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ARTICLE



Developing an Indigenous Mentoring Program for faculty mentoring American Indian and Alaska Native graduate students in STEM: a qualitative study

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ABSTRACT

In order to increase graduation rates of American Indian and Alaska Native doctoral candidates in the STEM (science, technology, engineering, and math) fields, a culturally attuned mentorship program needs to be developed. In our study, we used a conversational method of Indigenous research that privileges relationships and lived experiences to inform such a program. Data was collected in semi-structured interviews using a conversational guide and initial themes were deliberated and refined into a coding framework that was subsequently applied to the data. The themes that emerged from the research included relationality, cultural humility, Indigenous worldviews, suggestions for activities, and resources/support. These themes established the framework for an Indigenous mentoring program (IMP) for faculty mentors of American Indian/Alaska Native graduate students in STEM at four, 4-year institutions and a tribal college.

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Introduction

In an effort to facilitate students' successful navigation of American Indian and Alaska Native (AI/AN) doctorates in STEM graduate programs, we built upon previous scholarship that established the need to develop a culturally congruent mentorship program for faculty who mentor AI/AN graduate students. The development of an Indigenous Mentoring Program (IMP) for faculty could strengthen faculty mentorship of AI/AN graduate students in STEM, which, in turn, may enhance the graduate experience of these students and their graduation rates. The authors' previous work examined how AI/AN graduate students in STEM can successfully navigate graduate education with their cultural identity intact (Windchief & Brown, 2017). In our study, we move

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beyond the stage of conceptualization to developing a mentoring program for faculty who mentor, or who are interested in mentoring, AI/AN graduate students in STEM. Our research question is as follows: When AI/AN students and those that contribute to their success (faculty and professional staff) construct a mentoring program for faculty who mentor AI/AN graduate students in STEM, what key components are identified? Our work further refines a conceptual framework (Windchief & Brown, 2017) established as a result of an NSF-AGEP grant awarded in 2014¹ Essentially, we explored the lived realities of these students, their mentors, and the other support people in higher education and developed an Indigenous Mentoring Program (IMP) for faculty to address those needs.

Native Americans and other Indigenous peoples have applied sophisticated science thought processes for thousands of years (Cajete, 1999). Yet the participation rates of AI/ANs in science, technology, engineering and mathematics (STEM) doctoral programs are low. Sixty-eight percent of all doctorates earned are in STEM fields. Of these, only 0.24% were earned by AI/ANs, compared to 29% earned by foreign nationals, 4.5% earned by Hispanics or Latinos, 6% earned by Asians, 4% earned by Black or African American, and 46% earned by White students (National Science Foundation, National Center for Science and Engineering Statistics, 2015). These data show there is a need to increase doctoral graduation rates for AI/ANs in STEM fields.

We based our inquiry in this qualitative study on existing literature and the conceptualization of an AI/AN mentoring program (Windchief & Brown, 2017) to develop an IMP for faculty who mentor AI/AN graduate students in STEM that considers three important components toward academic success: to (a) create meaningful mentor/student relationships with clear expectations, (b) recruit and retain self-identified AI/AN students into STEM fields, and (c) serve multiple stakeholder needs. These stakeholders included Native American and other Indigenous communities, institutions of higher learning, and the fields that could benefit from a broader representation of skilled professionals. Indigenous systems of knowing, being, doing, and learning can be applied in the academic setting (Barnhardt, 2005; Bartlett, Marshall, & Marshall, 2012; Wilson, 2008) creating a more meaningful experience that helps Indigenous students align their scholarship with indigenous philosophies.

Though there are many researchers who have considered mentoring for underrepresented minorities (Campbell & Campbell, 2007; Davis, 2008; Kendricks, Nedunuri, & Arment, 2013), there are few that consider specifically the AI/AN demographic (Guillory, 2009; Shotton, Oosahwe, & Cintrón, 2007).

¹The Alliances for Graduate Education and the Professoriate (AGEP) program seeks to advance knowledge about models to improve pathways to the professoriate and success for historically underrepresented minority doctoral students, postdoctoral fellows, and faculty, particularly African Americans, Hispanic Americans, American Indians, Alaska Natives, Native Hawaiians, and Native Pacific Islanders, in specific STEM disciplines and/or STEM education research fields (National Science Foundation, 2013).

Conceptual framework

The conceptual framework that guided our research recognizes five components in developing an Indigenous Mentoring Program (IMP) as seen in [Figure 1](#). These components include information that was iterated throughout the data gathering and analysis portion of the research. The important components include: (a) mentoring being place based, to consider both geographic location and campus climate and resources; (b) mentor commitment, starting with those who have facilitated academic success for AI/AN graduate students in STEM; (c) students' location on an indigenous identity continuum (Joseph & Windchief, 2015; Starnes, 2005); (d) indigenous worldviews considered by examining the interaction between Indigenous values and higher education including culturally congruent modalities; and (e) indigenous systems of relating to one another and the surrounding world such as the family education model (HeavyRunner & DeCelles, 2002). The following conceptual framework guides the development of an IMP for faculty who mentor AI/AN graduate students in STEM.

Responding to distinctive cultural sensitivities and educational experiences, and using a conversational Indigenous research methodology, we guided the design of a mentor training program (model) as depicted in [Figure 1](#) and as developed from Windchief and Brown (2017). We postulated that faculty who are mentoring AI/AN graduate students in STEM fields are in a unique position to enhance the graduate education experience of these students, in part, by strengthening indigenous community connections through the mentoring

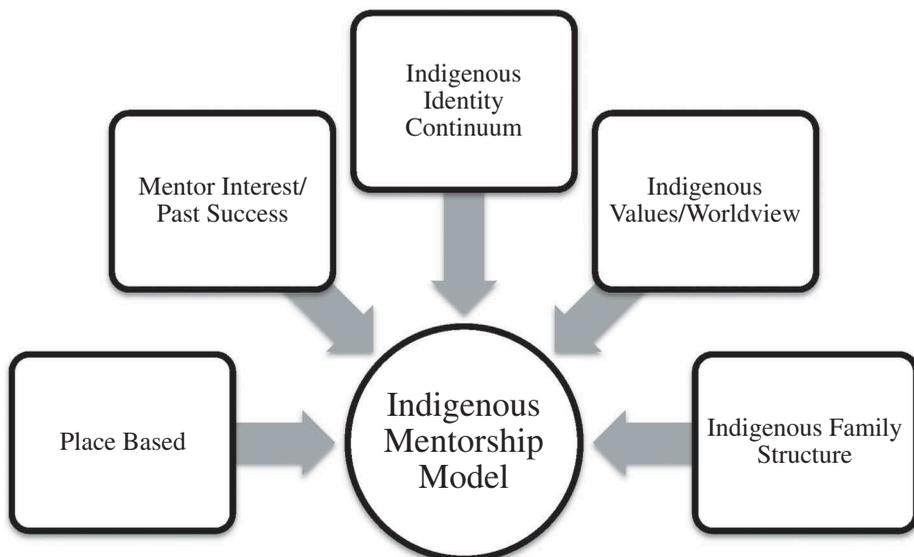


Figure 1. Indigenous mentorship model (Windchief & Brown, 2017).

program. These mentoring strategies could increase the number of successful AI/AN graduate students in STEM.

Methods

Members of the research team recruited participants to the conversational interviews by telephone or in person. Flyers describing the study and recruiting participants were posted in prominent places that students, faculty, staff, and administrators frequent on campuses at three, four-year institutions and one tribal college. The flyers contained a contact name (e.g. research team member) and phone number. Also, project team members made lists of names of people they knew, who were either faculty members or professional staff who worked with AI/AN students or AI/AN graduate students in STEM fields; snowball sampling was then utilized to recruit these potential participants in person or through email. Inclusion criteria to participate in the conversational interviews were being 18 years or older; an AI/AN undergraduate or graduate student interested in, or currently enrolled in, a STEM field or STEM-related discipline; a faculty member or instructor who were interested in, or who were currently, mentoring AI/AN students in STEM disciplines; a professional staff person who worked directly with AI/AN students on one or more of the four campuses; a faculty alumnus or an administrator at one of the participating institutions.

Conversational interviews

The development of an IMP for faculty who mentor AI/AN graduate students in STEM was rooted in indigenous research methodologies to include story, conversation, and considerations of relationships between faculty mentors and student mentees, and staff and administrators who work with AI/ANs. These factors (story, conversation, and relationships) make use of appropriate qualitative methodology suitable for working with Indigenous peoples, otherwise known as a conversational method (Archibald 2008; Kovach, 2010; Walker, Fredericks, Mills, & Anderson, 2014). As described by Kovach (2010), the conversational method aligns with an Indigenous worldview that honors orality as a means of transmitting knowledge. Conversation is a relational process that is accompanied by a particular protocol that upholds the relationship, which is necessary to maintain a collectivist tradition and is consistent with tribal knowledge (Kovach, 2010; Thompson, 2008). Furthermore, conversational methodology articulates the meaning-making practices of mentoring from the interviewees' point of view. Applying the conversational method is helpful in aligning research with Indigenous community ontologies. The goal is an authentic and dependable representation of lived experiences as they relate to AI/AN graduate students in STEM.

Prior to facilitating the conversational interviews, research team members received training in qualitative methods, including conducting mock conversational interviews. The research team designed the moderator's guide and semi-structured conversational interview questions to gain in-depth information based on personal experiences from faculty, professional staff, administrators, alumni and AI/AN students, on thoughts and opinions for developing an IMP for faculty, and activities that faculty and AI/AN students could feasibly take part in that would increase the recruitment, retention, and graduation of AI/AN graduate students in STEM disciplines. The questions were based on existing literature: the Family Education Model (HeavyRunner & DeCelles, 2002), the UMass-Amherst Mutual Mentoring guide (Yun, Baldi, & Sorcinelli, 2016), concepts of bi-directional mentoring relationships (Keener, Johnson, & Collins, 2012), ideas about Indigenous kinship structures (Kawagley & Barnhardt, 1998), mentor roles and responsibilities (Lechuga, 2011), and the concept of Academic Genealogy (Sugimoto, Ni, Russell, & Bychowski, 2011). The interview guide was reviewed by the project's External Advisory Board members and the authors. The guide included 10 open-ended questions. Example questions included: 'Tell me about you or your family member's experience in an educational setting.' 'What is mentoring for you?' 'Describe your experiences as an educator, or as a student, taking part in mentoring activities for AI/AN students in STEM during your experience in an educational setting.' Following the questions, participants were given the opportunity to speak on any other topic that might be relevant to the conversation. All interviews were digitally recorded. An Institutional Review Board at the tribal college provided approval and oversight of our study.

Data analysis

The digital recordings were transcribed and an initial coding scheme was constructed based on the inductive methods of grounded theory (Patton, 1987). To construct the initial coding scheme, the authors reviewed the transcripts and discussed preliminary codes. The transcriptions were then read in order to develop a draft coding frame. The final delineated coding scheme was applied to the transcriptions. Another member of the research team then applied the coding scheme to 10% of randomly selected transcript text to determine the reliability of the coding scheme. The overall agreement between raters was 82% (54/65), with Cohen's kappa significantly higher than expected by chance ($\kappa = .820$) (Cohen, 1960), and represented robust agreement (Landis & Koch, 1977). Because the coding scheme indicated a high level of reliability, it was used for the remainder of the study. A qualitative analysis software program (NVivo 10) was used to group content information for organizational purposes,

analysis, and discussion. The authors corrected minor grammatical inaccuracies in the participant statements presented to illustrate themes.

Results

In total, 33 people were interviewed. Of these, 8 were AI/AN students, 14 were faculty members, 6 were professional staff, 4 were administrators, and 1 was a faculty alumnus. Participants were on average 48 years old, 36% female, and 42% AI/AN, 27% white/non-Hispanic, 6% Asian, and 9% Native American/White. Interview length was between 16 and 86 minutes, with transcript length from 6 to 35 typed pages.

Summary of themes and sub-themes

The analysis of the interviews identified common themes which included academic environment, relationality, Indigenous worldviews, and suggestions for mentoring activities. Permeating the results were general attitudes about AI/AN graduate student experiences and factors that either encouraged or deterred academic success. The sub-themes within these included: Resources and support, the organic development of relationships, and cultural humility which helped refine and emphasize key components for an IMP for faculty who mentor AI/AN graduate students in STEM (Table 1). These themes and sub-themes, and participant comments that illustrate these themes are described in more detail below.

Academic environment

An assessment of the academic environment through the participants' experiences shows a connection to the literature around campus climate for students from communities that are historically underrepresented in higher education and STEM in particular (Huffman, 2001). Students shared, at times, that they felt unwelcomed, isolated, misunderstood, and marginalized. Interestingly, some of the responses spoke to their mentors and others on campus that helped them overcome these feelings of marginalization.

Table 1. Themes and sub-themes identified for IMP development.

Theme	Sub-theme
Academic Environment	Resources/Support
Relationality	Organic development of relationships
Indigenous worldviews	
Suggestions for mentoring activities	Cultural humility

Resources/support

Although participants described how the academic environment influences mentoring and AI/AN students experiences during the course of their degrees, the most important issues disclosed were related to the variety of resources and support services that can influence AI/AN graduate student success in STEM disciplines. Particularly, how financial and mentoring programs influence the academic journey, student retention, and encourage students to enter into a graduate program in STEM. Several participants described how AI/AN students struggle with obtaining financial support and/or going through the bureaucratic process to access the right information to apply for financial aid. A student said,

I fought with [the office of] financial aid for 13 years. They'd be like, do these forms, and so you do the forms. Then they're like, oh, well, we need this tax form, and then you do that tax form. Then they'd say, Oh no, we've changed our thing. We need that tax form. Oh, you didn't do it by this deadline. They're always changing the goal line. They change the regulations and they change the rules. Financial aid was a big deal.

A staff person remarked '... I was their go to person, [for] any of our native pharmacy students, if they had any questions about scholarships or their financial aid ... I even babysat one time [while the parents filled out the forms].' Students noted, ' ... when we became graduate students, I didn't understand how my financial aid is affected once I entered graduate school, ' ... programs expect you to [go to conferences] ...but there was no support, whatsoever. That makes it tough because you expect us to do these things.' Proactively, one of the interviewed students even created a budget for his/her department that showed the cost for each graduate student to go to one conference each 'it was about ten thousand dollars that [the] students are paying out of pocket. There was no support, whatsoever.' However, no solution was presented to the student.

Students identified the need to interact with other people who have gone through similar experiences, even emphasizing on the resource of his/her university that has a place where other American Indian students congregate and '[i]f you can get people to know about these places and know that they're there, and get comfortable with interacting there ... that's certainly going to foster more success ...' Student participants pointed out that finding a network of people to support AI/AN graduate students, whether connected to their disciplines or not, is an important resource.

[T]here have been a lot of other people that I could go to ... even if they weren't necessarily assigned mentors, I sought them out and they were able to provide a lot of very good advice and even guide me towards some of the resources that I might need to solve the problems that I was experiencing.

Additionally, '...from other graduate students involved, to hav[ing] family [support] and sharing knowledge... go talk to this person if you want the

answer to that question.’ The need for those resources or support was relayed by both students and faculty that reported student are often not aware of the funding mechanisms for graduate school and are confused by the limitations,

Most of the time I think the programs that are developed to help Native Americans be mentored and get them into higher education don’t help. Most of the money seems to go to hiring administrative staff and very, very, very little of it gets to the student level. I’ve always had problems trying to get the money. The universities and different programs are always trying to take their portion of grants that [my mentor] wrote and we only ever saw money or support from [my mentor himself], never [from] any of these other programs.

Relationality

An important element of Indigenous ontologies is what Wilson refers to relationality or the natural relationship building, connecting, sharing, knowing, being, and doing; (2008). Participants identified three factors associated with this theme: organic development of relationships as opposed to forced relationships, the expectations of both the faculty members and the students, and the benefits of well-developed relationships. As a student stated, ‘a good mentor is not only there to guide someone in their academic prospects, but a good mentor to Native American students definitely considers their personal life.’

In the data, there were descriptions of barriers to relationality that included (a) lack of understanding of what it means to be a mentor, (b) a separation of personal life from academic life that can be experienced as dehumanizing, (c) faculty attrition at the university, (d) personality disconnect between mentors and students, (e) a lack of effective communication, and (f) faculty mentors’ expectations that students will enter the program knowing what to do.

Organic development of relationships

Faculty mentors who develop strong mentoring relationships are not necessarily trained on how to be good mentors; thus, there is an organic development of the relationship. Often, faculty members learn how to mentor students by reflecting on their own experiences when they were students.

I think mentoring, for me, was based upon my own experience as a graduate student and the person who became my doctoral thesis advisor ... was in many respects like an older brother. Between an uncle and an older brother, but closer to an older brother in the relationship. Providing guidance and navigating the research. Also, we developed a very, very close relationship. We spent a lot of time playing music together and doing things other than science. Mentoring, for me, was like a family relationship.

Whether or not there is an intentionality in fostering the relationship, part of the success comes from experiences that happen outside the classroom,

strengthening the relationship as the understanding of one another develops. One of the student participants said it best ‘[t]hese little projects and internships and classes and different trips that we’ve taken during those times, these summer time experiences, has really solidified some of those relationships [with professors]’.

Faculty and students commented on the importance of developing relationships that go beyond the typical mentor–student relationship. A faculty participant remarked,

The only way you are ever going to get to know that student deeper to a more personal level, to understand more how they were brought up and what sort of challenges and opportunities and skills are presented with them, it just means seeing them every day. Even if it’s just bumping into them while you drink coffee. This idea that they are in another building and then you, twice a semester, have a formal meeting [where] they come and present what they’re doing ... to me is not a way for graduate school to operate.

Faculty and students mentioned how some faculty are aware of Indigenous culture and the lived realities of contemporary Indigenous communities through the relationships they co-create with their students, while others are not aware. Creating safe space for that conversation and self-reflection are needed. A student said,

... do you really know what it is like to talk to somebody who had it really rough and saw stuff around them that most people don’t need or want to see? And realize that that is who you might be dealing with, but that is not everyone? I think that by opening that door a little bit and having that person [faculty mentor] know what some of those challenges might be ... [would be good].

The main theme in these excerpts is that personal connections are needed in the relationship between faculty members and Indigenous students, beyond the academic connection, to foster a good relationship during the Indigenous student’s educational journey. Accomplishing this through mass training does not necessarily build these kinds of connections, and in fact, may lead to cultural commodification (Grande, 2015; Griest & Kranitz, 2016). One faculty member explains,

I think most faculty want to, when I’ve seen them want to engage [with Indigenous students], what they really want is more cultural tourism which is very superficial, and it doesn’t get to the underlying assumptions. [Y]ou really have to look at yourself, and how you interact with the world, and how you see the world, and not be so focused on ‘how do I change these Indian students into scientists’. Tribal input is there through your tribal students. I think when you bring tribal people in, it’s not a bad thing, but you can’t just bring them in and say, ‘okay, here’s the elder and they’re going to talk’...

The various barriers to relationality that exist between mentors and students in STEM disciplines prevent the organic development of relationships that have been reported as essential for good mentoring. A student said,

It's probably like the status quo, but it's kind of an uncomfortable feeling, because there's your advisor and then four other [faculty committee] members, if you're a Ph. D. student. It's very research-related, there's really no kind of a friendship level, so it's just like strictly professional. You give them a presentation and it's all science professional level, they don't ask you any outside issues like, 'Is everything going okay?'

Students reflected on their experiences of choosing committee chairs who were a bad fit, even though there was respect for the chairs' scholarship, the relationship did not meet the students' needs to be seen as a whole person. A student explained,

... just being aware of the culture and my upbringing, and my history, that sort of thing. Everyone comes [from] different backgrounds, like mine wasn't really, I would say, normal. It's different, so it might help them understand more of the graduate students [who are] working for them, ... giv[e] them a better idea. You're going to be working in that lab for five years or something like that, I mean that couldn't hurt.

Indigenous worldviews

Participants shared how Indigenous perspectives impact the educational setting and how including Indigenous worldviews at the institution impact how students learn. A student said, 'I'm a Native person, academics don't necessarily come first ... and then [I'll] think about having children once I'm in my career.' This statement was interpreted to mean that the participant would think about family first and academics second, thus reflecting the importance of family relationships and responsibilities within their community context. Students described being confronted with a crisis of relevance that was connected to the lack of meaningful learning grounded in Indigenous perspectives, as a student noted, '...when you feel like your research doesn't have any kind of impact, a direct impact on tribal communities...' Students and faculty relayed how Indigenous worldviews impact science and research, and the concept of bicultural accountability; with a faculty member explaining,

These are tribes that are half impoverished and yet, they value their natural landscape and their natural culture more than money. I've seen that over and over, and that is an impressive ethical stance that you don't see all that often in our [main stream] culture.

An AI/AN faculty participant described it best as,

I think students need to know both ways of doing research. In fact, ..., one of my elders, calls it two-eyed seeing. [on incorporating Indigenous Research Methodologies]... A student said to me one time, 'I really hated research. I didn't like to do it the western way and now I love it so much. I really like to do research.'

Participants described what AI/AN students experience attending an academic institution located a great distance from their home communities. One of the staff interviewed said '...the most successful students will find balance [in academe] where they're not completely ignoring home community issues;'

while one student expressed that missing community and ceremonies was difficult, and that the connection to his/her community and indigenous worldview through family provided a much-needed support 'My family was a big part of [my] support system. My mother moved with me here [at the city the university is located at].'

The role of the family in AI/AN students' lives was also acknowledged. Often, a family is at the forefront when students make choices about their educational career. A student said, 'It's always been about how can I use my education to enhance my family life and to make my life the way I want it to be, which has always included my family.' Faculty and staff interviewed talked about the importance of reaching out to AI/AN students, their families, and trust of the academic institution or faculty member. As one faculty member remarked, '... an Indigenous student's parents came to me when they learned that their child might be working with me, and then asked me to look out for him.'

Suggestions for indigenous mentoring activities

Participants were asked about ways institutions could increase/improve Indigenous mentoring activities for AI/AN students, and these suggestions were categorized (Table 2).

Several participants reported that organizing informal gatherings that are family friendly would be helpful for building relationships. One professional staff interviewed shared,

I think maybe smaller things like a day at [local park near one of the campuses]. I know that this university has a lot of non-traditional AI/AN students who are married and have kids, it could be more of like a family thing. I also think that's a connection that a lot of people can have with their adviser. A lot of people have kids, and they can talk about that.

In addition, participants requested mentoring and relationship building activities that are not expensive. A student noted, 'People always love free food. We [AI/AN students] always love free food. We're all poor here'. The suggestions made highlighted that these events would be for the whole family, 'relationship outside of the institution has been effective, and that has been something that fostered trust and strengthened our [mentor/mentee] relationship'. Suggestions of

Table 2. Suggestions for mentoring activities for AI/AN students.

Suggested activity	#coded excerpts
Faculty Training	12
Building Relationships and Co-constructing Community	20
Peer Mentoring	34
Organized Events	29
Handbooks/Handouts	11
Cultural Humility	61

handouts, manuals, video resources, articles, and websites available to faculty mentors spoke to the academic identity of faculty participants,

I would expect that there's a mentoring literature and multiple types of programs that have been used in a variety of settings . . . and to tap those informational resources as much as possible to see what looks like might fit or might not fit, in terms of the local perspective, would be what else one needs to know.

However, the sub-theme that highlighted the unique needs of AI/AN graduate students in STEM was cultural humility, described in more detail below.

Cultural humility

Participants responses show that cultural awareness and self-awareness should be key components in the IMP for faculty. A faculty member confessed, 'I've been surprised over the years [of] some of the nuances of their tribal culture that then influences how they perceive academia that I would never thought of on my own.'

A staff person noted,

. . .it would be handy for the faculty to go through some sort of preliminary sensitivity training or at least acknowledging the difference . . . I think a lot of them [faculty] would say there's the Natives and then there's the non-Natives whereas [we] hav[e] seven different reservation systems, and 11 to 12 different tribes within those reservation systems. There is uniqueness to all of those, drastically different stories and emotions and languages and cultures as a result of that. Appreciating those differences and the thinking that all of those tribes have, that's a great first step for all faculty members.

Further, '[I]arge group trainings . . . don't seem effective' whereas 'to actually talk to people is way, way more interesting.' One faculty participant acknowledged an important reality, '...that when I maybe will have one native student a year, [I] am not really going to experience much impact from that because that might be one out of twenty [students].'

Several student participants remarked on the issue of a death in the family and a professional staff explained how 'a wake, it's going to be three to four days and they're going to be traveling [large distances] back to their homes' and some faculty understands that, while others do not. Overall, participants agreed that 'nuances of their tribal culture that then influences how they perceive academia' might not be evident at the beginning of the relationship, and developing cultural awareness is 'really helpful for the person in charge of mentoring the Native American student.' One of the interviewed faculty remarked that by 'at least being cognizant [of cultural differences] is the first step, then being sensitive to it is the next step, and accepting of it or accommodating to it would be the third step.'

Discussion

As stated previously, we engaged AI/AN graduate students, and faculty and professional staff who work with them, in conversations to understand key components necessary to construct an IMP for faculty who mentor AI/AN graduate students in STEM. The IMP components uncovered by those conversations relate to the academic environment, relationality, Indigenous worldviews, and suggestions for mentoring activities.

The holistic development of mentoring relationships

The data indicated that at the intersection of AI/AN student experiences and non-Native institutional practice, there is often a disconnect between a need for genuine relationship building and the reality of superficial relationships relegated to the task at hand (i.e. an academic relationship only). This can be mitigated by the conscious development of relationships that view the human experience more holistically, particularly when Indigenous peoples are on the research team as in the cases of community-based participatory research and school psychology (Kratochwill, McDonald, Levin, Bear-Tibbetts, & Demaray, 2004; Wallerstein & Duran, 2006). Most of our participants were very aware of the positive aspects of organic relationship development and the negative aspects of forced relationships that were seen as superficial. The results indicate that it is important to encourage faculty to know AI/AN student on a more personal level. This can often happen through summer research opportunities that are hosted by college campuses for undergraduate students and become pathways to research careers (Jones, Barlow, & Villarejo, 2010; Lopatto, 2004, 2007), and informal gatherings between faculty and students during the academic year.

The data also reflected the gradual improvement of relationships that can lead to academic success. This is supported by Liddell, et al., who shared that developing mentoring relationships with faculty can encourage high expectations and an obligation to the professional roles that await students (2014). This holistic approach to the mentor/student relationship creates opportunities for faculty that relate to the benefits of diversity. The focus on mentoring AI/AN students necessitates the consideration of Indigenous worldviews by faculty that is beyond being open to learning about the students' home communities; it leads to a call for faculty to visit the home communities of the Indigenous students they mentor, to see success to include AI/AN definitions of success in opposition to success as defined from a western, non-Indigenous paradigm.

In order to comprehend this, faculty may need to move beyond cultural competence, and into an understanding of cultural humility (Hook, Davis, Owen, Worthington, & Utsey, 2013; Juarez et al., 2006; Tervalon & Murray-

Garcia, 1998). The idea of cultural humility considers mentors moving beyond an ethnocentric perspective to an ethnorelative perspective (Hernandez & Marshall, 2010; Pedersen, 2009). Therefore, the concept of cultural humility as a foundational part of developing the IMP is based on the prevalence of references to cultural awareness and self-awareness in the results. In the Medical and Health related fields, cultural humility is defined as:

... a process that requires humility as individuals continually engage in self-reflection and self-critique as lifelong learners and reflective practitioners, it requires humility in how physicians bring into check the power imbalances that exist in the dynamics of physician-patient communication by using patient-focused interviewing and care, and it is a process that requires humility to develop and maintain mutually respectful and dynamic partnerships with communities. (Juarez et al., 2006, p. 97)

Thus, the IMP for faculty proposed that the mentoring relationship should be grounded in cultural humility as an ongoing process that allows faculty mentors to respect and acknowledge the Indigenous identity of AI/AN students and actively work to honor them as keepers of unique knowledge in opposition to assimilating them into non-Indigenous paradigms.

A relational and inclusive paradigm

Participants in our study agreed that if mentors could see students' interactions with their family and the relationship between mentor/student moves beyond the academic arena, students might become more comfortable with their mentors in a way that helps students persist. Although mentors may understand different perspectives, they are likely grounded in non-Indigenous ways of knowing, being, and doing. Therefore, the IMP would foster understanding of indigenous research methodologies that can help mentors address the needs of AI/AN students who want to serve their communities. These findings concurred with Sanyal, Ward, and Becerra (2016), who stated,

AI/NA students, this process of "mentoring" can be culturally and historically understood as a process that is complex and inclusive of their cultural backgrounds. For example, this might include students sharing relevant customs, skills, spiritual practices, and languages so that faculty mentors can understand how they are embedded in a larger cultural framework of family, community, and elders (p. 25).

Our results indicated that all participants support the need for a connection beyond that of merely passing through the academy. AI/AN students are sharing that they seek relationships, want their families to be involved, and that they often are struggling financially. These aspects of the AI/AN graduate students in STEM experience can be mitigated through listening to their call for informal activities that bring people together over food.

The conversations highlighted that AI/ANs are often underfunded when compared to non-AI/AN students. This is supported by US American

Community Survey data (2010), the median income of American Indian and Alaska Native households was \$35,062, compared to \$50,046 for the nation as a whole. Furthermore, 28.4% percent of American Indians and Alaska Natives were in poverty in 2010. For the nation as a whole, the corresponding rate was 15.3% Bureau, U. C., (n.d.). The authors understand that the IMP would not be able to address such disparities; however, the mentoring program could provide information about the struggles and the services that are available to students that can mitigate such reality, because financial limitations are keeping AI/AN graduate students in STEM from participating fully in their academic socialization.

In summary, the respondents identified key components for an IMP for faculty that could be further developed and implemented, as well as activities that faculty and AI/AN students could participate in to increase recruitment, retention, and graduation of AI/AN graduate students in STEM. An IMP for faculty who mentor AI/AN graduate students in STEM could provide faculty with knowledge on indigenous worldviews, cultural humility, expanded understanding of mentoring in the academic setting and beyond, a working knowledge of resources that can support AI/AN graduate students in STEM fields, the role of both formal and informal support systems, and the infusion of Indigenous culture into STEM fields would be ideal. Such a program is congruent with our conceptual framework. A consideration of variability among students regarding indigenous identity location, connection to place, mentor commitment, and institutional type, could improve AI/AN graduate student success in STEM fields.

Conclusion

Developing a culturally attuned mentoring program for faculty who are mentoring, or who are interested in mentoring, AI/AN graduate students in the STEM fields is supported in the realm of graduate education (Finch & Fernández, 2014; Kendricks et al., 2013) and in the lived realities of Indigenous peoples (Goforth, Brown, Machek, & Swaney, 2016; Thompson, Johnson-Jennings, & Nitzarim, 2013). Based on the results of our study, we propose a nine-module IMP, offered once a month for 90 min during the academic year, that provides faculty mentors with knowledge and skills to successfully develop relationships with AI/AN graduate students in STEM, while considering the students' lived realities as contemporary Indigenous people, their unique communities experience with regard to research, and the co-construction of a supportive community (Table 3).

Indeed, the IMP for faculty is focused on an important component of relationship development that is bi-directionality where faculty and students are learning from one another, and where the student is not the only one in the relationship that needs to change. In an effort to mitigate potential barriers

Table 3. Indigenous mentoring program: modules and the related themes from the data.

Module	Themes			
	Acad. Env.	Relat.	I.Wordviews	Sug.
1. Introduction to Indigenous mentoring models		X	X	
2. Indigenous Research Methodologies			X	
3. Familiarity with AI/AN student services	X	X		X
4. Faculty visiting home communities		X	X	X
5. Interface with prospective STEM students		X		
6. Informal gatherings for STEM faculty & AI/AN students	X	X		X
7. Training on cultural humility		X	X	
8. Presentation of research to community leaders			X	X
9. Access to literature on mentoring AI/AN students	X			

Acad. Env. refers to Academic Environment & sub-theme Resources/Support; Relat. refers to Relationality & sub-theme Organic development of relationships; I. Worldviews refers to Indigenous worldviews; and Sug. refers to Suggestions for mentoring activities & sub-theme cultural humility.

to success, expectations need to be made clear to students and presented in a way that maintains a good working relationship. Successfully mentoring AI/AN graduate students in STEM is a balance of genuine personal relationship that is infused with clear expectations. In order for this to transpire, we advocate for the mentors to learn about indigenous methodologies in research and consider indigenous worldviews but exhibit cultural humility. In addition, both students and faculty would benefit from understanding the support systems available including, but not limited to, student services, financial resources and professional socialization for AI/AN graduate students in STEM.

Indigenous Mentoring Program modules

Module 1: Introduction to Indigenous Mentoring Models. The main objective of this module is to introduce and provide specific examples of Indigenous mentoring models and offer knowledge helpful in working with AI/ANs.

Module 2: Indigenous Research Methodologies. The main objective of this module is to introduce Indigenous Research Methodologies (IRMs), and how researchers can work with and within Indigenous communities in a culturally responsive way.

Module 3: Familiarity with AI/AN Student Services. The main objective of this module is for faculty to gain familiarity with student services for AI/AN on their campus.

Module 4: Faculty Visiting Home Communities. The main objective of this module is to provide mentors with a greater understanding of AI/AN lived realities.

Module 5: Interface With Prospective STEM Students. The main objective of this module is to provide mentors with information on recruitment.

Module 6: Informal Gatherings for STEM Faculty and AI/AN Students. The main objective of this module is to provide mentors with insight on venues/activities for building and strengthening relationships with their AI/AN students.

Module 7: Training on Cultural Humility. The main objective of this module is to explore the differences and similarities of cultural competency and cultural humility.

Module 8: Presentation of Research to Community Leaders. The main objective of this module is to highlight the need to bring research results back to Indigenous communities in a way that is beneficial to the community.

Module 9: Access to Literature on Mentoring AI/AN Students. The main objective of this module is to provide research-based resources to mentors.

These modules answer our research question: When AI/AN students and those that contribute to their success (e.g. faculty, professional staff, and administrators) help us construct a mentoring program for AI/AN graduate students in STEM disciplines, what key components are identified? As seen in [Table 3](#) below, the sub-theme *Resources/Support*, under Academic Environment, helped inform the content for modules 3, 6, and 9 where participants would understand services and resource for mentoring students, and the research and other tools to help them expand their skills in mentoring AI/AN students in order to create an inclusive academic environment. The theme *Relationality* is addressed in modules 1, 3, 4, 5, and 6, where faculty are exposed to ways of developing relationships with current and future students.

The theme *Indigenous worldviews* were essential for understanding and creating modules 1, 2, 4, 7, and 8; these modules are the foundation of the IMP as they allow for faculty to engage in learning about the specific needs of the students they mentor, their lived realities, and how to best facilitate success. The theme *Suggestions for activities* painted a broader picture of what faculty, students, and staff reported that could be used to improve mentoring for AI/AN STEM students, and directly informed modules 3 and 6, while the sub-theme *Cultural humility* is used in modules 4, 7, and 8 for developing cultural awareness and self-awareness to mentors.

These nine modules developed through this study, provide a culturally congruent faculty development program that prepares faculty to: (a) socialize and provide pathways into the STEM fields for Indigenous students and (b) become mentors who are more attuned to their unique needs. AI/AN students, who are future researchers, would then have an opportunity to contribute to the body of research in a responsible way with their Indigenous identities intact or even strengthened.

Future directions

Our next step is to implement the IMP for faculty described above and examine the feasibility of implementing the program, identify what needs 'fine-tuning', and what can be scalable to other institutional contexts. A pilot study that includes evaluation with commendations and recommendations of the IMP is the natural progression of this research and will provide us with *on-the-ground* information and understanding to fit the multiple variables

including unique institutional types, various fields of study, and differing communities served. Additionally, in the spirit of Indigenous redistribution (Harris & Wasilewski, 2004) we view this future study as being created for other institutions and their STEM faculty to implement their own program.

Disclosure statement

No potential conflict of interest was reported by the authors.

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