

How do Preservice Teachers Feel About Integrating American Indian Culture When Teaching Science?

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Abstract: *While Montana teachers are tasked with including American Indian culture when teaching science, barriers exist, such as no knowledge of American Indian cultures or low efficacy for teaching science. In an exploratory study, survey responses were collected from elementary (K-8) preservice teachers in a science methods course about their perspective of teaching science, specifically including American Indian culture. Results highlight three major structures (past culture, current community, and higher education) that support preservice teachers' feelings of confidence when integrating American Indian culture in their future teaching. These structures are critical since most elementary preservice teachers shared discomfort or fear at the idea of including American Indian culture when teaching. As such, higher education can be a starting point to building critical understandings of American Indian culture when teaching science.*

INTRODUCTION & REVIEW OF LITERATURE

Note. The term 'American Indian' is an intentional selection as the study does not speak to specific American Indian tribes and it aligns with current recommendations in Montana (American Indians 101, n.d.). However, the terms "Indigenous," "Native," and "Native American" will also be included when directly used by other authors or in participant quotes.

There is a growing movement in many states to affirm and teach the historical role of American Indians and the place they continue to have in the United States (National Congress of American Indians, 2019). For example, in 2015, Washington state passed legislation requiring specific lessons to be included into social studies curricula (WA Senate Bill 5433, 64th Leg., 2015). Just recently North Dakota passed a bill similar to Washington, requiring specific curriculum to be taught in 4th-8th grades (ND Senate Bill 2304, 67th Cong., 2021). Unlike states specifying a particular curricular approach, Montana adopted a constitutional amendment, the first to do so, in 1972 reiterating a free quality public education system specifically including American Indians. Article X says that "[Montana] recognizes the distinct and unique cultural heritage of the American Indians and is committed in its educational goals to the preservation of their cultural integrity" (MT Const. art X, pt. 2). 27 years later, further legislation (MT Annotated Code, Indian Education for All (IEFA), 1999) expanded on this article and shared that every Montanan should learn about the distinct and unique cultural heritage of American Indians and all school personnel should have

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an understanding and awareness of American Indian tribes. Then, in 2005, funding was set aside which led to the development of *The Essential Understandings Regarding Montana Indians* (Essential Understandings; Montana Office of Public Instruction (OPI), 2019) through which Indian Education for All (IEFA) can be achieved. The Essential Understandings were developed by Montana's tribal education experts to help citizens understand the most important issues common to all tribes in the state. The Essential Understandings help educators ensure that their educational curriculum and pedagogy provide awareness and understanding about American Indian tribes in Montana (Elser, n.d., p.4).

Beyond state legislation and requirements, there is a significant body of research suggesting and sharing the importance of teaching through a cultural lens and recognizing, affirming, and supporting the cultural identity of students. From culturally relevant pedagogies (Ladson-Billings, 1995) to culturally-sustaining (Paris, 2012) practices, these approaches stand as a testament to the long-standing power and inherent need to explicitly include diverse cultures in education. Supporting preservice teachers in developing positive perspectives on families and communities, communicating high expectations, and creating learning environments within the context of culture, are essential components in many culturally responsive pedagogies (e.g., Ladson-Billings, 1995; Gay, 2000, 2002; Castagno & Brayboy, 2008; McCarty & Brayboy, 2021).

Castagno & Brayboy (2008) in their review of culturally responsive schooling for Indigenous youth (pg.1), discuss the need to consider sovereignty, racism, and epistemology for successful implementation (p. 948). Building on Brayboy's work with Tribal Critical Race Theory (2005), the unique status of tribal nations in the United States requires teachers to understand more about Indigenous peoples particularly around sovereignty and self-determination. First, there is immense diversity amongst the 574 Federally recognized American Indian nations and the number of institutions that serve American Indian peoples (McCarty & Brayboy, 2021, p. 430). Second, "perhaps the most significant distinguishing feature of Native American education is the shared status of Native peoples as inherent sovereigns" (2021, p. 431). Indigenous sovereignty, which predates the United States Constitution, is a legal-political relationship with the United States Government but also conveys a connection between and within Native peoples and the land. Thus, for culturally responsive teaching and pedagogies to speak to Indigenous peoples, they must include and express these distinctive features (McCarty & Brayboy, 2021, p. 431).

AMERICAN INDIAN CULTURE & SCIENCE EDUCATION

When K-12 educators teach science minimizing the influence of culture, American Indian students may be at a disadvantage (Nelson-Barber & Estrin, 1995), left to navigate the transition between western science worlds and life-worlds (Aikenhead, 1996, 2001) alone. Aikenhead & Jegede (1999) have described this phenomenon with American Indian student learners, sharing that the way that science is traditionally taught asks students to walk in separate worlds, reconciling the discrepancy between meaningful scientific learning and Indigenous ways of knowing (pg. 274). Further, as argued by Bang & Medin (2010), focusing on an acultural approach to science deprives all students of knowing diverse ways of being, which has the potential to expand the very foundation of science knowledge and understanding. Particularly with American Indian communities, using the "intellectual resources students develop in their everyday lives," (Bang & Medin, 2010, p. 1009), can lead to a focus on teaching science guided by interest and personal relevance (Bell et al., 2009; Warren & Roseberry, 2004).

Despite the importance of culturally relevant pedagogies in science, teachers may struggle to implement them due to a lack of cultural awareness or belief in the efficacy of these approaches

(Neri, Lozano, & Gomez, 2019). These barriers may be exacerbated when preservice teachers are asked to integrate American Indian culture and science teaching; science being a subject that many preservice teachers do not understand nor feel confident in teaching (Nadelson et al., 2013; O'Keeffe et al., 2019; Bergman & Morphew, 2015). Several studies point to the consistent trend of preservice teachers feeling unprepared to teach science through inquiry with low science content knowledge being a primary underlying cause (Santau et al., 2014; Kind, 2009). Preservice teachers lacking science knowledge is important because K-12 student outcomes increase when teachers feel prepared to teach science (Darling-Hammond & Youngs, 2002; Krall, Lott, & Wymer, 2009).

CULTURALLY DIVERSE TEACHERS

While the promise of teaching using a cultural lens is widely accepted, the difficulties of preparing preservice teachers to use culturally responsive/relevant pedagogies specific to American Indian culture are daunting. Foremost, there are fewer American Indian teachers than non-American Indian teachers and “increasingly, Native American students attend K-12 public schools off tribally held lands” (McCarty & Brayboy, 2021, p. 436). According to the National Congress of American Indians, 1.2% of the student population in the United States are American Indian/Native Alaskan and approximately 90% of those students attend public schools. Montana has one of the highest percentages of American Indian students in the United States (11% of the population; NCAI, 2011), with some school districts having between 13-18% American Indian student populations. Thus, non-Native teachers will likely have American Indian students in their classrooms (McCarty & Lee, 2014).

When culturally diverse teachers are hired, they may face different issues. Santoro (2013) shares the stories of several Indigenous or ethnic minority teachers who felt they were given an identity that created a homogenous view of culture, as if they were singular, static, and predictable (pg. 870-871). For example, they felt as an Indigenous teacher that they were expected to teach all of the cultural topics regardless of the subject area they were hired to teach. Additionally, in hiring a teacher of color, some administrators might assume that they can bridge the gaps between all students of that racial/ethnic group and the classroom (e.g., one American Indian teacher can support all American Indian students). “It is not necessarily the case that teachers [of color] will have special and nuanced understanding of the needs of all students with whom they share ethnicity or race” (p. 871). All American Indian cultures are distinctive and unique and the hiring of one American Indian teacher does not mean that they have the knowledge or ability to understand and support students from all American Indian tribes. Caution must be exercised to ensure equitable expectations for culturally diverse teachers and supporting students from all cultural backgrounds must not solely sit on the shoulders of culturally diverse teachers.

ROLE OF TEACHER PREPARATION

Sadly, we cannot, under the best conditions, hope to recruit and retain a sufficient number of Native American teachers... We can, however, better prepare all teachers to appropriately teach Native children and teach all students accurate information regarding Indigenous Peoples. This preparation and awareness begins in TEPs [teacher education programs], however bitter, horrible, controversial-or liberating-the learning may be. (Writer, 2002, p. 9)

The ability of teacher education programs to successfully prepare candidates with the knowledge and skills to teach American Indian students varies. This goal is particularly difficult as candidates may “have little understanding of discrimination or racism, and an almost nonexistent background in cross-cultural experiences or knowledge (Shedrow, 2017, p. 271). Further, as shared by McInnes (2017), “a specific focus on Indigenous education is strikingly absent in most [teacher education] programs of study” (p. 146), despite the evidence suggesting that learning about the history of Indigenous peoples leads to positive learning outcomes in future students and school culture (Mooney & Craven, 2013). Critical to note is that no course could aim to teach students about everything of a particular culture, specifically the “deeper aspects of culture” (McInnes, 2017, p. 160). Therefore, the goal of teacher preparation may be to support all teachers in building culture-based systems within education (McInnes, 2017).

PROBLEM

Preparing preservice teachers to teach through a cultural lens specific to American Indians is both, in part required by Montana State code, and a promising approach to supporting American Indian student success. Some states are adopting curricular materials to include American Indian culture into schools, yet the recent moves in over 27 states to ban conversations of culture and race in schools (Sawchuk, 2021) suggests universal change is far off. Therefore, teachers need accessible and accurate information about American Indian culture beginning in teacher preparation (Writer, 2002) as a basis for their ability to implement culturally responsive pedagogies (McCarty & Brayboy, 2021). While “footprints” exist of including culturally responsive pedagogies focused on Indigenous education (McCarty et al., 2014), these remain critically important models rather than the accepted norm. Further, little research exists (e.g., Daniels-Mayes, 2020) on preservice teachers’ foundational understanding and awareness of American Indian culture and even less exists when exploring preservice teachers understanding of how to include American Indian culture when teaching science.

PURPOSE

The purpose of this study is to uncover elementary preservice teachers’ (EPSTs) perceptions of American Indian culture, science, and their understanding of how to successfully integrate American Indian culture into science in their future teaching. This survey study is exploratory aimed at uncovering EPSTs perspectives towards creating more effective interventions on including American Indian culture when teaching science in teacher education programs.

METHODOLOGY

Survey research approaches were used to ascertain EPSTs perceptions given the topics under exploration (American Indian culture and teaching through a cultural lens). Participants responded anonymously, which may help curb the influence of social desirability bias (Krumpal, 2013) and enable participants to share more openly versus holding their responses confidentially (Ong & Weiss, 2000).

CONTEXT

We want to first acknowledge the people and places that supported our work. The study was conducted on the ancestral lands of Apsáalooke (Crow) Tribe. These are also the common hunting grounds of the 12 American Indian Tribal Nations in Montana, and other members of the

Idaho, North Dakota, and South Dakota state recognized, as well as their brothers and sisters of First Nations. We acknowledge their elders past and present, their future generations, and all Indigenous people of this land, including those upon we reside upon now. These lands continue to be important to the Apsáalooke (Crow) people. We recognize, acknowledge, and affirm American Indian sovereignty, history, and self-determination.

The study was conducted at a public, four-year institution of higher education in Montana in a teacher education program (TEP) that has an initial elementary teacher license endorsement. Through IEFA (OPI, n.d.) and the Essential Understandings (OPI, 2019), teachers in Montana are tasked with ensuring that their classrooms and curricula promote American Indian cultural heritage. Training to integrate American Indian culture begins in the TEP and EPSTs take required courses in either Native American Studies or IEFA through the Department of Education. In an integrative manner, the TEP includes culturally responsive pedagogies (CRPs), however the TEP does not have a specific course on CRPs.

PARTICIPANTS

EPSTs (N = 44) in this study ranged in age from 19-48 and all but 9 were born and raised in Montana. Three EPSTs self-identified as American Indian, with the remaining identifying as “white.” These EPSTs enrolled in an elementary science methods course in one of two semesters, occurring typically in their third year of study in the TEP. Prior to taking the science methods course, all EPSTs will have taken either an American Indian Studies course or an IEFA course and will have taken at least two science content courses and one science laboratory.

DATA COLLECTION

The 15- question survey was designed in collaboration with two American Indian researchers with expertise in supporting teachers in culturally responsive pedagogies and, specifically, integrating IEFA into pK-20 education (Appendix; Authors, personal communication, May 2019). The survey was aimed at uncovering EPST’s perceptions about American Indian culture, science education, and how to integrate American Indian culture when teaching science. 3 questions covered demographic information. 7 open-ended questions (e.g., *What role do you think American Indian culture should play in the public education system?* and, *what might it look like for you to include Indian Education for All when you teach science?*) were aimed at understanding EPSTs relationship, experiences, and perceptions of American Indian culture as it relates to education. Finally, 5 closed-ended questions using 5-point Likert scales and yes/no responses (e.g., *Do you like science?* and, *I feel comfortable integrating Indian Education for all in my teaching*) were geared towards understanding EPSTs relationship and confidence in teaching science, based in motivational theories (Eccles & Wigfield, 2020).

The survey tool (Appendix) was uploaded into an online survey platform (Qualtrics Survey Software, 2019). Students enrolled in one of four sections of elementary science methods over one year were asked via email to participate in the survey. Emails were sent out twice, three weeks apart at the beginning of the semester. Students were not required to take the survey as a part of the course and no additional benefits were provided as compensation for their participation. Out of a total enrollment of approximately 120 students, 44 fully responded to the survey, therefore the response rate is about 36%.

DATA ANALYSIS

Results from the survey were entered into the qualitative data analysis software, Dedoose (Dedoose, 2021). The first round of data analysis explored the data by question (Appendix) and in vivo coding (Miles, Huberman, & Saldana, 2020). In the second round, pattern coding was used to group similar responses within survey questions into themes. The third round of data analysis synthesized the findings and helped to clarify causality or explanations within the results (Miles, Huberman, & Saldana, 2020).

RESULTS

The results from this baseline survey research study will be organized into the following sections: 1) EPST's experience and understanding of American Indian culture, 2) their interest and perceived comfort in teaching science, 3) their ideas of integrating American Indian culture while teaching science, and 4) emerging and unanticipated findings will be shared.

EXPERIENCES WITH AMERICAN INDIAN CULTURE

Open-ended question #4 (Appendix) explored previous experiences with American Indian culture. Almost 50% of EPSTs shared sentiments like EPST 12 in saying, "I don't have a lot of experience." Critically, for those EPSTs born outside of Montana, every EPST claimed to have little or no experience with American Indian culture. Emphasizing this, EPST 30 said that "I do not have much experience with Native American Culture at all. This was never a big deal where I grew up, so coming to MT for school, it was all pretty new to me."

Even for students who were born in Montana nearby Tribal Reservations, the sentiment remains the same, "I don't have much experiences besides playing sports against some native schools in high school and what I've learned so far in school" (EPST 26). For those who discussed more proximate experiences with American Indian people and culture (24 excerpts), many shared stories around K-12 school and sports. It follows that student's raised on or near Reservations likely have more experiences with American Indian culture. EPST 20 did note that because they went to school with an American Indian student, their teachers "were a lot more active in teaching things about the culture." Interestingly, despite close and consistent interaction, four EPSTs still shared a relative lack of experience expressing that, "I have not had much exposure other than having students in my class in elementary school that were Native Americans. Sometimes their parents would come in and tell about their culture and bring food related to their culture as well" (EPST 37).

Four of the remaining students shared personal and family connections to American Indian tribes. One of the ESPTs shared:

I have had very little experience with Native American culture. My mom kind of put her past in a box and doesn't want to open it. I have her bell dress and her star blanket, but she doesn't like talking about it (EPST 31).

In contrast, however, another EPST talked about being somewhat comfortable given that they had "family members that are a part of the [American Indian Tribe]. And I also worked at [American Indian Tribal Event] many of my summers" (EPST 30). Even when family members have Tribal affiliation, it cannot be assumed that students have experience or knowledge of American Indian culture.

CHANGING PERSPECTIVES TOWARDS AMERICAN INDIAN CULTURE

Open-ended question #5 asked EPSTs to share if their understanding of American Indian culture had changed over time (Appendix). Markedly, 28 students shared that their perspectives had changed. A few shared about a growing or deepening knowledge base, like EPST 40 who grew up “surrounded” by Reservations sharing, “I have learned more about the significance of events. Growing up next to a reservation has given me the opportunities to see how their school operates and how they incorporate tradition as well.” EPST 33 who grew up in Montana, spoke:

When I was in elementary school, I was often bored or frustrated by the prevalence of IEFA activities throughout my education. Now that I'm older however, I am very thankful to have learned so much about Native American culture and history, as many people outside do not receive such opportunities.

For some EPSTs, the change in views over time has been drastic. EPST 37, who grew up in Montana, shared that, “I think the main view that has changed is just the history between whites and native Americans. It was not until college that many of those things came to my attention and it made me sad.” Echoing these notions, EPST 38 added that, “mostly my understandings [have changed] about how history happened and how Native people are still being treated to this day in our country has changed over my time in college.”

In the process of sharing a change of views, EPSTs often discussed a possible mechanism of change. These largely were classified in one of two areas: experiences within a community that highlights American Indian culture and/or courses and conversations in higher education. As noted by the two quotes above from EPSTs 37 and 38, 17 more EPSTs credited their experience in higher education as the defining agent of change. Straightforward statements such as “my views have changed over time especially when I came to school here in Montana and learned about IEFA curriculum” from EPST 4, share the importance of integrating specific curricular interventions around American Indian culture. This may be all the more important if institutions of higher education are located in areas with smaller American Indian populations as highlighted by EPST 30 when they shared that, “Since coming to MT I have been enlightened and learned much more. MT is a very Native rich area...I never saw it as a big deal previously, but now I see the importance of it in a new light.”

ROLE FOR AMERICAN INDIAN CULTURE IN EDUCATION

EPSTs were asked in open-ended questions #7 and #8 (Appendix) to share their views on the role that Indian Education for All does and should play in education. In response, EPSTs' ideas ranged from saying that Indian Education for All should play a “bigger and more important” (EPST 21) role to “I feel they should be involved and treated like every other student. They should be accommodated for their beliefs as other students would be based upon religion” (EPST 5). Overall, responses were categorized into four themes of “Better Role,” “Bigger Role,” “The Same Role,” and an emergent theme of “Other Findings for the Role of American Indian Culture in Education.”

BETTER ROLE

Sixteen responses were shared that conveyed the belief that American Indian culture “needs to be put in a better light...” (EPST 3). As was the case for EPST 3 who grew up in Montana, some of these responses went further sharing a justification, “...because, I still hear people say that Native Americans are [negative stereotype] by people in this community” (EPST

3). Others were more aspirational like EPST 28 saying that, “I think current practices are commendable, though I hope to uplift Native American voices more often and allow IEFA principles to spread to the rest of the country.”

BIGGER ROLE

Nine EPSTs shared sentiments saying that efforts to include American Indian culture in schools need to increase. EPST 43 noted that, “I think that Native American culture plays a small role. It is incorporated into mostly just history classes” suggesting that current efforts are largely subject specific. Others were more universal in their thinking like EPST 24, “I think Native American Culture should be a huge part in Montana's education system. Native Americans are a big part of our history so they should be a big part of our education as well.” Some went further than the bounds of a state, like EPST 20, saying, “Equality. This should be something that in every state we learn about because our children need to be educated on what their history is and how it does not necessarily align with our written history.”

THE SAME ROLE

Two EPSTs seemed to suggest the current approach was enough, such as EPST 35, “I think the role that they should play is that [*sic*] what we have as it does include them.”

OTHER FINDINGS FOR THE ROLE OF AMERICAN INDIAN CULTURE IN EDUCATION

Several of the responses conveyed beliefs beyond the scope of the initial prompt concerning the role that American Indian culture does or should play in education. Some shared specific curricular approaches such as EPST 8, when they shared that “there should be more text books [*sic*] that include Native American culture since some of the kids in classrooms are Native American.” EPST 37 shared that, “I think giving students who would not normally have exposure to that culture should have more of it in a way that is fun depending on the grade,” which seems to suggest that culture should only be taught in specific grades and only when it was “fun.” Another EPST said, “I think there should be some level of education about the Native American culture because of the large population of Native Americans in Montana” (EPST 14), suggesting only areas with high populations of American Indians should learn about American Indian culture. This sentiment was also echoed by EPST 31 when they shared that Native American culture should be in the education system “since we have a ton of tribes located her [*sic*].”

SCIENCE TEACHING

Two scaled questions were posed regarding EPSTs views on science (*Do you like science?* Yes/No scale; *It is important to become a good science teacher*, 5-point Likert scale). 82% of EPSTs responded that they liked science, leaving 4 who do not like the domain and 4 sharing responses like “some disciplines,” or “sometimes.” On average, EPSTs rated that felt strongly that it was important to become a good science teacher ($M = 4.79$, $SD = 0.07$, $N = 44$). In a follow up comment section though, three EPSTs conveyed sentiments similar to, “Teaching science makes me pretty nervous but I hope I can be come [*sic*] good at teaching it” (EPST 26).

HOW COMFORTABLE ARE YOU AT INTEGRATING IEFA WHEN YOU TEACH SCIENCE?

Responses to this topic came from several questions, some quantitative Likert scales and other open-ended inquiries. The quantitative results are presented in Table 1, and show that most EPSTs neither disagree or agree that they are comfortable (3, neither disagree or agree) when it

comes to integrating Indian Education for All into their science teaching. No EPST reported they ‘strongly disagree’ in feeling comfortable integrating Indian Education for All into their teaching, though some did ‘strongly disagree’ that they were comfortable doing so in their science teaching. Table 1. Likert scale responses to comfort integrating IEFA

	Mean	SD	Med	Min	Max
I feel comfortable integrating Indian Education for All into my teaching.	3.59	0.95	4	2	5
I feel comfortable integrating Indian Education for All into my SCIENCE teaching.	3.05	1.10	3	1	5

Note. SD, Standard deviation. Med, median. Likert scale, 1-5.

A t-test was run to ascertain differences in EPSTs responses to integrating IEFA into teaching in general or to science specifically. Significant differences were detected between responses on these questions ($t(84) = 2.49, p < 0.01$), suggesting that EPSTs feel significantly less comfortable in integrating IEFA when teaching science specifically. However, a mean response of 3 on a 5-point Likert scale indicates that, on average, EPSTs neither agree nor disagree that they are comfortable integrating IEFA into their future science teaching.

WHAT IS MAKING YOU FEEL COMFORTABLE OR UNCOMFORTABLE ABOUT TEACHING AND INCLUDING AMERICAN INDIAN CULTURE IN YOUR FUTURE CLASSROOM?

Open-ended responses to the above prompt revealed a more nuanced understanding of EPSTs' feelings. Only 6 of the 44 EPSTs did not mention discomfort or fear. Specifically, a theme that emerged in the responses surrounds the fear that EPSTs have around perpetuating negative stereotypes or providing false information. One EPST simply, but importantly, said, “I just don't want to get someones [*sic*] culture wrong. I don't want to offend anyone especially students I care about” (EPST 12). EPST 14 shared their fear of being attacked for their efforts saying, “[I'm uncomfortable about teaching Native American culture] being white and being accused of ‘cultural appropriation.’ I don't want to seem like I know more about the Native American culture when I am not Native American myself.”

Responses also conveyed a lack of knowledge of American Indian culture which causes discomfort. “I do not personally know enough about Native American Culture, and I am worried I may teach it incorrectly. I want the facts and culture to be accurate and I feel as though I am not prepared for that” (EPST 24). In addition, EPST 6 brought up the concern that they lack the knowledge to review materials, saying:

I do not want to have/ use the wrong language or reference material that is not accurate. I have learned by teaching a social studies IEFA lesson that the mentor text I was using was not an accurate representation of the story that was being told.

HOW MIGHT YOU TEACH IEFA THROUGH SCIENCE?

The final question asked EPSTs to share how they might integrate IEFA through science (Appendix). Results show 19 of the EPSTs shared ideas, 12 did not share specific ideas, 1 shared only excitement for learning and 8 did not respond. None of the 19 who shared ideas mentioned any specific American Indian tribe. However, many seemed to bring previous experience into their responses such as EPST 36 who shared that, “I like space and stars, so I found it interesting that

different Nations have their own guide to the stars. That is something I would definitely teach in my classroom.” Others brought up using plants, saying that, “I love the idea of teaching about plants that the Native Americans used for medicinal and nutritional purposes” (EPST 18). EPST 42 shared the view that, “When teaching science, I would likely include IEFA to inform students of how those that respect the Earth and did not use machines or anything similar did ‘science’.” Put strongly by EPST 4, “I feel like I do not know some history but knowing what is true and not true in books that I have read is hard. So I do not want my students to be getting false information from me.”

Specific ideas aside, four EPSTs shared more aspirational than practical application. For example, EPST 33 stated that, “I believe it is important to include specific tribal connections into teaching practices in regard to IEFA. As such, I would likely attempt to tie in scientific practices to specific stories or traditions that relate to the standard at hand.” EPST 38 shared:

I think that it would be important for me to take the time to consider within every lesson where I could integrate IEFA. There are countless opportunities as long as we are actively trying to find them and use them appropriately.

The 12 EPSTs who were unable to share specific ideas largely said, “I am not sure” (5 EPSTs) or “I don’t know” (4 EPSTs). EPST 6 simply said, “I have no idea. I have never taught or have seen an IEFA science lesson being taught before.”

OTHER FINDINGS

Analysis of the open-ended responses often yielded information beyond the initial scope of the question that are worth sharing. These findings revolve around two key themes: Culture Within Schools and Racism in the Community.

CULTURE WITHIN SCHOOLS

When prompted about the role that IEFA plays in the current educational system, EPSTs shared about their experiences within the school system currently. EPST 6 said, “The [mentor] teachers made it clear that IEFA is hard to teach and they do not do it often.” Another mentioned, “I would say it is a box teachers try to check off” (EPST 37) referring to the notion that current practicing teachers see the inclusion of IEFA in their classrooms as part of a checklist. Two EPSTs shared that, “At the moment, I feel that Native American culture tends to take on a historical connotation in the public education system” (EPST 33), and “I think that Native American culture plays a small role. It is incorporated into mostly just history classes,” (EPST 43), suggesting that social studies classes or historical contexts are the only time in which practicing teachers integrate IEFA.

RACISM IN THE COMMUNITY

In sharing experiences either of their views changing or their experiences with American Indian culture, several EPSTs talked about some of the issues facing IEFA integration within their communities. EPST 12 shared that, “I have heard a lot of stereotypes growing up, but as I got older I was able to determine if they were true or not.” EPST 41 told a story: “Back in high school ... everyone spoke bad of them using references from back in history. So I believed what I was told then.” One EPST shared that they felt IEFA needed to be put “in a better light in the classroom,

because, I still hear people say that Native Americans are [negative stereotype] by people in this community” (EPST 3).

DISCUSSION

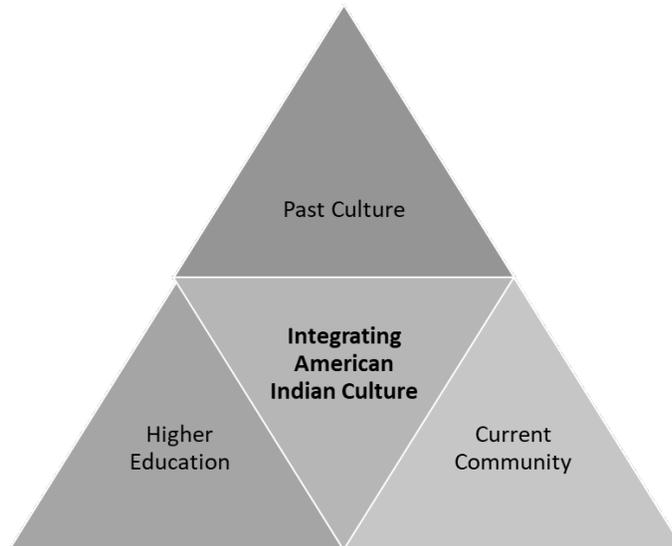
This baseline survey study aims to uncover elementary EPST’s perceptions of American Indian culture, science, and their abilities to successfully teach Indian Education for All through science. The intention was to uncover perspectives towards crafting more effective interventions in teacher preparation programs that support EPSTs in including American Indian culture when teaching science. To meet this goal, this study engaged EPSTs enrolled in science methods courses to share their perceptions through an online survey.

Results from the study shed light on the influential factors impacting EPSTs attitudes and abilities in integrating IEFA when teaching science. The issue with integrating IEFA into science teaching does not appear to revolve around its inclusion in science, but rather its inclusion overall. Despite differences between how EPSTs feel about integrating IEFA in general verses science specifically, responses were on average neutral rather than negative. The quantitative data suggested a neutral attitude towards teaching IEFA through science and the majority (80%) of EPSTs strongly agree that they like science. The qualitative responses do not point to additional sources of concern integrating IEFA into science more so than any other subject area. Therefore, the focus of the analysis will be on the integration of American Indian culture into teaching in general.

Analysis of the results points to three key aspects of EPST development: Past Culture, Current Community, Higher Education (Figure 1).

Figure 1.

Framework for the factors influencing EPST’s views on integrating American Indian Culture into teaching



Past culture refers to EPSTs’ experiences with American Indian culture prior to coming to higher education. Approximately half of the EPSTs in the study claimed to not have had experiences with American Indian culture, and half had, though many of these were not positive.

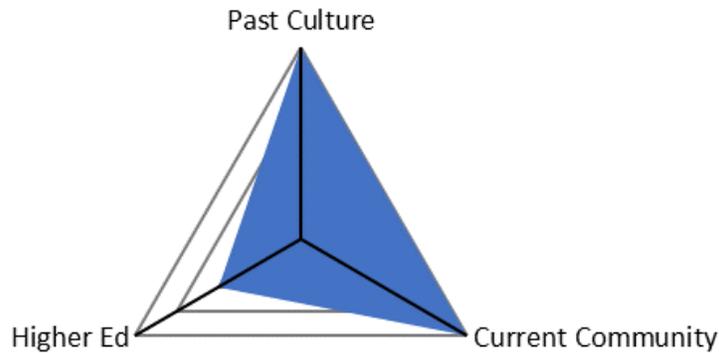
In the process of talking about any changing perceptions, something shared by the majority of EPSTs, several talked about the culture surrounding them when they were growing up.

Current Community refers to the culture currently surrounding EPSTs, either the teaching they are doing or the culture of the area they lived in when they participated in the survey. EPSTs shared how the move to Montana and experiencing IEFA in the schools has shifted or challenged their views.

Higher Education refers to EPSTs' experiences directly related to the curriculum of higher education or the TEP. When asked about things that influenced their views or what made them comfortable with teaching American Indian culture through science, more than a third of students directly stated that higher education played a critical role.

Through the framework presented in Figure 1, EPSTs individual responses can be given relative weight (no-0, medium-2, and high-4) in their ability to positively support EPSTs' abilities and confidence to include American Indian culture when teaching. For example, EPSTs who have not had previous experiences with American Indian culture would have no (0) Past Culture to draw on for positive support. Equally, a person who has had negative previous experiences would also have no (0) Past Culture to support their future teaching of IEFA. If a EPST, however, mentioned that a college class supported their understanding through an entire class, this would give Higher Education a high relative weight (4). If a EPST only mentions some resources, the impact of this is likely smaller and was given a medium relative weight (2). For example, take EPST 42 (Figure 2). They mention Higher Education in the context of obtaining additional resources (2) and share large positive experiences in their past (4) and current communities (4). When added to a radar plot, these weight amounts provide a visual representation of their amount of support to include American Indian culture when teaching.

Figure 2.
EPST 42's framework map and quotes

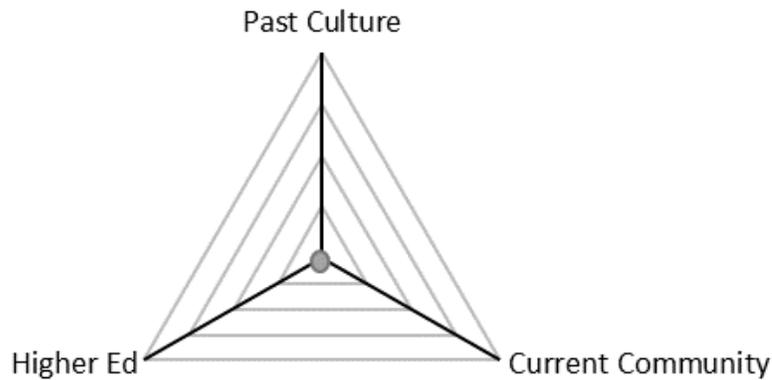


EPST 42 Quotes		
Higher Ed	Past Culture	Current Community
I would say that the resources that are available are what make me feel more comfortable about teaching and including Native American Culture in my future classroom.	My experiences with the Native American Culture are positive. I have cousins that are of Native American descent, so listening to their dad tell stories about how he grew up was interesting and eye-opening.	My views or understandings of Native American Culture have stayed the same for the most part because of where I grew up and how that culture was taught throughout my school experience.

EPST 42 was one of the six that did not express discomfort in the prospect of teaching American Indian culture through science, “I would say that the resources that are available are what make me feel more comfortable about teaching and including Native American Culture in my future classroom.” The diagram resulting from plotting the relative weights show a triangle of support (Fig. 2) for integration that is large. Accordingly, the comfort expressed by the EPST is amongst the highest of those included in the study.

EPST 6’s map (Fig. 3) differs from that of EPST 42 (Fig. 2), showing much less support for the student to integrate American Indian culture when teaching.

Figure 3.
EPST 6’s framework map and quotes

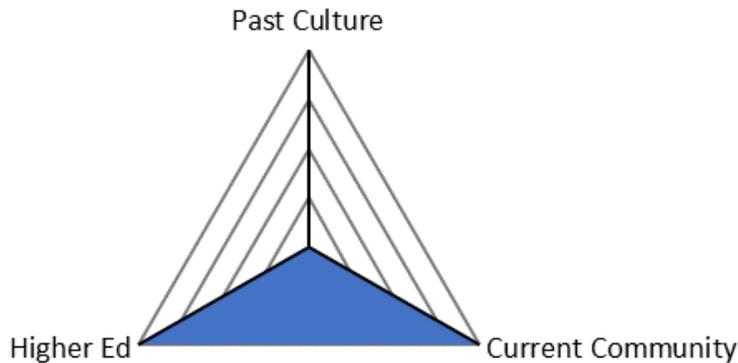


EPST 6 Quotes		
Higher Ed	Past Culture	Current Community
I have learned by teaching a social studies IEFA lesson that the mentor text I was using was not an accurate representation of the story that was being told.	I do not have any experience besides what I have learned at MSUB.	Not a very big role at all. In my junior field, the teachers made it clear that IEFA is hard to teach and they do not do it often.

Having not grown up experiencing American Indian culture and only living in Montana for college, EPST 6’s ‘Past Culture’ and ‘Current Community’ do not provide support to integrating American Indian culture when teaching (0). Further, the experiences they have had in the ‘Current Community’ expressed the idea that IEFA is not integrated frequently and is hard (no positive support; 0 relative weight). The only other experiences they have had with American Indian culture have been in Higher Education, but they too were not positive. Thus, the resulting diagram is a single dot, sharing no support being present for this EPST to have confidence or ability in integrating IEFA into their teaching. Responses to questions asking about their comfort on integrating share this lack of confidence, saying “I do not want to have/ use the wrong language or reference material that is not accurate,” and they ‘somewhat disagree[d]’ to feeling comfortable integrating IEFA in their future teaching.

EPST 41’s map emphasizes the importance and focus on positive supports for EPSTs integrating American Indian culture in the classroom during their experiences in ‘Higher Education’ and ‘Current Community.’

Figure 4.
EPST 41's framework map and quotes



EPST 41 Quotes		
Higher Ed	Past Culture	Current Community
I have gained a better understanding after going through a class specifically understanding them as people and their culture.	Back in highschool [<i>sic</i>] with sports they were rough and everyone spoke bad of them using references from back in history. So I believed what I was told then.	It should be more involved in our curriculum and lessons as it is a very important part of history and our everyday life.

‘Higher Education’ was clearly important in helping frame their overall views of American Indian culture, thus it was given a high relative weight (4). The ‘Past Culture’ that ESPT 4 raised in did not support them in integrating American Indian culture into teaching, therefore it has no relative weight despite the intensity of the remark. The EPST expressed that “it is a very important part... of our everyday life” therefore ‘Current Community’ been given high relative weight. Overall, this EPST shared that “I dont [*sic*] feel uncomfortable about it. It is a new learning experience for not only the students but me as well.” Their resulting diagram show a small triangle of support (Fig. 2) representing positive experiences coming from ‘Higher Education’ and ‘Current Community’ that have supported this EPST in integrating American Indian culture when teaching.

LIMITATIONS & FUTURE RESEARCH

The limitations of survey research and self-report measures are well documented as incomplete and sometimes invalid representations of behavior or attitude. Different survey questions would invariably return different results and the survey used has not been subjected to any reliability testing. Particularly as the survey questions may elicit less than socially desirable responses, EPSTs may share sentiments that do not track with their held beliefs (Krumpal, 2013). Further, the survey being fully anonymous may lead to issues with survey satisficing and decreased accuracy (Lelkes et al, 2012). Given that the survey was administered during an enrolled course, there may be some impact on student’s desire to satisfice. The survey was designed with careful attention to the areas where socially undesirable sentiments could be expressed and no questions were required, allowing EPSTs to opt out of any question at any time. Future research should

certainly use either different questions and/or different methodologies (e.g., interviews), to elicit more nuanced understanding of EPST's perceptions.

Other limitations include the population under study and the context in which the study took place. Results may not generalize to other populations (e.g., practicing teachers) and it is important to note that the study took place in an area with a significant population of American Indians. Located near multiple Tribal Reservations in a state that requires the inclusion of American Indian Culture in education, the study was conducted in an unique context, and it is possible that EPSTs from other areas will not have similar beliefs.

CONCLUSION

Given that American Indian students are in public school classrooms, ensuring that non-American Indian teachers have an awareness and understanding of American Indian culture is a critical step to supporting student success. The use of culturally responsive pedagogies must be based in the unique aspects of American Indian culture, therefore teachers need help in building this essential knowledge (Brayboy, 2005) beginning in teacher preparation (Writer, 2002).

This baseline survey study was conducted to uncover elementary preservice teachers' (EPSTs) perceptions of American Indian culture and science when teaching. The study is exploratory aimed at crafting more effective interventions in teacher preparation programs that support EPSTs in including American Indian culture when teaching science. However, the results have implications for all teacher education courses aiming to teach EPST's about culturally responsive pedagogies.

Interestingly, the majority (80%) of EPSTs share they like science and responses around integration of American Indian culture when teaching science did not highlight concern for integrating IEFA into science more so than any other subject area. Thus, it may be such that EPSTs included in the study do not have concerns about teaching science or that their concerns around including American Indian culture far outweigh their fears around science.

EPSTs come into teacher preparation with a myriad of experiences, but many lack awareness or understanding of American Indian culture, as seen with about half of the EPSTs sharing this very sentiment despite living and learning in an area with multiple American Indian Reservations nearby. Current experiences within their communities also influence their confidence, such as how they are introduced to state policies, how they see IEFA supportive curriculum implemented in schools, and their everyday life experiences. Some EPSTs came from and continue to be around people who espouse racist notions, making it difficult for these future teachers to feel supported in integrating American Indian culture into the schools successfully. Finally, in keeping with McInnes (2017) it is clear that higher education experiences can play a pivotal role in supporting integration of American Indian culture through specific courses and overall experiences with IEFA. When considering interventions that support EPSTs in integrating American Indian culture into their future teaching, providing space to consider past and current community-based experiences within teacher preparation offers a better chance at increasing their confidence.

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APPENDIX

Survey Tool

1. Share your race/ethnicity (e.g. White, Latinx, American Indian, Black, Hispanic).
2. Share your age.
3. Where were you born and/or raised?
4. Please describe your experiences with American Indian Culture?
5. Have your views or understandings of American Indian Culture changed over time?
 - a. If so, who or what influenced your beliefs?
6. Within your formal education, what do you recall learning about American Indian Culture?
7. What role do you think American Indian culture currently plays in the Montana public education system?
8. What role do you think American Indian culture should play in the Montana public education system?
9. What is making you feel comfortable or uncomfortable about teaching and including American Indian culture in your future classroom?
10. Do you like science? - Selected Choice
11. Do you see yourself as becoming a good science teacher? - Selected Choice
12. I feel comfortable integrating Indian Education for All into my teaching. - Selected Choice
13. I feel comfortable integrating Indian Education for All into my SCIENCE teaching. - Selected Choice
14. It is important to become a good science teacher. - Selected Choice
15. What might it look like for you to include Indian Education for All when you teach science?