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Assessing the Impact of an Indigenous Mentoring Program on Faculty to Support American Indian/ Alaska Native Graduate Students in STEM

Blakely Brown, Sweeney Windchief, Barbara Komlos, and Raquel Arouca

Effective mentoring of American Indian/Alaska Native (AI/AN) students in STEM can make a difference in degree completion. The researchers designed and implemented a program to prepare faculty for mentoring AI/AN students in STEM, which then allowed the study to take place. Process measures (e.g., participation and program satisfaction measures) and faculty self-reported knowledge of mentoring practices, and attitudes and intentions to change mentoring practices that can shape AI/AN students' connections with STEM research, were assessed. Four institutions implemented the nine-module Indigenous Mentoring Program (IMP). Thirty-four faculty enrolled in the program with 38% to 44% of these faculty completing all nine modules. Participant satisfaction with the IMP was moderate. Faculty self-reported knowledge of practices that help AI/AN students complete their degrees showed favorable improvement indicating that the IMP may enhance the academic achievement of AI/AN students in STEM.

POSITIVE MENTORING RELATIONSHIPS have been shown to increase the success and retention of underrepresented minority (URM) college students (Brown, Davis, & McClendon, 2010; Chan, 2008; Ortiz-Walters & Gilson, 2005; Thomas, Willis, & Davis, 2007). However, faculty do not always have the competencies nor training required to effectively mentor URM students (Johnson & Huwe, 2002). That faculty may not always have these competencies is important to consider given the potential impact of deficiencies in the mentorship experience for URM students (Thomas et al., 2007).

Though many studies consider mentoring for URMs (Campbell & Campbell, 2007; Davis, 2008; Kendricks, Nedunuri, & Arment, 2013), very few consider the American Indian/Alaska Native (AI/AN) demographic (Guillory, 2009; Manson, Goins, & Buchwald, 2006; Shotton, Oosahwe, & Cintron, 2007) and none focus specifically on AI/AN graduate students in Science, Technology, Engineering and Mathematics (STEM) fields. The opportunity to retain AI/AN graduate students in STEM is critical in developing future members of the professoriate and increasing diversity in STEM fields and academe. Thus, we developed an Indigenous Mentoring Program (IMP) for faculty who currently mentor, or who are interested in mentoring AI/AN graduate students in STEM. The development of the IMP is reported in more detail elsewhere (Windchief, Arouca, & Brown, 2018; Windchief & Brown, 2017) and briefly described here.

To develop the IMP, we conducted interviews with Native and non-Native college administrators, staff, and faculty who worked with AI/AN students enrolled in, or interested in pursuing, degree programs in STEM; AI/AN students in STEM; and AI/AN alumni of degree programs in STEM. The purpose of these interviews was to acquire meaningful feedback to inform mentoring practices that could increase the number of AI/ANs completing graduate degrees in STEM. A thematic analysis of the interview data found common themes for the academic environment, relationality, Indigenous worldviews, and suggestions for mentoring activities. Sub-themes included the organic development of relationships, cultural humility and Indigenous worldviews activities, and resources/support. Permeating these themes and sub-themes were general attitudes about AI/AN graduate student experiences and factors that either stimulated or hindered success. Based on these data, we developed the learning modules for the IMP. The purpose of the current study was to implement and assess the impact of the

IMP on faculty self-reported knowledge of practices that support AI/AN graduate students' connections to STEM research and degree completion.

Description of the Indigenous Mentoring Program

The IMP contains nine modules that develop faculty mentorship skills and knowledge about academic and indigenous practices that help AI/AN graduate students in STEM successfully complete their degrees. These modules are briefly described here.

- Module 1: Introduction to Indigenous Mentoring Models, provides participants with descriptions of Indigenous mentoring models and systems that use varying formats that are place-based, considerate of mentor positionality, influenced by institutional setting, and attentive to student identity location (Sorcinelli & Yun, 2010; van Emmerik, 2004; Windchief & Brown, 2017).
- Module 2: Indigenous Research Methodologies (IRM), introduces how research can contribute to Indigenous communities and explores the relationship between Indigenous students' motives/work in graduate school and in contributing to tribal communities. Indigenous research methodologies can enable research to be carried out in respectful, ethical ways, which are useful and beneficial to Indigenous peoples and communities. For example, IRM can enable reclamation of cultural or traditional heritage; a decolonization of the captive and colonized mind and thought; protection against further colonization, exploitation, and appropriation of Indigenous knowledge; and a validation of Indigenous practices and worldviews (Chilisa, 2012).
- Module 3: Familiarity with AI/AN Student Services, provides an overview of campus and community-specific services for AIAN students as well as cultural awareness activities for faculty, administrators and staff.
- Module 4: Faculty Visiting Home Communities, provides knowledge about the importance of the Native community in the students' lives and as a support system and how one would go about visiting a tribal community. This information is useful for faculty interested in conducting a successful visit in the future. AI/AN students and mentors who had previously visited the students' home community shared stories about their visit during this module.
- Module 5: Interface with Prospective Students, engages mentors in dialogue about campus-specific recruiting practices, explores factors that influence students' choice of program, and shares external venues for recruitment.
- Module 6: Informal Gatherings with Faculty and AI/AN students in STEM fields, addresses the need for not only formalized western socialization in graduate programs but socialization that occurs with the mentee and their families and communities. This module provides insight on campus and community-specific venues/activities for building and strengthening relationships with the mentee.
- Module 7: Cultural Humility, explores Indigenous worldviews through de-centering the narrative from a faculty member's checklist on how to work with URMs and self-reflection that helps faculty understand their own cultural identity. During this module, faculty engage in story work to hear and share stories about cultural humility and learn the difference between cultural competence and cultural humility.
- Module 8: Presentation of Research to Community, translates the idea of cultural humility and Indigenous worldviews from the academic environment into AI/AN communities, by connecting the research (either the mentor's or the mentee's) to a particular community, and making it accessible to non-academic audience.
- Module 9: Literature on Mentoring AI/AN Students, provides a resource library for the module topics that includes traditional western science and traditional ecological knowledge journal articles.

Methods

Implementing and Assessing the Feasibility of the IMP

Faculty from three Predominantly White Insti-

tutions (PWIs) and one Tribal College University (TCU) located 60 to 200 miles from one another were recruited to participate in the IMP study. The primary recruitment mode was to identify faculty who were working with or interested in working with AI/AN students in STEM. Graduate Deans also helped recruit STEM faculty. The study was approved by Institutional Review Boards at The University of Montana and Salish Kootenai College.

Delivering the IMP

The IMP was designed to coincide with a nine-month academic year calendar. Seven synchronous IMP sessions (e.g., physical, distant, and co-located faculty presence at the sessions) were conducted across the four sites using video conferencing. We developed a web-based learning management system to host additional resources and information that was shared across the four sites. Two of the four institutions used the same online learning management system for asynchronous student learning. The learning management system contained materials relevant to each of the modules, including additional readings, online resources and video recordings of the in-person sessions (modules one through seven) for participants to access if they missed a session. Two of the nine modules (Module 8 and 9) were delivered solely through the online learning system. A key feature of the IMP was that faculty were asked to complete activities associated with each module before being permitted to proceed to the next module. Participants were also asked to complete a survey that assessed learning objectives associated with each module. Interactive questions were also posted in the learning system to generate faculty discussion of the various topics and foster greater cross-institutional dialogue.

During the study, project team members (n=7) met weekly to discuss relevant content and activities for each module. For some modules, a person(s) from the project team or institution served as presenter(s). Non-project team experts also contributed content to various sessions. Each site had a coordinator who planned each session (rooms, catering, audio and video equipment, panelists), and communicated with their institution's participants. One coordinator was in charge of maintaining and trouble-shooting issues with the online platform, uploading module materials and recordings. Participants who completed all nine modules received a certificate of participation at the end of the program.

Measures: IMP Process; Demographics and STEM Discipline; Knowledge and Attitudes

Process measures: Project coordinators tracked participant attendance at their respective institution. At the end of each IMP module, participants rated their satisfaction regarding the presentation and relevance of the module on a Likert scale ranging from 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent). Participants rated their satisfaction for each module on these five items: 1) the presenter's ability to communicate information about the module topic, 2) the relevance of the module presentation/information as it related to success in the faculty members' current position, 3) the relevance of the module presentation/information as it related to success of students in the faculty members' lab, 4) the quality of the module in terms of providing ideas/resources that the faculty member would use in their lab, and 5) the quality of the module in terms of knowledge and skills acquired overall. Participants also responded to an open-ended question at the end of the survey that asked for other feedback about the module.

Demographic and STEM discipline measures: At the end of each module, participants completed a five-item demographic and STEM discipline questionnaire reporting ages, sex, ethnicity, race, and their specific STEM field.

Knowledge and Attitude/Intentions measures: Participants completed a three to six item self-administered, retrospective survey at the end of each module. Survey questions were designed by the project team to assess self-reported faculty change in pre- and post-test knowledge about the specific module topic as well as attitudes and intentions to incorporate knowledge, activity or resource of a particular module into their lab and/or mentoring practices. Participants rated their pre- and posttest knowledge and attitude/intentions regarding the module on a Likert scale ranging from 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent). We chose the retrospective pre-and posttest survey methodology to reduce the amount of time faculty needed to complete the survey (e.g., faculty had to access the online survey site one time each module to complete the assessment).

Statistical Analysis

Data from all participants were included in the analysis regardless of the amount of participation in the program. To describe program process measures, recruitment and retention rates in IMP are reported as percentages and participant satisfaction regarding the presentation and relevance of each module are described using mean and standard deviations. Participant demographic and STEM discipline characteristics are described using mean and standard deviations. Change in pre- to post-test knowledge of practices and attitudes/intentions that help AI/AN students successfully complete their degrees are described using mean scores and standard deviations. A higher mean score at posttest means faculty self-assessment of knowledge increased from pretest to posttest, while a lower mean score at posttest means faculty self-assessment of knowledge decreased from pretest to posttest. We conducted a paired *t* test to detect changes in pretest (before the module) and posttest (at the end of the module) in knowledge scores. A positive change in mean score indicates faculty self-assessment of knowledge increased from pretest to posttest, while a negative change in mean score indicates faculty self-assessment of knowledge decreased from pretest to posttest. Due to small sample size, statistical significance tests were not conducted. Analyses were performed in SPSS 22 (SPSS Inc., Chicago, IL).

Results

Forty-six faculty in STEM fields at four institutions were recruited to participate in the IMP study. Of these participants, 74% (n=34) enrolled in the IMP. Of the participants who enrolled, 79% (n=27) completed the first module. Thirty-eight to 44% of participants (n=13 to15) who initially enrolled completed the remaining eight modules with most being the same individuals. At Module 2, (n=14), 43% (n=6) of the participants were female. The mean age of participants was 43 years old, with an age range between 30 and 58 years old. Eighty-six percent of the participants were White (n=12), 7 % (n=1) were AI/AN, and 7% (n=1) were Asian. Nearly all participants (n=13) reported being non-Hispanic or Latino. Sixty-four percent (n=9) were faculty in science; 14% (n=2) were faculty in engineering; 14% (n=2) were faculty in math, and 7% (n=1) were faculty in other non-STEM-related fields such as social work.

Participants reported moderate satisfaction for the presenter's ability to communicate information about the module topics (mean rating of 3.6, on a 1-5 scale). Participants reported similar satisfaction for 1) the relevance of the modules as they related to success in their current position (mean rating of 3.5, on a 1-5 scale), 2) the relevance of the modules as they related to the success of students in their lab (mean rating of 3.6, on a 1-5 scale), 3) the quality of the modules in terms of providing ideas/resources that they would use when going back to the lab (mean rating of 3.5, on a 1-5 scale), and 4) the quality of the modules in terms of knowledge and skills acquired overall (mean rating of 3.5, on a 1-5 scale). Illustrative faculty comments noted the program had "quality presentations and relevant material," and "the experience of meeting others interested in mentoring AI/AN students was helpful," and "<was> thankful for the opportunity to learn and <make> connections to other interested mentors."

Table 1 shows the pretest, posttest, and change scores corresponding to each module assessing self-reported knowledge of academic and indigenous practices that help AI/AN graduate students successfully complete their degrees.

Discussion

Given the dearth of URM faculty in STEM, particularly AI/AN faculty, most URM graduate students will likely be mentored by someone who is racially and/or culturally different from them (Chrobot-Mason & Thomas, 2002). For an AI/AN student, having a non-AI/AN mentor is not problematic in and of itself. However, having a non-AI/AN mentor who experiences diversity-based anxiety, lacks cultural humility and competence, and whose own racial identity has not yet been developed and/or is culturally insecure can create dysfunctional relationships and negative career outcomes for AI/AN students (Thomas et al., 2007).

To our knowledge, no other studies reported in the literature have implemented and assessed a program to develop effective mentorship skills for faculty who mentor AI/AN graduate students in STEM. However, there are studies highlighting mentorship programs with demonstrated positive impacts on academic performance and faculty perceptions of

Table 1. Survey Results for the 9 Modules

Module 1: Introduction to Indigenous Mentoring Models (n=27)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about Indigenous Mentoring Models.	2.11 ± 0.84	3.78 ± 0.64	1.68 ± 1.11
I had (have) adequate information about ways to incorporate Indigenous mentoring approaches into my lab.	2.16 ± 0.80	3.88 ± 0.68	1.72 ± 1.02
I had (have) adequate information about strategies that increase the likelihood that AI/AN students will fit well into my lab.	2.41 ± 0.97	3.67 ± 0.78	1.26 ± 1.06
I was (am) committed to learning about what helps AI/AN students persist in STEM graduate programs.	4.04 ± 0.98	4.48 ± 0.70	0.44 ± 0.75
I was (am) committed to thinking about ways to provide a sense of community for AI/AN students in STEM graduate programs.	3.70 ± 1.10	4.59 ± 0.50	0. 90 ± 1.05
I was (am) committed to incorporating Indigenous mentoring activities into my lab.	3.63 ± 1.04	4.44 ± 0.57	0.82 ± 0.92

*n=number of survey respondents
‡ () indicates the word used in the posttest survey question
^ mean rating ± standard deviation on a 1 to 5 scale; 1=strongly disagree; 2=disagree; 3=both agree and disagree; 4=agree; 5=strongly agree
Δ Pre/Posttest indicates mean change ± standard deviation between pre- and post-test scores

Module 2: Indigenous Research Methodologies (n=14)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about Indigenous Research Methodologies (IRMs).	2.21 ± 1.05	3.57 ± 0.51	1.36 ± 0.84
I had (have) adequate information about ways to incorporate IRM approaches into my lab.	2.38 ± 1.04	3.62 ± 0.76	1.23 ± 1.01
I had (have) adequate information about strategies that increase the likelihood that AI/AN students will fit well into my lab.	2.43 ± 0.94	3.71 ± 0.61	1.29 ± 0.83
I was (am) committed to thinking about ways to incorporate IRMs for AI/AN students in STEM graduate programs.	3.36 ± 1.15	4.36 ± 0.63	1.00 ± 1.11
I was (am) committed to incorporating IRMs into my lab.	4.00 ± 0.96	4.36 ± 0.75	0.36 ± 0.93

Module 3: Familiarity with AI/AN student services (n=13)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about American Indian student services on my campus.	2.31 ± 1.11	3.92 ± 0.64	1.62 ± 1.19
I had (have) adequate information about services I can refer my students to when necessary.	2.38 ± 1.26	3.85 ± 0.69	1.46 ± 1.33
I had (have) adequate information about who to talk to when looking for information about American Indian student services.	2.54 ± 1.13	4.08 ± 0.64	1.54 ± 1.13
I was (am) committed to thinking about ways to incorporate knowledge of American Indian student services to my mentoring of AI/AN students in STEM graduate programs.	3.31 ± 1.25	4.31 ± 0.63	1.00 ± 0.91

Module 4: Faculty visiting home communities (n=15)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about the importance of visiting home communities.	2.13 ± 1.06	4.33 ± 0.49	**Pre/Posttest**
I had (have) adequate information about American Indian students lived realities.	2.40 ± 0.83	4.00 ± 0.54	1.60 ± 0.74
I had (will have) conversations about visiting home communities with my current/future AI/AN student.	2.67 ± 0.98	4.20 ± 0.68	1.53 ± 1.30
I had (have) adequate information about developing relationships with individuals in AN/AN home communities as it pertains to research.	2.40 ± 1.12	3.73 ± 0.70	1.33 ± 1.35
I was (am) committed to thinking about ways to engage native communities to my mentoring of AI/AN students in STEM graduate programs.	3.07 ± 1.53	4.33 ± 0.62	1.27 ± 1.33

Module 5: Interface with prospective STEM student (n=14)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about the importance of developing relationships early with prospective students.	3.00 ± 1.18	4.14 ± 0.78	1.14 ± 1.17
I had (have) adequate information about the relationship between REU opportunities and recruitment.	2.36 ± 0.84	3.93 ± 0.73	1.57 ± 0.94
I had (have) a better understanding about how my institution recruits AI/AN students.	2.50 ± 1.01	3.71 ± 0.61	1.21 ± 1.05
I had (have) adequate information to inform my recruitment practices in a culturally appropriate way.	2.29 ± 0.83	3.93 ± 0.80	1.64 ± 1.01
I was (am) committed to thinking about ways to engage tribal colleges/high schools in a long-term recruitment relationship.	2.93 ± 1.07	4.14 ± 0.86	1.21 ± 1.05

Module 6: Informal gatherings STEM faculty and AI/AN students (n=14)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about different activities existent on my campus to help foster a sense of community with and for <AI/AN> students.	2.43 ± 0.94	4.14 ± 0.54	1.71 ± 1.07
I had (have) a better understanding about Pow Wows.	2.43 ± 0.85	4.00 ± 0.68	1.57 ± 1.09
I had (have) adequate information to inform my current/future strategies in a culturally appropriate way.	2.46 ± 0.78	4.20 ± 0.60	1.69 ± 0.80
I was (am) committed to thinking about ways to engage with <AI/AN> students in formal or informal gatherings to create a supportive environment for my students.	3.43 ± 1.02	4.21 ± 0.58	0.79 ± 0.70

Module 7: Yearly training on cultural humility (n=13)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about cultural competency.	2.38 ± 0.77	3.92 ± 0.28	1.54 ± 0.88
I had (have) adequate information about cultural humility.	2.17 ± 0.93	4.00 ± 0.43	1.83 ± 0.94
I had (have) adequate information about ways to incorporate cultural humility in my mentoring style.	2.31 ± 1.11	4.08 ± 0.50	1.77 ± 1.01
I was (am) committed to thinking about ways cultural humility can help in mentoring AI/AN STEM graduate students.	2.77 ± 0.93	4.15 ± 0.56	1.39 ± 0.87

Module 8: Presentation of research to community leaders (n=15)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about presenting research to community leaders.	2.13 ± 0.74	3.67 ± 0.49	1.53 ± 0.64
I was (am) committed to thinking about ways to present research to people living in AI/AN communities.	2.73 ± 1.03	4.07 ± 0.80	1.33 ± 0.90
I was (am) committed to developing a personalized list of the ways my work can be applied to, and adapted for, AI/AN communities.	2.80 ± 1.01	3.93 ± 0.80	1.13 ± 0.74
I was (am) committed to helping AI/AN STEM graduate students adapt their research to support their communities' needs.	3.33 ± 0.82	4.27 ± 0.70	0.93 ± 0.80

Module 9: Access to literature on mentoring AI/AN students (n=13)*

Survey Item‡	Pretest^	Posttest^	Δ Pre/Posttest
I had (have) adequate information about literature on mentoring AI/AN students.	2.00 ± 0.63	3.73 ± 0.79	1.73 ± 0.91
I was (am) committed to understanding challenges and advantages of mentoring AI/AN students.	3.00 ± 1.10	4.36 ± 0.67	1.36 ± 1.21
I was (am) committed to understanding conceptual models for mentoring current/future AI/AN STEM graduate students.	3.00 ± 1.10	4.27 ± 0.65	1.27 ± 1.10

mentor/mentee relationships at Historically Black Colleges and Universities (Kendricks et al., 2013), and Latinx STEM students at two-year institutions (Martin et al., 2018). Multi-disciplinary models for Intercultural Teaching Competence (Dimitrov & Haque, 2016) and Culturally-Responsive Teaching Workshops (Colbert, 2010) are other tools available for faculty who seek to enhance cultural and Indigenous perspectives in their teaching and mentorship (Dimitrov & Haque, 2016).

Surveys and informal feedback indicated that faculty enrolled in the IMP because of a need and interest in being a better mentor to AI/AN students, support for the program from graduate deans, and the research-based and STEM-focused curriculum. Twenty-seven faculty attended the first module. After that, 13 to 15 faculty attended Modules 1 to 9 who were mostly the same faculty. While we are not entirely sure why there was a large decrease in participants between Module 1 and the remaining modules, email communication with some of the faculty participants in Module 1 indicated they did not have time to participate in additional modules during the academic year. Nonetheless, that we were able to consistently retain 13 to 15 participants in all nine modules is encouraging for the implementation of a novel Indigenous mentoring program for faculty.

Faculty appreciated how the modules were presented, and also found the modules relevant to their success and to the success of students in their lab. Additionally, faculty participants rated the applicability of the modules favorably in terms of providing ideas/resources that they could apply in their lab/research group. These "satisfaction with the IMP components" concur with some faculty development/mentoring studies found in the literature (Bean, Lucas, & Hyers, 2014; Phitayakorn, Petrusa, & Hodin, 2016; Tracy, Jagsi, Starr, & Tarbell, 2004) although these designs differ significantly from ours. Nonetheless, we had hoped for higher satisfaction ratings of the IMP.

Feedback from faculty regarding the challenges of attending seven sessions spread over an academic year and remaining engaged online for nine modules prompted exploration of different delivery formats for future iterations of the IMP. For example, some faculty indicated that they would prefer a one-day weekend workshop to immerse themselves in the modules.

While we worked to develop connections among participants both within and across institutions, the latter proved more challenging given the need to coordinate scheduling across four institutions, and the reliance on video technology that did not consistently offer either seamless connectivity or clear visual and audio communication. While the online learning management system served the principal purposes of providing access to all materials and conducting assessments, faculty engaged minimally in online discussions around the module topics and using the system as an interactive asynchronous learning environment. These situations and challenges may have diminished overall participant satisfaction with the IMP.

Across all nine modules, faculty reported increased knowledge of academic and indigenous practices that help AI/AN students successfully complete their degrees. These results suggest our approach developing knowledge of these practices for faculty who mentor AI/AN students may be effective. The modules were based on interviews with students, faculty and staff regarding the types of knowledge and activities that would be important for improving mentor relationships with AI/AN graduate students in STEM (Windchief et al., 2018). Thus, it is not surprising that faculty self-reported knowledge improved at the end of each module since we were providing information that faculty may not have known about before.

Mean pre- and post-test scores and change in mean pre- to post-test scores for each module showed a favorable pattern of improvement from the beginning to the end of each module. That the range in standard deviation in the pre-test scores was wider than the range in standard deviation in the posttest scores suggests there was greater variability in faculty knowledge of academic and indigenous practices prior to attending the module than following completion of the module. That the standard deviation in the mean difference in pre- to post-test scores is wider than the mean for some individual items in Modules 1, 2, 4 and 5 suggests there may have been minimal or no pre- to post-test change in self-reported faculty knowledge of the item or that the question wasn't sensitive enough to detect change in knowledge for the particular item.

The difference in pre- to post-test mean scores

were greater on some issues compared to others. For example, at the end of the first module, the difference in mean pre- to post-test scores for items one and two "..had/have adequate information about Indigenous Mentoring Models," and "..had/have adequate information about ways to incorporate Indigenous mentoring approaches in my lab," were higher than item four "..committed to learning about what helps AI/AN students persist in STEM." These findings suggest participants held a similar level of commitment to AI/AN students from the beginning to the end of the module, but gained considerable self-reported knowledge about Indigenous mentoring approaches during the module. Likewise, Module 3 seemed most effective in changing self-reported knowledge about AI/AN student services on campus, compared to changing pre- to post-test faculty commitment of incorporating this knowledge in their mentoring practices, which stayed consistent pre- to post-test. The assessment outcomes for "commitment to AI/AN students," in Modules 6 and 8 showed similar patterns.

Self-reported knowledge seemed to change most, pre- to post-test, on items/modules that were very culturally and contextually specific for AI/AN students and their communities. For example, all pre- to post-test change scores in Module 4, "Faculty Visiting Home Communities" indicated participants gained considerable pre- to post-test self-reported knowledge about AI/AN communities, and visiting these communities in the future. Likewise, pre- to post-test change in self-reported knowledge scores were strong for learning about the importance of relationships and cultural recruitment practices with AI/AN students (Module 5); increasing knowledge about cultural activities with AI/AN students (Module 6) and understanding differences between cultural competency versus cultural humility (Module 7). Nonetheless, the smaller difference in pre- to post-test change for the item in Module 8, "…was/am committed to developing a personalize list of ways my work can be applied to, and adapted for AI/AN communities," compared to other items in this module, "…had/have adequate information about presenting research to community leaders," and "…committed to thinking about ways to present research to people living in AI/AN communities," suggests this module may have prompted self-reported knowledge change but not necessarily steps to actually change mentoring practices.

In our study, AI/AN faculty and graduate students shared experiences in higher education settings that shaped their academic journey. In turn, faculty had opportunities to reflect on how this knowledge and insight could inform their attitudes and behaviors with AI/AN students. Having TCU faculty participate in the IMP provided unique perspectives and greater understanding of teaching contexts and students' lived realities, especially as a large number of AI/AN students attending the PWIs had previously attended a TCU.

Faculty became familiar with each other during the program which helped create an informal faculty support network and learning community. Participants embraced opportunities to reflect on how they mentor and were eager to apply new concepts in the classroom and research space. Although we did not assess faculty social support, research shows that faculty who participate in a mentoring program gain a greater sense of camaraderie (Tracy et al., 2004).

Formalizing/Institutionalizing this social support network for mentoring AI/AN students amongst faculty could increase the number of faculty who effectively mentor AI/AN and other URM students. We also did not assess direct evidence of faculty intention to change/enhance their mentoring practices for AI/AN students. Exploring this evidence, perhaps through an analysis of reflective work that the IMP participants engaged in, including designing new approaches to their mentoring approaches for AI/AN students, would be compelling.

Conclusion and Future Directions

Although this was a small study, the favorable evaluations and improvements in developing faculty knowledge about practices that help AI/AN graduate students in STEM successfully complete their degrees were encouraging. However, the study relied on self-reported survey data which limits its ability to draw any causal connections to the actual impact of the program on mentoring AI/AN students. Following this study, we implemented a second iteration of the IMP that included faculty, staff and administrators (Brown & Komlos, 2019). We also created a facilitators guide for institutions to adapt and implement the IMP on their respective campuses (Arouca, 2018).

There are universal benefits of improving

mentoring practices of faculty who mentor AI/AN students. Improved mentoring for AI/AN students, could promote an increase in AI/AN students and in faculty who effectively mentor AI/AN students. Additionally, faculty, especially non-Native faculty, gain cultural Indigenous knowledge and competence that promotes diversity in STEM fields. We contend that the IMP can serve as an effective platform for improving the relationship between faculty mentors and AI/AN student mentees. Improving this mentor/mentee relationship can enhance the academic achievement and degree attainment of AI/AN graduate students in STEM, and ultimately increase the number of AI/AN faculty in STEM disciplines.

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Blakely Brown, Ph.D., is a Professor in the School of Public and Community Health Sciences at the University of Montana.

Sweeney Windchief, Ed.D., is an Associate Professor of Adult and Higher Education at Montana State University.

Barbara Komlos, Ed.D., is a Program Manager in the Graduate School at Montana State University.

Raquel Arouca, Ph.D., is a Director of Recruitment, Retention, and Diversity Initiatives in the Graduate School at the University of Missouri.