action establishes reciprocal intergenerational knowledge exchange or ongoing learning between generations. Indigenous femininity portrays a cultural and relational sharing of wisdom, mentorship, and teaching. The value of femininity supports youth empowerment, reciprocity, and accountability through maternal leadership.

Indigenous femininity accepts creativity as a connection, resilience, and personal expression. The value of femininity ushers in the transmission of intergenerational cultural artistry and creative skills. Another Sister recanted her favorite art projects, including beaded jewelry and moccasins, giving way to a simpler life (see Figure 4.21a, Figure 4.21b). Her daughter's artwork, featuring nature, animals, and infrastructure projects, added to her happiness and ultimate wholeness. Creativity appeared to melt a troubling environment slightly. Indigenous women find joy, completeness, and purpose in witnessing and supporting the creativity of the next generation. The value of femininity nurtures intergenerational bonds through relational mentoring. " I also like to kind of go against...creative destruction. I'm much more of a very simple person...my youngest daughter, she does paintings...little mini paintings. We can...be in our creativity." Indigenous femininity appreciates the simplicity of living mindfully and creates spaces for reflection and creativity. The value of femininity harmonizes family and personal life with balance and intentional living.

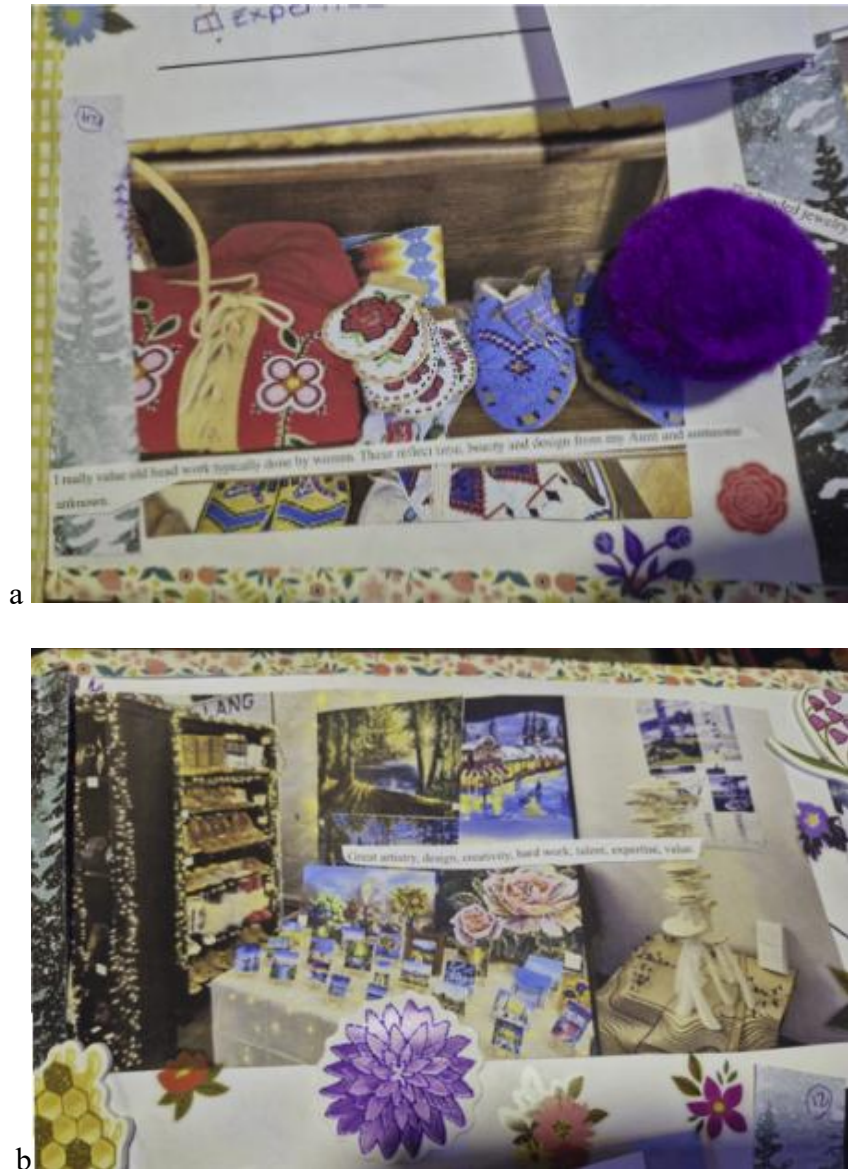


Figure 4.21

Displays of creativity with an Auntie's beadwork, daughter's creative projects, and from others from photovoice storyboard.

Although issues arise in STEM, an Indigenous woman's hope motivated her to see a new beginning with a sense of wholeness. Indigenous femininity empowers adaptability and perseverance in the wake of exclusionist STEM spaces. The value of femininity transforms along educational and professional pathways, empowering strength and adaptability. By believing in

the possibility of a better future, this Indigenous woman worked toward achieving better emotional, physical, spiritual, and mental wholeness. Indigenous femininity encompasses resilience, hope, and holistic well-being practices during times of turbulence. The value of femininity instills the emotional, physical, spiritual, and mental dimensions of self, optimism to heal.'

Indigenous femininity may find an outlet for spiritual connections, cultural knowledge, and heritage. The value of femininity embodies cultural community, identity affirmation, and traditions. Indigenous attire serves as a profound connection to identity. The unique patterns and colors symbolize a rich cultural history intertwined with spiritual traditions, practices, healing, and knowledge systems. Indigenous women wear traditional and culturally inspired attire to integrate their personal and spiritual identities, making them feel whole. The value of femininity utilizes clothing artifacts to vitalize their relationship to community, honor ancestors, and reflect a holistic self.

Another Sister brought her holistic self with her Indigi attire. She often wore beaded earrings and ribbon skirts, especially on special occasions (see Figure 4.22). The gesture invoked the presence of her people, family, and heritage. Additionally, her department gifted her with an Indigi stole to wear at her doctoral hooding ceremony. The significance of attire as a symbol of accomplishment possesses the power to link personal achievements to femininity and Indigeneity. The value of femininity in higher education fosters empowerment and pride in identity. "I have a Pendleton stole that was gifted to me from the program. I gotta have big earrings...I got this PhD, and I'm aunt... I'm an Indigenous woman." Wearing Indigenous attire or accessories in a significant non-Native ceremony served as a connection to the past, present, and future, tethering the self inward and outward to the community. Indigenous women view their femininity as relational

because it connects these women to ancestors, the present community, and future generations. The value of femininity shows cultural stewardship, relational accountability, and intergenerational continuity. Symbols operate as components within a larger context that holistically completes us and the community. Cultural attire stimulates Indigenous women's sense of belonging and holistic well-being. The value of femininity bestows a wholeness, connection to community, and the possibility of weaving their collective and personal identity.

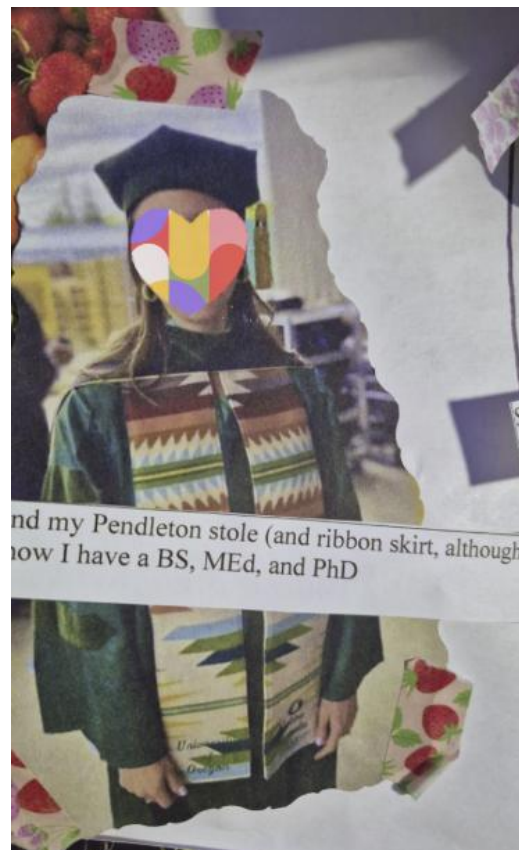


Figure 4.22

Pendleton stole gifted from the department and worn them at graduation from photovoice storyboard.

The value of femininity moves past identity into a cultural force as it highlights cultural connectedness, resilience, creativity, relational identity, and holistic well-being. The value of Indigenous femininity: 1) prevented the fragmentation of identity; 2) reinforced intergenerational

healing and resilience; 3) preserved Indigenous knowledge systems; 4) demonstrated innovative cultural evolution; 5) empowered self-determination and agency in STEM; 6) strengthened maternal leadership for youth empowerment; 7) provided mindful living, balance, and creativity; 8) built holistic optimism in STEM; 9) affirmed identity and fostered a sense of belonging through attire; 10) created collective empowerment with community bonds, cultural stewardship, and holistic well-being.

Artistry.

The definition of artistry: artistic ability (Merriam-Webster, n.d.). Figure 4.23 symbolizes the values of artistry. The values of self-narratives, personal creative energy, and other ways to share knowledge and academic research coalesced into the art. As a value, artistry defines cultural, spiritual, and social connections or creative practices that invigorate wholeness.

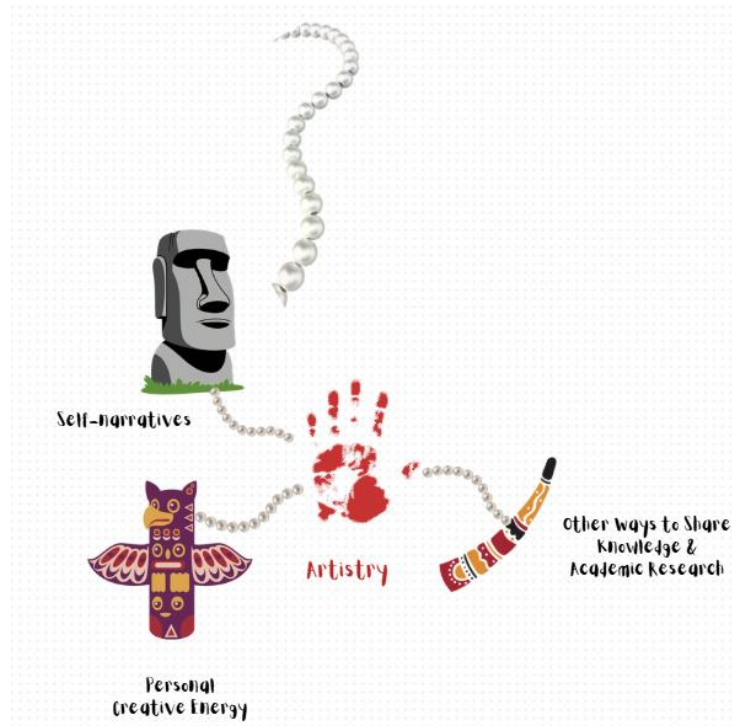


Figure 4.23

A red handprint with Indigenous artifacts symbolizes the artistry value cluster. Own work using Canva.

Art plays a harmonizing role in bridging Indigenous and Western knowledge systems. The value of artistry lies in the relational weaving of knowledge, the balance between epistemologies, and creative unification. STEAM education aligns with the concept of braiding Indigenous and Western worldviews. Creative expression in the arts adds to the facets of emotions and restorative relationships. The value of artistry contributes to the humanization of STEM knowledge creation, holistic learning, and relational co-learning.

Indigenous Science promotes grounded co-learning journeys that offer opportunities to complement Western Science in a humanizing manner. Another Sister spoke about incorporating what made her happy about her research methodology. She commented on science spaces questioning her approaches but thought of how her ancestors traveled the globe on stargazing See

Figure 4.24). Since the early foundations of Indigenous intellectual inquiry, cosmology has been rooted in artistic research practices that have ushered exploration with abstract scientific information. The value of artistry honors abstract concepts into visual narratives and philosophical reflections that offer ancestral continuity, grounding in nature, and ancestral knowledge. In kind, her scientific methods of creative expression explored the reaches beyond the constraints of Scientism. Indigenous artistry pushes back against the traditional rigors of STEM and redefines the quantification of legitimate research approaches. The value of artistry recreates research standards that incorporate innovative methodologies, diverse epistemologies, and accessible STEM norms. These artistic manifestations made science complete for her. "[I] wrote a poem and danced towards the end [of my research presentation]. I wanted that space to be completely different, completely [mine], and completely Indigenous." Indigenous artistry empowers Native researchers to assert their values in higher educational spaces. The value of artistry in professional settings brings forth cultural affirmation, creative sovereignty, and autonomy.



Figure 4.24

Indigenous self with cultural accessories and highlighting their tribe's artistic ability to wayfind from photovoice storyboard.

Indigenous artistry incorporates emotional, cultural, physical, and spiritual elements into research. The value of artistry understands holism, seeks the balance of diverse bodies of knowledge, and inquires under the guidance of completeness. The ability to incorporate STEAM approaches ushered in a holistic practice that balances differing bodies of knowledge. An Indigenous researcher strives to build their understanding on common ground without dismissing uniqueness. Braiding art and STEM invite multiple research approaches to work together and expand holistic learning of the whole body of knowledge and all that is attached to it. Indigenous

artistry cultivates shared meaning-making. The value of artistry facilitates a space for collective growth, participatory knowledge creation, and accountability.

Another Sister commented on the relationship of a fellow science Sister, conveying relational knowledge in STEM environments (see Figure 4.25). Storytelling passed on wisdom between connections. Indigenous artistry communicates in an alternative form of STEM knowledge, similar to storytelling, that relationally conveys knowledge through lived experiences, motion, and voice. The value of artistry establishes creative storytelling as a valid form of knowledge-making. Indigenous storytelling as an approach incorporates IK into the Western science in a shared space. Indigenous storytelling weaves Native knowledge into STEM academic environments. The value of artistry creatively binds oral traditions as an expansion of STEM research practices.

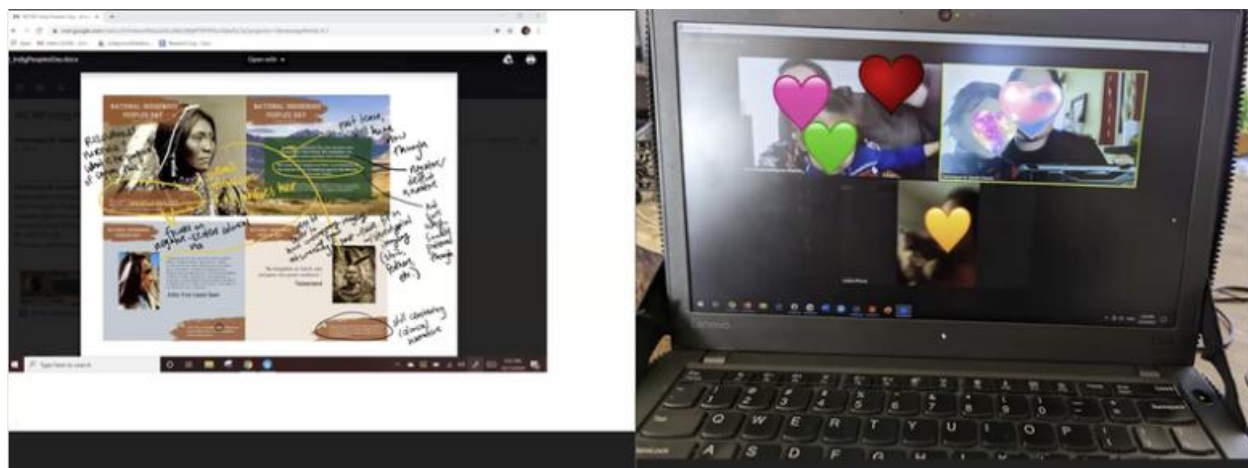


Figure 4.25

Propaganda on Indigenous Peoples Day (their storytelling) and (her) storytelling with loved ones from photovoice storyboard.

In exclusive environments, storytelling becomes a creative form to maintain presence. The value of artistry uses creative storytelling that transforms and humanizes STEM culture. These Sisters shared their triumphs and woes of navigating research work, which uplifted each other to

proceed forward and not exit STEM. The art of storytelling gives Indigenous women the chance to bring their whole selves into STEM spaces. The value of artistry accepts the colorful nature of humor, vulnerability, emotion, and identity into the knowledge-creation process. "[It] brings me comfort [and] probably the reason I stay is my science sister. We just kind of let our whole selves [with] all our rants and all. [We] could really relate to one another, and in those moments, I'm just so comfortable. It gives me energy." The sharing of stories between them strengthens their human connections. Each Sister tells a story in a mutual exchange that creates shared experiences that bring joy to each other. Since storytelling favors co-creation and collaboration, it revitalizes community bonds. The value of artistry lies in creating art that supports participatory knowledge-making. Stories craft living and communal knowledge. The value of artistry lies in its role as a creative process for knowledge weaving. Hence, the relational practice of storytelling in science furthers woven IK communal knowledge.

Valuing Indigenous artistry ensures that research and STEM spaces are not confined to technical rationality but are enriched through creativity, embodiment, relationality, and ancestral continuity. Indigenous artistry affirms identity, broadens epistemological legitimacy, and transforms knowledge production into a holistic and culturally grounded practice. Artistry transforms STEM into a space that incorporates participatory, holistic, culturally responsive, and creative forms of rigor. The value of Indigenous artistry in STEM held importance to these Contributors as it: 1) created balance with the braiding of various bodies of knowledge; 2) humanized STEM; 3) validated ancestral traditions; 4) refined the research legitimacy in STEM creatively; 5) empowered creative sovereignty; 6) advanced creative holistic and pluralistic ways of knowing; 7) strengthened participatory learning spaces; 8) sustain presence in STEM settings; 9) weaved living and collective knowledge

STEM Change Agent.

STEM is an abbreviation for the Science, Technology, Engineering, and Mathematics fields (Merriam-Webster, n.d.). Change is defined as the act, process, or result of transforming (Merriam-Webster, n.d.). An agent refers to something that produces or is capable of producing an effect—an active or efficient cause (Merriam-Webster, n.d.). Figure 4.26 symbolizes the values of a STEM change agent. The values of change, redefinition, humanizing STEM, and outreach to both Native and broader communities are woven into this concept. As a value, a STEM change agent embodies a person, group, or community that initiates, guides, and sustains transformation. Their actions are rooted in ancestral knowledge, relationality, and stewardship to promote holism, ecological responsibility, justice, and self-determination. This transformation in STEM spaces, or in spaces connected to STEM, occurs within the individual, with others, and in the surrounding environment.

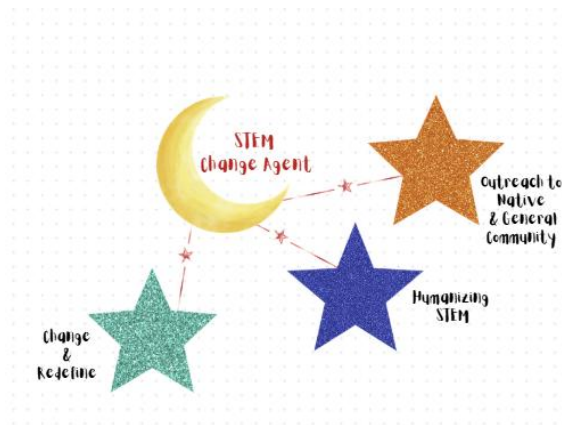


Figure 4.26

A crescent moon with stars symbolizes the STEM change agent value cluster. Own work using Canva.

Indigenous STEM change agents prioritize values such as relational knowledge, cultural validation, healing, self-determined identity, and epistemological transformation. These priorities

demonstrate that Indigenous women in STEM transcend traditional diversity initiatives. Instead, they are redefining what matters and broadening the very concept of value within STEM.

Creative research became a pathway for interdisciplinary approaches among contributors for blending IK and Western Sciences. The creativity of merging IK and Western knowledge systems challenges the fragmentation and isolation of intellectual boundaries. The value of a STEM change agent enacts pluralistic epistemologies indicates an opportunity to honor multiple ways of knowing without pitting one against the other. To see various knowledge as equal, strive for holistic balance.

One Indigi Sister felt a flood of emotions with braiding arts and science but saw it as a validation of valuing culturally relevant science (see Figure 4.27). The experiences transform their future endeavors into scientific research. STEM often gives the impression that an input-output system remains objective. However, STEM research opens the door for resilience, healing, and ancestral connection. Objectivity may often lead to the perception that detached, neutral research serves as the measure of validation. Yet, the Indigenous perspective deems STEM research as grounded in relationality and spirituality. The cultural value of being a STEM change agent entails a sense of intergenerational responsibility, community drive, and the continuation of STEM knowledge. "How amazing [to feel] that strength and that resilience, and feeling healing, and understanding. [It is a way for] our people, our ancestors. I'm no longer going to be whatever you think a scientist should be. I am going to be what I think a scientist should be". Actively defining her STEM identities, this Indigenous woman refused to adopt a STEM trope. Identity is established through self-determination and cultural grounding. The value of a STEM change agent empowers the sovereignty of identity, preventing the assimilation of identity into STEM culture.



Figure 4.27

Poster of creative research and science storytelling of one's Indigenous experiences in STEM.

STEM often places qualities that suggest its identity and how it functions. What happens when those characteristics conflict? Indigenous women acting as STEM change agents transform STEM culture and its rigid legitimacy. The value of a STEM change agent lies in transformation, holistic consciousness, and reflection on knowledge systems rooted in relations and cultural concepts. This Sister brings to the forefront the importance of choosing her STEM identity and breaking free from the science trope. The experience of creatively baking IK steered identity transformation that shifted the core values and beliefs of STEM. The alignment of her true self gave way to personal and professional growth. STEM conformity quells the growth of individuals and, in turn, the institution. STEM conformity quells the growth of individuals and, in turn, the institution. Living your authentic self extends to many aspects of human existence and does not stop at the door of the institution. Indigenous scientists (and other related STEM fields) view

culture and scientific practice as merged into identity. When aligned, transformation trends from self to structural systems. The value of a STEM change agent is seeking and practicing holistic alignment with cultural identity and values, fostering integrity and wholeness in STEM culture.

Intersecting IK with the STEM field supported the methods by which Indigi scientists consider how their work impacts both the community and themselves. Indigenous women act as transformative leaders, setting priorities that reflect holistic governance and futures. The value of an Indigenous STEM change agent is to undertake the responsibility of a transformational leader, involving advocacy, agency, and sovereignty that empower STEM pathways in the institution. One Indigi Sister remarked on her ability to help their community as a driving force to set humanizing standards, serving as a steppingstone for future scientists (see Figure 4.28). Indigenous women act as transformative leaders, setting priorities that reflect holistic governance and futures. The value of an Indigenous STEM change agent is to undertake the responsibility of a transformational leader, involving advocacy, agency, and sovereignty that empower STEM pathways in the institution.



Figure 4.28

Indigenous land restoration grant project with head students, faculty, elders, and community members from photovoice storyboard.

Indigenous women focus their science scholarship on helping their communities rather than on individual achievement. The value of a STEM change agent includes servant-leadership, community well-being, and collective responsibility in research. Data sovereignty ethically reframes how Indigenous research engages with how it is conducted, analyzed, and disseminated. The value of an Indigenous STEM change agent lies in serving as a check on STEM knowledge production to protect Indigenous sovereignty over data governance. "The focus was climate resilience and our Indigenous knowledges to guide [the] blueprints for our future, but in ways that we self-determine how we govern our research and data through sovereignty. I set [out] to do all the things as faculty, but it is really driven by and coming from serving the communities." Indigenous scientists care to see their future people reflected in STEM. This thought inspires a duty of care and dignity when working in STEM. The value of a STEM change agent lies in their professional roles' intergenerational responsibility to sustain a viable future for potential

community members. In environmental contexts focused on sustainability for future generations, look to Indigenous knowledge as the lead. The value of an Indigenous STEM change agent lies in futurism and relational thinking, which shape land-based knowledge and stewardship.

Community-engaged STEM offers collaboration between communities and researchers to drive social change. The traditional top-down research process opens to community empowerment. Reciprocal partnerships empower communities. The value of an Indigenous STEM change agent is that they uplift their communities by turning research into reciprocal, participatory action research collectives. Thus, STEM transforms into a people-centered and collaborative way of doing science. Lived experiences maintain the relational balance in science and dispel knowledge extraction. The value of an Indigenous STEM change agent is that they view science as a way to serve others, not as self-serving.

Indigenous knowledge teaches interconnection rather than fragmentation. The value of an Indigenous STEM change agent is to integrate holism as a method for transforming one-dimensional science. Integrated STEM pathways propose a real-world understanding of science with interdisciplinary problem-solving. Students receive the chance to draw on several interdisciplinary topics and address an issue as a whole. Another Indigi Sister spoke of the schools with Native populations developing a science education curriculum, unifying ideologies from the start. Indigenous STEM change agents utilize language to situate science in equitable knowledge production (see Figure 4.29). The value of an Indigenous STEM change agent is to incorporate the lived experiences and community expertise that counter the larger one-sided STEM narrative. "They were creating this curriculum that they wanted their students to learn, and we were doing this translation work to see all the science that they're already doing. And some of it was actually in a language classroom, and it was really beautiful." Indigenous STEM change agents redefine

education by recognizing that STEM approaches have long-term relationships in non-academic communities. The value of an Indigenous STEM change agent is to validate that all learners contribute to the STEM narrative, regardless of the academy's recognition of who they deem an expert. Indigenous STEM change agents redefine education by recognizing that STEM approaches have long-term relationships in non-academic communities. The value of an Indigenous STEM change agent is to ensure that all learners contribute to the STEM narrative, regardless of the academy's recognition of who it deems an expert.



Figure 4.29

Indigenous quilting and creating space for what is valued in other spaces from photovoice storyboard.

Indigenous STEM change agents are leaders in bridging interdisciplinary STEM and making it accessible. The value of an Indigenous STEM change agent is to shift paradigms through the coexistence of relational translation. The marrying of IK and scientific language became the starting point to make science "legible". Interdisciplinary efforts reshape STEM education into creative, fluid, and culturally responsive intellectual pursuits. The value of an Indigenous STEM

change agent is to transform structure through creativity. Offering integrated STEM pathways breaks down the walls between science and other disciplines, similar to the arts. The introduction of Indigenous languages initiates a systematic and transformative change in STEM education. The value of an Indigenous STEM change agent is to understand that change can occur with incremental effort. By becoming the leaders of change, educators transform students' critical thinking and understanding to become expanded and fluid.

The Indigenous women serving as leaders of STEM change agents countered STEM's data culture extraction and self-serving tendencies by ensuring STEM is a culture that protects and serves its people holistically. Becoming a change agent is important for transforming STEM into a space and culture that 1) prioritizes community responsibility; 2) asserts data sovereignty; 3) validates multiple ways of knowing; 4) blends Indigenous language; 5) promotes holistic and interdisciplinary thinking; 6) humanizes through transformative co-learning models; and 7) views scientific possibility as the need for interdisciplinary integration of knowledge.

Relational Community.

Relational is defined as of, relating to, or characterized by relations. (Merriam-Webster, n.d.). Community is a group of people who share a common characteristic or interest. (Merriam-Webster, n.d.). Figure 4.30 symbolizes the values of relational community. The values of faculty perspectives, family, and diverse perspectives coalesce into a relational community. As a value, relational community is a kincentric ecology that incorporates respectful care and stewardship to all living and non-living entities.

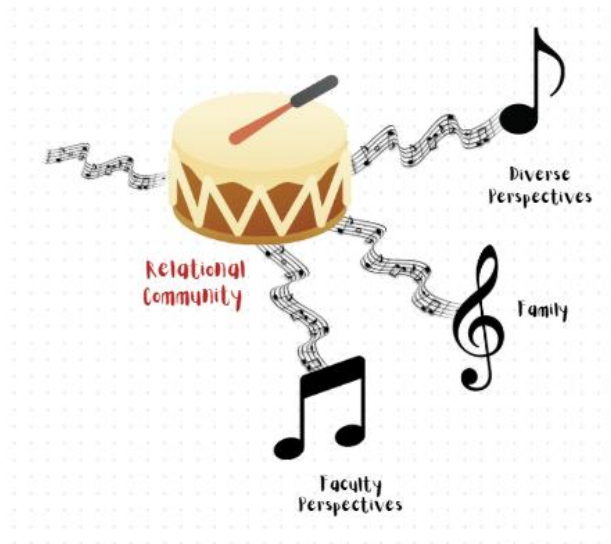


Figure 4.30

An Indigenous drum with music notes symbolizes the relational value cluster. Own work using Canva.

As many Indigenous students will find non-Native support in STEM education, culturally grounded support makes a difference for harmonizing cultural science. Mentorship reflects kincentric ecology by honoring the relationships between people, along with their ways of knowing, values, and communities. The non-Native support for Indigenous STEM students becomes an act of stewardship that guides respectful co-existence. The value of a relational community makes mentorship a form of relational care. Mentors serve as stewards who care for students' ancestral knowledge, identities, and leadership aspirations.

Another sister reflected on the importance of mentorship in a PhD program (see Figure 4.31). Mentorship contributes to a pathway for academic leadership to thrive and for others to follow. Mentors help extend Indigenous kinship into places that never existed, creating opportunities for others to make higher education sustainable for all. The value of relational community in mentor-mentee care lies in collective responsibility that supports future generations. "I had some really great mentors, to be perfectly honest, but having her was special,

right? So, for me, being in this [academic science] space [and] being an Indigenous woman in the academy, opens space for other people, right?" Achieving positions in educational leadership allows Indigenous educators to serve as mentors who invigorate cultural relevance in building the STEM identity. Non-Native and Indigenous mentors work together in a transformative way, possess the ability to reorient the STEM identity by bridging knowledge systems, fostering reciprocity, psychosocial support, and creating belonging. This Sister's positive experience with a mentor set the foundation for her mentoring. Collaborative mentorship displays kincentric ecology by practicing reciprocity and balance. When mentors care about cross-cultural knowledge and mutual respect, they apply relational stewardship of both communities and ways of knowing. The value of relational community sees higher education spaces as part of the kincentric ecosystem, which cares for all its people through reciprocity and balance.



Figure 4.31

Indigenous mentors and mentee at a conference from photovoice storyboards.

Collaboration connects all learners and embodies a kincentric ecology. Working together emanates collective stewardship to build a shared future and protect cultural integrity. The value of relational community seeks relationships across diverse perspectives that enhance respect, reciprocity, and shared responsibility. Collaboration enhances cultural integrity. By Indigenous and non-Natives working together, they reach a common outcome. Another spoke of working from a base of Indigenous history to create techniques in which Indigi and Non-Native students and faculty had a space to work together (see Figure 4.32). "I now take that (Indigenous historical knowledge) in the classroom and how I engage with my non-Indigenous students, and non-Indigenous faculty. I have different strategies in the classroom. I use this concept of ethical space articulated by the Cree elder, Willie Ermine." The idea of ethical space embodies a kincentric ecology, with careful and respectful relationships between faculty and diverse perspectives, particularly with elders. These relationships strengthen through accountability and intentionality. The value of relational community shows care in how diverse populations come together with their ways of knowing. Cross-cultural collaboration creates diverse groups that foster a non-judgmental space where everyone feels valued and can contribute to the greater good. Creating non-judgmental environments reveals the care for fostering well-being in a relational community. When members of the relational community feel valued, the kincentric ecosystem thrives to reinforce the collective. The value of relational community supports the greater good and shared uplift.

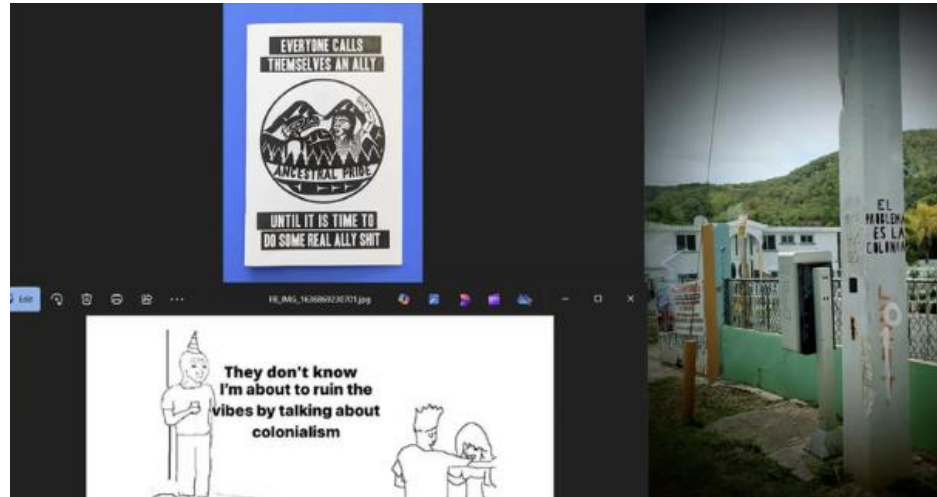


Figure 4.32

Meme and a place in the Caribbean to call attention to the vulnerability and challenges faced for Indigenous understanding of history to now from photovoice storyboard.

I urge the importance of collective movements by Indigenous and non-Native community members, as they advance diverse teamwork, cultural intelligence, shared vision and goals, and cultural respect. We learn from each other versus pick at our difference. Diverse perspectives, student and faculty viewpoints, shepherd kincentric balance when honoring interconnectivity over fragmentary relationships into divisions of difference. The value of relational community is balanced by seeking growth and harmony from diverse worldviews. Not to mention, some Indigenous faculty members may not have the ability to rely on other internal Natives as representation remains small. With small internal kincentric networks, sustaining Indigenous well-being and presence requires collaboration. The value of relational community is shared caretaking of community spaces in the academy.

Cultural collaboration takes time, but it does need Indigenous input. Still another Indigi Sister articulated the dual terrain of working with non-Native faculty, alluding to the varying degrees of awareness regarding Indigi cultural competency (see Figure 4.33). Culturally

informed practices create support, trust, and understanding between diverse faculty perspectives. Learning is interdependent and relational. The value of relational community signals a kincentric approach in which knowledge is valued alongside connections. "Now with the new program [I am] starting with those new faculty members. I've really made better connections." These individuals served as a source of support for Indigi faculty and expanded the Indigi curriculum. The same Indigi Sister added, "They (Non-Natives) were bringing me [for] guest lectures. Okay, cool, we did it. How about you [Non-Natives] actually have some work, and I can help you develop some work on it? [A Non-native said] Yeah, let's put a model together, and we found a model we liked." Co-created models advance ownership and innovation. The value of relational community emphasizes collective stewardship and shared care. This Sister highlights the importance of Indigenous faculty participation in formulating opportunities for cultural integrity. The ability to voice perspectives is essential, but it does not sustain worldviews as effectively as integration into the curriculum. Cultural integrity in the curriculum expands the opportunity for diverse thought and meaningful thinking for all. Diverse perspectives enrich learning reflective consciousness and expand worldviews. The value of relational community honors the belief that all learners are interconnected to each other which nurtures respect and stewardship within a kincentric space.

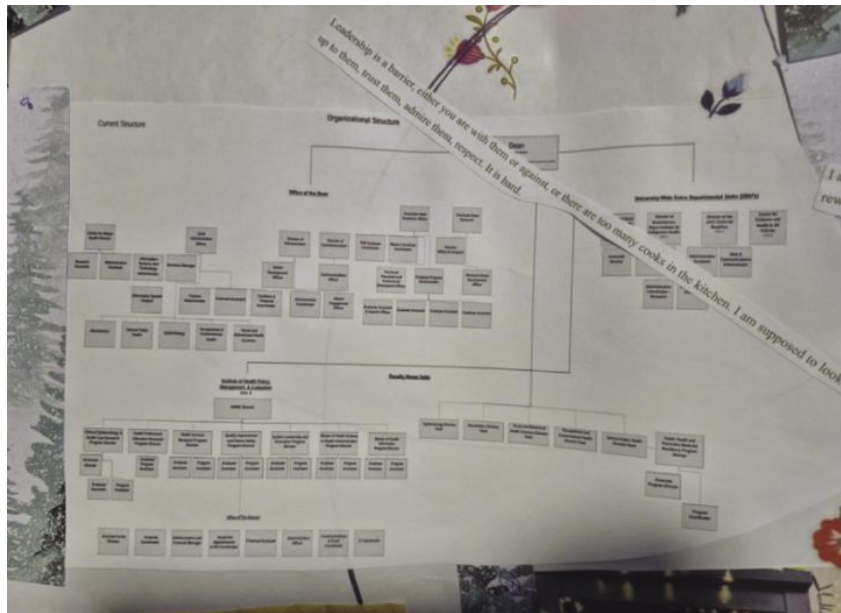


Figure 4.33

Copy of an Institution's Organizational chart of leadership and positions of faculty from photovoice storyboards.

The leadership of Indigenous women stands as the foundational guides for cultural relations cohesion across diverse communities. The value of relational community lies in Indigenous women nurturing kincentric relationships within community and family systems. In matrilineal Indigenous communities, Indigenous women take a central role in wholeness with family and community. The second Indigi Sister honors wholeness with teaching and fashioning a strong Indigenous connection with her children (see Figure 4.34a, 4.34b). She hoped her children would experience the world through their eyes. "I'm not perfect as a parent, right? [I'm] trying to do something different and do something better so that I have these two Indigenous women who are going to go out into the world. Maybe they could do something in their own way as well." Parents bear the responsibility to shape future generations through cultural values. However, it is vital for children to find their pathway in their life's journey. The value of relational community reflects the kincentric approach with children as responsibility and

interconnectedness across generations. Children represent the future of the community's identity and belonging. Children are the carriers of community identity, values, culture, and collective knowledge that ensure the family and community's consciousness of worldviews. The value of relational community views children as the center of relations and kincentric balance. I think about my background as a mixed Indigenous woman, as my parents had to possess a strong sense of self and tolerance for diversity. Each generation represents a better future. Similarly, this Indigenous woman saw her children's future as the continuation of their journey toward wholeness. The value of relational community nurtures intergenerational wholeness, demonstrates stewardship, fosters interconnectedness, and supports the community's continuity.



Figure 4.34

Beaded from a Sister's tribe thinking of past and present which are her daughters from photovoice storyboard.

A relational community weaves together mentorship, curriculum, leadership, and collaboration through acts of stewardship and care. By nurturing interconnectedness and harmony, it helps Indigenous knowledge, identity, and culture flourish across generations and within diverse academic spaces. The value of relational community presented the importance that: 1) mentors act as stewards of relational care; 2) shared care and reciprocity occurs with the collaboration of diverse perspectives; 3) kincentric ecosystems in higher education share in stewardship and collective responsibility; 4) children are cultural carriers for intergenerational wholeness, interconnectedness, and stewardship; 5) diverse faculty help collective sustainability; and 6) kincentric ecosystems include reciprocal relationships, balance growth, and collective well-being.

Leadership.

Leadership is defined as the office or position of a leader (Merriam-Webster, n.d.). Figure 4.35 symbolizes the values of leadership. The cluster of other values coalesce into leadership. As a value, leadership is a relational concept that prioritizes service to the community, balance, spirituality, and culture.



Figure 4.35

Mountains symbolize the leadership value cluster. Many of the other clusters are tied into leadership. Therefore, smaller points do not exist as in previous examples. Own work created using Canva.

Indigenous leaders take charge of restoring disrupted relationships to land, community, and culture. The value of leadership is relational and restorative. In Indigenous rematriation, a woman leader takes on the roles to restore the sacred relationships to ancestral lands, ways of life, and worldviews. The negative influences disrupt wholeness. The value of leadership is holistic as it nurtures balance, harmony and interconnectedness among living and non-living entities. Rematriation provides healing or the re-establishing of holistic balance. One Sister expressed, “I feel I’m this rematriator in my role and within the academy, within the institution. We bring these [viewpoints] together to restore those relationships.” This comment speaks about restoring the relationship and the role taken in the process between Indigi and the academy with regard to power, agency, and stewardship (see Figure 4.36). Leaders prioritize nurturing relationships with intentionality, respect, reciprocity, and ethical engagement. The value of leadership ensures decision-making honors culture and people to construct community-centered outcomes. Holistic value cultivates active care and ethical cultivation of relationships. The relationship is living, long-term, and a necessity for the completeness and health of the community. Indigenous leaders focus

on community wholeness through ongoing commitment. The value of leadership is continuous to sustain wellness.



Figure 4.36

Sign on shed that was on a land trust form photovoice storyboard.

With very few Indigenous scholars in higher education, blending IK and Western science requires exploration and experimentation, as there is no roadmap. Leadership involves the willingness to experiment. The value of leadership is innovative and relational, providing opportunities for cultural integration into learning. Another Indigi Sister spoke of using technology and the intersection of Indigenous methodologies (see Figure 4.37). It puzzled her how to proceed forward, as ancient IK did not employ these advancements. However, her tone exhibited a willingness to try, as an IK value became a driving force to transform quantitative methodologies into a blended approach.

"We don't feel like this [research work/project] is Indigenous methodologies, because we're using GPS and doing transit walks. I struggle with how to respond to...these criteria they [science] had created. I remember struggling. I had the same experience on my committee

when they were like, well, if you're using quantitative methods, it's not just [Western science] methodologies, is it? And I was like, what? Even then, just thinking, it's [IK] in my hands, and my community's our values, our knowledge, our questions about guiding it. That's what makes it Indigenous."



Figure 4.37

Indigenous woman traditional weaving of a palm and thinking about braiding knowledge from photovoice storyboard.

Leadership draws on Indigenous ways of knowing and community values. The value of leadership is guided by community-centered priorities. No matter the prowess of an Indigenous scientist, the merging of IK and STEM takes action. The act of trial and error generates innovation and encourages the emergence of new ideas. The continuous practice of introducing cultured science into sterile environments may contribute to the transformation of STEM culture.

Indigenous leaders act as change agents with braiding ways of knowing, reshaping learning practices, and creating space for Indigenous perspectives.

The value of leadership is transformative, helping relations stewardship reach beyond individuals into institutional systems. To add, scientific experimentation is critical for progress, skill development, and making informed decisions. In which case, the STEM field should invite the unification of IK and Western Science. Who knows what other discoveries would surface? Indigenous leaders assume the responsibility for cultivating pathways that serve Indigenous communities and the greater good of society. The value of leadership serves the well-being of the community, knowledge expansion, and cultural continuity.

The community upheld and respected the cultural integrity of one Indigenous educator and her curriculum. It fabricated a culture of Indigeneity to thrive and was supportive of fashioning a co-learning journey. Indigenous leaders create space for diverse knowledge systems to interact. The value of leadership is co-creative, emphasizing reciprocity and shared responsibility. Leadership thrives in building a collective vision. The value of leadership's community-centeredness plays a role in relational accountability. One Indigi Sister expressed their position on leadership to address the issue and felt the support of her surrounding community (see Figure 4.38a, 4.38b). "We had lecturers over time (from Native educators)...but my goal is to have a majority [of] Indigenous people in my...department. The programming that we have for Native students is the thing most of the folks embrace. They enjoy getting to know the culture...even...when they are not Indigenous." With community involvement in co-building cultural integrity, it protected this Indigenous professor from the pressures of assimilation. Indigenous leaders rely on community support to maintain their authenticity. The value of leadership is relational and protective as Indigenous leaders and communities work together to

safeguard peace, identity, and values. It inspired a shared learning journey with various knowledge systems. Community members grow into active co-creators who share in power with the collaborative processes. Indigenous leadership empowers others by sharing power. The value of leadership is to create reciprocity, trust, and collective ownership.

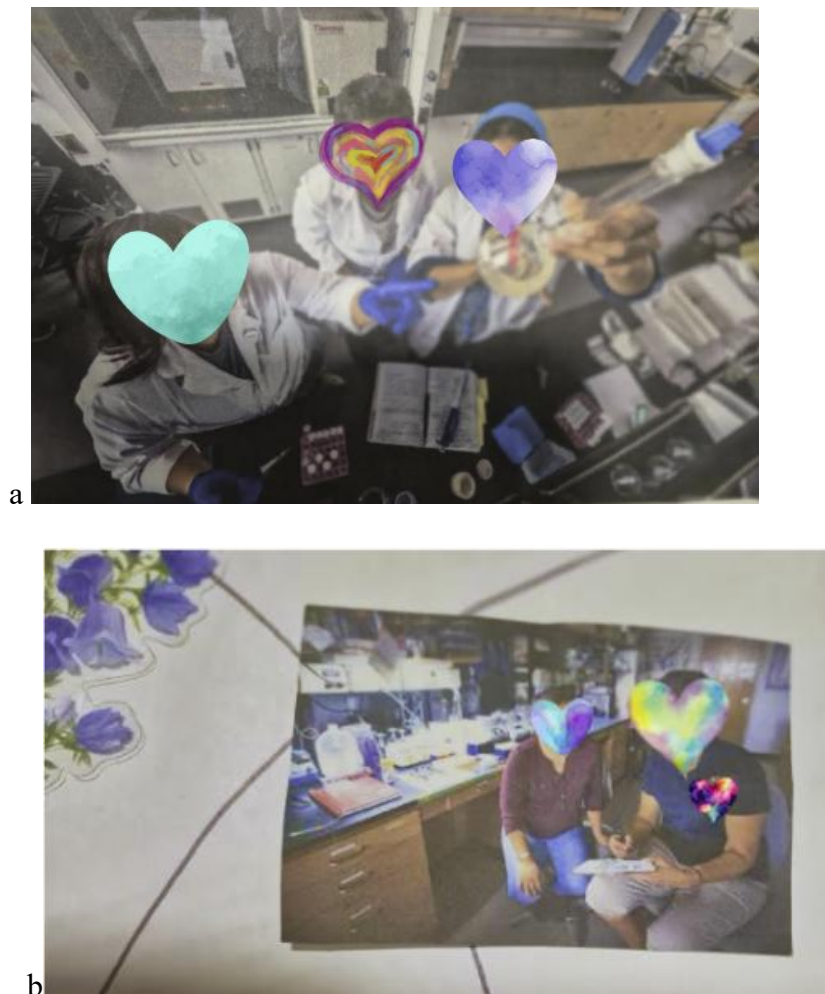


Figure 4.38

In the lab with students from photovoice storyboard.

Indigenous leadership grows from deep relationships, holistic thinking, creativity, and genuine care. The importance of Indigenous leadership as a value: 1) creates restoration to culture, land, and community; 2) commitment to long-term well-being; 3) fosters creative leadership with

innovation; 4) transforms as an agent of change; 5) co-creation and community-centered; and 6) empowers and protects.

Holistic Me.

Understanding our values is fundamental to understanding ourselves. Values complete the holistic view of who we are (see Figure 4.39). They are at the heart of our sense of self. By shaping our identities, guiding our decisions, and influencing our interactions with others and the world, values act as internal principles. They help us recognize what is meaningful and profound, serving as a moral north star in diverse situations.



Figure 4.39

The heart of who we are – our values. They are a part of us and serve as our cosmic guide. Own work created using Canva.

Values shape our identity. The beliefs and principles we prioritize, such as respect, reciprocity, community, or stewardship. These values define how we perceive ourselves and our roles within a sociocultural context. These values evolve through lived experiences, cultural

teachings, family influences, and interactions with the environment. Eventually, they become ingrained in our worldview, deeply influencing how we interpret and engage with the world.

Values serve as guides for decision-making and behavior. When Indigenous women encounter choices or challenges, their values shape their responses and determine which actions they consider acceptable or important. For instance, a woman who values community well-being may prioritize actions that benefit others, while another who values environmental stewardship may focus on protecting natural resources.

Values influence relationships and foster connections to community and place. Shared values strengthen social bonds and cultural identity, allowing Indigenous women to build relationships with others, both Native and non-Native, who share similar beliefs. In many Indigenous worldviews, values are deeply intertwined with connections to land, community, and spiritual traditions. These values emphasize balance, reciprocity, and respect for natural systems, reinforcing the truth that individual well-being is inseparable from the well-being of the collective and the environment.

Ultimately, values are central to who we are. They shape our sense of purpose, guide our actions, and connect us to broader social and ecological systems. Values influence not only individual behavior but also how communities organize, make decisions, and sustain enduring relationships with both the natural and relational world.

Community is at the heart of Indigenous holistic values, acting as an interconnected web that nurtures identity, resilience, and healing. Storytelling serves as a vital thread, transmitting cultural knowledge and the land's histories across generations, thereby strengthening collective identity and ensuring cultural continuity. Indigenous worldviews prioritize reciprocal relationships with the land, recognizing it not merely as a resource but as a living relative

deserving of respect and stewardship. This perspective underscores the deep interdependence between individual and community well-being. Harm to one member reverberates throughout the entire community. Indigenous professionals may encounter tension when workplace norms conflict with the values of land, history, and relationality embedded in Indigenous traditions. Holistic Indigenous values include interconnectedness, collective reciprocity, cultural preservation, and reverence for the land.

The community holds great power for Indigenous health, as a holistic ecosystem that values collective well-being. Our Sisters found support for identity, resilience, and healing. The ecosystem thrives on interconnectedness, but erosion of the community often leads to trauma and health impacts. Another Sister shared a story about a Native individual who became a professional while staying connected to their community through storytelling, preserving the history of the land (see Figure 4.40). "He wrote a book. It was just fascinating, because he's got the stories. He's telling the stories of the people, the stories that he heard about how they [Natives] were living that traditional life." The infrastructure projects this Sister worked on served as a reminder of the importance of respecting historical relationships with the land. This story reminded her of community values of interconnectedness with the land. Her job did not share the same outlook on the land and its history. She and the community are tied. If one member becomes harmed, the community faces the same fate and vice versa. This story reminded her of the importance of community values and their interconnectedness with the land. However, her job did not align with this perspective on the land and its history. She felt a strong connection to the community; if one member suffers, the entire community is affected, and the same is true in reverse.

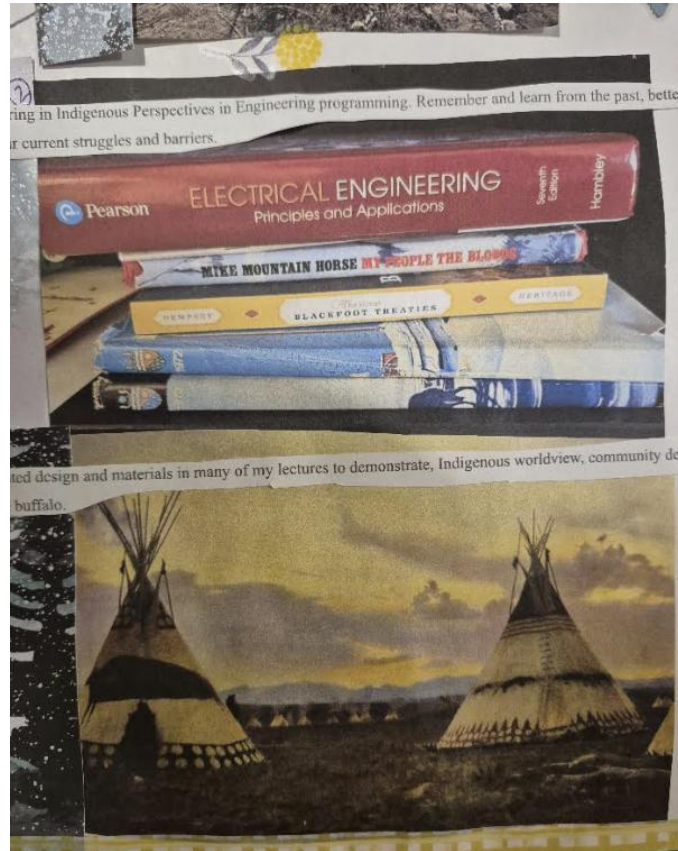


Figure 4.40

Engineering textbooks, cultural books, and teepees from photovoice storyboard.

For Indigenous students, graduation signifies more than the completion of academic requirements. It is a profound rite of passage that weaves personal achievement together with cultural identity, community pride, and a sense of future responsibility. Through an Indigenous holistic lens, such milestones are embraced as communal experiences that strengthen ties to family, culture, and community. The holistic values of community bonds, cultural continuity, and cultural identity reinforce social connections and a sense of belonging.

Graduation symbolizes the closure of their student chapter in higher education and embarking on a new future. These graduates become a part of the workforce, contributing to solving complex challenges. The journey to the graduation stage consists of peaks and valleys.

However, I find it incredible that in that final moment, culture exudes from Indigenous students, no matter the field. Another Sister revealed her joy for a local Indigenous high school graduation celebration (see Figure 4.41). It provided the opportunity to reconnect to culture for herself and others. In creating Indigi regalia, she felt it helped Indigi students to embolden their community ties as they journeyed onward to the future. A shining moment that they would hold onto when the days appeared to dim who they were.

"The week prior [I] made different types of leis, like ribbon leis, candy leis, tea leaf leis, and it was just so amazing. I'm only half [Indigi] on my dad's side, but [I] was disconnected...[Learning to make] the tea leaf lei that's something I never had the ability to learn...sitting with all these other Indigenous women from different tribes [and making leis]. Whether it was liberal arts or sciences, [it was an emotional scene] seeing all their loving community [at the Indigenous graduation]. There were non-Indigenous teachers and faculty [as well]. For them to have that special moment, how proud [students must be to have] everyone in that community come together, Indigenous, non-Indigenous, to give these students that moment, and hopefully that they will remember that as they go into college as something that encourages them."



Figure 4.41

An Indigenous graduation of various tribes where the community gifted each graduate a cultural item from photovoice storyboard.

In the moment of outstanding achievement, I find it fascinating to see a new Indigenous workforce in their customary garb. With their community surrounding them, that moment speaks of pride, but not forgetting who they are as they step into new roles. This moment reflects the transformation of the workforce, including STEM. To add, the celebration became a transformative experience for one Sister to reconnect to Indigeneity. These Indigenous graduates demonstrate new pathways for generations to follow, with Indigeneity as a whole identity, while inspiring others to value culture. Graduations signify collective pride rather than individual success, with values of collective celebration, community support, and shared responsibility for success. Most importantly, the holistic value of maintaining cultural identity in their professional futures.

Indigenous art supports the holistic me by strengthening identity, emotional expression, and cultural resilience. The self-portrait described by the Sister serves as a symbolic form of protection, reconnecting her to her purpose and cultural identity as she navigates the challenges of faculty life. Through artistic representation, memories, emotions, and cultural values are preserved, allowing Indigenous individuals to maintain balance and healing. The Indigenous holistic values emerge from a strong sense of identity, both personal and communal resilience, authentic emotional expression, and the protection of cultural heritage.

Art inspires Indigenous wholeness by serving as a conduit for cultural connection, healing, and resistance. Another Sister articulated a self-portrait hanging in her office as a daily reminder of her mission for the betterment of Indigi students and acts as a form of protection (see Figure 4.42). She continued to communicate that the eyes in the self-portrait remained blank as her eyes voiced her emotions. The fluctuation of emotions demonstrated the undulating terrain one experiences with this work. "I keep this portrait in my office along with some other things in my office. [They] are all art-based, but you wouldn't think [they] are forms of protection, but this [self-portrait] is for me, a form of protection." Indigenous art and artifacts protected her wholeness. The painting of the self stirred reminiscing of identity and resilience. Each brushstroke brought her story back to her, helping her feel complete despite what she may have encountered on the pathway of faculty.



Figure 4.42

Self-portrait from photovoice storyboard.

Self-care supports the heart of Indigenous holistic values, nurturing mental, emotional, physical, and spiritual well-being in an integrated way. Participation in culturally meaningful, community-based activities, such as harvesting plants alongside Elders and children. This activity encouraged the Sister to slow down, reflect, and attune to her own needs. Such practices cultivate a sense of wholeness, strengthen cultural bonds, and maintain equilibrium across all facets of life. The holistic Indigenous values include balance, self-awareness, cultural connection, and relational well-being.

Self-care nourishes the mental, spiritual, physical, and emotional aspects that deepen the self, leading to self-completion. Engagement with what we value generates wholeness. Another Sister told of a community engagement event with an Elder and children harvesting plants (see Figure 4.43). The interaction highlighted the importance of self-care in fully enjoying life's most

important moments outside academia. "I felt really slowing down. Doing the things that make you happy and [are] good for our well-being. [I am] not trying to do everything. Being like this is enough. I can just do this. This is enough. I don't have to do everything." Engaging in meaningful activities led to reflection on what contributed to this Indigenous Sister's sense of wholeness. She gained an understanding of her needs and an appreciation of her uniqueness.



Figure 43

Harvesting potatoes from photovoice storyboard.

The ecosystem of values with mentorship, culture, femininity, artistry, and STEM change agent. A relational community and leadership aligned with the Indigenous holistic self are revealed as deeply interconnected, multidimensional concepts that connect identity, culture, community, and purpose. These Indigenous women traverse STEM, academia, and professional fields by centering relational, cultural, and spiritual values that sustain their wholeness and integrity. Mentorship, community, and leadership are anchored in reciprocity, growth, and stewardship. This demonstrates that individual advancement is inseparable from the well-being

of the community. Additionally, these values are deeply rooted in who we are and carry over into every space and context.

Cultural practices, artistic expression, and femininity fortify identity, resilience, creativity, and relational meaning-making. Art humanizes STEM, expands the legitimacy of diverse epistemologies, and honors pluralistic ways of knowing, while Indigenous femininity nurtures intergenerational healing, holistic optimism, and empowerment in both academic and cultural settings. Indigenous leadership and change-making uphold community responsibility, data sovereignty, holistic and interdisciplinary thinking, and transformative co-learning, ensuring that academic and professional pathways remain rooted in core cultural values.

Self-care, cultural engagement, and community participation nourish the mental, emotional, spiritual, and physical dimensions of the self, fostering balance and wholeness. Across these experiences, the Indigenous holistic self is relational, culturally rooted, and intentionally cultivated through mentorship, creativity, leadership, and community stewardship. This holistic framework centers on who we are and affirms identity, strengthens resilience, and transforms knowledge production into a culturally responsive and interconnected sociocultural practice.

Values at Odds

The diminishment of values predominantly fell under institutional barriers. A second theme of visible and invisible vulnerability rose to the surface. Chapter two details many of the various challenges for Indigi students and faculty in higher education. For those reasons, I will not deliberate into detail and fixate on our insights for future institutional improvements of Indigi experiences. While the discussion acknowledged positive trends in value, specific questions revealed the struggles and challenges that undermined the previously established values. The

Values at Odds section answers the second question of this story of what behaviors and processes diminish the values of Indigenous women who are STEM faculty members?

Institutional Barriers

While the discussion acknowledged positive trends in value, specific questions revealed the struggles and challenges that undermined the previously established values. The detracting of values predominantly fell under institutional barriers. A second theme of visible and invisible vulnerability rose to the surface. The first theme of institutional barriers consisted of managing political and ideological contrasts, pressures and demands, worldview contrasts, misalignment, academic hurdles, power imbalances, and ethical challenges.

Profits over People.

Prioritization of profits reduces material and immaterial objects and people as commodities, focusing on amassing more, and defining controlling interests in resource extraction. Indigenous perspectives often place value in communal reciprocity and the greater good. Though these Sisters hit their goals of tenure and funding requirements, their departments positioned Indigenous work as fundable or notable impact. Hence monetization of education and its processes diminished their value.

Preference priority on department values depends on the nature of the grant. One Indigenous Sister recounted the battle of heart versus funded work. She indicated that grants factored into achieving tenure, although her nationally recognized accomplishments within her community should weigh more. What she found essential and the basis of her value as a tenured faculty member, the department did not agree. "For me, [it is] a little challenging, because the other part was, you need these [grants] to get tenure, you need to get funding. Then I went up for tenure, I [won several] million [dollars] for the university. It was still, like, that's not enough because your

work is just...Native work." A department's bottom line may influence faculty members' perceptions of value and, by extension, their work. This Indigenous educator sought to place value on Indigenous work, fostering reciprocity and giving meaning to her career. However, the culture of commodification in departments minimizes research into something bought, sold, and traded.

Market economies devalue Indigenous worldviews. Another Sister described the perceived division in her department on the concept of value. The department advertised colleagues who won grants versus those who pursued matters of the heart. Thus, the department influenced values and elevated those who shared its views.

"We don't have that conversation [about] what it is that we should value? I feel more [the department] values the monetary side, or things that get grants. The people [who agree with the department] get the attention, right? But if you're...like myself, who [says] there are different ways in which we procure knowledge, or what I value [humanizing education]...[it is overlooked because] this doesn't bring in big dollars.

The department applied market principles in its work culture, setting the tone for the type of research to value. The market model pressures the aggressive competition for resources and marks high-earning research potential as the most significant value. In contrast, research focused on humanization may struggle to put a value in financial terms. As an example, is there a price on family or women's empowerment research? Some would agree on its significant contribution to humankind, but how does one justify its worth to a department that concentrates on lucrative AI research?

The presence of market forces overshadows those considered to obtain little funding. Another Sister depicted the difficulty of finding others in the space to relate to her. She is the

only Indigenous person in the department, which makes it challenging for the department to recognize others' values, especially when that value does not have financial backing. She alluded to the capitalist ventures that influence what determines department value versus the needs of the community. "They definitely promote the grants and publications that they feel are their identity, which is very physical science and very mainstream capital source management...It does feel lonely in that space." Profits drove incentives that denoted values and visibility. As expressed by this Indigenous professor, her visibility was tied to the profit she generated for the department. Advocating for other values appeared challenging as her colleagues did not comprehend her Indigenous worldviews. Research was a tool to help, not generate riches.

As business and industry center on profit margins and are beholden to their shareholders, this may conflict with the priorities of an Indigenous partnership. Another Sister expressed displeasure with industry projects that focused heavily on profits, particularly those involving the community. Her goal served the community and built relationships of trust with community leaders, rather than brokering projects or deals. "One thing that I feel that always...made me uncomfortable was when I worked for industry. We're trying to make money off of everybody. I was trying to do brokering and...I just want to be...in the background." She continued to see similar monetary values in higher education as the aim became revving student recruitment for tuition dollars, regardless of their success in a program. The program failed to account for external factors that inhibited success. "Now in academia, I feel that because there's such a focus on getting students and part [it is] of the whole tuition thing. I get so worried. We have students failing...We had half the students fail." This Sister alluded to the Indigenous concept of wealth, where community well-being, accessibility to culture, and self-care stand above the Western definition of monetary wealth. When the students and community thrive and collectively

flourish, Indigenous wealth has been established. Individual profit does not align with the idea of Indigenous wealth, and caused her to question her partnerships.

The pursuit of grants dictates, to a degree, tenure and promotion, which may succumb to the influence of market pressures. Therefore, grants may impact the type of research performed or the specifics of commercially viable research. Another Sister articulated the department's lack of support for community-based scholarship in the tenure process. Grants triumphed over community work recognition. Likewise, the pressure of numerous publications did not allow for the establishment of proper relationships within the community, which proved problematic with the tenure clock ticking.

"When I get grant funding, no matter what it is, they'll promote that. I don't think I quite have that same [promotion] if I'm doing work with Indigenous communities. There's no support. I have to get the publications. I have to teach the classes. I have to get the grant money, right? As I'm doing those things, then it's great. But when it comes to thinking more deeply about what it means to do work with communities, and how long that takes, and what the relationship-building looks like. There's definitely this pressure to [say], no, no, no, you have to land [tenure]." The binding of tenure and grants dictated the type of impact and research productivity for this Indigenous woman. The value of community research did not garner favor with the tenure clock. It posed risks as something that could derail a career. With a negative stance of Indigenous research for a period of time, it raises the question of whether tenured Indigenous researchers looped back to community research.

The Dullard of One-Way Science.

One-dimensional thinking harms Indigenous values of collaboration and co-learning. Indigenous IK embodies complex, holistic, and relational ideologies. STEM environments propagate a linear and compartmentalized rationality. A couple Indigenous women shared their experiences about falling under the bandwagon of one-sided reasoning.

Stepping outside the box poses the practice of seeking alternatives to how to think about a problem or solution. Yet, it may cause discomfort to others heading into the unknown. Another Sister uttered the discomfort of others around her. She exuded confidence in embracing her cultural science approaches and the comfort of the unknown. Science is always seeking definition and explanation. Too often, it forgets that the mysteries of life may be uncovered through other courses of action. "There are things that science cannot measure, and that blows the quantitative world [up]. [Those other scientists say] I can't believe this [alternative methods] exists. Those were the things [creative science] that I felt I was comfortable with, but I noticed it makes other people uncomfortable." Naturally prone to avoiding uncomfortable situations, some researchers shy away from exploration. The familiar appeals, as they may take less mental effort, or the absence of adverse outcomes. However, as stated by this Indigenous woman, exploration and probing should come second to researchers. In this experience, the exploration of creative sciences inspired discoveries and new opportunities. Indigenous science research encompasses multidisciplinary approaches that facilitate dynamic problem-solving that challenge STEM's one-way thinking. The linear thought process often found in science diminished complex Indigenous Science thinking.

Each sister related to some experience of fitting into the science mold at some point, but no longer. We all connected on the ways in which we brought multidisciplinary rationale into the

STEM space. Another Sister portrayed an unyielding STEM space; however, her work talked back about redefining science. The study's sharing circle emboldened the idea that she was not alone. In some way, we all pushed back on Scientism. "All these experiences, there are a lot of common threads that we have here. Even though we all have our unique experiences...we're talking about all these firm values, contrasts, [and the gifts] we have. The reflective dialogue spurred the group's consciousness on other instances in a casual conversation. It felt empowering to know we were all spared the effort to keep our values intact. In this moment, we took the one-dimensional science reasoning and flipped it into a space of collective learning and thought process.

The Scientist Trope/Bombshell.

Femininity comes at a price in STEM. Absurdly, a woman's looks correlate with her ability to do science or be taken seriously by peers. Oftentimes, women in feminine clothing are mistaken for non-scientists compared to those who dress more masculine. As STEM is associated with being male dominated, it is understandable why the value of femininity may struggle. Matriarchal Indigenous cultures value the essence of women as a vital part of the community. A couple of Indigenous women detail their challenges with femininity in science and how they keep it.

To fit in a space, we don the trope identity counter to the person inside. Another Sister revealed the painful trauma of maintaining a false perception of herself as a scientist. The prolonged unhappiness shattered her spirit, denying her true nature and hindering her dreams. She spoke about her femininity as an issue for a male dominate field. Female scientists appear a certain way. Wearing makeup, a dress, and curling her hair acted as a liability.

“In a sense, I felt very broken. I almost quit my doctorate program. [Going to] a healing ceremony...I realized at this point...I wasn't whole. For me, the step about getting better was in the sense realigning what I valued as an Indigenous woman, and stop living this trope, this scientist that they [the academy] kept painting. [I am] sexualized, all the time, if I show up like this [wearing a dress, makeup, and hair curled], it's like, oh my goodness [from her colleagues expressing their discomfort with a pretty scientist]!

Authenticity forges core values. Pleasing others and living a shell of what they saw as a scientist caused the denial of this Indigenous woman's true self. It disrupted the inner balance and relationship with herself. Consequently, she undermined her value and interpretation of Indigenous womanhood.

Indigenous scientists struggle with how Native they should appear, as each higher education group will comment or critique. Another Sister explained the complication of holding an Indigenous woman's identity in a non-Indigenous space. Many students and faculty harshly criticized in evaluations how she carried herself. It did not matter. Each group appeared to take issue with her presence.

"Non-indigenous males, I don't know how many times...right to my face criticized [me]...to put me down because they don't believe I belong there. I think part of it is because I'm Native, and the other part is because I'm a woman...[I] show up to class professional looking. [You] don't wear any of your cultural things. Don't talk about those things. Thinking back about being a woman, I sometimes get more criticism from my female students than I do my male students. I get more crap or harassment sometimes from the Indigenous faculty because either I'm not native enough."

As Indigenous women prove a rarity at this level, these other groups may lack exposure to Indigenous cultural expression through clothing and jewelry. Nonetheless, this Indigenous woman demonstrated that non-Natives and Natives possess the right to direct her Indigenous appearance. It positions value on her looks and weakens the meaning behind Indigenous wear for cultural connection and expression.

As the only woman around men, one may feel lonely or a loss of identity. Another Sister vented about the appearance of women in the Sciences, leaning towards a masculine look. Most of the population consists of males, and any hint of femininity prompted a distraction or an indicator of unfavorable characteristics. However, this Sister enjoyed her painted nails. It gave the impression that her nails stood as a way to express and embrace femininity in male-dominated environments. "The majority [of STEM] is a constant reflection of a male figure. It's been hard to wear the pink t-shirt and look cute, you know, because of [societal sexualization of Indigi women]. A lot of times, [I have to] navigate the things that I say, and the things that I wear...Dodge my nails...but I have strength." To this Indigenous woman, painted nails became a symbol of female creative empowerment to contend with masculine space. Painted nails please herself and construct her own definition of femininity.

Federal Fallout.

Since 2025, the Department of Education (DOE) has terminated funding under White House Executive Orders. Programs or grants that researched, educated, or communicated DEI (diversity, equity, and inclusion), culture, or anything not aligned with the current Administration's agenda. The impact has adversely affected several higher education institutions nationwide. History will reveal the long-term damage, while short-term shifts are transforming the culture of higher education and conflicting with Indigenous values.

The current political climate, particularly with the Federal Administration, has shifted the values in education. A Sister specified that the turmoil confused the values in the department. As her department once prided itself on its DEI work, it now brushed it off as some fad or disposable trend. She elaborated about the increase in the invisibility of her and her work. "It was almost creepy how much they were into the DEI. Now it's crickets, and [I am] totally invisible, including a lot of my work...What are our values right now as a department? Very unclear." In sharing this experience, this Indigenous woman reveals how her work faced an increase in the lack of support. The DOE will no longer support Indigenous research, and its department will follow suit. She spotlights the challenge of departments standing by or becoming turncoat to their commitments.

The changes to the Executive orders resulted in some State-level governing bodies abandoning previous Indigenous work. Another Sister voiced the impact of the DEI Executive Order with state leadership. The places that once thrived with Indigi voice became severely diminished after decades of contributing to shared governance. "When the news came out about the DEI executive...he [was] not supportive. Everyone that he [has] put on our Board of Regents [was non-Native]. We've had a native person sitting in the chair position for decades. The first time he's in office; he replaces all the Native people with non-Native people."

This Indigenous woman's experience highlights the decreasing support for Indigenous initiatives in various areas. This situation is concerning, as institutions depend on multiple forms of support from local, state, and federal levels to fulfill their missions. Additionally, the lack of Indigenous representation in key decision-making positions will lead to further silencing of Indigenous voices in the future.

A Bridge too Far.

In the past, Indigenous research sometimes met unethical practices as Indigenous and Western perspectives clashed on values, knowledge, procedures, and more. With the limited number of Indigenous faculty researchers, how does the academy understand the values of Indigenous knowledge? Western Science sets researchers as the knowledge extractors while Indigenous Science views researchers as knowledge stewards. The Indigenous women foretell of negative experiences that devalue their obligation and moral compass for ethical Native research.

Some unethical Indigenous practices find higher justice. Another Sister told the unfortunate research project that required court intervention. The misuse of Indigi data crosses the line for any ethical researcher. She informed us of the faculty shutting down student input in these situations. "All my student wanted to do was go back to their community partners and say we've seen this trend. We think we want to move this way [and] to have a consultation. The faculty [said] absolutely not. They've [been] consulted. We're not doing that...The faculty felt threatened by this Indigenous student." I will limit the extent of the discussion in this comment for liability purposes but note it as a worthy point for our study. Unfortunately, the situation made it to court, but it set the precedent on the importance of ethical Indigenous research. From the experience, the Indigenous woman verbalized her attempt to correct the situation before it escalated to the courts. The circumstance showed how many Indigenous women advocate for what is right, but many will not be lucky enough to overpower the bad acting of a department. Unfortunately, the situation ended up in court, setting a precedent for the importance of ethical Indigenous research. The Indigenous woman involved expressed her efforts to address the issue before it escalated to legal action. This case highlights how many Indigenous women advocate

for justice, though many may not be fortunate enough to overcome the misconduct of a department.

When the only and newer Indigenous researcher on a Native project, power dynamics with seniority may come into play. Another Sister recalled the discomfort of a PI's (Principal Investigator) treatment of the Indigenous community as a data collection versus people. Indigi researchers prioritize relationship building first. Creating a bond begins with informal interactions, which may involve sharing a meal, getting coffee, taking part in a celebration, and more. Relationships take time to unfold, meaning patience. However, some PIs utilized Indigi faculty as the segue to fast-track results.

"I was gonna cry, because it was awful. I felt so terrible. This [is] really [an] uncomfortable place where I thought that this PI and I had a good relationship. I thought that her relationship with the community was good. That [it was] legitimate...We just have to go in, immediately walk in [to] start collecting data...I'm so uncomfortable...I'm really wrestling with, can I even use this data that they collected? Is it ethical for me to... I mean, I have IRB approval, right?"

This Indigenous woman expressed the pressures of having to fit in as a team player in academia. The Principal Investigator (PI), who holds significant power, often comes across as unapproachable and lacking in cultural competency. The Indigenous woman references the Institutional Review Board (IRB), yet it raises the question: how many of these boards consult with Indigenous individuals who could advocate for cultural competency and ensure that community voices are heard? If such support had been provided, this Indigenous woman might have felt empowered to speak up instead.

A Blazing Candle Burning on Both Ends.

As Indigenous women faculty are few in the academy, many colleagues, students, and community members rely on them for cultural work outside their job descriptions with no compensation. Everyone tugs on their presence for representation, but it may cause work overload. A couple of Indigenous women share their experiences, highlighting the emotional, physical, mental, and spiritual taxation felt by the only Indigenous person in their space.

The family pays the price of an unreasonable workload for the only Indigenous faculty member. Another Sister commented on the academy's awareness of the rarity Indigi faculty, as many of us represent the "only one". As the only Indigi expert, it assigned several students with Indigi identity and any Indigi-related work, which resulted in unrealistic workloads. The department did little to remedy the situation, resulting in a possible future career change. "It really hurts my heart. I'm the only Indigenous person who could be on a student committee to support them. I get spread so thin, and I really worry about burning myself out. I worry about taking too much from my family and my health." This Indigenous woman calls attention to the overwhelming workloads that brought a reflection on whether academia was worth the cost. The layered challenges to find a position in academia have now switched to keeping it. She remarked that her future seemed bleak in higher education and considered shifting to another career. Sadly, the institution will lose another rare treasure.

The only Indigenous person in a space takes a toll on health. Another Sister weighed in on the impact of being the only Indigenous woman in the department. It illuminated a lonely path where she suffered in silence. However, dancing furnished an escape toward healing. "[I felt] heartbroken and shattered. I don't know what to do. I'm the only Indigenous woman in my program. I don't know who to talk to about this because nobody has ever been in this space that

I've been in. [It was] isolating. It wasn't any good, a lot of anxiety. Depression was taking over, and that's when...I decided to dance." Though Indigenous and non-Native people may find common ground to build a relationship, difficulty may arise if cultural competency is lacking. In this experience, the Indigenous woman found it difficult to relate to others and to establish shared values. Since Indigenous people are sparse in higher education, exposure to Indigenous culture and values appears limited. The experience highlighted the importance of positive coping mechanisms to mitigate the negative repercussions of struggling without competent support.

Visible and Invisible Vulnerability

Family struggles, gendered harm, and emotional and psychological impacts contributed to times femininity brought an onslaught of challenges. Some of the Sisters felt seen while others underwent invisibility. At this point, the focus group transitioned into a support group of female camaraderie.

Sexual assault with Indigenous populations trend higher than non-Native groups. One Sister voiced experiences with sexual assault as a younger and as a middle-aged adult. Out of respect for privacy, I will purposefully omit direct quotes. According to the National Institute of Justice (NIJ), four out of five Indigi women will experience sexual assault throughout their lifetime (Rosay, 2016). Sexual assault negatively impacts anyone. However, the multiple occurrences induce increased trauma. Many victims suffer in silence, which promotes health issues and the devaluing of self-worth. Hence, this Indigenous woman felt invisible. Unresolved side effects may hinder the ability to feel whole. Sexual assault has a profoundly negative impact on individuals. When these incidents happen multiple times, the trauma can intensify. Many victims suffer in silence, leading to health issues and a diminished sense of self-worth. As a

result, this Indigenous woman felt invisible. Unresolved side effects can hinder one's ability to feel whole.

With male-dominated spaces, pregnancy may not resonate as an acceptable topic of public conversation. Another Indigi Sister commented on the joy of another woman in the lab, the understanding of the challenges of pregnancy. She felt invisible regarding her condition, as many of the lab students identified as males. "There is another lady in one of my labs. This is when I was a student. We all of a sudden start talking about being pregnant and birthing in the middle of the lab!" Interestingly, the technical culture of STEM blends into the social components of the space. Human occurrences, similar to pregnancy, did not seem appropriate, making this Indigenous woman not speak about pregnancy until she came across another woman. Her experience underlines the attitude that pregnancy represents a barrier to progression in the environment. With invisibility to pregnancy, I surmise it transfers to motherhood.

Multicultural backgrounds may devise invisibility with Indigenous and non-Native communities, as connection may be a struggle to establish. Another Sister expounded on reconnecting to Indigi culture later in life after encountering strong Indigi women and their lived experience. The disconnect from Indigi heritage arose from the societal pressure placed on her parents' diverse backgrounds and interpretation of Patriotism. She prided herself on her American heritage but saw inspiration in blending her Indigenous heritage with America's melting pot.

"Being American is the status, right? You're going to speak English. You're not [going to] know the Native tongue, or anything else. You are truly Americanized. For me, seeing that [Indigi] strength [of women warriors led to a desire to connect] with that [Indigi] side

again, my grandmother, all women, all tribal women. [I wanted to model] what strength and resilience we have as [Indigi Americans].

This Indigenous woman reflected on the challenges of fully immersing herself in her Native heritage due to her diverse background. Growing up, she embraced American culture, which often made her feel invisible to others and vice versa. Building knowledge and establishing connections within the community takes time; the transition from feeling like an outsider to becoming an insider is a gradual process.

Generational trauma produces inescapable feelings along with health issues. Another Sister verbalized the weight of carrying generational trauma as a morality check. Most importantly, dealing with guilt and moving forward in a manner that acknowledges past pain but improves our future selves. "I learned so much from my grandfather about how to be...His father had been taken, stolen from his family, and put in [a] boarding school. Learning that I can't change what happened in the past. It's not my fault that [it] happened. Now what do I do now that I'm in this space where I have a lot of privilege in so many ways?" Generational trauma affects every generation, leading to a loss of identity, difficulties in forming relationships, and a diminished sense of safety. Those dealing with generational trauma may experience severe responses, including suicidal thoughts, depression, low self-esteem, anxiety, and anger. An Indigenous woman highlighted that individuals are born into generational trauma, which shapes both their present and future selves. She embraced her vulnerability by recognizing that she held no responsibility for past events.

Emotional vulnerability requires acknowledgment of one's feelings. Another Sister discussed the hardship of finding happiness. Her position did not kindle any passion. Though

unhappiness did not bode well for mental stability, she discovered a bearable plane of existence. To add, balancing work and life produced an uptick in difficulties.

"I don't really love teaching. Teaching is not a passion. I don't do a lot of things that make me happy. I've kind of come to, like, a realization...I don't have to be happy, and that's okay to feel normal...I don't want to feel good, and I don't want to feel bad...honestly, probably not a lot of happy moments...A lot of moments of depression [and] exhaustion...I think I found motherhood just exhausting. With motherhood, I think I'm slowly coming out of that. [I'm] seeing the light, oh my gosh! It was 20 years I've invested. I'm fine because there were a lot of ups and downs."

Opening up about emotional vulnerability means not consciously hiding feelings or pain. The sharing of this experience led this Indigenous woman to convey her unhappiness festering within the STEM field and motherhood. She felt invisible as a parent as STEM needed to improve workload balance for working mothers.

Many colleagues cannot see past Indigeneity. Another Sister affirmed the obstacles of perceptions. These false conceptions undermined her capabilities and credibility. She was a ghost enshrined in a tomb of accolades. Above all, others could not see or care to know our pain and trauma. The group related to the various stages of their healing journey.

"Even though I got my PhD, even though I have research in my background, I'm still not seen half the time. You go into that space, and you can feel it. I'm the highest-ranking...Native at my institution. I get told that my opinion doesn't have value. You go through all these levels of what they tell you [what] to accomplish in order to be in that space. And they still don't see you. It's challenging a lot of days. Still, there's such a large group of people who don't see us as valuable. It's so challenging. I talk about historical

trauma, generational trauma sometimes in my speeches, and talk about indigenizing STEM education."

A label can either generate visibility or provide empowerment. Labels describe our identity and are often shaped by perception and judgment. They can influence how we value ourselves. Some labels carry more weight than others, depending on how they are perceived by different individuals. For instance, an Indigenous woman who was well-known for her work shared her experience of being overlooked by some colleagues, as if she did not exist. The label of Indigenous crafted a fixed and limited definition that failed to grant her the visibility she deserved, even after achieving nationwide recognition.

Indigenous cultures honor and celebrate all aspects of womanhood, while Western society often imposes shame on these expressions. Another Sister narrated about societal shaming of femininity and her childhood. She underwent humiliation reaching the age of her moon (menstruation). As an Indigenous woman, she wanted her daughter's experience centered on celebration. For Indigi women, the moon cycle signified renewal, purification, and sacred rest, not dishonor. The science tied to Indigi value became a platform for mother-daughter bonding and humanizing education. "I hid my femininity at times to protect myself...silent and shameful about anything to do with women's bodies...I knew my daughter [had] her moon soon. I had to teach her about this. I did all this research, and I talked to her. We got really nerdy. We talked about all the science I was learning with her about my own body."

From her early childhood, this Indigenous woman was taught to feel shame about the natural processes of womanhood. This upbringing fostered a negative view of femininity and devalued her womanhood. It created a sense of inferiority that may spiral over into male-dominated fields and influence how she navigates those spaces.

Indigenous women have the potential to take on leadership roles, as matriarchal Native communities provide them with numerous opportunities. However, the academic environment presents different challenges and circumstances for leadership pathways. Another Sister indicated the difficulty in finding their place in the academic organizational structure, as it lacks leadership in developing people. She hints at the massive program enrollment under the administration's direction, which suggests a degree production line, leaving little room for leadership or faculty professional development. "I think my chair isn't leadership...It's not recognized as leadership. I'd say [I have] to convince them [of] the role that I have. [They say] we just need you to teach because we have a thousand students that come through every year...The university values the degree."

The department prioritized monetary assets over developing its organizational leadership. This Indigenous woman's experience highlighted how the lack of focus on human leadership made the work culture less inviting and made its people feel invisible. In other words, the department lacked a true sense of what this Indigenous woman could bring to the table beyond checking the box for students completing their programs.

Concluding Insights

The Indigenous holistic self centers on a living ecosystem of values in which other values of mentorship, culture, femininity, artistry, STEM change agency, relational community, and leadership are inseparably woven together. Mirroring the intricate networks of a natural ecosystem, every element of mentorship, culture, femininity, artistry, STEM change agency, relational community, and leadership forms symbiotic connections that enrich and sustain the whole of self. In this context, mentorship transcends traditional academic guidance to embody relational care, reciprocity, and co-learning. Through these intentional relationships, Indigenous

women cultivate skills, confidence, and cultural affirmation, while advisors and peers also experience growth and transformation. The reciprocal, communal nature of mentorship reinforces the idea that individual achievement is intimately linked to the well-being and continuity of the community, exemplifying a truly relational and holistic worldview.

Cultural practices, creative expression, and artistry serve as essential threads within this living ecosystem of value, providing protection, resilience, and a sense of wholeness. Indigenous artistry humanizes STEM spaces, legitimizes ancestral knowledge, and fosters pluralistic ways of knowing. Expressions of Indigenous femininity reinforce identity, promote intergenerational healing, and empower participatory action. These cultural and creative practices infuse academic and professional environments with Indigenous knowledge systems, enabling scholars to navigate STEM with integrity, connection, and balance. Here, cultural engagement and self-care function like nutrient-rich waters, nourishing identity, well-being, and relational harmony across all dimensions of life.

Indigenous leadership and community stewardship are vital to maintaining the health and vibrancy of this ecosystem of values. Leaders foster innovation, co-creation, and ethical accountability, transforming STEM and higher education into spaces grounded in collective responsibility, reciprocity, and cultural integrity. By cultivating interconnectedness across generations and disciplines, Indigenous women leaders and scholars strengthen a resilient, adaptive system in which every individual and cultural practice contributes to the flourishing of the whole. This relational ecosystem illustrates how Indigenous women's wholeness is dynamic, interdependent, and holistic. It prioritizes balance, growth, and the enduring importance of cultural, emotional, and spiritual well-being alongside academic and professional success.

Examining Indigenous scholars and their work through an ecological lens reveals that each value of mentorship, culture, femininity, artistry, STEM change agency, relational community, and leadership plays a critical role in sustaining a holistic, humanizing, and value-inclusive environment. The Indigenous holistic self is not fixed or static. It flourishes through relationship, reciprocity, and continuous stewardship. Just as natural ecosystems require mindful care and equilibrium, likewise Indigenous selves and communities thrive through the intentional cultivation of relational, cultural, and creative practices. These humanizing practices shape academic and professional spaces that honor both knowledge and identity, ensuring generational continuity, resilience, and wholeness.

Indigenous values serve as the core of who we are and the heart of the relational ecosystem of value, where people, communities, and the natural world coexist in harmony. Stewardship, ceremonial practices, and culturally grounded knowledge are vital processes that sustain this ecosystem, much as biodiversity sustains a thriving natural environment. When these values are eroded by institutional barriers to profit, resource extraction, one-dimensional thinking, STEM tropes, federal defunding, disrespect for boundaries, massive workloads, or the suppression of cultural practices, the equilibrium is disrupted. The resulting losses are felt not just in the moment, but also culturally, mentally, physically, and spiritually. These actions highlight the inextricable link between our core values and holistic self.

Ecological grief arises directly from such disruptions. In an Indigenous relational ecosystem, harm to any value ripples throughout the system, impacting individuals, families, and future generations. Barriers to traditional lands, restrictions on cultural ceremonies, or the disrespect of Indigenous knowledge sever intergenerational bonds and weaken the balance of holistic self within the ecosystem of values. This grief is felt by the individual and the

community. The degradation of an Indigenous woman's ecological values mirrors a corresponding erosion of cultural, spiritual, mental, physical, and communal vitality. Prolonged disruption equates to the cessation of an ecosystem's life force. Therefore, institutional barriers quell the humanization, growth, and sustainability, or the overall inherent worth, of the holistic Indigenous woman in STEM.

Restoring and honoring Indigenous values is key to harmonious balance within this ecosystem. Acts of cultural stewardship, creative expression, mentorship, and relational community function as restorative forces, strengthening interconnectedness, identity, and resilience. By safeguarding both ecological and STEM systems, Indigenous communities help ecosystems thrive, ensuring the wholeness of being an Indigenous woman in STEM higher education. Upholding relational values in this ecosystem is vital to preventing ecological grief and nurturing holistic wellness for Indigenous women in STEM.

Chapter 5 - Valuing the Im_Possible Dream

Indigenous Women of Heart and Values

“Who am I?

I am the girl who loves my island

I'm the girl who loves the sea

It calls me

I am the daughter of the village chief

We are descended from voyagers

Who found their way across the world

They call me

I've delivered us to where we are

I have journeyed farther

I am everything I've learned and more

Still, it calls me

And the call isn't out there at all

It's inside me

It's like the tide, always falling and rising

I will carry you here in my heart

You'll remind me

Come what may, I know the way

I am Moana” (Lin-Manuel Miranda, Opetiaia Foa'i & Mark Mancina, 2016, 1:09)!

I lead with these lyrics from *Moana*, which encapsulate the Pacific Native character Moana's defiant moment of listening to her inner voice and embracing her identity tied to gender, culture, and values. These elements of our inherent worth guide us to trust our journey through this world filled with lived experiences (see Figure 5.1). Similarly, the Indigenous sisters in this study created an interconnected ecosystem of values through physical and non-physical artifacts and external and internal influences. This ecosystem of value created through their storytelling of lived experiences conjured an inner voice and served as the North Star to wayfinding through the calm and turbulent waves of STEM higher education. In Chapter Four, I discussed the importance of valuing a holistic self. Understanding one's core values is essential because they define who you are, how you navigate lived experiences, and help you comprehend the values of others. The values of mentorship, culture, femininity, artistry, STEM change agent, relational community, leadership, and holistic self-empowered these Indigenous women's inner voice to honor their roots, find their strength, and trust who they are as women, Indigenous people, and STEM faculty members. The agentic forces of creativity and reciprocity helped strengthen these connections by providing resilience and adaptability against disruptive challenges that attempted to disconnect their ecosystems of value or threatened ecological collapse. The causes of ecological grief these Indigenous women faced included profiting over people, one-dimensional thinking, the scientist trope, federal defunding, ignoring others' value systems, overexertion with massive workloads, and visible and invisible vulnerability.



Figure 5.1

Artistic interpretation of Moana and these Indigenous women carrying their values and inner voice/North Star to strengthen who they are and transform in every space. Own work using Canva.

Reflecting on the dangerously low participation of Indigenous women in STEM faculty positions and the STEM field, their self-narratives of the ecosystem of values revealed a couple of aha moments about why creativity and reciprocity were such an agentic force connecting all their values and transformative STEM culture shifts. The forces of creativity and reciprocity created a portable culture and soft power, yielding empowerment and transformation in their spaces. I contend these discoveries provide an impactful lead to the ability of Indigenous women to exist in any space, but especially in STEM. I do not wish to undermine their past and ongoing challenges; however, this does present implications for my future scholarship and for STEAM to holistically support invisible STEM populations with creative and reciprocal value systems, portable culture, and soft power. Most significantly, our values inform us of everything we do,

for they are the heart of who we are. As the Pacific Native character Moana described that she carried her people in her heart, these Indigenous women carry their values. Their hearts and values lead the way!

Indigenous Heart Carried by Stories

Indigenous stories allow their people to connect with what matters most (see Figure 5.2). When we lose the connection to storytelling, we no longer have a link to meaning making or sharing tradition (Archibald, 2008). Walter Lightning (1992), a member of the Samson Cree Nation, spoke of storytelling as a way to share lived experiences and build a compassionate mind to demonstrate your love for others. When Indigenous people cultivate compassionate minds through storytelling, it creates a space for learning the truth with love (Lightning, 1992). The compassionate mind requires spiritual, mental, physical, and emotional layers (Archibald, 2008). The notion of storytelling generates conflict with the rigors of STEM education because it is “academic work steeped deep into literacy, analysis, and explicitness” (Archibald, 2008, p. 7). Indigenous narratives find meaning in the implicitness, which counters STEM’s one-dimensional acceptance of knowledge creation.

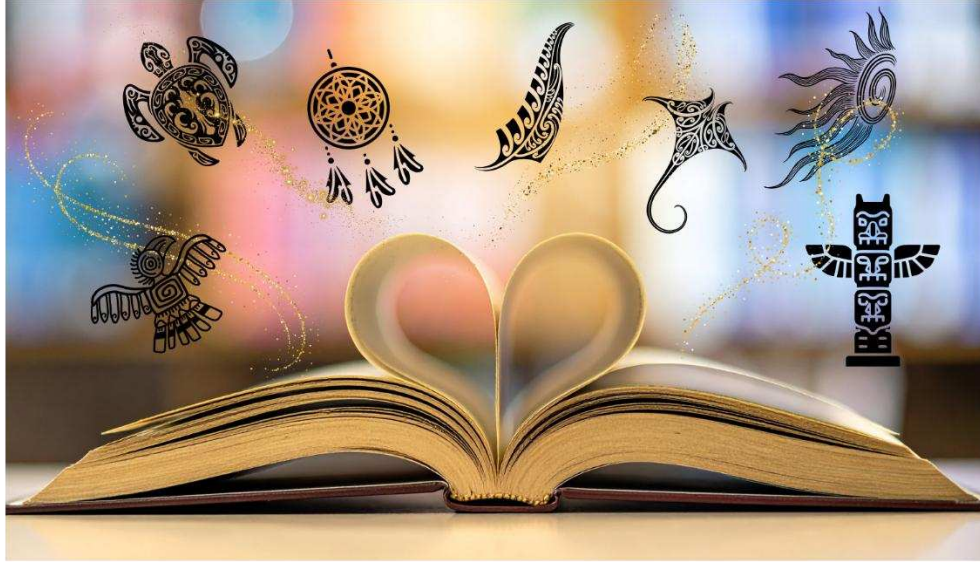


Figure 5.2

Artistic interpretation of how stories lie at the heart of us and our culture to make meaning with life. Own work created using Canva.

The ability to use self-narratives in this study enabled the exploration of an interconnected ecosystem of values embedded in the experience of Indigenous women. Although the lived experiences of Indigenous women are unique, their overlaps add the perspective that relational knowledge carries collective meaning and guidance. Photovoice served as a connective bond that illuminated the values and experiences hold a profound relationship to who you are and shaped lived realities. The construction of their storyboards with valued photos creatively captured the complexity of Indigenous presence within their idea of a transformative STEM space, navigation of their scholarship, and contributions to STEM. The Indigenous ecosystem of values shows how it beautifully unfolds within the larger value system of STEM culture, expanding the stark bounds on what is legitimate knowledge. Values carry into every space. As values makeup the heart of these Indigenous women, the higher education value system attempts

to separate them from their hearts. I ask, “Can you live without your heart?” Story becomes the vital vessel to carry and aid in sustaining the heart of Indigenous women and their value systems. Therefore, these lived experiences, values, and self-narratives act as agents of change to transform a STEM space that is human, holistic, collaborative, culturally responsive, accountable, and creative.

Interpreting the Results/Epiphanies of the Indigenous Heart

Throughout this work, several “aha” moments emerged that deepened my understanding of the experiences and values of these incredible Indigenous women. These realizations arose as relational patterns across their stories became visible through interaction. A value could shift through the stages of water, appearing in many forms. For example, mentorship included a photo of the mentor, becoming a mentor, peer mentoring, kincentric relationships, and communal ties as part of reciprocity. This revealed the significance of mentorship, culture, identity, creativity, and relational community. These components created an ecosystem of value within Indigenous women’s STEM experiences. What begun as individual insights evolved into broader recognition: these values are interconnected and, together, form a portable ecological culture for navigating and transforming academic spaces. These moments of clarity showed how Indigenous values use creativity to humanize STEM through relationships, reciprocity, cultural knowledge, and holistic well-being. Additionally, Indigenous values use reciprocity to balance values within their own and higher education’s value systems. In kincentric ecology, reciprocity treats all living and non-living things with respect, rather than with exploitation. Reflecting on these realizations helped me see how the Indigenous women’s experiences challenged narrow narratives and value limitations within STEM. Indigenous women’s values within an ecosystem offer meaningful pathways for more inclusive, relational, and culturally grounded approaches to knowledge and

leadership. Overall, this ecosystem of values empowers Indigenous women to carry their culture portably. This enables them to thrive with soft power and enact true transformation within the institution's value system and, most importantly, among their students, colleagues, programs, and the ever-hopeful future.

Portable Values Discussion

Depending on the context, the phrase portable culture can mean several things or contain several variations. One museum archival definition view portable culture as artifacts that are “important in the physical manifestation and support for creating and telling stories or histories about the recent and long-ago past” (Teeter, 2011, p. 142). Thornley (2015) describes portable personhood among Indigenous Māori women, highlighting the recognition and expansion of their relationships, responsibilities, and identity. Plotz (2008) comments that portable property, as cultural objects, safeguards the sense of self and one's community, no matter where in space and time. In the context of this study, I define portable values as physical and nonphysical artifacts with connected relationships that 1) fashion an Indigenous ecosystem of value; 2) empower the sense of holistic self; and 3) encourage the co-existence of pluralistic value systems. Thinking of a portable values system, these women carry them across institutions and spaces regardless of the geographic location of their home communities.

Photovoice created a physical artifact to capture the portable values of this study and to symbolize the physical and non-physical entities of nature, people, animals, clothing, spaces, art, dance, customs, STEM, and literature. The focus group offered richer insights into the connections among relational values, ways of knowing, ceremonies, and storytelling. Together, the ecosystem became a form of Indigenous portable culture (see Figure 5.3), grounded in values that enabled the continuity of Indigeneity and womanhood in any space. The ability to capture

portable value in the self-narrative boards illuminated how Indigeneity and gender navigated STEM higher education environments through relationships, practices, people, non-human objects, and items holding significant meaning.

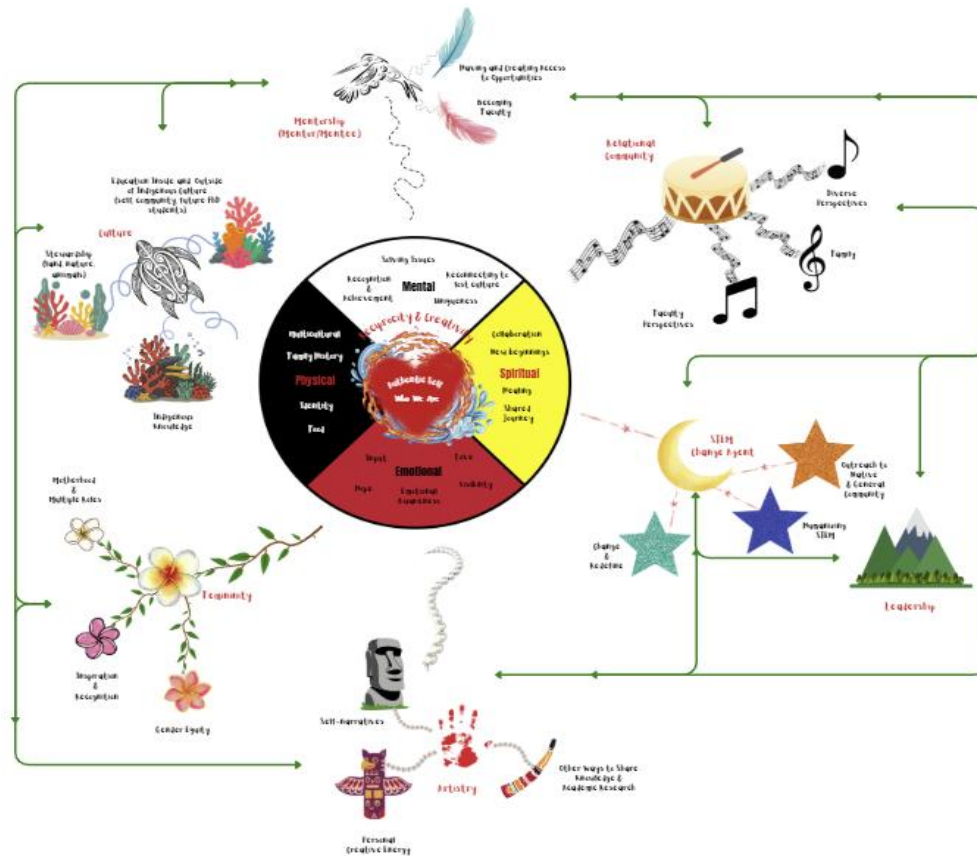


Figure 5.3

Indigenous Ecosystem of Values. Own work created using Canva.

Mentorship served as a portable value in that it helped Indigenous women transmit their values. Portable components included community and relational connections, support for cultural identity, shared reciprocal growth, and cross-cultural relationship building. Mentors stood as the platform for the sisters to bridge the academic and Indigenous worlds. When these women entered mentoring positions, they acted as carriers of values for community, legacy, and agency. Mentorship as a portable value for culture preserved Indigenous values within the academy.

Culture signified a portable value by reshaping the boundaries of STEM knowledge. Indigenous culture speaks back to the extractive culture of STEM, becoming humanized and community centered. Portable elements included multiple ways of knowing, accountability, reciprocity, ethics, place-based, and experiential learning. The ability of Indigenous women to remold STEM culture enabled a proper space for community and institutional knowledge to collaborate. Culture as a portable value for knowledge systems demonstrated Indigenous culture shifting into STEM and transforming the structure.

Femineity indicated a portable value that moves identity into leadership and practice. Some STEM spaces, leadership roles, community, and family systems supported feminine integration. The portability of femininity was expressed through cultural embodiment (attire, jewelry, roles, etc.), creativity and relational identity, and intergenerational healing and resilience. These Indigenous women carried physical artifacts of feminism or practiced feminism in every space they occupied, which helped deepen their sense of belonging, strengthen their identity, and transform those spaces into more meaningful connections that bridged into leadership. Femineity as a portable value for gender advocacy manifested that Indigenous women carried womanhood through the body, family and community roles, and leadership in every space.

Artistry detailed a portable value that permeated rigid knowledge systems. It carried across academic, generational, and cultural boundaries. Portable points featured the rigor of creative knowledge, artistic participation, and embodiment, as well as creative ancestral artifacts. Art transforms STEM by weaving pluralistic and holistic ways of knowing into one-dimensional knowledge systems and extends the boundaries of what counts as legitimate knowledge. The Indigenous sisters demonstrated great creativity in creating Indigenous art, from dancing to

quilting. Their storyboards featured decorations like gems, feathers, decorative tapes, and colorful papers. While decorating was optional, each Sister chose to do so, using decorations to highlight what mattered most in their stories. Artistic creative expression became a way to unlock the expertise of their lived experiences and to forgo the formalities of a rigid STEM mindset. Therefore, the Indigenous sisters possessed a mechanism or object that enabled them to share Indigeneity and femininity in a vital way, fostering connection and cultural continuity. Artistry as a portable value for creative epistemology moved Indigenous worldviews as legitimate and reshaped research practices.

The STEM change agent demonstrated a portable value that enabled Indigenous women's leadership to embed Indigenous values into academic systems. Portable leadership practices entailed ethical responsibility, data sovereignty, holistic and interdisciplinary thinking, and the combination of Indigenous perspectives and language. STEM was repositioned as a priority that served the community, not one extracted from it. The Indigenous sisters ensured they built reciprocity into their work by helping address community issues, seeking community input, and not prioritizing profits or publications. STEM change agent as a portable value for change to carry over taught that Indigenous women: 1) saw STEM knowledge as a holistic system that protected and served its people; 2) showed that institutional transformation occurred with intentional movement of their values; and 3) these Indigenous women were the ones who created cultural values in STEM systems. Chapter Two detailed the various struggles Indigenous populations face as they navigate STEM culture. Indigenous populations must choose whether to make sense of the world through their own viewpoints or through what STEM validates (Macedo, 1999). I contend there should be choice, as the STEM practitioner understands their research lens or the problem they wish to address. Without the flexibility to explore and

experiment with a shared viewpoint, Indigenous populations in higher education endure the pressure to abandon their values (Pidgeon, 2008). With the challenges of labeling a generalized experience that silences and produces invisibility (Gutiérrez & Rogoff, 2003; Miles et al., 2022). Portable cultures craft a space to anchor what matters in STEM environments. STEM culture often pushes cultural differences from mainstream culture into creative margins. With portable culture, I contend that it enables the growth of those on the creative margins and integrates harmoniously into the mainstream, fostering a shared epistemology and learning experiences.

Relational community exhibited a portable value that encouraged Indigeneity and womanhood to exist inside and outside the academy. Community was recreated through stewardship, kincentric relationship, and reciprocity. A portable community involved collective responsibility, shared care systems, and cross-cultural and intergenerational knowledge transfers. Each Sister reported the community, both internally and externally, as a pillar of support for connection, healing, and cultural preservation. Members of their communities resembled kin. Relational community, as a portable value and humanizing framework, demonstrated that sustained value materializes through relationships, not solely through location.

Leadership expressed a portable value rooted in care, reciprocity, relationships, and creativity. Indigenous women leaders used these portable aspects to sustain collective empowerment, Indigenous and womanhood restoration, and longevity of well-being. These Indigenous women exhibited their leadership values across community and academic contexts. Leadership as a portable practice transferred Indigenous and feminine leadership values to every space the Sisters inhabited.

The holistic self, as a portable value, enabled individuals to carry Indigenous values across emotional, mental, physical, and spiritual domains. A portable identity of self was

maintained through community, mentorship, and cultural engagements. The portable value of identity ensured the community of Indigenous womanhood in STEM. These Sisters valued their sense of self and, regardless of the setting, brought Indigeneity and womanhood into STEM spaces through various ways, from clothing to creative curriculum. A holistic self embodied as a portable value brought the insight that Indigenous women were the carriers of values across all spaces.

The domestic sphere provided American women with the opportunity to physically craft a cultural corner that strengthened international consumerism (Hoganson, 2010). I emphasize that the action establishes American women cultivating overseas culture in their daily lives. In their homes, women of elevated status invested their energy, creativity, and finances in creating cultural cornerstones with international items or fashion that introduced acceptance of overseas culture into American domestic life and fostered self-reflection on American women's identities through other elements of culture (Hoganson, 2010). Additionally, Hoganson's (2010, p. 17) use of "cozey corners" facilitated the acceptance of international culture and contributed to the idea of soft power, which I discuss in detail in the soft power section. Likewise, the Indigenous women of this study composed a portable culture with their value system.

Figure 5.4 illustrates the ecosystem of values that the body carries internally. Physical or non-physical artifacts may represent values; however, their meaning and significance are internally carried into every space the body inhabits. The bodies of the Indigenous women were carried into STEM spaces, identities, beliefs, values, memories, and practices connected to their Indigeneity and womanhood. Within the body, two systems existed: the heart (values) and the mind (STEM). As the functions of the heart and mind differ, the Indigenous ecosystem of values and the cultural values of STEM higher education often contrast. The spaces of STEM (mind)

tended to overpower the core values (heart), leading to instances of ecological grief over profiting from people, one-dimensional thinking, the scientist trope, federal defunding, ignoring others' value systems, overexertion with massive workloads, and visible and invisible vulnerability. The constant struggle for existence and balance left some of the Indigenous sisters exhausted, burned out, unwelcome, heartbroken, and contemplating exiting STEM. Chapter Two detailed the numerous challenges faced by Indigenous populations. I insist, with respect, that the concept of portable cultures enables both individuals and their communities to explore and understand values, such as spirituality, emotionality, physicality, and mentality, beyond what is discussed in existing literature, thereby offering a deeper perspective on Indigenous experiences. This point aligns with what I respectfully contend contributes to a major factor in the low and declining participation of Indigenous populations in STEM higher education, especially when crossing into faculty positions (Leong et al., 2020; Mayeda et al., 2014; NCSSES, 2019/2021; Patel, 2014; Pidgeon, 2014; Ramirez, 2014). The challenges endured by these Indigenous women appeared layered; nonetheless, the inability to integrate values into STEM's culture ripples through the soul, disrupting our true selves. In the same vein, the moments of humanistic approaches that integrated values and STEM culture cultivated support for the Indigenous sisters' perceptions of their true selves or their souls. In other words, Indigenous women in STEM faculty positions in STEM higher education brought transformative change through their ecosystems of values and STEM culture, building a reciprocal and creative connection that co-shared their existence.

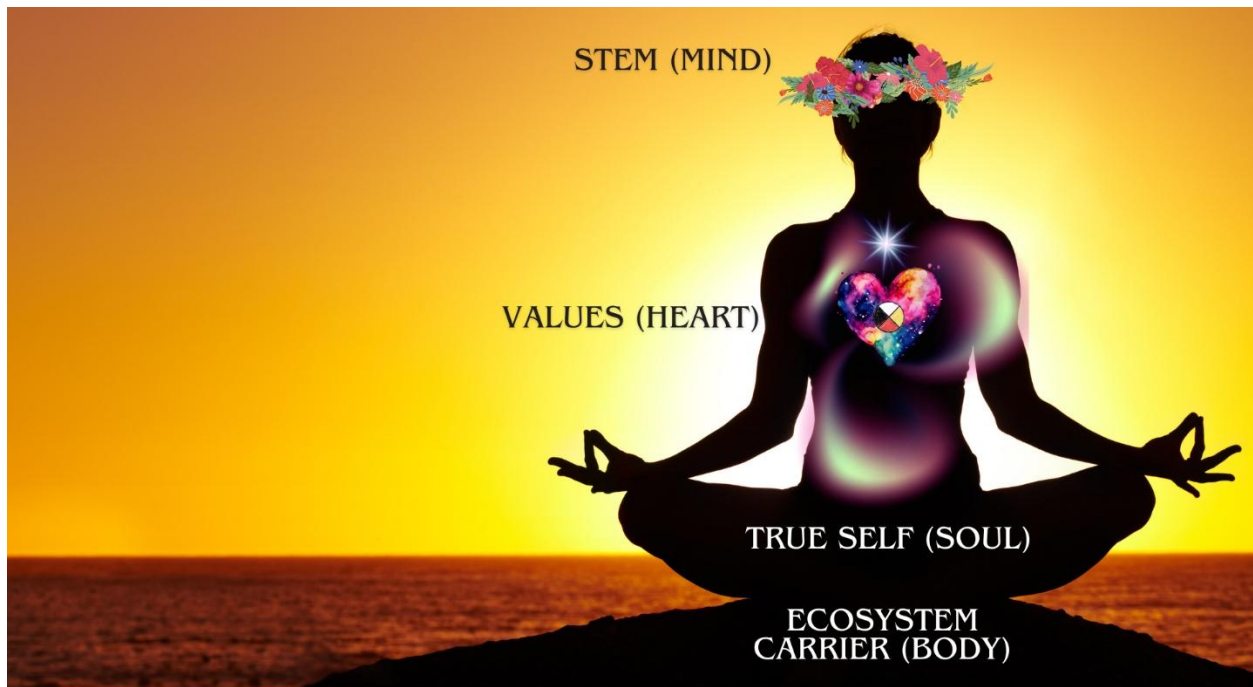


Figure 5.4

Artistic interpretation of mind and heart uniting to reflect the soul and all carried within the body. Own work created using Canva.

The Indigenous ecosystem of values traveled through people, relationships, and practices, turning the system into a portable culture of Indigenous value. Carrying these values into spaces helped these Indigenous women maintain culture, womanhood, community, reciprocity, relational accountability, and holistic frameworks. Additionally, the Indigenous ecosystem of value demonstrated its adaptability and grounding. A portable ecosystem allowed Indigenous values to become transferable, relational, human-centric, embodied, and transformative in STEM environments. Overall, it helped empower self-agency when some STEM situations attempted to erode their values, causing ecological grief, and imbalance. This section of portable values in practice that sustained the empowerment of Indigeneity and womanhood illuminated the transformative path forward that humanizes and expands STEM knowledge to consider multidimensional thinking. I respectfully insist that the agentic impact of the Indigenous

ecosystem of values highlights true transformative change through soft power. A soft power that chooses to collaborate, not force change.

Soft Power Discussion

The concept of soft power is "synonymous with non-military power and includes both cultural power and economic strength" (Vuving, 2009, p. 3). Others define soft power as a force that "entices and attracts," compelling others to "acquiescence or imitation" in a way similar to love (Nye, 2013, p. 9). Notably, the rise of soft power chiefly stems from values expressed in culture (Nye, 2013), providing a foundation for its global influence. "If culture and ideology are attractive, others will follow willingly" (Nye, 2004, p. 167). Resources include soft power, international institutions, cultural attraction, and ideologies (Nye, 2004). Watanabe and McConnell (2015) saw soft power as requiring three elements: culture, political values, and international policy. It is a form of power that achieves desirable outcomes (Watanabe & McConnell, 2015). However, this study aligns with Fraser's (2014) definition of soft power, based on values, while hard power is predicated on facts. The explanation paints a picture of the diametrically opposed worlds of Indigenous soft power through their ecosystem of values and STEM hard power, through quantified reality.

Many scholars examine soft power in vast corners of the world. Drawing on my experience with American culture, I spotlight examples of American soft power to demonstrate its effectiveness and connect the same instance occurring in the Indigenous women's sphere of influence with a portable ecosystem of values in STEM higher educational contexts. The portable culture of film and television resonates with international audiences, inspiring the American Dream in students and impacting their desire to study in the US (Nye, 2003). International students returning home after undertaking higher education experiences in America

reflect US ways of thinking, values, and attitudes (Fraser, 2014). Thus, soft power shapes global perceptions, such as viewing the American education system as central (Watanabe & McConnell, 2015). Overseas, the film industry further projects American values of multiculturalism, humanity, and democracy, which have powerfully shaped English's international influence, enabling it to “become the lingua franca of the global economy” (Nye, 2004, p. 169). With Hollywood and pop culture, American values, lifestyles, beliefs, and norms have infiltrated international spaces, thereby strengthening American soft power (Fraser, 2014). De Grazia (2005) commented that the shaping of American cinema gave rise to entertainment value worldwide, particularly through cinematic communication. The various American dialects, slang, witty remarks, and jive talk, as well as nonverbal gestures, became the model for international audiences (De Grazia, 2005). “It produced a new vernacular offering new strategies of communication that undermined the old barriers of culture and deference, all while promising cooperation to contain the excesses of mass culture” (De Grazia, 2005, p. 303). American culture brought intentional and unintentional transformations across the world; however, not all change was welcomed.

Soft power exerts a transformative force. I respectfully contend that the characteristics of STEM culture are specialized, fragmented learning that often seeks isolation rather than interdisciplinary and pluralistic epistemologies (Kidman et al., 2025; Ortiz-Revilla et al., 2020; Reynante et al., 2020). By no means is STEM culture a soft power compared to the Indigenous women in this study. I bring to the forefront that rigid systems in general become uneasy with soft power because of their invisibility and their ability to shift homogenization. However, the soft power of the portable Indigenous ecosystem of values possesses reciprocity in connections to each value. This component, I respectfully assert, fosters balanced collaboration rather than

promoting an influence that undermines local identity. As an example of soft power fears, International educational collaborations in STEM education raised concerns about the American education system. For example, in 1970, Japan did not welcome the influence of American soft power in STEM education systems, as they were unsettled by the thought of Westerners integrating into Japanese student identity and into Japan's social and cultural sectors (Watanabe & McConnell, 2015). Similarly, the culture of values embedded in Indigenous women's viewpoints struggles with acceptance in the larger STEM value culture in higher education. Why? The ecosystem of value for these Indigenous women contained the agentic force of creativity, which fused the worlds of art, science, and culture.

People are fascinated by culture. And culture is closely connected to creativity. Creative industries need cultural resources such as creative and talented people. Creative people live to live or work in a 'creative and cultural atmosphere' that drives them to new challenges (Watanabe & McConnell, 2015, p. 130).

Creativity, people, and attention overlap at a common point in culture. Soft power arises from a culture that encompasses spirituality, emotions, values, artistic expression, and knowledge, empowering the inherent work of all (Aromaa, 2020; Fraser, 2014; Watanabe & McConnell, 2015). Soft power charms and persuades, while hard power discourages and pressures (Fraser, 2014). Hence, creativity is vital to culture, which strengthens the influence of soft power.

Through the exploration of self-narratives of Indigenous women lived experiences, beliefs, practices, creative and reciprocal relationships, and values, I observed soft-power transformations that opened the door to Indigenous values, creating an ongoing construction of a new STEM epistemology, values, and culture. Examples include soft power transformation of STEM between Indigenous and non-Native value systems:

- Blending Indigenous and non-native STEM concepts shows a new STEM curriculum.
- Wearing cultural attire in STEM spaces to affirm a new acceptance of STEM faculty appearance or persona.
- Weaving interdisciplinary practices of art, science, and culture to formulate new STEM exercises of rigor.
- Carrying Indigenous values as a portable culture in STEM environments to influence a new higher education value system.
- Centering on the holistic self of mental, physical, spiritual, and emotional components to make new STEM pedagogies.
- Connecting creativity and reciprocity in a relational, values-based way to forge a new collaborative culture in STEM.

As previously mentioned, change often confronts objections. These Indigenous women carved out space to plant an ecosystem within STEM's higher education and a broader culture of values. Indigenous values encountered resistance and hesitancy within STEM. Reflecting on the example of American cinematic soft power, the international film industry, which held more power, some of its leaders labeled American Hollywood culture as a vulgar and negative influence, especially toward youth (De Grazia, 2005). Prior to American cultural dissemination, some international film leaders viewed cinema as an industry rather than a "valuable tool of national pedagogy" for art and education (De Grazia, 2005, p. 308). Once some leaders recognized the growing soft power of America's films, the stance shifted to one of protection to prevent the miseducation of international youth (De Grazia, 2005). In comparison, Indigenous women's values embedded with an implicit practice and plural ways of knowing find creative and even artistic methods of cultural transmission, which some STEM structures deem irrelevant

or a delusion of facts, which sounded impressive and acceptable to STEM Indigenous and some non-Native student populations. The lived experiences of all the Indigenous sisters recalled predominantly positive and supportive student interactions when integrating Indigeneity and womanhood in the STEM learning environment. Therefore, student populations seemed to be more open-minded and willing to try a blended space, similar to international youth and American films. The majority of value resistance occurred within the power structures of STEM higher education. American film did bring change from solely an industry concept to art and education but promoted international culture to construct a place or ‘institute of pedagogy’ which gave birth to the ‘film professoriate’ to inquire and support film as education and artistic freedom (De Grazia, 2005, p. 308). I insist that Indigenous values be given the same courtesy in higher education and its leadership. Therefore, I recommend creating the experience of art in STEM to build a STEAM platform that supports multiple value systems without hindering inherent worth thereby humanizing STEM education for all learners.

The Indigenous Experience of Art and Next Steps

Often higher education tends to create silos around STEM and Indigenous knowledge, even though Native science incorporates artistic elements and expressions (Cajete, 2004; McAllister et al., 2023; Reinholz & Andrews, 2019). This study shed light on the interdisciplinary Indigenous mind grounds in inseparable holistic wisdom. Utilizing art-based methodologies, unearthed artistic expressions of Indigeneity and womanhood in the context of lived experiences and values and revealed the inability to separate from their value systems in any setting. Furthermore, the values blend into lived experiences and vice versa. Thus, the shift in values may occur from either direction. I found that these Indigenous women were poised to co-learning forward, but the higher education environment was at times partially invested. In

other words, some of these women still faced challenges that imbalanced their value systems from various entities. Each found it difficult to find their footing in academic spaces, particularly in STEM, when weaving the arts and culture into science. As an example, I think of research. The unified perception of research was that it served the community. Community held high value. Higher education has demonstrated the value and importance of community through numerous statements and physical spaces within its establishments. Nonetheless, community-based research and community were undervalued in tenure/promotion processes, suggesting misaligned metrics of value. Hence, the partial investment. However, there was hope. Others within and outside higher education supported collaborative efforts, driving remarkable transformations and new STEM approaches. Therefore, incorporating a STEAM mentality and practice does value system integration and optimizes the experience and meaning making for all, especially for populations rendered invisible. It is important that educators provide opportunities for students to truly integrate the arts, and that the arts not appear as an afterthought or appendage within STEM. Interdisciplinary approaches give the space or canvas to experiment with integration. For Indigenous populations, it offers the opportunity to build relationships across differing epistemologies.

Dewey (1934) emphasizes the importance of art as a form of communication that unites people through the shared experiences of everyday life while still creating individual experience. This study revealed that Indigenous experiences are uniquely personal but always add to the collection of ancestral wisdom, family history for future generations. Experiences are imaginative, which helps connect new and old insights of self (Dewey, 1934). Indigenous experiences need imagination to envision a way forward. The application of Photovoice illustrated the connection between past memories and values and future possibilities. Naturally,

humans strive to understand their thoughts through science, art, and practice, but art offers very expressive qualities (Smith et al., 1993). Consistently, art and science possess distinctions in their roles and engagement, but they share commonality with uplifting human experience and universal values across differences (Weisskopf, 1979). Each Indigenous woman spoke of an interdisciplinary space or opportunity that allowed them to restore who they are, elevating their inherent worth. I contend that providing an interdisciplinary space for pluralistic thinking encourages a narrative of soft power that seeks to empower rather than to fault-find. The complexity of human experience, embedding inner and outer and human and non-human components, a full range of emotions, action, and communication, improvement and avoidance manifest human creativity that “ attempt to give some sense to the various impressions, emotions, experiences, and actions that fill our lives, and thereby to give some meaning and value to our existence” (Weisskopf, 1979, p. 474). Some values and meaning making are best expressed through art, and the process holds no difference whether a scientist, artist, or philosopher (Dewey, 1934). These Indigenous women saw no need to separate their Indigeneity and womanhood in the role of STEM educator, as Photovoice supported the process of meaning-making and values.

Art plays a vital role in holistic approaches to culture, emotions, and new ideas, authentically and organically expressing a whole truth that adapts and carries diverse interpretations and meanings (Weisskopf, 1979). Science differs in that it poses limited questions that examine partial truths; however, the contributions of such questions add to a collective truth over time (Weisskopf, 1979). Working together heightens the understanding of truth. The Indigenous women in these studies acknowledged differences between Western and Indigenous knowledge systems but did not see differences in how science and art approached inquiry. If

inquiry viewed art and science as complementing each other, we “get a full experience of life” and add “meaning and sense to the human experience” (Weisskopf, 1979, p. 478-480). In the same way, Indigenous women drew on their understanding of knowledge creation through processes such as art, science, and culture. These actions and practices filled their holistic self. More importantly, the integration of art and science emphasizes Indigenous interconnectedness, intergenerational knowledge transmission, healing, holism, empowerment, and cultural continuity. Therefore, I recommend that STEAM education is the vital next step to attract, not repel, eager learners. STEAM offers:

- Acts on holistic, humanizing pedagogies that enhance real-world problem-solving.
- Nurture and respect the values and inherent worth of all.
- Seeks to increase and support the success of invisible populations through cultural relevance and engagement.
- Demonstrates the capacity to demonstrate complex STEM concepts.
- Fosters imaginative thinking for innovation.
- Co-learns and shares in a participatory manner.
- Emphasize reciprocal relationships and sociocultural learning.

Gleaning from this study, I see the arts as the relationship between the self or learner and the other disciplines, and between the disciplines themselves. Similar to Indigenous women, the arts are the heart of STEM. It allows learners to expand on an interconnected truth in a manner that tells a story or creative questions. The arts help individuals see their connection to the field, their values, and the path forward. Consequently, the arts widen our understanding that they and the

other subjects in STEM do not stand alone. When STEM and the heart connect, learners can dream bigger.

Contextualizing STEAM Education with Sociocultural Tools

Indigenous knowledge continues to evolve within sociocultural and constructivist frameworks. The use of Photovoice illuminated how knowledge is constructed from values, lived experiences, and community engagement. These Indigenous women led communities that developed contextual and place-based knowledge, emphasizing relationships and stewardship. By practicing their values daily, the Indigenous Sisters learned through experience how to become STEM faculty and a STEM change agent for STEAM. Each participant described meaningful interactions with elders and community members, reaffirming that knowledge transmission is a socially constructed, collaborative process. As the conversations around lived experiences varied, they highlighted the importance of co-learning among students, faculty, and community members, suggesting that knowledge and experience are dynamic and ever-changing. While Indigenous knowledge aligns with constructivism, it uniquely incorporates holism, spirituality, and culture in shaping reality. Ultimately, adding sociocultural foundations offers a pathway to transform STEM education, moving it away from exclusivism toward inclusion.

A profound discussion enriched the understanding of Indigenous knowledge as a lived state of being. The values held by each Indigenous sister emerged from context-specific communities, whether shaped by geography, family ties, or local connections, rooting their knowledge in deeply localized relationships. The overlap of these values created a collective ecosystem grounded in holistic and relational worldviews. This highlights the importance of Indigenous populations practicing and applying knowledge in ways that remain integrated and contextually relevant, rather than isolated or decontextualized. Moreover, the weaving together

of multiple ways of knowing revealed that their journey to becoming Indigenous women STEM faculty was continuous, experiential, and deeply rooted in values that affirmed their identity.

An Indigenous Sociocultural STEAM Pathway.

Today, the contemporary Indigenous woman serves as a knowledge weaver, skillfully honoring both Indigenous and Western perspectives. This study reveals a lack of existing models or spaces to support such experimentation. While role models, whether trailblazers or supportive Indigenous communities and organizations, have been valuable, there is a significant opportunity for higher education to create these spaces for future Indigenous generations. Providing such environments is crucial to redefining STEM education and challenging exclusivism. Therefore, higher education institutions must intentionally develop and sustain inclusive spaces that use sociocultural tools to support Indigenous knowledge and leadership in STEM. Sociocultural tools embedded with Indigenous and STEAM education values to help strengthen the pathway for Indigenous women students to become STEM faculty or support Indigenous STEM faculty with their higher education work include:

- **Steward-based STEAM learning** positions the land as both laboratory and educator, fostering deep engagement with place-based knowledge. This approach empowers Indigenous communities to seamlessly integrate ecological knowledge into STEM education. Observing natural patterns can inspire innovative applications across disciplines. For example, Indigenous students might test groundwater quality, map results design solutions, calculate impacts, create visual stories and collaborate with elders and community members to share and refine their findings
- **Cross-generational knowledge** actively engages elders and knowledge keepers in contemporary Indigenous learning, fostering respect, reciprocity, and the preservation of

cultural protocols within STEM education. By recognizing elders and community members as co-teachers, all learners are empowered to co-create and collaborate on projects. As an example, an elder might share knowledge about wayfinding or historical observations connected to astronomy or environmental science, enriching the learning experience with cultural depth and lived expertise.

- **STEM storytelling** blends scientific concepts with creative expression, using Indigenous storytelling traditions to spark exploration and innovation in science. This approach enriches the STEM design process by grounding it in human experience, making science accessible and meaningful for diverse audiences. For example, Indigenous students can use storytelling to infuse STEM projects with cultural significance, amplifying both their function and meaning.
- **Integrating art** is essential for Indigenous peoples to navigate and express themselves within STEM educational spaces. The arts spark creativity, innovation, and holistic approaches to real-world problem-solving. Visual arts, for instance, enhance understanding of complex STEM concepts and structures. By incorporating art, STEM education becomes more inclusive, recognizing that success is not limited to technical skills alone. Those with artistic backgrounds contribute vital soft skills, which include communication, collaboration, compassion, and empathy, that strengthen teams and organizations. Artistic creation also fosters resilience, persistence, and adaptability when tackling complex challenges. Examples such as beading (symmetry, geometry, patterns), carving and weaving (structure, materials science), and music and dance (rhythm, patterns, systems) illustrate how Indigenous arts naturally integrate STEM principles.

- **Sharing circles and collaborative inquiry** foster a respectful, dialogic environment where multiple ways of knowing are honored. These practices provide Indigenous students with meaningful entry points to share their experiences and learn from the perspectives of others. Through collaboration, Indigenous and non-Indigenous participants can reflect on their scholarly work together, cultivating a community that values every voice. Following a STEM project or investigation, students engage in collective discussion of their interpretations and results, deepening understanding and promoting shared growth.
- **Living knowledge systems and sustainability** emphasize balance and long-term stewardship in research and higher education. Recognizing the interconnectedness of resources that span Indigenous knowledge, land, physical and non-physical entities, and both human and non-human elements, encourages conservation and discourages extractive practices. This approach enables culturally relevant learning, empowering Indigenous students to meaningfully integrate their knowledge systems with STEM disciplines. For example, combining traditional and modern designs to build energy-efficient housing demonstrates how Indigenous and scientific approaches can be harmonized to serve communities and the environment.
- **Technology serves as a bridge** to preserve and transmit Indigenous knowledge. When thoughtfully applied, digital tools can support cultural storytelling and empower Indigenous communities to steward their own data. This autonomy ensures that knowledge is accurately passed down to future generations, counters misinformation, and safeguards languages and artifacts from loss. For instance, Indigenous students may use

digital archives to preserve endangered languages for museum educational programs, ensuring that cultural heritage remains accessible and vibrant.

These sociocultural tools help transform STEM into a living and relational knowledge system. It blends art, STEM, and culture while honoring multiple ways of knowing. A STEAM approach is vital for Indigenous learners to 1) empower identity connected to their Indigeneity and womanhood; 2) make STEM relevant and meaningful; 3) support holistic learning (mental, physical, spiritual, and emotional); 4) encourage future pathways in STEM without losing connection to the Indigenous ecosystem of values. The next subsections provide expanded insight into self-reflection, dance, and musical theatre as possibilities for enhancing the Indigenous experience in the arts and for cross-pollinating into the STEAM education curriculum.

This reframing of STEAM moves beyond the conventional model of merely adding the arts to STEM disciplines. Instead of treating the arts as an afterthought, it positions them as a vital integrative force that enables meaningful participation. Here, the “A” in STEAM Education acts as a binding agent, empowering individuals to engage with STEM fields in ways that are genuinely reflective of their identities, values, and lived experiences. This study speaks back to the instrumental approaches to STEAM that treat the arts as merely supplementary or decorative. Rather, it contends that the arts create the conditions for participation to be accessible, non-invasive, and personally meaningful. This is especially important for supporting participation, as it enables learners to bring their full selves, inseparable from their identities, lived experiences, and values, into their engagement with STEM rather than conforming to rigid disciplinary norms. Accordingly, this perspective makes clear that the arts are not peripheral but essential for fostering participation, success, and long-term retention in STEM-related fields. Although

STEAM initiatives are widespread, their limited impact may partly result from a failure to fully articulate and center the arts' role in shaping how individuals engage with and persist in STEM domains. By foregrounding the arts as foundational rather than supplemental, this approach offers a more robust and inclusive vision of STEAM.

Providing the Artistic Drive of Creativity and Self-Reflection

Supporting artistic creativity and self-reflection is especially important for Indigenous women in STEM because it helps bridge cultural and feminine identity with scientific practice. STEM fields have often been shaped by rigid, fragmented Western frameworks that can overlook or undervalue Indigenous ways of knowing, which are frequently grounded in holistic, relational, and deeply connected to land, community, and storytelling (Citation). By encouraging creativity and reciprocity through art, narrative, and collective expression, Indigenous women can integrate their cultural and feminine perspectives into their STEM work rather than feeling pressured to separate their values from STEM spaces in higher education.

Self-reflection helps the understanding of ourselves, while creativity provides a way of self-expression and to inquire into the extent of our human essence. The arts reveal the bond of self-reflection and creativity that humanizes and is vital to the practice of learning. Experiencing opportunities for creativity and self-reflection teaches us not always to think linearly, to be open to experiences, to be willing to question and explore, and to empower our voice (Guillaumier, 2016). A qualitative study with a self-reflection article on artistic representation revealed that creativity ignites a self-reflection skill that fosters emotional awareness (Autry & Walker, 2011). Guillaumier (2016, p. 357) shares, "Reflection enables an imaginative and critical approach to work and process. Critical thought enables us to engage and challenge our ideas and those of others; in this way students gradually become able to recognize and evaluate valuable (not

necessarily original) outcomes and products". In research, art-based practices elevate an educator's reflexivity and the origin of their voice, which influences the outcomes of the study (Clarke & Bautista, 2017). Ultimately, inner reflections of self-release through creativity in dance, writing, and musical theatre.

Self-reflection played an integral part in this process of unearthing the values and lived experiences of these Indigenous women. It allowed Indigenous women in STEM to navigate complex spaces where they may face misunderstanding, invisibility, or cultural dissonance. Reflective practices, such as Photovoice, storytelling, or other artistic expression, strengthened resilience, affirmed identity, respected values, and created a sense of belonging. These practices also support balanced well-being, which was crucial in high-pressure academic and professional environments.

The preceding section on STEM education highlights the historical nature of creativity within the innovation process. STEAM education considers the arts and humanization to foster compassionate innovation. The creative expression examples unbind creativity and self-reflection, which find practical application with innovation. Wei (2024) notes that self-reflection in engineering leadership fosters reflexivity regarding one's values, leadership style, knowledge, and tolerance. The self-reflection extends into the collective reflexivity of the organization. The comparison identifies problems and solutions with the relationship, leading to interventions and innovative leadership (Wei, 2024). With technology, reflective individuals can understand the relationship between society and technology, thereby driving product innovation (Schweitzer et al., 2015). In STEM education, instructor self-reflection leads to discovery, challenges norms, and innovates educational practices with newly gained insights (Hains-Wesson & Young, 2017).

Thus, the arts in STEAM provide an opportunity to nourish self-reflection through creative ventures.

Creativity permeated every aspect of Indigenous women's lives, from ornate storyboards and participation in the arts to the ways they used creativity to sustain their values. This creative energy fueled innovation in STEM. When Indigenous women drew upon their cultural and feminine values, they brought distinctive perspectives to problem-solving, emphasizing community, sustainability, interconnectedness, and long-term stewardship. The study demonstrates that artistic thinking can inspire novel approaches to visualizing data, communicating research, and designing solutions that are both inclusive and culturally responsive.

Ultimately, fostering artistic drive and self-reflection reveals that values are not separate from scientific success. Values enrich it. Carrying values into a STEM space enables Indigenous women in STEM to thrive authentically, contribute diverse perspectives, and reshape the boundaries of what science can be. I contend that what STEM can be is based on who we are.

Cultivating Creative Expression: Dance

Cultivating the artistic expression of dance is profoundly significant for Indigenous women in STEM, serving as a dynamic bridge between identity, knowledge systems, and personal well-being. Many Indigenous women participated in or supported traditional dance within their communities, finding in these practices a grounding force that affirms interconnected worldviews. In higher education, where Indigenous faculty in STEM remain underrepresented, often comprising less than 2%, the academic environment can feel isolating and culturally disconnected (NCSES, 2019, 2021). Dance offered a powerful form of self-affirmation, allowing Indigenous women to express their cultural identity authentically without having to

compartmentalize or suppress their values. Through such artistic expression, these Indigenous women counterbalanced environments that may overlook or undervalue Indigenous perspectives. Values that sustained their sense of belonging and enriched their STEM community with cultural depth.

Indigeneity and dance possess an unbreakable bond. The deep roots of Indigenous dancing stand as a long tradition in rituals, revival, and celebrations (Lyons, 2012). Dance sparks “our collective pursuit of happiness” and “healthy for our minds, bodies, and souls” (Lyons, 2012, p.1). Through bodily movement, dancers dissolve the sharpness of “deliberate language” into a natural, real-world vibe of “spontaneous language” (Lyons, 2012, p. 2). The profound power of dance offers non-verbal communication that conveys history to cultural identity. I attribute dance as a form of bodily voice that transcends words. Its creative language tells a story that connects with audiences in various ways. Many anti-Native-dance policies were imposed by missionaries and government entities as they viewed Indigenous dancing as an immoral threat to civility (Troutman, 2013). The resurgence of dance may serve as a tool for sustaining Indigenous knowledge and filling the holes in traditional education (Chielotam, 2012). Chielotam (2012, p. 2) articulates, “Dance still remains a very powerful medium of communication both within theatre and in our indigenous communities. Its development over time has been linked to the human design to communicate innately.” Consequently, dance and science create an innovative and creative interface for communication and knowledge creation between Indigenous and Western worldviews. The unsaid is said, the invisible becomes visible, and the impossible transforms into possible.

Dance also supported emotional, physical, spiritual, and mental resilience for these Indigenous women. STEM fields are often high-pressure and competitive. Indigenous women

additionally experienced invisibility, value contrasts, and cultural barriers. Through dance, some processed stress, reconnected with community values, and maintained a sense of balance.

Movement became a way to release tension while strengthening the inner voice and values

STEAM opens the door to integrating dance into STEM education. Interdisciplinary teaching emboldens students' scientific literacy, creative, and critical thinking skills (Li & Chin, 2024). In dance, bodily movement spurs curiosity and enables a new way of learning, particularly among populations with low STEM participation rates. Solomon et al. (2022) conducted a study on meaning-making through the merging of physics and dance with Black girls, which provided a culturally relevant pedagogy. Dance gave Black girls the opportunity to comfortably inquire about their learning, expand their scientific vocabulary, reinforce body positivity, and carry their values into the physics space (Solomon et al., 2022). A study found that students and educators exposed to an integrated STEAM curriculum with dance scored higher on various competencies (Li & Chin, 2024). STEAM individuals blending dance and science "created a richer and more diverse learning environment that stimulated students' creativity," and "effectively strengthens students' problem-solving and analytical abilities", and "approach problems from multiple perspectives, further improving their understanding and application of scientific knowledge" (Solomon et al., 2022, p. 10). Another study combining geometrical reasoning and dance demonstrated student enrichment as patterns, structures, and logical creativity overlapped (Suárez & González, 2025). Dance heightened the visualization of mathematical knowledge. These studies, among others, exhibited the untapped potential of dance in STEAM and the arts in STEM education.

Creative and analytical thinkers share a common affinity for innovation. Dance enacts a process of constant evolution. The dance fads and new genres of today speak to the innovation of

traditional dancing by recreators (Alter, 1999). High-level performers benchmark their artistry not by following the original piece but by demonstrating “interpretative excellence” in recreating it (Alter, 1999, p. 470). This interpretative excellence demonstrates a high level of intelligence. Psychological researchers measuring increased capacity in creative individuals, such as dancers, found that their intelligence was above average, more positive, more achievement-oriented, more influential, and more flexible than that of the average college student body (Alter, 1999). Autobiographical and biographical artifacts evidenced dance choreographers as “high levels of verbal, interpersonal, and intrapersonal intelligences” (Alter, 1999, p. 470). Dancers draw on knowledge and innovate their physical interpretations on stage. The process inspires a dancer to innovate their creative process, aligning it with their understanding, themes, and challenging traditional practices (Arnold, 2000). Somatic or mind-body techniques innovated new vocabulary and language for dance training and education (Bales & Netti-Fiol, 2008). In conclusion, dance reaps many benefits and develops creative thinking and innovation for STEM and Indigenous learners.

Dance fosters cognitive skills vital for STEM, such as pattern recognition, rhythm, spatial awareness, and adaptability. These abilities drive innovative problem-solving. Indigenous dance traditions, especially those emphasizing interconnectedness with people, nature, and the spiritual realm, inspire holistic and sustainable approaches in science. Dancing created another possibility for identity affirmation, holism, and a sense of belonging. Ultimately, cultivating dance in STEM education is not separate from STEM success. Dance amplifies it. Dance empowers Indigenous women to engage fully and authentically in their STEM fields, enriching STEM spaces with cultural depth, creativity, value inclusion, and humanizing perspectives that broaden and strengthen the discipline.

Cultivating Creative Expression: Musical Theatre

Ancient Greece and Rome laid the foundation of early musical theatre with drama and the first tap shoes for dancers (Kenrick, 2010). After a long journey through several golden ages, musical theatre contains key elements such as songs, a connecting story through dialogue, dance, stage movement, sets, and costumes (Kenrick, 2010). Indigenous communities strongly associate with musical theatre by way of storytelling. Cultivating the artistic expression of musical theatre holds particular significance for Indigenous women in STEM, as it interlaces voice, narrative, movement, and identity to foster both personal and professional growth. While the Indigenous women in this study did not specifically reference musical theatre, I highlight its potential due to its powerful capacity for storytelling. Musical theatre seamlessly combines music, dialogue, and performance to convey lived experiences, offering a vibrant platform for Indigenous women to share cultural narratives, histories, and contemporary realities that are often marginalized in STEM higher education. Many of the participants practiced oration and storytelling within their communities, using these forms to connect and affirm their identities. Engaging in musical theatre would provide a creative space for Indigenous women to carry forward their stories and values, allowing for authentic expression without the need to silence or separate cultural identity within STEM environments.

Ancient Indigenous cultures practiced traditional performative expression with verbal storytelling, artistic visuals, song, crafts, and dance (Thurow, 2021). Indigenous storytelling intermeshes the physical and spiritual worlds (Dewar, 2022). Indigenous musical theatre empowers its community to question the complex challenges, educate and take action, reinforce well-being, encourage “multidisciplinary and interdisciplinary” communities of practice, and subdue distorted narratives (Casey, 2004; Davis, 2022; Delport, 2025, p. 10; Woodland & Bell-

Wykes, 2024). Most significantly, Indigenous musical theatre urges the audience “to listen from the heart to Indigenous perspectives “(Davis, 2022, p. iv). Kahikina et al. (2025, p.112) speaks of Native Hawaiian designers for musical theatre who are in a constant state of innovation to revive traditional knowledge into a visual language of “scenic, lighting, projections, costume, props, and sound, is hugely important in creating a visual and auditory language that engages with the senses, creating extraordinary experiences and stories that connect with actors and audience members alike.” The process of Native translation on stage requires innovation, weaving to honor thoughtfulness, history, language, land, story, connection, and community, which differ from American theatre (Kahikina et al., 2025). Comparable to dance, musical theatre offers an alternative form of innovative communication with the community, reflecting and amplifying voices. I consider the Indigenous art of musical theatre an alternative to innovative science storytelling in STEAM education.

STEM fields that can sometimes prioritize objectivity and technical conventions, musical theatre brings emotional intelligence and creativity back into the fold (Alfonso-Benlliure, 2021; Kindelan, 2022). Performance knowledge builds confidence, public speaking skills, and presence. These qualities are incredibly valuable in STEM careers, whether presenting research, leading teams, or advocating for inclusive practices. Musical theatre engages in self-reflection. Through character work and performance, Indigenous women in STEM can explore identity, values, and belonging. This is especially important when navigating spaces where Indigenous women’s values may be invisible. Musical theatre provides an outlet for processing lived experiences and values in a creative and empowering way.

Theatre mirrors the human essence of society. “By presenting stories, characters, and scenarios that resonate with the audience’s experiences, theatre fosters a sense of collective

identity and shared understanding. It allows individuals to see themselves and their communities reflected on stage, prompting reflection of their values, behaviors, and social structures” (Balan, 2025, p. 59). In other words, the creative expression of theatre encourages audience members to critically reflect, challenge, communicate, and raise awareness (Balan, 2025). Regarding Indigenous peoples, musical theatre could call attention to the conflicts between low STEM participation rates and various objections, which I detail in later sections. Furthermore, musical theatre may amplify the values, beliefs, spirituality, emotions, and physicality that individuals bring to the STEM space. Besides, Indigenous people, others find discord with STEM.

Creativity in musical theatre also encourages flexible thinking and collaboration, which are transferable aspects in STEM. Rehearsing, adapting, and working with others emphasize co-learning in scientific work steeped in pluralistic knowledge and the co-existence of multiple value systems. At the same time, Indigenous storytelling often centers on community, land, and interconnectedness, which can inspire new ways of thinking about STEM challenges, especially in areas such as sustainability and value systems thinking. Ultimately, cultivating musical theatre as a creative expression does not separate but promotes value integration in STEM. Musical theatre as a creative expression in STEM allows Indigenous women to show up fully as scientists, creators, and storytellers, bringing depth, values, innovation, and cultural strength into STEM higher education spaces that deeply benefit from diverse voices.

Although STEM education receives funding and publicity, many students report that science is dull and apathetic, which drives future science talent to reconsider pursuing another field (Davidson & Simms, 2017; Papacosta, 2006). A pilot program of musical theatre in K-12 Science theatre for storytelling about energy, water, and climate change (Davidson & Simms, 2017). The project reported that most students' knowledge of the tested topics was 100 percent,

that teachers and students demonstrated commitment to extracurricular poster-making for public communication, that students showed signs of enjoyment through positive bodily expressions, and that school leadership financially supported the program's return (Davidson & Simms, 2017). Musical theatre in an afterschool program assisted students in the introduction of robotics through movement, music, and sound, and through anthropomorphism, leading to effective engagement in STEAM education (Dong et al., 2024). Segarra et al. (2018) advocate for STEAM education in K-12 and higher education as the training grounds to develop professional scientists. STEAM education produces creative scientists with exemplary skill sets, appealing to both scientific and non-scientific communities through data visualization, performative and visual communication, and the promotion of human-centric classrooms and interdisciplinary collaboration. STEAM education widens science outreach by showcasing the vibrancy and “beauty of science” (Segarra et al., 2018, p. 3). Thus, musical theatre enhances STEAM education, which redefines STEM.

Overall, the arts in STEAM education expand the ways we inquire into and interpret knowledge with deep connections to humanity. The arts of dance and theatre express creativity that honors diverse thoughts, values, beliefs, and spiritualities. Arts emphasize creativity and innovation, similar to STEM concepts. Art and science represent the paddles that lead the learner to various sociocultural and constructivist adventures of meaning-making. Presently, no consensus exists on STEM or its underpinning in education (Bybee, 2013). Evidently, the tone rings true as STEAM exist predominantly in K-12 settings. Higher education seems to be a silo of arts and science, forcing its students, educators, and leadership to lead linearly. One-dimensional thinking and learning curtail intellectual diversity in particular communities that struggle with accessibility and visibility. If STEM is ambiguous in its definition, then STEM

education is open for interpretation. The arts in STEAM education provide an accessible platform for all. Namely, Indigenous communities that fuse arts, science, and culture in knowledge creation possess the opportunity to share and contribute to general understandings.

Ending Thoughts

Previously, I offered the foundational influences of STEM education as constructivist, as current trends reflect heavy positivism and fragmentation in higher education. These pursuits create barriers that cast STEM pathways in an exclusivist light, especially for Indigenous populations whose knowledge is grounded in constructivist and sociocultural directions. I do not invalidate knowledge produced by positivism or other knowledge systems; instead, I encourage STEM education and its educators to offer interdisciplinary pathways. Specialization is important, but cross-disciplinary collaboration also offers opportunities for multidimensional research, expanding the boundaries of STEM. For those still on the fence, I remind you that, to date, there has been no agreement on the definitions of STEM education, nationally or worldwide (Bybee, 2013). Therefore, the assumptions I see, as a member of STEM, and the construction of this study create a new pathway forward for STEM by transforming it into STEAM.

In this study, Indigenous women exemplified the transformative potential of uniting knowledge, womanhood, culture, and values to foster meaningful change, demonstrating a compelling case for integrating the arts into STEM to create STEAM. Through their ecosystem of values, these women exercised soft power, influencing others through creativity, reciprocity, collaborative learning, and a relational, feminine approach rather than authority or force. STEAM education in Indigenous communities equips individuals with the skills for self-agency, all while honoring and preserving traditional knowledge. Crucially, artistic creativity and

reciprocity provided space for co-learning and coexistence, nurturing both value and knowledge creation. Integrating arts such as dance and musical theatre makes learning more holistic, mirroring Indigenous values of balance, creativity, and interconnectedness. Dance and musical theatre hold particular significance as they transmit stories, histories, and identities across generations, supporting cultural preservation, emotional expression, and reinforcing confidence and community bonds. This creative expression not only enhances communication and innovation within STEM but also makes learning more engaging and personally meaningful. Indigenous women and STEAM practitioners draw on values like respect, empowerment, sustainability, and collaboration to inspire others and drive positive change that bridges knowledge, culture, and artistic expression to enrich education and community life.

With the interconnectedness of the individual to self and the whole, the study repeatedly signifies the way of life. How we live is inseparable, no matter the space we inhabit. To honor and respect the values that make us whole in a vast ecosystem of kinship that brings holistic systems of spirituality and obligation to a duty of care to self and those around you. Therefore, I present this work as a new dawn for STEAMS (Science, Technology, Engineering, Arts, Mathematics, Spirituality), which I plan to further develop in my future work.

Using Photovoice revealed the values of Indigenous women in STEM faculty positions in higher education, an area previously unexplored in research. As one of the earliest studies to document these perspectives, this work addresses a significant knowledge gap. The Indigenous ecosystem of values emerges as a living, inseparable mechanism that shapes identity and interaction within academic and community spaces. Values form the core of the holistic self, interconnecting through creative and reciprocal relationships. Rooted in mental, physical, spiritual, and emotional influences, these values transcend disciplines and sustain adaptability.

This ecosystem of values provided Indigenous women with a flexible framework that they wove into the broader fabric of STEM higher education. While the process was imperfect, it offered meaningful support. Students, community members, colleagues, physical and non-physical artifacts, and both human and nonhuman entities served as anchor points or spaces for weaving together holism, multiple perspectives, value coexistence, and interdisciplinary thinking. Creativity and reciprocity served as the bonding agent within the ecosystem, but also as a transformative force, creating a portable ecosystem of values for these Indigenous women.

As these Indigenous women are often among the few, and often the only ones, in their spaces, it makes tremendous sense for them to carry their values into every space, a huge aha moment from this study. By sharing their Indigenous values in receptive STEM spaces, it: 1) promoted the pluralist epistemologies; 2) encouraged open-mindedness across differences; 3) Two-way respectful exchange of values to strengthen identity and belonging; 4) Builds a compassionate and empathetic mindset; 5) Inspired creativity and innovation; and 6) supported balance. Their capacity to construct and transport a portable ecosystem is transformative because it spreads and integrates various values that elevate the inherent worth of all learners, thereby humanizing STEM education. When values carry into spaces, it reshapes everyone's thinking into a collaborative approach. The mixing of values leads to new hybrid value systems and shared experiences. Carrying values holds Indigeneity and womanhood, which empower identity to reshape new environments. Portable values advocate for evolving existing structures to include greater acceptance of diverse worldviews. Hence, the portable ecosystem of values is transformative because of its co-learning movement, which shares and constructs a relational relationship that leads to change.

Another significant finding from this study is the soft power embedded within the portable ecosystem of Indigenous women's values. While the participants may not be fully aware of this influence, it is a unique discovery given the limited research on this population. Historically, the concept of soft power has been documented in relation to women, but rarely with Indigenous values intentionally woven into STEM higher education ecosystems, a realm often associated with hard power (Fraser, 2014; Hoganson, 2010). This insight shapes my future work, inspiring deeper exploration of the Indigenous ecosystem of values as a catalyst for transformative change and subtle influence. The integration of these values into mentorship, curriculum, leadership, and other areas has positively impacted non-Native colleagues and institutions through creative and reciprocal relationships. The Indigenous women in this study infused their values into their voices, scholarship, teaching, mentorship, and leadership, generating incremental but meaningful changes. Over time, these accumulations have steered broader shifts and fostered long-term relationships. This trajectory of this work offers hope for continued transformation.

Reflecting on ecosystems, it is natural to assume that introducing something new and foreign harms them. In nature, we term the entity as an invasive species that will cause negative impact, damage, and a rapid takeover to the point of ecological collapse. While I do not argue that these unfortunate occurrences do happen, it seems the same mentality occurs among humans, with characteristic differences. When these Indigenous women enter with values that are not of STEM culture, they could be viewed as invasive, but I hope this study illustrates that it is not. Rather, the values of Indigenous women and those of STEM can harmoniously engage. In nature, different ecosystems can come together to form an ecotone, or transition zone. The transition zone benefits from connecting the movement of life from one side to the other.

Likewise, I contend that interdisciplinary spaces, such as STEAM, allow multiple value systems and pluralistic epistemologies to thrive and bridge the specialized, isolated sides of knowledge. Imagine the richness found in discoveries that fragmented and one-dimensional value systems miss. Thus, rigid and myopic systems overlook the bigger picture. Therefore, STEM culture and leadership in higher education should adopt a continuous learning mindset, break down disciplinary silos, and promote experiential pedagogies. I contend that it is the new future to increase STEM participation, foster innovation, and solve the world's complex problems.

Values serve as a North Star that defines what matters most and who we are. They influence our relationships, decisions, and behaviors. These women affirmed that Indigeneity and womanhood are states of being, not components that critically challenge. Their core values in the ecosystem defined how they wanted to live or to exist. I found this discovery essential in transforming STEM culture. I think of the expression “life is work, and work is life”. The statement refers to professional and personal lives having a unified experience because they are inseparable. I insist that value systems are the same. Values cannot be separated without dire consequences and detriment. Some of the Indigenous women’s values demonstrated integration with STEM culture’s values. When blending STEM and Indigenous values, it provides a source of optimal self-worth that fulfills passion, purpose, and meaning, which may increase the pathway for success. Hence, values are vital to long-term success to obtain the Im_Possible Dream.

Weaving the Im_Possible Dream

An Epilogue of Transformative Change.

As I reflect on this study, I feel fortunate to share the stories of these remarkable, transformative women. Their lived experiences have highlighted values that illustrate the

significant changes within themselves, the environments they influence, and the advancements in both science and the humanization of education. Transformation begins at the heart and strengthens as others catch our rhythm and reciprocate. We cannot thrive on a singular connection alone. We must construct a network of interconnectedness between Indigenous and non-Native, human and non-human communities. In other words, it takes all of us to learn and lean into each other with love, respect, and kindness to understand the values that make us whole. A wholeness that ignites and sustains a transformation that counteracts the academic underbelly and dispels the deterioration of values operating in the political shadows.

One story had a remarkable impact on me, as it served as a gentle reminder of our shared humanity and the immense value of kind reciprocity. A Sister mentioned a non-Native faculty member (who later became her advisor) working in Indigi communities. Although their research held significance, the faculty member recognized the void of Indigenous students in the program. A non-Native used their power to change a program and develop a pathway for Indigenous students. This advisor and program offered this Sister the chance to help her community, in which she achieved many successes while growing the program. Imagine the world would not know of her brilliance without the ripple effect of a non-Native advisor understanding and respecting the value of a hopeful young Indigi lady dreaming of science.

Why Indigenous Women's Values Matter.

The context of this study describes value as wholeness or completeness, referring to how someone feels whole. Completeness for purposes of this study incorporates the ability to retain the values of Indigeneity and femininity in STEM spaces. Curtice (2023) contends that the practice of Indigenous core values centers on love, belonging, and kinship, which bring forth peace and hope in the spaces we enter. When we care about our values, we learn the importance

of others' values. We learn to love, respect, and care for each other to which I offer a Samoan chant acknowledging creative and spiritual power from the ancestors as our values carry across the sea of differences to find a home and community (see Figure 5.5).



Figure 5.5

The chant “Tulou Tagaloa” by Olivia Foa’i and Opetia Foa’i sung before a voyage to sea. Own work created using Canva.

Through storytelling, we uncover the values in our hearts as we spend our time on Mother Earth finding wholeness (Curtice, 2023). In other words, our values complete us. Indigenous storytelling reshapes research, restoring balance in our lives, including transformative learning, transcendence, wellness, resilience, and connectedness (King & Trimble, 2013; McKinley, 2024; Penak, 2018; Rosenberg, 2000). Indigenous value embodies respect. It is “a matter of appreciating the inherent value of some entity or activity, the value it has by virtue of

the fact that it inheres in, or belongs to, the natural world" (Whitt et al., 2001, p. 13). Value plays a critical role in sustaining the natural world through our connections with humans and non-humans. Therefore, respect entails that we reflect and maintain value, rather than contributing to its degradation (Whitt et al., 2001). Finding wholeness within ourselves demonstrates self-respect. When we respect our values, we open the possibility of building reciprocal relationships that respect others' wholeness. When we respect each other and sustain our wholeness, we reinforce our connection to each other that honors Mother Earth.

The STEM culture and its leadership seek innovation to elevate the human condition; however, I ask how this is possible, as it consistently fragments knowledge and architects exclusivism through one-dimensional approaches of rigor? The goal of STEM is to attract, not repel, interested populations. Additionally, why restrict innovation? Reflecting on my work as a scientist, part of my job relied on experimentation to eliminate factors, test limits and failures, and, by happy chance, make a new discovery. How that happens is very subjective and fluid. Most significantly, why I do it is driven by what I value. For example, this dissertation is based on what mattered to me as a multicultural Indigenous woman and scientist, and on my efforts to help save communities by providing hope that their children have a chance, knowing that their academic community was waiting to embrace them. In particular, I am an Indigenous woman with a promise to pass on a legacy of learning built on values for a future with endless possibilities.

REFERENCES

- Aberšek, B., Flogie, A., & Aberšek, M. K. (2023, June). Transformation of education: From dehumanization to re-humanization of society. In *International Baltic Symposium on Science and Technology Education*. Scientia Socialis Ltd. 29 K. Donelaicio Street, LT-78115 Siauliai, Republic of Lithuania.
- Adams, T. E., Ellis, C., & Jones, S. H. (2017). Autoethnography. In *The International Encyclopedia of Communication Research Methods* (pp. 1-11). Hoboken, NJ: John Wiley & Sons.
- <https://doi.org/10.1002/9781118901731.iecrm0011>
- Akremiti, L. (2020). *Unit of analysis*. SAGE Publications Ltd.
- Alfonso-Benlliure, V., Teruel, T. M., & Fields, D. L. (2021). Is it true that young drama practitioners are more creative and have a higher emotional intelligence?. *Thinking Skills and Creativity*, 39, 100788. [10.1016/j.tsc.2021.100788](https://doi.org/10.1016/j.tsc.2021.100788)
- Alkholi, S. O., Gendron, F., McKenna, B., Dahms, T., & Ferreira, M. P. (2017). Convergence of indigenous science and western science impacts student's interest in STEM and identity as a scientist. *Ubiquitous Learning an International Journal*, 10(1), 1-13.
- [10.18848/1835-9795](https://doi.org/10.18848/1835-9795)
- Alter, J. B. (1999). Dance and creativity. *Encyclopedia of Creativity*, 1, 469-481.
- American Psychology Association. (2018). *APA Dictionary of Psychology*. Dictionary.apa.org; American Psychology Association. <https://dictionary.apa.org/creativity>.

- Anderson, L. (2006). Analytic autoethnography. *Journal of Contemporary Ethnography*, 35(4), 373-395.
- Anthony-Stevens, V., & Matsaw Jr, S. L. (2020). The productive uncertainty of Indigenous and decolonizing methodologies in the preparation of interdisciplinary STEM researchers. *Cultural Studies of Science Education*, 15, 595-613.
- Anonson, J. M., Desjarlais, J., Nixon, J., Whiteman, L., & Bird, A. (2008). Strategies to support recruitment and retention of First Nations youth in baccalaureate nursing programs in Saskatchewan, Canada. *Journal of Transcultural Nursing*, 19(3), 274-283.
- Archibald, J. A. (2008). *Indigenous storywork: Educating the heart, mind, body, and spirit*. UBC press.
- Archuleta, E. (2006). "I give you back": Indigenous women writing to survive. *Studies in American Indian Literatures*, 18(4), 88–114. <http://www.jstor.org/stable/20737352>.
- Arnold, P. J. (2000). Aspects of the Dancer's Role in the Art of Dance. *Journal of Aesthetic Education*, 34(1), 87-95.
- Arnold, P. P. (2023). *The urgency of Indigenous values*. Syracuse University Press.
- Aromaa, E., Eriksson, P., Montonen, T., & Mills, A. J. (2020). Emotion as soft power in organizations. *Journal of Organizational Effectiveness: People and Performance*, 7(4), 341-357.
- Asmar, C., & Page, S. (2009). Sources of satisfaction and stress among Indigenous academic teachers: Findings from a national Australian study. *Asia Pacific Journal of Education*, 29(3), 387-401.
- Atkinson, R. D., & Mayo, M. J. (2010). Refueling the US innovation economy: Fresh approaches

- to science, technology, engineering and mathematics (STEM) education. *The Information Technology & Innovation Foundation, Forthcoming*.
- Autry, L. L., & Walker, M. E. (2011). Artistic representation: Promoting student creativity and self-reflection. *Journal of Creativity in Mental Health*, 6(1), 42-55.
- Auxier, C. (2003). Of gaps and bridges: Educational challenges for the South Pacific. *Journal of Educational Studies*, 25, 17-27.
- Babbie E, (2016). "The Practice of Social Research", 14th edition, Cengage Learning.
- Bailey, K. A. (2016). Racism within the Canadian university: Indigenous students' experiences. *Ethnic and Racial Studies*, 39(7), 1261-1279.
- Balan, S. (2025). *Development through dialogue*. Orange Books Publication.
- Bales, M., & Nettle-Fiol, R. (Eds.). (2008). *The body eclectic: Evolving practices in dance training*. University of Illinois Press.
- Ball, J. (2004). As if Indigenous knowledge and communities mattered: Transformative education in First Nations communities in Canada. *American Indian Quarterly*, 454-479.
- Balehegn, M., Balehey, S., Fu, C., & Liang, W. (2019). Indigenous weather and climate forecasting knowledge among Afar pastoralists of north eastern Ethiopia: Role in adaptation to weather and climate variability. *Pastoralism*, 9(1), 1-14.
- Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science education*, 94(6), 1008-1026. <https://doi.org/10.1002/sce.20392>.
- Barajas-López, F., & Bang, M. (2018). Indigenous making and sharing: Clay work in an Indigenous STEAM program. *Equity & Excellence in Education*, 51(1), 7-20.
- Bartlett, C., Marshall, M., & Marshall, A. (2012). Two-eyed seeing and other lessons learned

- within a co-learning journey of bringing together indigenous and mainstream knowledges and ways of knowing. *Journal of Environmental Studies and Sciences*, 2, 331-340.
- Bat, M., Kilgariff, C., & Doe, T. (2014). Indigenous tertiary education—we are all learning: both-ways pedagogy in the Northern Territory of Australia. *Higher Education Research & Development*, 33(5), 871-886.
- Battiste, M. (2016). Research ethics for chapter protecting Indigenous knowledge and heritage. *Ethical futures in qualitative research: Decolonizing the politics of knowledge*, 111.
- Bazzano, M. (2019). The tyranny of hope and the transformative tendency. *Person-Centered & Experiential Psychotherapies*, 18(2), 151-165.
- Bell, N. (2014). Teaching by the medicine wheel. *Education Canada*, 54(3), 14-16.
- Benally, T. E., Scholar, M., & Soto, J. A. (2020-2022). We are still here: Expanding empathy through humanization and cultural appropriation. *The Penn State McNair Journal*, 69.
- Benjamin, D. P., Chambers, S., & Reiterman, G. (1993). A focus on American Indian college persistence. *Journal of American Indian Education*, 32, 24-40.
- Berkes, F. (2017). *Sacred Ecology (4th ed.)*. Routledge. <https://doi.org/10.4324/978131511464>
- Bhawuk, D. P. S. (2019). Toward a spirituality-based theory of creativity: Indigenous perspectives from India. In Kuang-Hui Yeh (Ed.), *Asian Indigenous Psychologies in the Global Context* (pp. 139-168). London, UK: Palgrave MacMillan.
- Bochner, A. P. (2016). *Coming to narrative: A personal history of paradigm change in the human sciences*. Routledge.
- Booth, A. L., & Skelton, N. W. (2011). “You spoil everything!” Indigenous peoples and the

- consequences of industrial development in British Columbia. *Environment, Development and Sustainability*, 13(4), 685-702.
- Boylorn, R. M. (2014). A story & a stereotype: An angry and strong auto/ethnography of race, class, and gender. In R. M. Boylorn & M. P. Orbe (Eds.), *Critical autoethnography: Intersecting cultural identities in everyday life* (pp. 129–143). Walnut Creek, CA: Left Coast Press.
- Brayboy, B. M. J., & Castagno, A. E. (2008). How might Native science inform “informal science learning”? *Cultural Studies of Science Education*, 3, 731-750.
- Brayboy, B. M. J., Fann, A. J., Castagno, A. E., & Solyom, J. A. (2012). *Postsecondary education for American Indian and Alaska Natives: Higher education for nation building and self-determination: ASHE Higher Education Report 37: 5* (Vol. 37, No. 5). John Wiley & Sons.
- Brayboy, B. M. J., Solyom, J. A., & Castagno, A. E. (2014). Looking into the hearts of Native peoples: Nation building as an institutional orientation for graduate education. *American Journal of Education*, 120(4), 575-596.
- Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. (2012). What is STEM? A discussion about conceptions of STEM in education and partnerships. *School science and mathematics*, 112(1), 3-11.
- Bruner, J. S. (1966). *Toward a theory of instruction*. Belknap Press of Harvard University Press
- Bryant, J., & Ellard, J. (2015). Hope as a form of agency in the future thinking of disenfranchised young people. *Journal of Youth Studies*, 18(4), 485-499.
- Bull, J., Beazley, K., Shea, J., MacQuarrie, C., Hudson, A., Shaw, K., ... & Gagne, B. (2020).

- Shifting practice: Recognizing Indigenous rights holders in research ethics review. *Qualitative Research in Organizations and Management: An International Journal*, 15(1), 21-35.
- Bunde-Birouste, A., Byrne, F., Kemp, L. (2018). Autoethnography. In P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences*. Springer, Singapore.
https://doi.org/10.1007/978-981-10-2779-6_86-1
- Burghardt, M. D., & Hacker, M. (2004). Informed design: A contemporary approach to design pedagogy as the core process in technology. *The Technology Teacher*, 64(1), 6-8.
- Burnard, P. (2012). *Musical creativities in practice*. Oxford University Press.
- Bybee, R. W. (2013). *The case for STEM education: Challenges and opportunities*. NSTA Press.
- Cajete, G. (2000). *Native science: Natural laws of interdependence*. Santa Fe: Clear Light Publishers.
- Cajete, G. (2004). Philosophy of native science. *American Indian thought*, 45-57.
- Camangian, P., & Cariaga, S. (2022). Social and emotional learning is hegemonic miseducation: Students deserve humanization instead. *Race Ethnicity and Education*, 25(7), 901-921.
- Carter, L. (2008), Sociocultural influences on science education: Innovation for contemporary times. *Science Education*, 92: 165-181. <https://doi.org/10.1002/sce.20228>.
- Casey, M. (2004). *Creating frames: contemporary Indigenous theatre 1967-1990*. University of Queensland Press.
- Castagno, A. E., Camplain, R., Ingram, J. C., & Blackhorse, D. (2023). “It hurts to do work like that”: The nature and frequency of culturally based ethical barriers for Indigenous people in STEMM. *Science Education*, 107(4), 837-852.
- Catterall, L. G. (2017). A brief history of STEM and STEAM from an inadvertent insider. *The*

- STEAM+ Journal*, 3(1), 5.
- Chan, A. S. (2021). Storytelling, culture, and Indigenous methodology. In A. Bainbridge, L. Formenti, L. West (eds.), *Discourses, dialogue and diversity in biographical research: An ecology of life and learning* (pp. 170-185). Brill.
- Chew, K. A., Anthony-Stevens, V., LeClair-Diaz, A., Nicholas, S. E., Sobotta, A., & Stevens, P. (2019). Enacting hope through narratives of Indigenous language and culture reclamation. *Transmotion*, 5(1), 132–151. <https://doi.org/10.22024/UniKent/03/tm.570>
- Chielotam, N. A. (2012). Expressing Indigenous knowledge through dance. *African Journal of History and Culture*, 4(5), 69-73.
- Cicek, J. S., Herrmann, R., Forrest, R., & Monkman, K. (2022). Decolonizing and Indigenizing Engineering: The Design & Implementation of a New Course. *Proceedings of the Canadian Engineering Education Association (CEEA)*.
- Clarke, A., & Bautista, D. (2017). Critical reflection and arts-based action research for the educator self. *The Canadian Journal of Action Research*, 18(1), 52-70.
- Clarke, R., & Davison, R. M. (2020). Research perspectives: Through whose eyes? The critical concept of researcher perspective. *Journal of the Association for Information Systems*, 21(2), 1.
- Clement, J. J. (2009). The role of imagistic simulation in scientific thought experiments. *Topics in Cognitive Science*, 1(4), 686-710.
- Cochrane, J. (2007). To dream the impossible dream. *Journal of theology for Southern Africa*, 129, 23-34.
- Cole, E. R., McGowan, B. L., & Zerquera, D. D. (2017). First-year faculty of color: Narratives about entering the academy. *Equity & Excellence in Education*, 50(1), 1-12.

- Corneille, M., Lee, A., Allen, S., Cannady, J., & Guess, A. (2019). Barriers to the advancement of women of color faculty in STEM: The need for promoting equity using an intersectional framework. *Equality, Diversity and Inclusion: An International Journal*, 38(3), 328–348. <https://doi.org/10.1108/EDI-09-2017-0199>.
- Côté, S. (2011). How social class shapes thoughts and actions in organizations. *Research in organizational behavior*, 31, 43-71.
- Creswell, J.W. (2003) *Research design: Qualitative, quantitative, and mixed method approaches*. Sage Publications, Thousand Oaks.
- Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into practice*, 39(3), 124-130.
- Curtice, K. B. (2023). *Living resistance: An Indigenous vision for seeking wholeness every day*. Baker Books.
- Daehn, I. S., & Croxson, P. L. (2021). Disability innovation strengthens STEM. *Science*, 373(6559), 1097-1099.
- Davis, A. (2024). *Birthing Vital Stories: an examination of First Nations Australian maternal care narratives* [Doctoral dissertation, The University of Manchester].
- Davidson, C. D., & Simms, W. (2017). Science theater as STEAM: A case study of "save it now". *The Transdisciplinary STEAM+ Journal*, 3(1), 14.
- De Grazia, V. (2005). *Irresistible empire: America's advance through twentieth-century Europe*. Harvard University Press.
- Deloria, P. J., Lomawaima, K. T., Brayboy, B. M. J., Trahant, M. N., Ghiglion, L., Medin, D., & Blackhawk, N. (2018). Unfolding futures: Indigenous ways of knowing for the twenty-first century. *Daedalus*, 147(2), 6-16.

- Delport, L. S. (2025). The value of musical theatre training in performing arts education: a multidisciplinary and interdisciplinary paradigm shift. *The Independent Journal of Teaching and Learning*, 20(1), 10-28.
- Denzin, N.K., & Lincoln, Y. S. (2000). *Handbook of qualitative research 2nd Edition*. Thousand Oaks, CA.
- Dewar, C. (2022). Indigenous representation and participation in Canadian opera (1879-2017) [Class Materials]. <https://www.opera.ca/wp-content/uploads/2022/06/DEWAR-Indigenous-Representation-in-Opera-edited.docx.pdf>
- Dewey, J. (1934). *Art as experience*, by John Dewey. Minton, Balch and Company.
- Dewey, J. (1938). *Experience and education*. New York: Macmillan Company.
- Di, C., Zhou, Q., Shen, J., Li, L., Zhou, R., & Lin, J. (2021). Innovation event model for STEM education: A constructivism perspective. *STEM Education*, 1(1), 60-74.
- Diamond, S. (2019). Addressing the imagination gap through STEAMMM+ D and indigenous knowledge. *Proceedings of the National Academy of Sciences*, 116(6), 1851-1856.
- Dong, J., Choi, K., Yu, S., Lee, Y., Kim, J., Vajir, D., ... & Jeon, M. (2024). A child-robot musical theater afterschool program for promoting STEAM education: a case study and guidelines. *International Journal of Human–Computer Interaction*, 40(13), 3465-3481.
- Dugger, W. E. (2010, January). Evolution of STEM in the United States. In *Knowledge in Technology Education: Proceedings of the 6th Biennial International Conference on Technology Education: Volume One (TERC 2010) Volume One (TERC 2010)* (pp. 117-123). Surfers Paradise, QLD: Griffith Institute for Educational Research.
- El-Hani, C. N., & Souza de Ferreira Bandeira, F. P. (2008). Valuing indigenous knowledge: To call it “science” will not help. *Cultural Studies of Science Education*, 3, 751-779.

- Elliott, J. A. (2005). *Interdisciplinary perspectives on hope*. Nova Publishers.
- Ellis, C. (2010). *Final negotiations: A story of love, and chronic illness*. Temple University Press.
- Elstad, E. C., & Davis, D. M. (2017). Implementing innovative constructivism: An architected approach to enhancing STEM education. In *the Proceedings of the Interservice/Industry Simulation, Training and Education Conference*. Orlando, Florida.
- Farrell, B. A. (1950). Experience. *Mind*, 59(234), 170–198. <http://www.jstor.org/stable/2250659>.
- Firmansyah, F., & Aslan, A. (2025). Effectiveness of special education programmes in primary schools: An analysis of the literature. *International Journal of Social and Education*, 2(4), 766-776.
- Foa'i, O., & Foa'i, O. (2016). Tulou Tagaloa. On *Moana: Original picture soundtrack*. Walt Disney Records.
- Ford, M. (1993). Involving Aboriginal people in course development. *A Journal of Australian Indigenous Issues*, 9, 70–81.
- Fox-Tree, J.E., & Vaid, J. (2022). Why so few, still? Challenges to attracting, advancing, and keeping women faculty of Color in academia. *Frontiers in Sociology*, 6, 792198–792198. <https://doi.org/10.3389/fsoc.2021.792198>.
- Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings, 1972- 1977*. Harvester, Brighton.
- Fraser, M. (2014). *Weapons of mass distraction: soft power and American empire*. Macmillan.
- Fredericks, B. (2011). 'Universities are not the safe places we would like to think they are, but they are getting safer': Indigenous women academics in higher education. *Journal of Australian Indigenous Issues*, 14(1), 41-53.

- Freire, P. (1995). *Pedagogy of hope*. Bloomsbury Academic.
- Freire, P. (1998). *Pedagogy of freedom. ethics, democracy and civic courage*. Oxford: Rowman & Littlefield.
- Freire, P., & Faundez, A. (1989). *Learning to question. A pedagogy of liberation*. Continuum: New York.
- Gallagher, M. W., & Lopez, S. J. (Eds.). (2018). *The Oxford handbook of hope*. Oxford University Press.
- Genz, J., Aucan, J., Merrifield, M., Finney, B., Joel, K., & Kelen, A. (2009). Wave navigation in the Marshall Islands: Comparing Indigenous and Western scientific knowledge of the ocean. *Oceanography*, 22(2), 234-245.
- George, J.M. (1999). Indigenous knowledge as a component of the school curriculum. In Semali, L. M., & Kincheloe, J. L. (Eds.), *What is indigenous knowledge?: Voices from the academy* (Vol. 1191). Routledge.
- Goeman, M., and Denetdale, J.N. 2009. "Native feminisms: Legacies, interventions, and Indigenous sovereignties, *Wicazo Sa Review* 24 (2):9-13.
- Goldschmidt, W. (1977). Anthropology and the coming crisis: An autoethnographic appraisal. *American anthropologist*, 79, 293–308. doi:10.1525/aa.1977.79.2.02a00060.
- Grant-Vallone, E., Reid, K., Umali, C., & Pohlert, E. (2003). An analysis of the effects of self-esteem, social support, and participation in student support services on students' adjustment and commitment to college. *Journal of College Student Retention: Research, Theory & Practice*, 5(3), 255-274. <https://doi.org/10.2190/C0T7-YX50-F71V-00CW>.
- Gratani, M., Sutton, S. G., Butler, J. R., Bohensky, E. L., & Foale, S. (2016). Indigenous environmental values as human values. *Cogent Social Sciences*, 2(1).

- Greer, S., & Patel, C. (2000). The issue of Australian indigenous world-views and accounting. *Accounting, Auditing & Accountability Journal*, 13(3), 307-329.
- Guillaumier, C. (2016). Reflection as creative process: Perspectives, challenges and practice. *Arts and Humanities in Higher Education*, 15(3-4), 353-363.
- Gutiérrez, K. D., & Rogoff, B. (2003). Cultural ways of learning: Individual traits or repertoires of practice. *Educational Researcher*, 32(5), 19-25.
- Guntarik, O., & Daley, L. (2017). Indigenous creative practice research: between convention and creativity. *New Writing*, 14(3), 409-422.
- Gupta, R., & Jha, M. (2022). The psychological power of storytelling. *The International Journal of Indian Psychology*, 10(3), 606-614.
- Guyette, S., & Heth, C. (1984). Higher education for American Indians in the 1980s. *Integrated Education*, 22(1-3), 21-30.
- Hains-Wesson, R., & Young, K. (2017). A collaborative autoethnography study to inform the teaching of reflective practice in STEM. *Higher Education Research & Development*, 36(2), 297-310.
- Haran, J. (2013). Redefining hope as praxis. In J. Haran (Ed.), *Hope and Feminist Theory* (pp. 81-96). Routledge.
- Harmsworth, G. R., & Awatere, S. (2013). Indigenous Māori knowledge and perspectives of ecosystems. In J.R. Dymond (Ed.), *Ecosystem services in New Zealand—conditions and trends* (pp.274-286). Manaaki Whenua Press, Lincoln, New Zealand.
- Harding, Z. D. (2010). *Voices and visions: Transformative creativity in a northern context*. University of Northern British Columbia.
- Hasanah, U. (2020). Key definitions of STEM education: Literature review. *Interdisciplinary*

- Journal of Environmental and Science Education*, 16(3).
- Hatcher, A., Bartlett, C., Marshall, A., & Marshall, M. (2009). Two-eyed seeing in the classroom environment: Concepts, approaches, and challenges. *Canadian Journal of Science, Mathematics, and Technology Education*, 9(3), 141-153.
- Hayano, D. M. (1979). Auto-ethnography: Paradigms, problems, and prospects. *Human Organization*, 38, 99–104. doi:10.17730/humo.38.1.u761n5601t4g318v.
- HeavyRunner, I. (2009). *Miracle survivor (Pisatsikamotaan): An Indigenous theory on educational persistence grounded in the stories of tribal college students*. University of Minnesota.
- Heider, K. G. (1975). What do people do? Dani auto-ethnography. *Journal of Anthropological Research*, 31, 3–17. doi:10.1086/jar.31.1.3629504.
- Henry, F. (2012). Indigenous faculty at Canadian universities: Their stories. *Canadian Ethnic Studies*, 44(1), 101-132.
- Hermans, H.J.M. (2012) Dialogical self theory and the increasing multiplicity of I-positions in a globalizing society: An introduction. *New Directions for Child and Adolescent Development*, 137, 1–21.
- Hill, G., & Wilkinson, A. (2014). Indigegogy: A transformative Indigenous educational process. *Canadian Social Work Review/Revue Canadienne de service social*, 175-193.
- Hladik, S., Zacharias, K., & Cicek, J. S. (2023). Experiences of Engineering Education Research Faculty Members in Canada: A Collaborative Autoethnography. *Proceedings of the Canadian Engineering Education Association (CEEA)*.
- Hoganson, K. L. (2010). *Consumers' imperium: the global production of American domesticity, 1865-1920*. University of North Carolina Press.

- Houser, S. (1991). Building institutions across cultural boundaries. *Tribal College*, 2(3), 11.
- Hsieh, T. S., Kim, J. B., Wang, R. R., & Wang, Z. (2022). Educate to innovate: STEM directors and corporate innovation. *Journal of Business Research*, 138, 229-238.
- Hurtado, S., & Figueroa, T. (2013). Women of Color faculty in science technology engineering and mathematics (STEM): Experiences in academia, *American Educational Research Association*. <https://www.heri.ucla.edu/nih/downloads/AERA-2013-WOC-STEM.pdf>.
- Ibnouf, F. O. (2012). The value of women's indigenous knowledge in food processing and preservation for achieving household food security in rural Sudan. *Journal of Food Research*, 1(1), 238.
- Imad, M., Reder, M., & Rose, M. (2023, October). Recasting the agreements to re-humanize STEM education. *Frontiers in Education*, 8.
<https://doi.org/10.3389/feduc.2023.1193477>
- Jacob, M. C. (2006). Scientific culture and the origins of the first industrial revolution.
- Jimerson, S. R., & Haddock, A. D. (2015). Understanding the importance of teachers in facilitating student success: Contemporary science, practice, and policy. *School Psychology Quarterly*, 30(4), 488.
- Johnson, S. R. (2024). The importance of learning with/on/from land and place while honoring reciprocity in Indigenous science education. *Cultural Studies of Science Education*, 1-25.
- Martin, D. H. (2012). Two-eyed seeing: a framework for understanding Indigenous and non-Indigenous approaches to indigenous health research. *Canadian Journal of Nursing Research Archive*, 20-43.
- Jull, J., Morton-Ninomiya, M., Compton, I., & Picard, A. (2018). Fostering the conduct of ethical

- and equitable research practices: the imperative for integrated knowledge translation in research conducted by and with Indigenous community members. *Research Involvement and Engagement*, 4, 1-9.
- Kachchaf, R., Ko, L., Hodari, A., & Ong, M. (2015). Career–life balance for women of color: Experiences in science and engineering academia. *Journal of Diversity in Higher Education*, 8(3), 175.
- Kant, J., Burckhard, S., & Meyers, R. (2018). Engaging high school girls in Native American culturally responsive STEAM activities. *Journal of STEM Education*, 18(5).
- Keefe, B. (2010). *The perception of STEM: Analysis, issues, and future directions*. Delhi: Entertainment and Media Communication Institute.
- Kelley, A., Belcourt-Dittloff, A., Belcourt, C., & Belcourt, G. (2013). Research ethics and indigenous communities. *American journal of public health*, 103(12), 2146-2152.
- Kelley, T. R., & Knowles, J. G. (2016). A conceptual framework for integrated STEM education. *Journal of STEM Education*, 3(11), 1-11. doi:10.1186/s40594-016-0046-z.
- Kenrick, J. (2010). *Musical theatre: A history*. Bloomsbury Publishing USA.
- Keshoofy, A., Lisnyj, K., Pearl, D. L., Thaivalappil, A., & Papadopoulos, A. (2023). A qualitative study of university students' perspectives of hope during the COVID-19 pandemic. *SAGE Open Medicine*, 11.
- Kidman, G., & Tan, H. (2025). Disciplinary thinking in STEM: Balancing epistemologies for integrated education. In G. Kidman, H. Tan, and D.D. Mango (Eds.), *Knowledge generation in STEM and STEAM education: Integrative thinking and agency* (pp. 29-60). Cham: Springer Nature Switzerland.
- Kindelan, N. (2022). *STEM, theatre arts, and interdisciplinary integrative learning*. Springer

Nature.

- King, J., & Trimble, J. E. (2013). The spiritual and sacred among North American Indians and Alaska Natives: Mystery, wholeness, and connectedness in a relational world. *American Psychological Association*, 1, 565-580. <https://doi.org/10.1037/14045-031>
- Kirkness, V. J., & Barnhardt, R. (1991). First Nations and higher education: The four R's respect, relevance, reciprocity, responsibility. *Journal of American Indian Education*, 30, 1-15.
- Kitchen, J., Hodson, J., & Raynor, M. (2013). Indigenous teacher education as cultural brokerage: A university/First Nations partnership to prepare Nishnawbe Aski teachers. *International Education Journal: Comparative Perspectives*, 12(1), 119-134.
- Kohout, K., & Kleinfield, J. (1974). *Increasing the college success of Alaska Natives* (Report No. 900). Scholarworks. https://scholarworks.alaska.edu/uaa_iser_reports/900
- Kunoth-Monks, R. (2006). Land and culture: Necessary but not sufficient for the future. Identity in the 21st century. *Australian First Nations' Journal*, 36, 90-93. <https://search.informit.org/doi/10.3316/informit.437403332722563>
- Kwaymullina, A. (2016). Research, ethics and Indigenous peoples: An Australian Indigenous perspective on three threshold considerations for respectful engagement. *AlterNative: An International Journal of Indigenous Peoples*, 12(4), 437-449.
- Lamichhane, B. R. (2021). STEAM education for transformative mathematics learning. *Saptagandaki Journal*, 36-53.
- Leavy, A., Dick, L., Meletiou-Mavrotheris, M., Paparistodemou, E., & Stylianou, E. (2023). The prevalence and use of emerging technologies in STEAM education: A systematic review of the literature. *Journal of Computer Assisted Learning*, 39(4), 1061-1082.

- Lee, A. S., Wilson, W., Tibbetts, J., Gawboy, C., Meyer, A., Buck, W., ... & Pantalony, D. (2019). Celestial calendar-paintings and culture-based digital storytelling: Cross-cultural, interdisciplinary, STEM/STEAM resources for authentic astronomy education engagement. In *European Physical Journal Web of Conferences*, 200. [10.1051/epjconf/2019200001002](https://doi.org/10.1051/epjconf/2019200001002)
- Leon, C., Lipuma, J., & Oviedo-Torres, X. (2025, July). Artificial intelligence in STEM education: A transdisciplinary framework for engagement and innovation. In *Frontiers in Education*, 10.
- Leong, K. J., Ashlee, A. A., Ejiogu, N. I., Fernández, D., Idoate, R. E., Mugabo, D., ... & Youssef, S. (2020). *Degrees of difference: Reflections of women of color on graduate school*. University of Illinois Press.
- Lewis, C. I. (1934). Experience and Meaning. *The Philosophical Review*, 43(2), 125–146. <https://doi.org/10.2307/2179891>.
- Li, Y. (2023). From STEM education to STEAM education-the new role of art education. *Frontiers in Art Research*, 5(5), 46-49.
- Li, J., & Chin, L. F. B. H. (2024). Interdisciplinary integration in dance education: the intersection of art and science. *Contemporary Education Frontiers*, 2(2), 5-12.
- Lightning W. (1992). Compassionate mind: Implications of a text written by Elder Louis Sunchild. *Canadian Journal of Native Education*, 19(2), 215–253.
- Lin-Manuel, M., Opetiaia F., & Mancina, M. (2016). I am Moana. On *Moana: Original picture soundtrack*. Walt Disney Records.
- Lipsey, R. G., & Bekar, C. (2000). Science, institutions, and the Industrial Revolution. *The Journal of European Economic History*, 33(3) 709-753.

- Lloyd-Jones, B. (2011). Diversification in higher education administration: Leadership paradigms reconsidered. In G. Jean-Marie and B. Lloyd-Jones (Eds.) *Women of Color in higher education: Changing directions and new perspectives*, 10, 3-18. Emerald Group Publishing Limited.
- Lombrozo, T. (2019). " Learning by thinking" in science and in everyday life. In A. Levy and P. Godfrey-Smith (Eds.), *The scientific imagination: Philosophical and psychological perspectives* (pp. 230-249). Oxford University Press.
- Lopez, J. D. (2020). Indigenous data collection: Addressing limitations in Native American samples. *Journal of College Student Development*, 61(6), 750-764.
- Luna, Z. (2016). "Truly a women of color organization" Negotiating sameness and difference in pursuit of intersectionality. *Gender & Society*, 30(5), 769-790.
- Lyons, R. C. (2012). *The revival of banned dances: A worldwide study*. McFarland.
- Macedo, D. (1999). Decolonizing Indigenous knowledge. In Semali, L. M., & Kincheloe, J. L. (Eds.), *What is indigenous knowledge?: Voices from the academy*. Routledge.
- Main, J. B., McGee, E. O., Cox, M. F., Tan, L., & Berdanier, C. G. (2023). Trends in the underrepresentation of women of color faculty in engineering (2005–2018). *Journal of Diversity in Higher Education*, 16(5), 589.
- Mainhard, T., Oudman, S., Hornstra, L., Bosker, R. J., & Goetz, T. (2018). Student emotions in class: The relative importance of teachers and their interpersonal relations with students. *Learning and instruction*, 53, 109-119.
- Malin, M., & Maidment, D. (2003). Education, Indigenous survival and well-being: Emerging ideas and programs. *The Australian Journal of Indigenous Education*, 32, 85-100.
<https://doi.org/10.1017/S1326011100003859>

- Mangare, C. F., & Li, J. (2018, June). A survey on Indigenous knowledge systems databases for African traditional medicines. In *Proceedings of the 2018 7th international conference on bioinformatics and biomedical science*, 9-15.
- Marin, A., Halle-Erby, K., Bang, M., McDaid-Morgan, N., Guerra, M., Nzinga, K., ... & Booker, A. (2020). The power of storytelling and storylistening for human learning and becoming. *Proceedings of the 14th International Conference of the Learning Sciences: The Interdisciplinarity of the Learning Sciences, Nashville, United States, 4*, 1-8.
- Maslow, A. H. (1968). *Toward a psychology of being* (2nd ed.). New York: Van Nostrand Reinhold.
- Maurial, M. (1999). Indigenous knowledge and schooling: a continuum between conflict and dialogue. In Semali, L. M., & Kincheloe, J. L. (Eds.), *What is indigenous knowledge?: Voices from the academy* (Vol. 1191). Routledge.
- Mawere, M. (2024). *Culture, indigenous knowledge and development in Africa: Reviving interconnections for sustainable development*. Langaa RPCIG Publishers.
- Mayeda, D. T., Keil, M., Dutton, H. D., & Ofamo'Oni, I. F. H. (2014). "You've Gotta Set a Precedent": Māori and Pacific voices on student success in higher education. *AlterNative: An International Journal of Indigenous Peoples*, 10(2), 165-179.
- McAteer, B., & Flannery, W. (2022). Power, knowledge and the transformative potential of marine community science. *Ocean & Coastal Management*, 218, 106036.
- McAllister, T., Hikuroa, D., & Macinnis-Ng, C. (2023). Connecting science to Indigenous knowledge. *New Zealand Journal of Ecology*, 47(1), 1-13.
- McKinley, C. E. (2024). "Prayer is universal": How integrative faith practices enable Indigenous

- peoples' persistence and resistance to transcend historical oppression. *Psychology of Religion and Spirituality*, 16(1), 114.
- Merriam-Webster. (n.d.). Word. In *Merriam-Webster.com dictionary*.
- Miles, M. L., Agger, C. A., Roby, R. S., & Morton, T. R. (2022). Who's who: How “women of color” are (or are not) represented in STEM education research. *Science Education*, 106(2), 229-256. [10.1002/sce.21694](https://doi.org/10.1002/sce.21694)
- Mills, M. A. (2021). The Case Against "STEM." *The New Atlantis*, 63, 63–84. <https://www.jstor.org/stable/26966377>.
- Mizzi, R. (2010). Unraveling researcher subjectivity through multivocality in autoethnography. *Journal of Research Practice*, 6(1), 1-13. <http://jrp.icaap.org/index.php/jrp/article/view/201/185>
- Mohamed, T., & Beagan, B. L. (2019). ‘Strange faces’ in the academy: experiences of racialized and Indigenous faculty in Canadian universities. *Race Ethnicity and Education*, 22(3), 338-354. [10.1080/13613324.2018.1511532](https://doi.org/10.1080/13613324.2018.1511532)
- Moraga, C., & Anzaldúa, G. (Eds.). (2022). *This bridge called my back: Writings by radical women of color*. State University of New York Press.
- Moreton-Robinson, A. (2021). *Talkin'up to the White woman: Indigenous women and feminism*. U of Minnesota Press.
- Morris, B. (2010). Indigenous knowledge. *The Society of Malawi Journal*, 63(1), 1–9. [http://www.jstor.org/stable/29783605](https://www.jstor.org/stable/29783605).
- Morrison, L., Robinson, P., & Nusseiri, R. (2025, March). Transforming rural education: Advancing

- culture-based and inclusive STEAM learning with a mobile makerspace in Hawai'i. In *Society for Information Technology & Teacher Education International Conference* (pp. 2298-2303). Association for the Advancement of Computing in Education (AACE).
- National Research Council (2014). STEM integration in K-12 education: Status, prospects, and an agenda for research. National Academies.
<https://www.nationalacademies.org/read/18612/chapter/2>.
- National Science Foundation, National Center for Science and Engineering Statistics. (2019). *Women, minorities, and persons with disabilities in science and engineering: 2019*. Special Report NSF 19-304. Alexandria, VA. Available at <https://www.nsf.gov/statistics/wmpd>.
- National Center for Science and Engineering Statistics. (2021). *Women, minorities, and persons with disabilities in science and engineering: 2021*. Special Report NSF 21-321.
- Nieveen, N., van der Veen, J., & Ventura-Medina, E. (2024). *Pathways to innovative STEM Education* [Class handout]. Department of Applied Physics and Science Education, Eindhoven University of Technology.
- Nweze, O. J., Agom, A. D., Agom, J. D., & Nwankwo, A. (2015). A critical analysis of the concept of hope: The nursing perspective. *International Journal of Science and Research*, 4(3), 1027-1030.
- Nye Jr, J. S. (2003). *The paradox of American power: Why the world's only superpower can't go it alone*. Oxford University Press.
- Nye, J.S. (2004) *Soft power: The means to success in world politics*. Public Affairs, New York.
- Ober, R., & Bat, M. (2007a). Paper 1: Both-ways: The philosophy [Book Review]. *A Journal of Australian Indigenous Issues*, 64–86.

- O'Connor, K. (2020). Developing a STEAM curriculum of place for teacher candidates: Integrating environmental field studies and Indigenous knowledge systems. In M. Corbett and D. Gereluk (Eds.), *Rural teacher education: Connecting land and people* (pp. 257-277). Springer Singapore.
- Oguamanam, C. (2022). Transition to the Fourth Industrial Revolution: Africa's Science, Technology and Innovation Framework and Indigenous Knowledge Systems. *African Journal of Legal Studies*, 15(1), 1-37.
- Okereke, I. E. (2019). Science Process Skills Practised in Palm Wine Tapping. *Journal of CUDIMAC*, 6(1), 22-36.
- Ong, M., Wright, C., Espinosa, L., & Orfield, G. (2011). Inside the double bind: A synthesis of empirical research on undergraduate and graduate women of color in science, technology, engineering, and mathematics. *Harvard Educational Review*, 81(2), 172-209.
- Ortiz-Revilla, J., Adúriz-Bravo, A., & Greca, I. M. (2020). A framework for epistemological discussion on integrated STEM education. *Science & Education*, 29(4), 857-880.
[10.1007/s11191-020-00131-9](https://doi.org/10.1007/s11191-020-00131-9)
- Papavlasopoulou, S., Giannakos, M. N., & Jaccheri, L. (2019). Exploring children's learning experience in constructionism-based coding activities through design-based research. *Computers in Human Behavior*, 99, 415-427. [10.1016/j.chb.2019.01.008](https://doi.org/10.1016/j.chb.2019.01.008)
- Park, S. (2016). Development of the scale for “convergence thinking” in engineering. *International Journal of Educational Management*, 30(4), 592-602.
- Patel, V. (2014). Why so few American Indians earn Ph. D.'s, and what colleges can do about it. *The Chronicle of Higher Education*, 205-27.
- Pavel, D.M., & Colby, A.Y. (1992). American Indians in higher education: The community

- college experience. Los Angeles, CA: ERIC Clearinghouse for Junior Colleges.
- Penak, N. (2018). A story pathway: Restoring wholeness in the research process. In J.P., Restoule, D. McGregor, and R. Johnston *Indigenous research: Theories, practices, and relationships*, (pp. 257-270). Canadian Scholars.
- Peters, A. M. K. (2023, June). (Re) membering Indigenous spirituality in engineering education: A narrative literature review. In *2023 ASEE Annual Conference & Exposition*, 1-15.
<https://peer.asee.org/44625>
- Piaget, J. (1952). Jean Piaget. In E. G. Boring, H. Werner, H. S. Langfeld, & R. M. Yerkes (Eds.), *A History of Psychology in Autobiography*, Vol. 4, pp. 237–256). Clark University Press. <https://doi.org/10.1037/11154-011>.
- Pidgeon, M., Archibald, J. A., & Hawkey, C. (2014). Relationships matter: Supporting Aboriginal graduate students in British Columbia, Canada. *Canadian Journal of Higher Education*, 44(1), 1-21.
- Pidgeon, M. (2008). Pushing against the margins: Indigenous theorizing of “success” and retention in higher education. *Journal of College Student Retention: Research, Theory & Practice*, 10(3), 339-360.
- Pink, S. (2007). *Doing visual ethnography*. Sage.
- Plotz, J. (2008). *Portable property: Victorian culture on the move*. Princeton University Press.
- Polly, D., Allman, B., Casto, A., & Norwood, J. (2017). Sociocultural perspectives of learning. *Foundations of learning and instructional design technology*, 147-166.
- Puletapuai, C. (2025). *The totality of I* [Unpublished poem]. School of Education, Colorado State University.
- Rainie, S. C., Schultz, J. L., Briggs, E., Riggs, P., & Palmanteer-Holder, N. L. (2017). Data as a

- strategic resource: Self-determination, governance, and the data challenge for Indigenous nations in the United States. *International Indigenous Policy Journal*, 8(2).
- Ramirez, E. (2014). “¿ Qué estoy haciendo aquí?(What am I doing here?)”: Chicanos/Latinos (as) navigating challenges and inequalities during their first year of graduate school. *Equity & Excellence in Education*, 47(2), 167-186.
- Reano, D., David-Chavez, D., Skillen, K., Ridgway, K., Dahlin, K., & Chong, R. (2025). Supporting the next generation of Indigenous STEM scholars demands Indigenous leadership. *Journal of Geography*, 124(3), 62-72.
<https://doi.org/10.1080/00221341.2025.2499822>
- Reid, A. J., Eckert, L. E., Lane, J. F., Young, N., Hinch, S. G., Darimont, C. T., ... & Marshall, A. (2021). “Two-Eyed Seeing”: An Indigenous framework to transform fisheries research and management. *Fish and Fisheries*, 21(5), 1-19. [10.1111/faf.12516](https://doi.org/10.1111/faf.12516)
- Reinholz, D. L., & Andrews, T. C. (2019). Breaking down silos working meeting: An approach to fostering cross-disciplinary STEM–DBER collaborations through working meetings. *Life Sciences Education* 18(3), 1-8. [10.1187/cbe.19-03-0064](https://doi.org/10.1187/cbe.19-03-0064)
- Revenko, I., Popova, O., Hvozdyak, O., Bazyliak, N., & Kruhlyk, O. (2023). Humanization of relationships between teachers and students in educational work. *Khazar Journal of Humanities and Social Sciences*, 26(3), 78-88. [10.5782/kjhss.2023](https://doi.org/10.5782/kjhss.2023)
- Reynolds, T. S. (1992). The education of engineers in America before the Morrill Act of 1862. *History of Education Quarterly*, 32(4), 459-482. <https://doi.org/10.2307/368959>
- Roher, S. I., Yu, Z., Martin, D. H., & Benoit, A. C. (2021). How is Etuaptmumk/Two-Eyed Seeing characterized in Indigenous health research?: A scoping review. *PloS One*, 16(7), 1-22. <https://doi.org/10.1371/journal.pone.0254612>.

- Rosay, A.B. (2016). Violence against American Indian and Alaska Native Women. *NIJ Journal*, 277, 1-8. <https://www.ojp.gov/pdffiles1/nij/249822.pdf>.
- Rosenberg, D. G. (2000). Toward Indigenous wholeness: Feminist praxis in transformative learning on health and environment. In G.J. Sefa Dei, B.L. Hall and D.G. Rosenberg (Eds.), *Indigenous knowledges in global contexts: Multiple readings of our world*. University of Toronto Press.
- Ruef, J. L., Johnson, S. R., Jacob, M. M., Jansen, J., & Beavert, V. (2019). Why STEM needs Indigenous traditional ecological knowledge: A case study of Ichishk'ain math. *International Journal of Gender, Science and Technology*, 11(3), 429-439.
- Sabirova, U. F., Gusenina, S. V., Sukhomlinova, M. V., & Safyanov, V. I. (2019). Humanization as a sociocultural component of the higher education quality. *International Journal of Innovative Technology and Exploring Engineering*, 9(1), 3209-3218.
- San Pedro, T., & Kinloch, V. (2017). Toward projects in humanization: Research on co-creating and sustaining dialogic relationships. *American Educational Research Journal*, 54(1), 373S-394S. <https://doi.org/10.3102/0002831216671210>
- Sangha, K. K., Le Brocque, A., Costanza, R., & Cadet-James, Y. (2015). Ecosystems and Indigenous well-being: An integrated framework. *Global Ecology and Conservation*, 4, 197-206. <https://doi.org/10.1016/j.gecco.2015.06.008>
- Sartorio, F. S., & Thomas, H. (2022). Freire and planning education: The pedagogy of hope for faculty and students. *Journal of Planning Education and Research*, 42(4), 668-678. <https://doi-org.ezproxy2.library.colostate.edu/10.1177/0739456X19844574>.
- Segarra, V.A., Natalizio, B., Falkenberg, C.V., Pulford, S., & Holmes, R.M. (2018). STEAM:

- Using the arts to train well-rounded and creative scientists. *Journal of Microbiology & Biology Education*, 19(1), 19-1
- Schwartz, S. H. (2009). Basic human values: Theory, measurement, and applications. *Revue Française de Sociologie*, 47(4), 929–968.
- Schweitzer, F., Rau, C., Gassmann, O., & van den Hende, E. (2015). Technologically reflective individuals as enablers of social innovation. *Journal of Product Innovation Management*, 32(6), 847-860. [10.1111/jpim.12269](https://doi.org/10.1111/jpim.12269)
- Secules, S., & Masta, S. (2020, October). Towards a framework for equity in engineering classrooms. In *2020 IEEE Frontiers in Education Conference*, 1-4. [0.1109/FIE44824.2020.9273991](https://doi.org/10.1109/FIE44824.2020.9273991)
- Semali, L. M., & Kincheloe, J. L. (1999). *What is indigenous knowledge?: Voices from the academy*. Routledge.
- Semyonov, I. N. (2001). Reflexive processes and control. *International Interdisciplinary Scientific and Practical Journal*, 1(1), 1-112.
- Simonds, V. W., & Christopher, S. (2013). Adapting Western research methods to Indigenous ways of knowing. *American Journal of Public Health*, 103(12), 2185-2192. [10.2105/AJPH.2012.301157](https://doi.org/10.2105/AJPH.2012.301157)
- Shachter, A. M. (2024). Indigenous knowledges, encouragements, engagements, and experiences in STEM, *Scientia*. <https://www.scientia.global/dr-amy-shachter-indigenous-knowledges-encouragements-engagements-and-experiences-in-stem/>
- Shah, M., & Widin, J. (2010). Indigenous students' voices: Monitoring Indigenous student satisfaction and retention in a large Australian university. *Journal of Institutional Research*, 15(1), 28-41.

- Sheridan, A., 1977. *Discipline and punish: The birth of the prison*. Pantheon, New York.
- Shotton, H. J. (2008). *Pathway to the Ph. D.: Experiences of high-achieving American Indian females*. The University of Oklahoma.
- Shotton, H. J. (2018). Reciprocity and nation building in Native women's doctoral education. *American Indian Quarterly*, 42(4), 488-507. [0.5250/amerindiquar.42.4.0488](https://doi.org/10.5250/amerindiquar.42.4.0488)
- Shotton, H. J. (2019). Indigenous women's approaches to educational leadership: Creating space for Indigenous women in education. *International Journal of Human Rights Education*, 3(1), 6.
- Shotton, H. J., & Minthorn, R.Z.T.H.A. (2020). Narratives of Indigenous women leaders. *Wicazo Sa Review*, 35(1-2), 74-85. [10.1353/wic.2020.0004](https://doi.org/10.1353/wic.2020.0004)
- Shotton, H. J., Lowe, S. C., & Waterman, S. J. (2023). *Beyond the asterisk: Understanding Native students in higher education*. Routledge.
- Skyer, M. E., & McKay-Cody, M. (2025). Deaf and Indigenous curricula and eco-pedagogies: Hybridizing languacultures and biocultures for sustainable STEAM education founded on collaboration, mutualism, and symbiosis. *Education Sciences*, 15(9), 1132. <https://doi.org/10.3390/educsci15091132>
- Slavin, R. E. (2012). *Educational psychology: Theory and practice*. Pearson.
- Smith, A. (2005). Native American feminism, sovereignty, and social change. *Feminist Studies*, 31(1), 116-132. <https://doi.org/10.2307/20459010>.
- Smith, L. T. (2019). *Decolonizing research: Indigenous storywork as methodology*. Bloomsbury Publishing.
- Smith, N. R., Fucigna, C. E., Kennedy, M. A., & Lord, L. (1993). *Experience and art*. Teachers College Press.

- Smylie, J., Olding, M., & Ziegler, C. (2014). Sharing what we know about living a good life: Indigenous approaches to knowledge translation. *The Journal of the Canadian Health Libraries Association*, 35, 1-14. [10.5596/c14-009](https://doi.org/10.5596/c14-009)
- Snyder, M. M. (2015). Leaning into autoethnography: a review of Heewon Chang's autoethnography as method. *The Qualitative Report*, 20(2), 93-96.
- Soares, F., Lopes, A., Serrão, C., & Ferreira, E. (2024, April). Fostering humanization in education: A scoping review on mindfulness and teacher education. *Frontiers in Education*, 9, 1373500). <https://doi.org/10.3389/feduc.2024.1373500>
- Soeharyadi, Y., & Iskandar, G. H. (2024, June). Towards STEAM education platform for Indigenous communities: The case of Kasepuhan Ciptagelar. In *Journal of Physics: Conference Series*, 2773(1), 012024.
- Solomon, F., Champion, D., Steele, M., & Wright, T. (2022). Embodied physics: Utilizing dance resources for learning and engagement in STEM. *Journal of the Learning Sciences*, 31(1), 73-106. <https://doi.org/10.1080/10508406.2021.2023543>
- Solyom, J. A. (2014). *The (in) visibility paradox: A case study of American Indian iconography and student resistance in higher education*. Arizona State University.
- Southerland, S. A. (2000). Epistemic universalism and the shortcomings of curricular multicultural science education. *Science & Education*, 9, 289-307. <https://doi.org/10.1023/A:1008676109903>
- Sternberg, R. J. (2003). The development of creativity as a decision-making process. *Creativity and Development*, 1, 91-138. [10.1093/acprof:oso/9780195149005.003.0004](https://doi.org/10.1093/acprof:oso/9780195149005.003.0004)
- Stevens, E. B., Buchannan, B., Ferrari, J. R., Jason, L. A., & Ram, D. (2014). An investigation of hope and context. *Journal of Community Psychology*, 42(8), 937-946.

- Stewart-Harawira, M. (2005). Cultural studies, Indigenous knowledge and pedagogies of hope. *Policy Futures in Education*, 3(2), 153-163. <https://doi.org/10.2304/pfie.2005.3.2.4>
- Strings, S. (2021). The emergent classroom: Activist tools to transform PhD seminars for women of Color (and all) faculty. *Feminist Formations*, 33(2), 185-207. <https://doi.org/10.1353/ff.2021.0031>
- Suárez, Y. M. S., & González, M. M. (2025). Curricular integration of mathematics and dance to improve geometric reasoning in secondary school students. *Revista de Gestão Social e Ambiental*, 19(1), 1-41. [10.24857/rgsa.v19n1-102](https://doi.org/10.24857/rgsa.v19n1-102)
- Suarta, I. M., Noortyani, R., Yarsama, K., & Adhiti, I. A. I. (2022). The role of teachers' Indigenous knowledge and cultural competencies in enhancing students' engagement and learning outcomes. *Journal of Ethnic and Cultural Studies*, 9(1), 244-264. <https://www.jstor.org/stable/48710297>.
- Tabor, S. M., Van Bavel, M., Fellner, K. D., Schwartz, K. D., Black, T., Black Water, C., ... & Pepion, J. (2023). Healing, empowering, engaging, learning, and decolonizing through culture: Living wellness, resilience, and resurgence in the classroom through creative arts. *Canadian Journal of School Psychology*, 38(1), 86-104.
- Thurrow, S. (2021). A dramaturgy of feeling: Exploring Indigenous concepts of knowing through multimodal aesthetics. *Performance Research*, 26(3), 49-58. <https://doi.org/10.1080/13528165.2021.1977501>
- Teeter, W. G. (2011). Portable cultural property: "This belongs in a museum?". *A companion to cultural resource management*, 141-155.
- Thomas, A., Hoagland, S. J., Kills, R. P. S. S., LaPier, R., Grant, A., Wu, K., & Belcourt, A.

- (2022). Lived experiences of Native American STEM faculty in academia: Our stories, insights, and advice. *Journal of American Indian Education*, 61(3), 62-88.
[10.1353/jaie.2022.a912063](https://doi.org/10.1353/jaie.2022.a912063)
- Thornley, D. (2015). Mobilizing Māori identity: Cultural capital and expatriate “portable personhood”. *Palgrave Communications*, 1, 15008.
<https://doi.org/10.1057/palcomms.2015.8>
- Tillmann, L. M. (2009). Body and bulimia revisited: Reflections on “a secret life.” *Journal of Applied Communication Research*, 37(1), 98–112. [doi:10.1080/00909880802592615](https://doi.org/10.1080/00909880802592615)
- Topkok, S. A., Marchant, S., Nagaruk, S., Takak, O., & Saccheus, H. (2020). Indigenous values in education. *Journal of American Indian Education*, 59(1), 50-72.
- Trisna, A. M., Hatta, P., & Budiyanto, C. W. (2022). Integration of STEAM method with constructivism approach in graphic design subject for Information Technology vocational high school: A systematic review. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 5276-5282.
- Troutman, J. W. (2013). *Indian blues: American Indians and the politics of music*. University of Oklahoma Press.
- Tsosie, R. L., Wu, K., Grant, A. D., Harrington, J., Chase, S. T., Thomas, A., ... & Plenty Sweetgrass-She Kills, R. (2024). A growing willow: The six Rs Indigenous research framework—Stories of the Native American faculty journey in STEM. *Rural Sociology*, 89, 620-637. <https://doi.org/10.1111/ruso.12576>
- Turner, C.S.V., González, J. C., & Wood, J. L. (2008). Faculty of Color in academe: What 20 years of literature tells us. *Journal of Diversity in Higher Education*, 1(3), 139–168.
- Vedder, R. (2018). Benefits of college—By degrees. *Computer*, 51(6), 96-99.

- Vogt, K. A., Schreier, A., Orloff, A., Marchand, M. E., Vogt, D. J., Fawcett, P., ... & Murphy-Williams, M. (2021). Building environmental literacy through holistic storytelling. *Online Journal of Ecology and Environmental Sciences*, 1(1), 1-12.
- Vuving, A. (2009). How soft power works [Paper presentation]. 2009 American Political Science Association Annual Meeting, Toronto, Canada.
- Walton, P., Hamilton, K., Clark, N., Pidgeon, M., & Arnouse, M. (2020). Indigenous University Student Persistence: Supports, Obstacles, and Recommendations. *Canadian Journal of Education*, 43(2), 430–464. <https://www.jstor.org/stable/26954694>
- Washington, P. A., & Harris, B. J. (2001). Women of color standpoints: Introduction. *NWSA Journal*, 13(2), 80-83.
- Watanabe, Y., & McConnell, D. L. (2015). *Soft power superpowers*. Routledge.
- Wei, J. (2024). Reflective learning: a new leadership development framework driving engineering innovation. *Reflective Practice*, 25(3), 352-377. <https://doi.org/10.1080/14623943.2024.2320141>
- Weisskopf, V. F. (1979). Art and science. *The American Scholar*, 473-485.
- Wells, R., Barker, S., Boydell, K., Buus, N., Rhodes, P., & River, J. (2021). Dialogical inquiry: Multivocality and the interpretation of text. *Qualitative Research*, 21(4), 498-514. <https://doi.org/10.1177/146879412093440>
- Wesley-Esquimaux, C. (2010). Narrative as lived experience. *First Peoples Child & Family Review*, 5(2), 53-65. <https://fpcfr.com/index.php/FPCFR/article/view/93>
- Whap, G. (2001). A Torres Strait Islander perspective on the concept of Indigenous

- knowledge. *The Australian Journal of Indigenous Education*, 29(2), 22–29.
<https://doi.org/10.1017/S1326011100001368>
- Whitt, L. A., Roberts, M., Norman, W., & Grieves, V. (2001). Belonging to land: Indigenous knowledge systems and the natural world. *Oklahoma. City University Law Review*, 26, 701-743.
- Whyte, K. (2017). What do Indigenous knowledges do for indigenous peoples?. In M.K. Nelson and D. Shilling (Eds.), *Forthcoming in keepers of the green world: Traditional ecological knowledge and sustainability* (pp. 1-20). Cambridge University Press.
- Whyte, M. K., & Toll, H. (2023). Creativity as Spirit: Re-Indigenization and anticolonialism in art therapy. *Canadian Journal of Art Therapy*, 36(1), 2–11.
<https://doi.org/10.1080/26907240.2023.2213935>
- Widya, Rifandi, R., & Laila Rahmi, Y. (2019, October). STEM education to fulfil the 21st century demand: a literature review. In *Journal of Physics: Conference Series*, 1317(1), 012208. [10.1088/1742-6596/1317/1/012208](https://doi.org/10.1088/1742-6596/1317/1/012208)
- Williams, D.E. (2009). Morrill Act's contribution to engineering's foundation. *The Bent of Tau Beta Pi*, 15-20. <https://www.tbp.org/static/docs/features/Sp09Williams.pdf>.
- Winarni, J., Zubaidah, S., & Koes, S. (2016, October). STEM: What, Why, and How. In *Proceedings of the National Seminar on Science Education (Graduate Program, UM)* (Vol. 1, No. 1, pp. 976–984).
- Wood, L., Kamper, D., & Swanson, K. (2018). Spaces of hope? Youth perspectives on health and wellness in indigenous communities. *Health & Place*, 50, 137-145.
<https://doi.org/10.1016/j.healthplace.2018.01.010>
- Woodcock, D. B., & Alawiye, O. (2001). The antecedents of failure and emerging hope:

- American Indians & public higher education. *Education*, 121(4), 810.
<https://link.gale.com/apps/doc/A78535677/AONE?u=anon~31bda95b&sid=googleScholar&xid=7e7a7464>
- Woodland, S., & Bell-Wykes, K. (2024). Theatre in health and wellbeing: A First Nations Australian approach. In *First Nations Australian theatre for health equity: Healing stories* (pp. 41-60). Springer Nature.
- Woodroffe, T., Wallace, R., Guthadjaka, K., Funk, J., Maypilama, E., Ireland, S., ... & Pollard, K. (2021). Indigenous women in science: A proposed framework for leadership, knowledge, innovation, and complexity. *Advances in Global Education and Research*, 4, 1-12.
<https://www.doi.org/10.5038/9781955833042>
- Wright, B. (1990). American Indian studies programs: Surviving the'80s, thriving in the'90s. *Journal of American Indian Education*, 30(1), 17-24.
<https://www.jstor.org/stable/24397994>
- Yao, C., Follmer Greenhoot, A., Mack, K., Myrick, C., Poolaw, J., Powell, L., & Yarger, L. (2023, October). Humanizing STEM education: An ecological systems framework for educating the whole student. In *Frontiers in Education*, 8.
<https://doi.org/10.3389/feduc.2023.1175871>
- Yim, I. H. Y., Su, J., & Wegerif, R. (2025). STEAM in practice and research in primary schools: A systematic literature review. *Research in Science & Technological Education*, 43(4), 1065-1089. <https://doi.org/10.1080/02635143.2024.2440424>
- Zaman, T., Kulathuramaiyer, N., Yeo, A. W., & Falak, H. (2013). Modeling Indigenous knowledge creation as a living system. *International Journal of Knowledge Management Studies*, 6(2), 136-150. [10.1504/IJKMS.2015.071760](https://doi.org/10.1504/IJKMS.2015.071760)

- Zhuravlyova, I., & Zhuravlyov, S. (2015). Humanistic sense of creativity in professional university education: The role of creativity in forming innovation model and modernization of university training. *Procedia-Social and Behavioral Sciences*, 206, 445-454. <https://doi.org/10.1016/j.sbspro.2015.10.081>
- Zidny, R., & Eilks, I. (2018). Indigenous knowledge as a sociocultural context of science to promote transformative education for sustainable development: A case study on the Baduy Community (Indonesia). In I. Eilks, S. Markic & B. Ralle (Eds.), *Building bridges across disciplines for transformative education and a sustainable future* (pp. 249-256). A. Shaker.