

# A Growing Willow: The Six Rs Indigenous Research Framework— Stories of the Native American Faculty Journey in STEM\*

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**ABSTRACT** Native American faculty in science, technology, engineering, and mathematics (NAF-STEM) disciplines are historically underrepresented. Creating inclusive academia for Indigenous people that typically live and thrive in rural communities requires insights

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into their personal, relational, and collective experiences. This study was guided by the Six Rs: relationship, respect, responsibility, relevance, representation, and reciprocity, and was informed by Indigenous Research Methodologies. Twelve NAF-STEM from tribal colleges and non-tribal institutions were asked to share their perspectives and experiences in seven Research Circles. NAF-STEM joined sequential hybrid workshops over seven weeks on how to conduct qualitative data analysis. Authors conducted analysis on the transcripts of Research Circles for themes associated with the professional satisfaction and success of NAF-STEM. Results of the study identified the importance of holistic support systems that remain mindful of both the opportunities and challenges facing NAF-STEM and emphasize the significance of balancing the need for respectful relationships, adequate representation, shared responsibility, relevance of diversity, and reciprocity in STEM. Through implementation of the Six Rs throughout the research process, the study identified successes, support systems, and challenges of NAF-STEM at both tribal and non-tribal colleges and universities. These outcomes can inform institutions to create an equitable and inclusive environment for NAF-STEM.

### Where our Willow Journey Began

In a number of Native American cultures, the willow symbolizes inner wisdom; an open mind with the stability and strength of age and experience. It represents flexibility and adaptation—not only to survive but to also thrive in some of the most challenging conditions. In many ways, Native American faculty in science, technology, engineering, and mathematics (NAF-STEM) are like willows—they grow and succeed in academia even under difficult and systemically disadvantaged conditions (Carrión, Belcourt, and Fuller 2021; Grant et al. 2022; Tsosie et al. 2022). As this project was conceptualized, the study's team of researchers adopted the name *willow* for their collaborative undertaking, with its nuanced symbolism and propensity for resilience. Willow's original intent was to advance knowledge and understanding about NAF-STEM pathways to success (Brown et al. 2022; Grant et al. 2022; Tsosie et al. 2022; University of Montana 2024). Willow aims to increase the success of NAF-STEM and not only expose issues impacting their career progression in STEM fields but to also alleviate them. We resolve to create institutional environments that are free of discrimination and change those systems in academia that were historically built on exclusion. Indigenous scholars can inform and educate on responsible and respectful methods for conducting research with and in Indigenous communities.

Nationally, in 2018, among institutions of higher education, <1 percent of faculty members are Native American (IES-NCES 2020). For tribal colleges and universities (TCUs), about one third of faculty are Native American and 82 percent of them possess a Master's degree or higher (Al-Asfour 2014). TCUs draw strength from their reliance on cultural scholars to lead courses centered on the delivery of cultural knowledge and/or language. Thus, 11 percent of faculty, staff, and administrators are listed as experts in their field with no degree (AIHEC 2008). Some of the challenges racial-ethnic minority faculty experience are feeling invisible or under-valued, having limited and inequitable opportunities for professional advancement, underrepresentation in leadership or administrative roles, lack of mentoring and role models, discrimination, disrespect, ethnic or racial bias, undeserved scrutiny, pressure, cultural taxation, as well as experiencing

environments of cultural homogeneity (Brown et al. 2022; Carrión et al. 2021; Cooper and Stevens 2002; Griffin 2019; Harrington and Harrington 2012; Joseph and Hirshfield 2011; Pololi, Cooper, and Carr 2010; Sámano 2007; Walters et al. 2019).

Native scholars' pathways to academic and professional success have additional historical and systemic obstacles. American Indians and Alaska Natives (AI/AN) lack access to quality math and science courses in high school (IES-NCES 2020). AI/AN have the highest high school dropout rate among all underrepresented groups (IES-NCES 2020). AI/AN experience historical and intergenerational trauma due to forced relocation, land dispossession, and loss of religious practices, languages, and cultures (Avalos 2021; Heart and DeBruyn 1998; Pember 2016). The causal reasons for historical exclusion in academia are many. Several scholars suggest that the main reason U.S. colleges and universities are failing to diversify their faculty is not from an undersupply of job candidates with doctorates, but rather from unreasonable and unjust barriers to racial-ethnic minorities' entry into and success in the professoriate (Carrión et al. 2021; Cooper and Stevens 2002; Dancy and Brown 2011; Griffin 2019; Harvey and Valadez 1994; Knowles and Harleston 1997; Moody 2004; Smith 1999).

This study shares the perspectives of Native faculty in STEM. The definition of Native American, Alaska Native (NA/AN), and American Indian and Alaska Native (AI/AN) varies across North America and at different times. Here, we use the terms NA/AN, Indigenous, Native, and Native American interchangeably. We are aware of the great diversity among the 500+ Native Nations in the United States and we know that individuals have personal and Native community-specific preferences. We acknowledge and respect the differences in their unique cultures, languages, traditions, and perspectives.

### **The Six Rs Indigenous Research Framework**

The Six Rs (Table 1) served as a research framework to guide the project. Willow asked NAF-STEM to share their personal experiences regarding each faculty member's institutional environment and the perceived differences that NAF-STEM may face. A history and development of the Six Rs Indigenous research framework are included in Appendix A. Building upon the intellectual scholarship and voice of Indigenous scholars, we contribute to the growing field of Indigenous Research Methodologies and Methods (IRM&M), an asset-based approach that also relies upon cultural wealth and communal implications (Chilisa 2020; Porsanger 2004; Smith 1999; Walter and Andersen 2013; Weber-Pillwax 1999; Wilson 2001; Windchief and San Pedro 2019). We recognize that Indigenous peoples "think and behave in ways unique to their worldviews and experiences" (Brayboy et al. 2012:423), which is fundamental to Critical Indigenous Research Methodologies (CIRM). CIRM emphasizes the important role Indigenous values have, in accordance with *accountability* in our interactions with the human, physical, and spiritual realms we occupy. Existing literature supports the idea that incorporating IRM&M is a strength of NAF-STEM (Walter and Andersen 2013) ... [it is] "sympathetic, useful and beneficial...seen from the point of view of Indigenous peoples" (Porsanger 2004:105–20).

Table 1. Six Rs Definition

6 Rs	Definition
Respect	The Respect is due regard for the feelings, wishes, rights, and traditions of others. It is mutually empowering by showing honor, considering the well-being of others' ideas, and treating others with kindness and courtesy. Through respect, researchers can fulfill their role and obligations to the community and develop long-term relationships with participants
Relevance	Relevance is being closely connected or appropriate to the experiences, perspectives, priorities, and ways of knowing, living, and doing, in Indigenous communities. Relevance needs to be expanded and embedded in all stages of the research. This includes careful consideration of how the research is relevant to Indigenous peoples and communities and protocols established by Indigenous communities
Reciprocity	Reciprocity is a continuous and intentional exchange process. It is "the belief that as we receive from others, we must also offer to others" (Rice 2007:7). All parties involved in the research are provided equal responsibility to negotiate relationship building
Responsibility	Responsibility is being accountable for the people and knowledge that are put in our trust. Indigenous communities are responsible for their own narratives, stories, people, and histories, not just in the present but also for future generations. We are also responsible for the reciprocal relationships that we have with Indigenous communities, the earth, and all that are a part of it
Relationship	Relationship is grounded in complex layers of Indigenous identity and relationship with land, nature, ancestors, community, and future generations. It is founded on kinship and accountability, built on mutual honesty and trust, and shapes Indigenous realities
Representation	Representation is having presence at the table and acting or speaking on behalf of another person or an entire people-group. Representation of Indigenous communities empowers them to identify and share what is relevant and important to their people. Representation allows the voice of the community and each participant to be heard

*Note:* 6 R definitions developed by Willow Alliance for Graduation Education and the Professoriate (Willow-AGEP), which evolved and were informed by the published works of multiple Indigenous scholars. It is important to create a space for the Six Rs to be applied holistically. We advise against compartmentalizing the Six Rs within their individual, limited definitions. See Tsosie et al. (2022).

Implementation of the Six Rs was born out of our desire to engage in relational work and better understand NAF-STEM pathways to success and transform access for NAF-STEM to the professoriate. The absence of Indigenous Research Methodologies and Methods in academia meant that relationships and accountability, reciprocity, respect, etc., were absent as well. Incorporating IRM&M is conducting research the "right way". As post-secondary institutions of higher education seek to be more inclusive of faculty that reflect the students and communities they serve, they can use these strategies to expand upon the strengths of NAF-STEM and address the types of challenges faced by NAF-STEM. Our evolving understanding of the factors attributed to NAF-STEM persistence or career fatigue led us to adapt and more fully embrace the Six Rs. Table 1 has the definition of Six Rs abstracted from Tsosie et al. (2022). Willow program development and implementation was guided by the Six Rs framework. In addition, this study's research method on data analysis and results presentation were guided and organized by this framework.

## Methods

The research aim is to examine the personal, relational, and collective experiences of NAF-STEM that enhance or inhibit their professional development and career advancement. The Six Rs guiding research principles were integrated into the research design, data collection, and data analysis. Value was placed on relationship building and reciprocity, the cultural practice of smudging, and development and implementation of an inclusive qualitative data analyses (QDA) series of workshops and subsequent analysis procedures.

## Background

The project is centered around the professional experiences of NAF-STEM and led by a team of Indigenous researchers. The design of the project and data protocols were informed by IRM&M and its surrounding philosophy (Brayboy et al. 2012; Chilisa 2020; Kovach 2009, 2010; Smith 1999; Walter and Andersen 2013; Wilson 2001, 2008). These include a goal of social justice with intent to be transformative and create positive change for Indigenous people, as well as to counter the inappropriate, exploitative, and unethical research done historically and which continues to be done in Indigenous communities. This research was created to increase equity while envisioning a new reality in research for NAF-STEM, one which supports their multifaceted roles and success in academia. Among our ten coauthors of this paper, nine are Native American from Six Native Nations in the Northwestern United States, and one is an Asian immigrant. We come from a diverse array of professional disciplines and backgrounds.

## Indigenous Research Ethics

This research has been approved by the Institutional Review Board (IRB) at two TCUs and one non-TCU. In addition, an inclusive authorship protocol was developed and implemented. The Willow team developed the protocol to respect the relationships with Native faculty and instructors, to practice reciprocity, and to intentionally increase representation. The protocol acknowledges the intellectual contributions of the faculty who shared their stories, perspectives, and lived experiences. Adhering to the protocol ensures NAF-STEM are invited to co-author the dissemination products that use their data. The authorship protocol includes criteria for inclusion in authorship, which includes acceptance of a collective responsibility among all the co-authors. All participants who provided qualitative data to the project were invited to join the research team in data analysis and development of the manuscript.

## Data Collection

We engaged in data collection using a talking circle approach. The talking/research circle is an Indigenous research method, which provides a safe space, builds and strengthens community, and honors all voices equally (Baskin 2005; Duffie 1989; Mehl-Madrona and Mainguy 2014; Obie 2016), hereafter referred to as Circle/s or Research Circle/s. Considering past abuses of Indigenous communities through research for academia, we engaged in a transformative approach that includes participants as collaborators, not as objects of study (Chilisa 2020; Lavallée 2009). The

host(s) acknowledged land, place, time, and space to pray and smudge before and after the Circles (Baskin 2005; Duffie 1989; Kovach 2009). Participants were given an opportunity to share experiences, obstacles, and reflection to look deeper at lingering barriers and/or accessible support to personal satisfaction and success (Baskin 2005; Duffie 1989; Nabigon et al. 1999; Obie 2016). Sharing in this way can result in emotional responses with the potential to be a time for healing among participants (Baskin 2005; Kovach 2009; Lavallée 2009; Nabigon et al. 1999; Obie 2016).

There were 12 NAF-STEM participants that took part in one or more of the seven Circles. Eight participants are from three TCUs and four are from non-TCUs. The Circles were audio recorded and later transcribed.

The Circle began by asking the participants to introduce themselves and then asked about their personal experiences, including their academic journey, mentors, challenges, and sources of support. As the Circle progressed, questions became more specific and relevant, asking about the institutional experiences and practices that improve or hinder the participants' professional development and career advancement. Participants were asked to further define personal and professional success. Each presentation slide had a theme and a few questions to choose from. Not all the questions required answers, but guided conversation in the Circle (see a slide example in Figure 1). The final slides asked about response and strategy, soliciting participants to elaborate on the methods and tools they use to address challenges and share what types of things they have done in their professions that they are most proud of, to date. The Circle closed with a cultural practice of reciprocity, where a small gift was given to each participant.

### Data Analysis

Following Willow-AGEP's development of an inclusive authorship protocol, participants in Circles were invited to join us in conducting data analysis. All of the Circle recordings were transcribed and de-identified. Each participant assisted to member-check the transcripts and were provided opportunities for clarification and additional information.

Personal Experiences
Survival:
<ul style="list-style-type: none"><li>Have you had to deal with adversity, such as colleague or student bias, in academia in general or specifically as a Native American faculty or research associate in a STEM field? If so, did the adversity or bias force you to make changes that you feel were not appropriate?</li></ul>
Sharing:
<ul style="list-style-type: none"><li>What Indigenous education, cultural practices, or place-based knowledge do you incorporate in your teaching?</li><li>Can you think of any examples of how your work supports Indigenous people? Is serving Native people valued at your institution or is it a risk?</li></ul>

Figure 1. Example of PowerPoint slide shown to Circle Participants.



This process resulted in recognition that, although the Circle participants are excellent scholars in their specific STEM fields, there was a need to learn how to conduct qualitative data analysis (QDA). A QDA discussion group was formed. Prior to each meeting, participants read readings relevant to the topic for discussion. QDA topics included key areas of science; types of knowledge; alternative ways of knowing; qualitative research paradigms such as grounded theory; phenomenology, hermeneutics, and Indigenous Research Methodologies and Methods (IRM&M); strategies and techniques for analysis of qualitative data consistent with the hermeneutic paradigm; content analysis approach, and ethnographic approach. Each participant read the transcript independently and discussed their findings collectively. The findings (codes, excerpts, and themes) from each Circle were then merged into one combined document. All coauthors of this manuscript further examined the combined document, interpreting and organizing the findings on specific narratives that NAF-STEM Circle participants identified with their professional satisfaction and success through the Six Rs framework.

## Results

The findings are organized under the Six Rs framework to demonstrate the personal, relational, and collective experiences of NAF-STEM in institutions of higher education. Elements associated with the success, support systems, and challenges are highlighted with quotes from participants. Our intent is to create a space for the Six Rs to be applied holistically and expanded upon. We advise against compartmentalizing the Six Rs within their individual, limited definitions. (Tsosie et al. 2022).

### Respect

NAF-STEM shared how they practiced respect for their students, their families, and their communities. Respect often directed the type of work faculty engaged in. NAF-STEM described this value of respect in proudly acknowledging their Indigenous identities and sharing stories of their culture, the places they came from, and the people and places where they worked. One participant said:

I'm enrolled in [a Native community] but I didn't grow up there...it was [through] my mom that I am connected to [the Native community] ... she always talked about home...it was important to me...because that was where my mom grew up.

Similarly, another participant acknowledged the connection to place, "I'm really drawn to that place [home]. I've been fortunate...to have a pretty strong connection to my homelands...a real good, deep connection to the place and I wanna continue that." Sharing the history of a place, recognition of the connections made with it and acknowledging its existence shows respect.

...because my grandma was really adamant, she was Laguna, she was really adamant about education, and us going on to school, and her family, and so... my grandmother worked really hard and was one of the first Native women to graduate from University with a Bachelor's degree in business, and that was

back in the 50s, and it was really neat that, you know, I think she was kinda at the forefront of a lot of things back then. And then my mom went on and got her Master's degree, and then me being in that third generation, to just complete my PhD.

Honoring the people and places in the faculty participants' stories illustrates the respect NAF-STEM has for those people and places. Respect is a foundational tenet of the Six R's. Respect is regarding others' ideas and knowledge, treating them with kindness and courtesy. Respect acknowledges the interconnectedness between Indigenous people and place. Respect helps one fulfill obligations to family and community and honors the Indigenous community's cultural integrity (Kirkness and Barnhardt 1991). With respect, one's traditions, abilities, and achievements are recognized and admired.

### **Relevance**

Too often research has been shaped by outside interests and lines of inferential inquiry within Indigenous communities. It is essential that Indigenous communities and priorities inform the ways in which STEM is pursued. This includes investment in social capital and resources to develop and support research that is relevant and beneficial to Native communities.

If it [doesn't] inherently benefit Indian people and give back to the researcher, there's no need for me to be here. It has to serve a purpose. And if that purpose doesn't benefit what we see as benefit for the Native American community, then, hey, I'm not sure it's something we want to be a part of.

Historical exclusion of Indigenous voices has led to research often lacking in relevance to Indigenous communities. This is a critical mistake.

As a tribe, as tribal people, we have to reflect on the group, not an individual, and once we get out of that mentality of individualizing scientific approach within Indian science and make it a group thing, that's true Indigenous science, because that's how Indigenous people worked. We're tribal people. We see the needs of the group over the needs of the individual.

Changing the systems of knowledge to more accurately inform science and policy requires that science serve all peoples in authentic ways. Good science is relevant science, Indigenous or otherwise. At the institutional level, relevant science legitimizes Indigenous knowledge, as one of the participants stated, "We want to do it in a way that people benefit, that the animals benefit, whatever we're dealing with."

### **Reciprocity**

Reciprocity is central to building relationships. Knowledge is developed through the accumulation of agreed upon facets of reality supported by different forms of inferential evidence. Reciprocity emphasizes the connectedness that empowers all parties to have interest in and commitment to the mutual collaborative growth of



the overall outcomes of the research or activity. Reciprocal actions include implementing protocols that value and align with the Indigenous community's common practices. For example, offering tobacco or acknowledging the land signifies respect for people and place, as well as recognition of how reciprocity plays a role in the community and relationship-building process that results in the exchange of knowledge.

Working closely with their often-times rural communities, mentoring, and communicating science are some of the major successes that highlighted the NAF-STEM desire to reciprocate and give back to their communities. Many NAF-STEM acknowledged the importance of Indigenous identity, culture, and place, all of which prove vital to both NAF-STEM and the communities with which they engage. Reciprocity is achieved in the education of Indigenous people, both at the undergraduate and graduate levels. NAF-STEM works reciprocally toward the overall improvement of tribal communities by training students to be the next leaders in their communities and bringing STEM ideas forward for potential economic development in historically underdeveloped and rural areas.

The measure of success is seeing students go where they want to go and do what they want to do. One of the most satisfying things for me is to have them come back and visit and just say, 'Wow thanks.', or, 'I really enjoy what I'm doing.' For me, it's a high measure for me. Like, 'I guess I'm doing something good here.' You feel like you're creating some really neat opportunities for folks.

For state institutions, once tenure and promotion are achieved, faculty have more flexibility to work with tribal communities and strengthen these relationships. Research projects with longer timelines can also better reflect this partnership as topics can be collaborative and grant funding can directly benefit the needs coming from within the communities.

How can we help with this? We started a research project that [was] initiated back in 2004 that we work on today. That's really galvanized I think, a really firm relationship that we have with the university and all of the tribal communities and working with other folks... Just becoming part of the research and going to more conferences, to me it's really been one of the more satisfying aspects of my research-faculty [position], has been more of this. It's meaningful, it seems so meaningful doing the research and the conferences tend to be smaller, but again the community of folks that you're with [are worth it].

There are specific challenges associated with promotion and advancement specific to the NAF-STEM need to build reciprocal relationships. The tenure process at state institutions can make it difficult for Native faculty to stay connected to and give back to their communities. The demands of teaching and research can hinder the amount of time that strengthening community connection requires. Furthermore, the short timeline for tenure and promotion may not allow for these relationships to be developed unless the research directly integrates community involvement.

Family is the best support system, naturally rooted in reciprocity, which expands to a faculty's home community (HeavyRunner and DeCelles 2002). In addition, once true mutual collaborations are developed through scholarship and other common activities, NAF-STEM sees the importance of the time and work needed to make an impact among tribal people as a source of support. Tribal colleges are excellent examples of reciprocity by addressing the needs of the community and being responsive to the changing needs of Indigenous people.

## Responsibility

Responsibility involves caring for one another and holding each other accountable for the well-being of all peoples and for the knowledge we are entrusted with to share. During the Circles, this concept was reflected by NAF-STEM and interwoven in their responses and general outlook on academic life.

Indigenous communities share responsibility for the stories they tell and for their ways of knowing. This includes how stories are shared in good ways and the ways that people are honored in the past and present. These responsibilities are held with future generations for all communities in mind, as NAF-STEM seek to restore and renew reciprocal relationships not only within Indigenous communities, but with the earth and all that it encompasses.

In all work that holds value, we've always included those who are not here. You can get into sounding real cheesy but that's the truth. The reality is we do think of our grandkids, our great-grandkids, and the people who come before us.

The concept of responsibility among NAF-STEM goes beyond just "*do no harm*" in research, it is a reflection of the collectivist culture mindset in which altruism is the expectation rather than the exception.

It seems like what we were talking about before with this passion for fulfillment, which in Native culture is not separable from other people. It's all about community and others—It's all for the greater good. I do feel, for myself, that people have helped me get to where I am. So, I feel it's almost like an obligation, but in a good way to help others.

Mutual responsibility for these values is crucial in the reciprocal relationships between Indigenous and non-Indigenous communities (Kirkness and Barnhardt 1991; Wilson 2008).

For many NAF-STEM, the concept of success is measured in how their efforts (grants, outreach, programs, and mentorship) impact Indigenous communities. While participants acknowledged the need to return to their community and give back, they also often felt like an outsider in their communities when they returned. They experienced feelings of self-doubt and the weight of taking on too much with respect to service. Building a sense of community among fellow NAF-STEM helped participants overcome some of these challenges.

I feel like a buffer between, like, the non-Native faculty and like, the Native students. So, where I help them understand each other better, like, somehow I became this translator where I'm, like, this is where they are coming from.

NAF-STEM described the benefits of having a cohort of individuals that identified with shared challenges and successes as beneficial to understanding their sense of responsibility to both the institution and their communities. "Some of the best experiences that I have is getting to work with Native youth groups...and tell them these are opportunities they can have. I'd say that's a success for me."

## **Relationship**

In the analysis of the Circles, NAF-STEM described the importance of relationships. NAF-STEM shared stories of their families, elders, mentors, and advocates. NAF-STEM credited families for their accomplishments and family holding NAF-STEM accountable in the work they were doing. Future students and Native scholars, as well as the Native community, are also important to NAF-STEM. This kinship obligation required NAF-STEM to be responsible in the work that they do as professionals in higher education. NAF-STEM are aware they are observed and admired for creating better access and improving opportunities for all of their relations. "My biggest goal in life is then to be able to go back home and bring back that knowledge, and it's, I think, interesting to think that then it's almost taken four whole generations to circle back around."

NAF-STEM also described the value of relationships and named some of the benefits of their relationships that contributed to their success and sense of accomplishment, including connection and staying connected, encouragement, support, guidance and feeling grounded. "I always had my mom help out immensely, I would always just call her when times got really tough and ask her for advice."

The concept of interconnectedness is challenged. NAF-STEM approach research holistically. It is difficult for them to put the human subjective lens aside and only employ objective perspectives. Institutions of higher learning often promote researchers to remove a part of themselves from the research and to view everything objectively. In doing so, institutions are asking NAF-STEM to forsake their Indigenous identities. Matsaw, Hedden-Nicely, and Cosens (2020) states that by only acknowledging human relations, one is not acknowledging the other half of their relations in the natural world, for example, animals, plants, spirits, and the elements. According to Wildcat (2009), human lives are "intrinsically related to the other-than-human life of Mother-Earth" with whom humans interact daily. People have a "symbiotic relationship" with the natural environment and all it encompasses, animate and non-animate. Recognition of this fundamental interconnectedness and relatedness leads to a "hopefulness," which Wildcat says, "resides with the peoples who continue to find their identities emerge" out of this "nature-culture nexus." As one participant explained, "And for me, [a] personal success story is... the stuff that I'm doing can continue to protect those species into the future that we all care so deeply about."

## Representation

Representation for NAF-STEM spans inclusion of Native American perspectives and applications (a) in science from content to pedagogy; (b) in academic roadmaps (i.e., tenure process and access); (c) on academic expectations (i.e. percentage of time given to teaching/student support/and service); and (d) the definition of personal and professional success. Participants consistently cited a lack of representation of NAF-STEM when they were students and the need to increase Native American representation in higher education. Participants also shared experiences of conflict and erasure when they were taught STEM from a non-inclusive pedagogy, inspiring their own goals to increase inclusion of Native American perspectives and experiences into STEM fields. Finally, the participants discussed the challenges of increasing Native American student representation in STEM while also trying to meet the expectations of the institution, oftentimes requiring more time involved with research and teaching than with student support and community outreach. NAF-STEM prioritizes increasing representation in STEM. “I feel like, to be supported...just being around other Native people, cause I kind of feel like we all understand some of the troubles better than, like, our non-Native peers,” and “I could say that non-Natives are given a larger voice in decision-making.”

Participants shared their experiences with representation and the lack of representation in academia, including some of the reasons why predominantly white institutions recruit Native students. One participant shared their concern about a recurrent paradigm in higher education that is failing to represent diverse cultures and perspectives, but is instead exploiting them:

So, there I was nine, 10 hours away from my family, and what I was hearing from my committee and from my department was that, the only reason I was there was because I was a Native. Not because I graduated from my bachelor's and masters' programs with a 4.0, not because I was a good researcher, but because I was Native. And that it was really good I was there, because they could get more money.

Participants also noted how important and supportive it is having representation in a program or at an institution:

He (Native student) transformed into this very deliberate confident person who understood who he was, where he came from, and how he was going to get to the next place. So, when he talked about adversity, the biggest thing I see in Indian Country is people not knowing who they are. So, they try to make this next step into higher education without having a strong foundation. That's our biggest fault, and that's our fault in Indian country, because we're in a position now where we can remedy that. At least since the 70s, there's stuff that we're dealing with, and we still deal with, but we have to acknowledge the harshness of reservation life, of urban Indian life...of detached heritage, and understand all those elements, how we deal with them before we can start sending our kids out to 20,000-people institutions that think they're going to do well. They're not going to do well. And in the same instance, how am I going to teach Indian people how to be Indian people, remain Indian, if I

don't know who I am and of where I come from, and what that means to me. It's hard to do, especially in our field.

NAF-STEM's values and actions, guided by the principles of respect, relevance, responsibility, reciprocity, relationship, and representation, are woven together as a foundation for maintaining identity and creating a more inclusive and supportive experience in higher education. The observations and perspectives of the faculty members informed institutional and social barriers in higher education for NAF-STEM. Cultural and community strengths support NAF-STEM, create positive change, and allow for greater representation of NAF-STEM in higher education.

### Reflection and Conclusion

Indigenous scholars can continue to inform and educate on responsible and respectful methods for conducting research with and in Indigenous communities. Inserting Indigenous pedagogy in academia, with equal respect provided to policy and science is an act of reclamation and self-determination. The shared NAF-STEM experiences in academia demonstrate the value in meeting the needs of NAF-STEM. Implementing the Six Rs throughout the research process allowed the research team and participants to identify contributing factors to NAF-STEM successes and challenges at both TCUs and non-TCU universities.

There are studies outlining both the positive and negative aspects of NAF-STEM experiences in academia (Brayboy, Solyom, and Castagno 2015; Brown et al. 2022; Carrillo, King, and Schafft 2021; Carrión et al. 2021; Grant et al. 2022; Page-Reeves et al. 2017, 2019; Tsosie et al. 2022). In this study, the Circles participants stressed that giving back to their community is a shared value that NAF-STEM deeply care about. Similarly, Page-Reeves et al. (2019) describe how NAF at research institutions experience lasting reciprocal benefits by giving back to communities and inspiring others to do the same. Circles participants identified *family, community, and cultural identity* as valuable and necessary parts of Native American self-determination, an idea that also aligns with other studies (Brayboy and Maughan 2009; Carrillo et al. 2021; Guillory 2008; HeavyRunner and DeCelles 2002; Mauer 2021; Page-Reeves et al. 2017). Native identity is multifaceted. Understanding the *fluid process* of Native identity is fundamental for NAF-STEM success. Circles participants agreed that personal identity is embedded in one's socio-cultural environment, individual upbringing, and experiences (Page-Reeves et al. 2017). The stronger the identity the more successful NAF-STEM are and the better equipped they are for negotiating their journey in STEM and academic spaces.

Institutional barriers and burdens have actively hindered NAF career advancements (Brayboy et al. 2015). Lack of representation of NAF increases the mentoring load for those NAF in the institution. These barriers are similar to those articulated by NA graduate students (Brayboy et al. 2015) and the Circles participants. They include, (a) tracking of research interests and Native student mentorship; (b) isolation, alienation, and racism/discrimination; (c) cultural discontinuity; (d) lack of mentorship and institutional support, and (e) service requests that take away from research and writing. NAF are burdened with representing all Indigenous people and viewed as possessing expertise related to Indigenous people in all areas

(Brayboy et al. 2012; Fox 2003; Kidwell 1992; Tippeconnic Fox 2005), which leads NAF to experience cultural discontinuity. Walters et al. (2019) described similar challenges highlighted in the Circles discussions, such as less inclusive *institutional climates*, inadequate access to culturally appropriate *mentoring*, *a family-work balance*, *cultural taxation*, and *discrimination*. Addressing these challenges will foster NAF success within the academy.

Circles participants expressed the importance of place, acknowledgment of the origins of their knowledge systems, and how connection to “home” is vital to their identities and relationship with community. This is echoed by Carrillo et al. (2021), “While rural sociologists have long emphasized the importance of place, place also intersects in keyways with race, disability, and legality, among other categories.”

Obstacles to opportunities include barriers in becoming independent scholars (e.g., chosen to be co-investigator over principal investigator), disproportionate service responsibilities to communities and campuses, marginalization of their research interests, persistent cumulative exposure to discriminatory micro-aggressions, and assaults on their academic identity (Adelman, Taylor, and Nelson 2013; Brayboy et al. 2015; Brown et al. 2022). These obstacles contribute to the commonly reported perception of being an “imposter” and feelings of isolation in the profession (Dancy and Brown 2011). Throughout the literature, several articles report similar experiences of NAF in many academic/institutional settings throughout the country. These voices and experiences are not a new phenomenon. It is necessary to take them into account to change institutional climates and policies toward further indigenization of the academy and make it more hospitable to future NAF-STEM.

Acknowledging NAF-STEM experiences is a first step in NAF success in academic settings. Their success can have a trickle-down effect especially for the rural and Indigenous communities that they come from and collaborate with. These collaborations can have insurmountable impacts for rural and Indigenous youth who are seeking mentors, advisors, and positive role models. With proper representation, Indigenous communities can benefit when it comes to research with and in their communities.

The Willow-AGEP project (University of Montana 2024) was implemented to increase success and advance the knowledge of career progression of NAF-STEM. It is through these efforts and other similar studies that we now understand how important identity, cultural identity, family, and community are to NAF-STEM. Through the collective experiences of NAF-STEM, we were able to better understand underlying institutional issues affecting promotion and advancement, while considering potential alternative approaches for working with NAF-STEM. The study implemented professional development workshops (grant writing, collaborative manuscripts), mentoring, course buyouts for project participation, and other efforts that identified the needs for institutional support for NAF-STEM to be successful.

Lastly, we want to highlight the following: each NAF-STEM brings unique, place-based, cultural wealth, knowledge, and experiences into academia. Rather than pressuring NAF to “fit” into an antiquated mold of an institution’s system and environment, institutions must make appropriate reciprocal changes in policy and practice



to remove obstacles. This respect may create an inclusive, equitable, nurturing environment to foster growth, and success as NAF-STEM define it for themselves and the future of the institutions they represent.

Limitations to the study include time and resources. Although willows are resilient and able to thrive in some of the most challenging conditions, adaptation takes time. Change takes time. Willows rely on each other (*reciprocity*) to develop their supportive branches and intertwined root systems (relationship). They are deeply connected to the earth (*relevance*) but also require clean water and air (*respect*) to grow their community. Participants in this study represent only a small number of NAF-STEM perspectives, but the *representation* of NAF-STEM is growing. Their resources are few. They often face more challenges. As we continue to advance knowledge and understanding about NAF-STEM experiences and perspectives, this community's growth will impact (responsibility) institutional systems for better inclusion, equity, and justice.

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## APPENDIX A

### History and Development of the Six Rs Indigenous Research Framework

In 1991, renowned Indigenous scholar, Verna J. Kirkness of the Fisher River Cree Nation in Canada and Dr. Raymond J. Barnhardt identified the Four R's guiding principles (respect, responsibility, relevance, reciprocity). The Four R's are foundational in the incorporation of Indigenous paradigms within higher educational systems. For this work, we are truly grateful. Using the Four Rs led Willow to several other related "R" terms that also fit within diverse pedagogies and Indigenous research conducted with and in, Indigenous communities (Chilisa 2020; Deloria and Wildcat 2001; Harris and Wasilewski 2004; Kovach 2009, 2010; Montgomery and Blanchard 2021; Pember 2008). The Willow project and coauthors here included "relationship" and "representation" in their framework to inform and guide the overall outcomes of the project and in examining the collective experiences of NAF-STEM.

In 2001, Shawn Wilson wrote, "Indigenous methodology means talking about relational accountability" (177). This acknowledges the varying degrees of relationship/s that each participant has with respect to their career satisfaction and individual success, while supporting the idea that all living things are connected and add value to each other. We gain knowledge from our relationship/s with the seen and unseen (Deloria and Wildcat 2001). Relational accountability benefits communities and contributes to *honest* research—research with integrity that is deemed trustworthy by all those involved (Barlo et al. 2021).

Relevance and representation are fulfilled by offering Willow-AGEP participants the opportunity of co-authorship, allowing accurate interpretations of first hand experiences. Smith (1999) says Indigenous representation is a fundamental right.