Native Education Collaborative

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College and Career Readiness

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College and Career Readiness

The National Comprehensive Center

The National Comprehensive Center (NCC) is one of 20 technical assistance centers supported under the U.S. Department of Education's Comprehensive Centers program from 2019 to 2024. The NCC focuses on helping the 19 Regional Comprehensive Centers and state, regional, and local education agencies throughout the country to meet the daunting challenge of improving student performance with equitable resources.

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Introduction

The National Center assembled a panel of experts in the field of American Indian and Alaska Native education from a broad constituency base to help determine current needs and interests in the field. Interviews conducted with the panel produced the following primary thematic categories:

Native culture and language

College and career readiness and access

Tribal consultation and sovereignty

Physical and behavioral health

Teachers and leaders

Promising programs and practices

The National Center's American Indian and Alaska Native Education Project developed the following briefs for each category to positively impact the learning lives of Native children and youth. These briefs are meant to enhance the effectiveness of state education agencies' work on Native education. Though tribal communities are very diverse, for the purposes of these briefs, the terms *American Indian and Alaska Native, Native, indigenous,* and *tribal* are used to refer to Native communities.

College and Career Readiness and Access

This brief provides an overview of inequity and barriers to Native student academic success and ways to address them. It also reviews how gifted and talented programs and advanced placement courses have impacted Native students. As many tribal communities live in rural areas, this brief further discusses education and career awareness for those areas and reviews career pathways beyond locally available options.

Recommendations for School Success

The 2014 Native Youth Report states, "The negative effects of entrenched poverty and the troubled history of Indian education have combined with systemic challenges to result in sharply lower academic and educational outcomes for Native youth, who also have dramatically fewer educational opportunities than their peers" (Executive Office of the President, 2014, p. 13). This means that Native youth have fewer college and career training options, and tribes have fewer opportunities to develop future leaders. Progress has been made in recent decades to improve education outcomes for Native students to bring them in line with educational outcomes experienced by the general population.

The 2014 Native Youth Report identifies five needs to improve Native educational attainment:

- increase the use of Native languages and cultures in school,
- develop genuine tribal control,
- create comprehensive student support,
- recruit and retain highly effective teachers and school leaders, and
- increase funding.

The following areas would benefit most from efforts to meet the needs of Native students.

- **School discipline –** Reduce suspension and expulsion rates for Native students. "American Indians and Alaska Natives are over represented in the school discipline system. They are disproportionately suspended and expelled, representing less than one percent of the student population but two percent of out-of-school suspensions and three percent of expulsions." (Executive Office of the President, 2014, pp. 15-16)
- **College readiness –** Improve Native students' readiness to succeed in college.

  - Ensure students have access to courses and encourage them to enroll in them through mentorship opportunities that will prepare them for the college experience. Native students tend to "attend high schools that simply do not have the right courses, strong mentorship, or opportunities that lead to a successful college experience. Few Native youth are enrolled in high-level math courses in high school, such as calculus, or in other rigorous high school classes, which are a gateway to higher education." (p. 17)
  - Ensure high schools with Native student populations include advanced placement courses and the full range of science and math courses in the curricula. "American Indian and Alaska Native youth are the least likely of all student populations to attend a high school that offers advanced placement courses, and fewer than half of Native high school students have the full range of math and science courses available at their schools. Only one in four Native high school students who take the American College Test (ACT) score at the college ready level in math, and only about one third score at the college-ready level in reading." (p. 18)

- **School conditions –** Provide funding to improve school conditions for Bureau of Indian Education school. "Of the 183 Bureau of Indian Education (BIE) schools, 34 percent (63 schools)

are in poor condition, and 27 percent are over 40 years old. The needed repairs are estimated to cost $967 million across all BIE funded schools." (pp. 16-17)

- **Academic success –** Help Native students achieve academic success throughout their school experience. "In these schools, fourth graders scored, on average, 22 points lower in reading and 14 points lower in math than Native students attending public schools." (p. 17)
- **Technology access –** Provide adequate technology to meet Native students' digital education needs. "Sixty percent of BIE-funded schools do not have adequate digital bandwidth or computers to meet the requirements of new assessments aligned to college and career ready standards." (p. 17)

Recommendations to improve Native students' educational outcomes (Executive Office of the President, 2014):

- Strengthen and expand efforts that target suicide prevention.
- Improve community systems of care to better address the behavioral health needs of Native youth.
- Strengthen the integration of Native cultures and languages into school climates and classrooms.
- Strengthen tribal control of education.
- Provide comprehensive, community-based student supports.
- Support highly effective teachers and school leaders.
- Promote 21st century technology for tribal education.

Cultural Representation in Schools

In 2013, Fryberg, Covarrubius, and Burack conducted a study focused on "the role of cultural representations of self (i.e., interdependence and independence) and positive relationships (i.e., trust for teachers) in academic performance (i.e., self-reported grades)" (p. 439) for Native students, as compared to their European American peers. As they predicted, their findings showed that "culturally congruent representations of self predicted academic performance" (p. 439).

Specifically, trust for teachers and interdependent representations of self positively predicted academic performance for Native American students.
(Fryberg et al., 2013, p. 439).

Fryberg et al. (2013) suggest that "much like first-generation college students… Native American students may feel a greater sense of belonging and motivation when the education context matches their own cultural understandings of self" (p. 447). The authors add, "Even subtle cues conveyed in the school environment can affect feelings of identity safety and self-relevance, and ultimately foster or undermine academic performance" (Fryberg et al., 2013, p. 440). For example, the outcomes of their

study imply that the mainstream educational contexts tend to focus on the development of independent, autonomous thinking. However, this focus is not the norm in Native cultures and may contribute to the underperformance of Native students. "The focus on autonomous thinking or independence may inadvertently convey to Native American students that they do not belong and cannot be successful in that environment" (Fryberg et al., 2013, p. 447).

If teachers, school psychologists and administrators focus on building relationships and including interdependent ways of being in the classroom, they can create identity safe contexts and thus, enhance academic performance for Native American students. (Fryberg et al., 2013, p. 447)

Tribal Control of Education

In 2010, Campbell completed a study of two tribal schools to determine how factors that are associated with improving Native education were being implemented within each one. Two questions guided her research: (1) What are the factors that make a tribal-controlled K-12 school successful? and (2) How do these schools define and measure success?

6 factors that may help tribally controlled schools and its students succeed (Campbell, 2010, p. 104):

- meaningful community and tribal involvement and control;
- meaningful parental involvement;
- a curriculum that integrates tribal histories, cultures, and languages;
- an increased number of Native professional educators and staff in schools;
- recognition of the unique tribal sovereignty status; and
- use of teaching methods that integrate Native cultures and languages.

Campbell's (2010) study also found "that the definition of success used in these schools is uniquely Native. Both schools want their students to be academically successful and competitive, but also they want students to have a foundation in tribal language and culture in order to be successful in the two worlds in which they live" (p. 106).

Recommendations for policy and practice (Campbell, 2010):

- "Policymakers should consider granting greater flexibility to Indian Controlled Schools to use multi-measures to determine school and student success." (p. 114)
- Tribally controlled schools "will have to decide how much external assistance [to accept as it] will affect their tribal sovereignty." (p. 115)
- "Leadership is one of the key factors in successful schools. Native school boards need to recruit and retain quality American Indian leaders who will facilitate the vision of their stakeholders." (p. 115)
- "Teachers need to continually meet to discuss data and develop curriculum and use of teaching strategies that will also include the relevant cultures languages and histories of their unique communities." (p. 116)
- Tribally controlled schools "will need to reach out and create a community beyond the classroom walls that will bring their parents in also" (p. 117).

Equity and Academic Success for Native Students

According to Quijada Cerecer (2013), "Educational disparities for American Indian students result from racial inequities that continue to exist in the United States. In their study, Hackmann, Malin, and Bragg (2019) noted that, "enacted in 2015, the Every Student Succeeds Act (ESSA) includes a prominent focus on college and career readiness (CCR) not contained in prior Elementary and Secondary Act (ESEA) reauthorizations" (p. 3). In the study, Quijada Cerecer (2013) "consider equity in conjunction with state accountability plans for ESSA implementation." (p. 3).

Quijada Cerecer (2013) point out the need for more states to reference an equity approach to include historically underserved students, over a color-blind or race-neutral one. Based on a review of 52 ESSA state plans (50 states, the District of Columbia, and Puerto Rico), only 17 referenced equitable participation (Quijada Cerecer, 2013). Quijada Cerecer (2013) affirm that an equitable approach can help address "racially charged educational environments and microaggressions emerging from these contexts" (pp. 591-592), which can affect retention rates for Native students.

Recommendations to eradicate microaggression toward Native students (Quijada Cerecer, 2013):

- Promote supportive teacher-student interactions by disrupting institutional assumptions of inferiority;
- Support the diversity of Native students within the campus climate;
- Disrupt epistemologies linking students of color to criminality;
- Do not assume that students of color share universal experiences; and
- Integrate Native culture and values in the campus climate, rather than assuming white, middle class values and communication styles as the norm.

The author also asserts that media could play a major role by highlighting noteworthy accomplishments of American Indians and Alaska Natives or their role as foundational and ongoing agents of change in the news or textbooks, rather than portraying them as being disengaged and indifferent to their education and career development. The author points out that this change in the media's role would heighten the visibility of historical and current Native contributions to society and diminish negative stereotypes of Native students to help strengthen their academic potential and persistence.

Quijada Cerecer (2013) conducted several interviews with Native high school students to examine how they were being affected by institutional practices. She found that "American Indian youth are aware of the covert, racially charged institutional policies and leadership practices that affect their persistence rates and engagement in P–20 systems" (p. 609).

The leadership practices exerted at this high school affected the campus climate and educational experiences for Native American youth. (Quijada Cerecer, 2013, p. 608).

College Readiness

For students to be ready for college, Brayboy and Maaka (2015) point out that they must be aware of college admission requirements well before they enter high school.

Criteria for college readiness (Brayboy and Maaka, 2015, p. 70):

- students must graduate from high school,
- students must have taken certain courses in high school required by colleges to prove competency in particular subject areas and skill sets, and
- students must demonstrate basic literacy and numeracy skills.

Higheagle Strong, Carbonneau, and Austin (2018) conducted a secondary analysis of the National Indian Education Study (NIES). They found that, based on an examination of numerous characteristics, parent education was a significant factor that affect whether students had a plan to attend college.

> Parents play a crucial role in fostering their children's desire to attend college. Parental encouragement and support is the most important indicator of a child developing college aspirations. (Brayboy and Maaka, 2015, p. 71)

The authors point out that many Native parents will need support to help their children become ready and eligible for college, as those who never attended college may not be aware of critical readiness steps. The authors suggest that school counselors and staff be prepared to assist Native students with information about going to college.

State Recognition of High-achieving Native Students

In 2010, about 31,360 (1%) of the total U.S. students identified as being gifted and talented were Native students (Morgan, 2014, p. 512). Morgan (2014) said this average was a bit lower than expected, given that Native students comprise 1.2% of the student population in the United States (p. 512). Though 0.2% seems like a minor difference, it disproportionately equals 6,272 Native students. Native student access and participation in advanced placement courses is lower than any other ethnic minority group in the United States (Benally, 2004, p. ix).

Identifying Giftedness by Ethnicity

Gentry, Fugate, Wu, and Castellano (2014) state that "early identification, enrichment programming, and ongoing identification should be done in a variety of areas" (p. 99). Morgan (2014) points out the need for the U.S. education system to better identify academically gifted minority students. She goes on to explain, "Researchers report that students with exceptional abilities, that are perhaps overshadowed by their racial or cultural differences or poverty, are often overlooked for inclusion in programs for the gifted" (p. 512). She adds, "Definition and identification of giftedness among these students is often contradictory, ineffective, and insufficient" (p. 512). Hoping to shed some light on why fewer non-majority (including Native) students are identified as gifted and talented than expected, Morgan (2014) found that this discrepancy may stem from differing ethnic perspectives of giftedness.

The most important giftedness traits by ethnic group (Morgan, 2014):

- **White –** cognitive ability (test scores, skill, brain games), verbal ability
- **Black –** self-expression ability, communication skill, kinesthetic ability/imitation (art/music/sports ability)
- **Hispanic –** kinesthetic ability
- **Asian –** cognitive ability
- **Native –** verbal ability, problem analysis/synthesis

Though "teachers often pick up on a student that exhibits outstanding ability in a particular subject area or writes well … characteristics that are challenging and bothersome in the classroom may be the very behaviors that the cultural community from which the student comes that are valued and rewarded" (Morgan, 2014, p. 512).

> Programs and curriculum should be tied to culture and delivered according to learning preferences and cognitive styles of the students…with a focus on opportunities to solve relevant problems in a small-group setting"
> (Gentry et al., 2014, p. 99).

A Need for Tribally Specific Research

Gentry et al. (2014) point to a dearth of research in the area of gifted and talented education for Native students. The authors state, "To date, issues of talent development, giftedness, and creativity among Native Americans have largely been ignored in our field" (p. 98). In their extensive review of the literature on gifted and talented Native students, Gentry et al. (2014) found limited academic and government literature and studies in the past 30 years, largely dated and generic literature that often grouped Native students into one cultural group, and a lack of tribal identification in samples (p. 99).

Putting Native students into one group ignores the great amount of diversity between Native cultures and ways of understanding giftedness. It can also lead to stereotyping. Further, the literature primarily focuses on deficits within the artificially homogenized group. which compounds the potential to misunderstand these students' experiences. In an effort to address the artificially homogenized Native culture, Gentry et al. (2014) sought to determine if the themes that emerged from the literature—talent development, culture and traditions, cognitive styles and learning preferences, and communication—were applicable to the Diné, Lakota, and Ojibwe people. As they predicted, they found that considerable agreement in some areas and diverging opinions in others. Their findings provide evidence that supports the need for further research on tribally specific gifted and talented programming.

Performance-based Assessment

In 2002, Sarouphim considered the work being done in the area of authentic assessment and multiple intelligences. She looked specifically at a performance-based assessment called DISCOVER, which incorporated this work as it was being used for Hispanic and Native students. DISCOVER stands for Discovering Individual Strengths and Capabilities through Observation while allowing for Varied Ethnic Responses. The author explains, "The assessment was specifically designed for the identification of gifted minority students and has been used with a variety of culturally diverse groups. The assessment consists of a set of activities for four aggregated grade levels: K–2, 3–5, 6–8, and 9–12" (p. 31).

> **Promising indicators for the DISCOVER assessment** (Sarouphim, 2002, p. 36):
>
> - DISCOVER activities with distinguishable cognitive tasks might measure different intelligences
> - DISCOVER activities lack gender and ethnic differences
> - DISCOVER diminished under-representation of minorities in programs for the gifted – "A total of 29.3% of students were identified as gifted, a much larger percentage than the traditional 1–3% identified through the use of standardized tests" (p. 36).

Prejudice toward Native Students

In 1991, Robbins postulated that "if gifted and talented Indian students are to fully develop their potentials, they must gain a more adequate understanding of what they really like and are capable of achieving" (p. 15). The author added that Native students "also need a clearer understanding of their tribal heritage, and how they can function as Indians in the greater American society" (p. 15). Robbins then interviewed four gifted and talented Native students who identified continuing prejudice as a major issue and recommended the following solutions.

- **Stop anti-Native celebrations:** Do not celebrate or re-enact events such as Land Run Day and Columbus Day.
- **Omit participation requirements:** Do not coerce Native students to participate in school activities that violate their traditions, such as the requirement to dissect animals in science classes or cut hair in sporting activities.
- **Stop name calling:** Do not allow stereotypical name calling, such as "chief," "squaw," "quitter," and "lazy."
- **Remove cultural bias in testing:** Remove cultural bias on achievement tests, so more Native students get into gifted and talented programs and qualify for scholarships.
- **Native learning styles:** Include Native learning styles in classes.
- **Reduce ignorance and insensitivity:** Educate teachers about Native cultures.
- **Include Native writers, Native language classes, and Native history in the curriculum.**

- **Ensure proper racial classification:** Ensure proper classification of students, so Native students are not misclassified classified as White and consequently are left out of the quotas. (Robbins, 1991, pp. 19–22)

College Readiness for Native Students

Bowman (2003) points to the need for more research studies on barriers to attending postsecondary institutions (p. 93). She calls out a few of the most notorious barriers, including difficulty adjusting to school/campus culture, a lack of mentors, and discrepancies between Native worldviews and worldviews manifested through philosophy, pedagogy, and other factors in postsecondary institutions (p. 93). Additionally, Brayboy and Maaka (2015) point to "structural barriers, cultural barriers, and climates of school(s) that make it challenging for AI/AN [American Indian and Alaska Native] students to be college-ready and for their parents to help them prepare for college" (p. 65).

Brayboy and Maaka (2015) note that "although the number of [Native] students who indicate a desire to attend college is increasing significantly, the number of students who actually go on to complete a college degree is not" (p. 64). The authors assert that "a thoughtful examination of academic achievement should not be delayed until a student graduates from high school. The move toward higher education and sustained academic achievement happens early in the schooling process" (p. 63). Wilcox (2015) provides the following recommendation for classroom practices and school district policies and processes to increase Native student graduation rates, based on a study of the Quill Valley district.

> **Recommendations to improve Native student graduation rates** (Wilcox, 2015, p. 342):
>
> - engage Native youth in the traditional high school curriculum;
> - offer personally relevant, real-world, experiential, and interdisciplinary learning experiences aligned to students' own learning goals;
> - provide pathways to credit recovery;
> - adapt school schedules to students' lives outside of school and provide flexibility regarding absences;
> - prioritize developing students' sense of worth in contributing to their communities and societies
> - offer effective supports for, and make strong connections to adult educators and other mentors in the community; and
> - partner with parents, families, and other community members.

Policy Considerations

According to Faircloth and Tippeconnic (2010), "in spite of the federal government's trust responsibility for federally recognized tribes, few policies have been enacted to specifically address the low educational attainment levels of Native peoples. This is due in large part to the geographical and epistemological distance between much of Indian country and the nation's capital, where most policies

are made with limited input from tribes" (pp. 22-23). However, there are a number of federally funded grant programs, including the Office of Elementary & Secondary Education's Demonstration Grants for Indian Children's Native Youth Community Project, which promote partnerships in tribal communities to ensure Native students are prepared for college and careers. Bowman (2003) asserts the need for flexibility among school systems and administrators to cultivate Native students and professionals from kindergarten through graduate education.

> **Activity recommendations to cultivate Native students and professionals**
> (Bowman, 2003, p. 93–94):
>
> - individualize learning within the context of a community of learners,
> - build cultural identity,
> - build cultural capital,
> - provide student-centered and experiential learning,
> - make formal and informal academic integration,
> - build a climate with a holistic approach across stakeholders, and
> - use bicultural and culturally pluralistic approaches.

Benally (2004) also offers a number of policy considerations "to assist schools and districts with building effective programs that produce high achievement with American Indian students leading to successful participation in AP [advanced placement] and accelerated learning programs" (pp. ix-x).

- **High achievement –** To prepare all Native students to be high achievers, elementary, secondary, and college educators should articulate and implement clearly aligned learning goals that intentionally guide Native students and lead to high achievement.
- **Community and parent inclusion –** To encourage more parental involvement and better community-school relationships, state policy should support equitable partnerships between schools, parents, and the tribal community.
- **Integrate culture into curricula –** To better educate all children and integrate culturally based curriculum and cultural learning models into school curricula and programs, including accelerated learning opportunities, state policy should support opportunities for understanding advanced placement curriculum within a holistic and cultural framework for learning.
- **Data collection –** To profile the actual experiences of Native students in diverse tribal community settings, states should collect disaggregated data to monitor disparities among all student groups for entry and completion of advanced placement courses and generate complementary data, such as case studies or portfolios.
- **Teacher professional development –** To strengthen teaching and learning leading to high achievement among Native students and to close the achievement gap, states should develop and support ongoing professional development for all teachers.
- **Incentives to improve achievement outcomes –** To help Native students achieve at high levels, states should expand incentives designed to increase the number of Native students in advanced placement and accelerated learning programs, strengthen programs that support and

build capacity for teachers of advanced placement programs, and develop data tracking and data collection systems that provide benchmarks for improvement in these areas.

Aspiring Native Educators

There are "significant differences between the home culture of a learner who is American Indian and the culture of the school where more 'formal' educational experience takes place" (Vogel and Rude, 2011, p. 26).

The authors purport, "Many of these students learn their way through life by listening to stories and constructing their sense of meaning and value through the purveyance of oral history and tradition" (p. 26). The authors also suggest that "educational leaders who understand the unique culture and challenges of indigenous communities are indeed desperately needed in order to promote and strengthen Indian identity, cultural awareness and community participation, and Indigenous ways of knowing among youth that lead to increased educational attainment" (p. 26).

Vogel and Rude (2011) interviewed aspiring Native educational leaders and compared their motivations to become educational leaders to a group of non-Native educational leaders.

- **The non-Native interviewees** were more concerned about their "desire to 'make a difference' within the areas of identified focus, almost equally divided between higher student academic achievement or educational attainment (particularly for English language learners or students from low socioeconomic backgrounds) and the development of more positive relationships among students and teachers" (p. 32).
- **The Native interviewees'** responses clearly indicated that "cultural education was viewed as essential 'to promote and foster lifelong learning'" (p. 34).

The authors add, "Many respondents stressed the fostering of tribal language skills (citing research supporting bilingual and immersion programs) and the integration of tribal values in curriculum as what they would like to achieve as educational leaders" (p. 34).

Expanding Education and Career Awareness in Rural Areas

Most tribal reservation communities are located in rural areas across the United States with a few exceptions. The 2010 U.S. Census map (see Figure 1) shows the location of all of the Native reservation areas. Rural and urban Native communities struggle with a variety of issues related to education. Though their issues may differ, they often experience similar outcomes. Educational opportunities and career awareness can seem rather limited in rural areas, as compared to urban areas that have access to a multitude of educational resources and businesses. Regardless of what is locally available, rural educators must maximize their surroundings to benefit their students.

Figure 1. 2010 U.S. Census map of tribal reservations in the United States
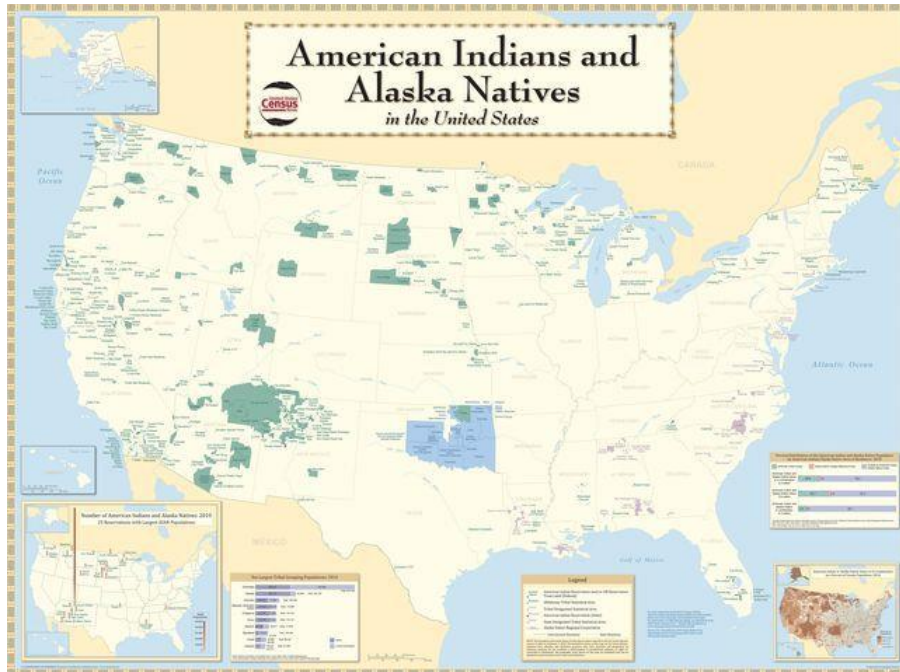
Rural educators are encouraged to use an asset approach that draws on the strengths of their students, local families, and communities, versus using a deficit model that blames the students and their families for their circumstances (Faircloth and Tippeconnic, 2010, p. 27). As such, educators must be prepared to immerse themselves in the Native communities in which they work and perhaps live (Klug and Whitfield, 2003).

Hardré and Lieuanan (2010) point out that "research comparing the motivational characteristics of Native and non-Native rural students is virtually nonexistent" (p. 41). As such, the authors conducted a study where they "compared matched samples of Native and non-Native students from the same rural schools and classes" (p. 41). Their findings indicate that Native students "present a different motivational profile, compared to non-Native students in the same schools and classes" (p. 57). In the study results, both students reported "high and consistent scores on teacher support and interpersonal relatedness" (p. 57). However, the Native students differed in the area of school effort and success where their "expectations are values, learning goals, perceived competence and ability" (p. 57).

Transitioning from the American Indian Home

Joseph and Windchief (2015) point out that "rural American Indian youth possess strong connections with their American Indian Home. In this context, the American Indian Home is represented with a capital H because, like immigrant youth, rural American Indian youth negotiate discourses rooted in their Home communities when relocating into academic communities containing multitudes of secondary cultural resources" (p. 82). The authors describe the conceptual model, *nahongvita*, a Hopi term that translates to self-empowerment, that aims to support rural Native youth in pursuit of higher education (p. 78).

> In conceptualizing the *nahongvita* model, we employ the spiritual essence of the term, which encapsulates the power of knowledge, awareness, keenness, and strength in an individual's relationship to environment and everything within it as a process of reciprocity. As such, the term nahongvita becomes a metaphor to articulate the conceptual model depicting the transition and negotiation process that American Indian youth experience as they leave their Home communities and move into new home communities with the specific purpose of entering higher education. The model offers a

way to examine, identify, and understand the cultural resilience that persists in and among American Indian people and their communities. The nahongvita model informs and encourages educators and the community to provide appropriate support to rural American Indian students in their pursuit of higher education. (p. 79)

Irvin et al. (2016) explain, "Research has demonstrated a strong link between educational aspirations, educational attainment, and numerous positive adult outcomes such as employment and health status" (p. 177). The authors conducted a study of "differences in the school characteristics and experiences of African American, Hispanic/Latino, and Native American youth in rural high schools as well as their relation to educational aspirations" (p. 176). Their findings show differences that may have important implications as these youth prepare to transition to adulthood (p. 176).

Native Academic Service Learning

Student involvement in academic service learning projects expose them to real-life situations and leaders in the field. It provides opportunities for students to see and experience first-hand what it would be like to work in various occupations. Further, academic service learning is not a one-way street, as it helps the community with ongoing projects and gives them opportunities to witness potential future leaders in action as they engage with their community. Educators can expand educational and career opportunities for Native students in rural communities through Native academic service learning. This learning must consider the nuances of Native cultural traditions, identities, jurisdictions, histories, and contemporary issues.

McNally (2004) identifies "some distinctive contours of Anishinaabe Ojibwe approaches to cultural transmission" (p. 604) and reflects on his "experience incorporating service-learning in classes on Native traditions" (p. 604).

Distinctions in Anishinaabe Ojibwe pedagogy (McNally, 2004):

- **Oral traditions –** It privileges knowledge rooted in oral traditions flowing through the complex authority of elders over book knowledge. (p. 605)
- **Responsibility for community –** It couples the knowledge taught and learned about tradition with responsibility on the part of both teacher and student to use that knowledge on behalf of community well-being. (p. 606)
- **First-hand experiences –** It engineers first-hand learning situated in and implicated in a student's experience, at the direction of, but not determined by the authority of the elder. (p. 607)
- **Holistic reflection –** It makes room for holistic reflection that engenders synthesis across the putative boundaries of a modern Western sociology of knowledge: those differentiating religion from politics, economics, medicine, art, and history, and differentiating knowledge about "religion" from the spiritual experience and ethical concerns that surround it. (p. 608)

McNally (2004) defines service learning as "a pedagogical posture that bases learning on students' experience in community service projects at the behest and direction of Native communities and agencies and that thoughtfully engineers students' structured reflection on that service" (p. 609). He adds that "crucially, this is more than extracurricular volunteerism, more than a supplement to classroom learning" (p. 609).
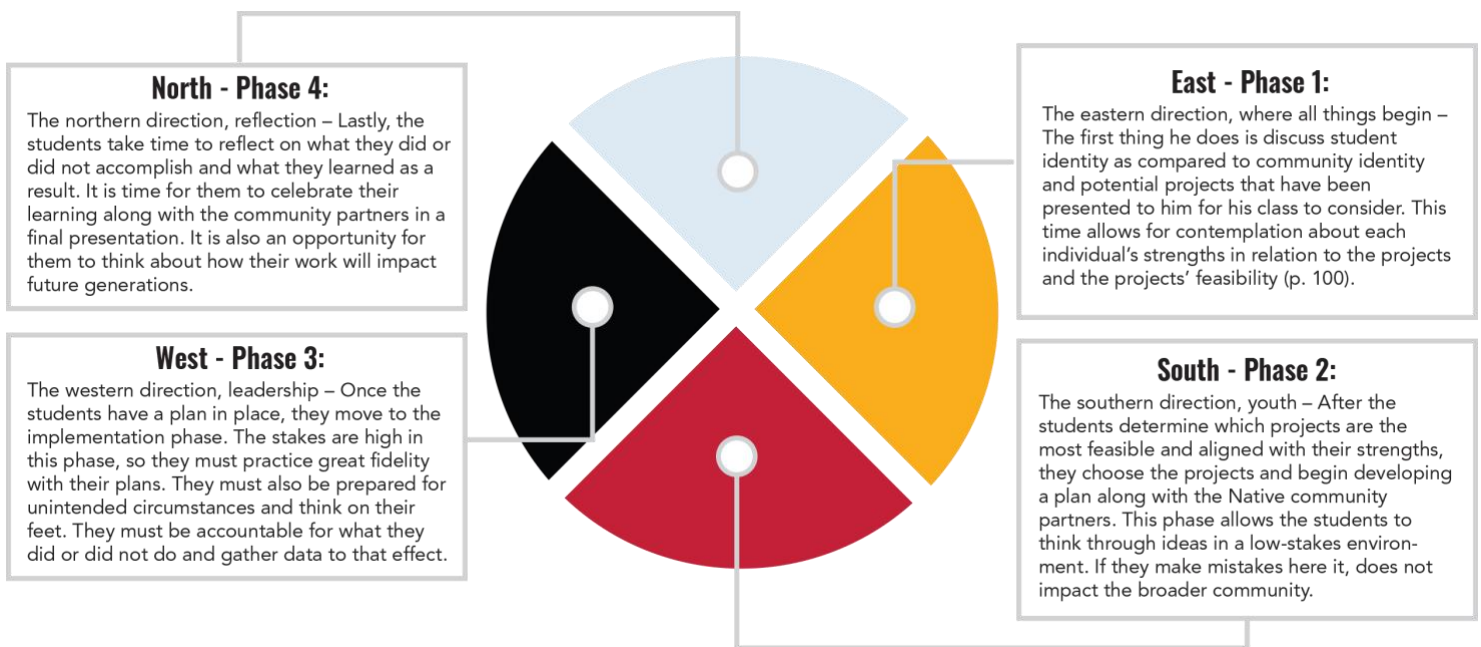
Service learning can instill a characteristically Ojibwe sense of the necessary connection between knowledge and responsibility. (McNally, 2004, p. 614).

Academic Service Learning Based on the Medicine Wheel

In 2017, Reinhardt described how he approaches academic service learning using the Anishinaabe medicine wheel.

North - Phase 4:
The northern direction, reflection – Lastly, the students take time to reflect on what they did or did not accomplish and what they learned as a result. It is time for them to celebrate their learning along with the community partners in a final presentation. It is also an opportunity for them to think about how their work will impact future generations.

East - Phase 1:
The eastern direction, where all things begin – The first thing he does is discuss student identity as compared to community identity and potential projects that have been presented to him for his class to consider. This time allows for contemplation about each individual's strengths in relation to the projects and the projects' feasibility (p. 100).

West - Phase 3:
The western direction, leadership – Once the students have a plan in place, they move to the implementation phase. The stakes are high in this phase, so they must practice great fidelity with their plans. They must also be prepared for unintended circumstances and think on their feet. They must be accountable for what they did or did not do and gather data to that effect.

South - Phase 2:
The southern direction, youth – After the students determine which projects are the most feasible and aligned with their strengths, they choose the projects and begin developing a plan along with the Native community partners. This phase allows the students to think through ideas in a low-stakes environment. If they make mistakes here it, does not impact the broader community.

For Reinhardt (2017), the medicine wheel framework is familiar to most Native students in the surrounding tribal communities. It is taught through oral tradition at ceremonies and is reflected in tribal flags and artwork in the local communities. The medicine wheel provides a framework for Native students to learn about careers in a similar context as they continue their education.

Pathways to Careers Beyond Local Options

Native students can follow multiple pathways to explore careers beyond those locally available. Pursuing mentor/mentee relationships and college summer programs are among paths that have shown some of the greatest results. Students can also find many opportunities through web-based programs; onsite visits to businesses, college campuses, and government institutions; and conference attendance.

Mentoring

Mentoring has proven an effective method of preparing Native students for higher education and the workforce. Reed (2007) shared an example based on her experience with a fall 2004 mentoring/exploratory Teaching Exploration Experience project, which encouraged Native middle school students to consider a teaching career (p. 25). Reed (2007) explains that the shortage of Native teachers in the United States makes it unlikely that Native students will see someone like themselves in a teaching or leadership position in their schools (p. 26).

Teachers of color are essential role models serving as primary examples of achievement that can positively influence the self perceptions and academic achievement of children of color. (Reed, 2007, p. 26).

In her article, Reed (2007) describes the major components of the project that made it successful, and provides objectives for those planning a similar experience. The "objectives include informing interested middle school students about (a) the teaching profession, including why individuals choose to become teachers, (b) how students can become licensed teachers and, (c) what it feels like to plan and implement lesson instruction to elementary students" (p. 32).

Intensive Summer Programs

Gilbert (2000) describes the Nizhoni Academy as an example intensive summer program. (In Navajo, *nizhoni* means for *to be beautiful*.) Nizhoni Academy was founded through a partnership of Northern Arizona University's (NAU) Center for Excellence in Education, Navajo Nation, Hopi Nation, and parents to provide disadvantaged Native students with academic preparedness and motivation (p. 41).

Nizhoni Academy accomplishes its goal "by acquainting and orienting the American Indian sophomore and junior students to the rigors of college or university life, preparing them as students for continued academic success in high school, and constructing an academic 'bridge' that would better prepare them for effective functioning in a college or university." (Gilbert, 2000, p. 41)

Nizhoni Academy is a 5-week intensive summer program held on the campus of NAU that better prepares students "to fulfill their dreams and aspirations for a career of their choice, and to participate in and become productive contributors to the larger American society" (p. 53). The program includes:

- 160 hours of instruction in composition, mathematics, and career development with reading, study skills, and computer literacy incorporated into the classes;
- English and mathematics skills development;
- study skills development;
- goal setting, clarification of values that build self-esteem, and career development activities
- ACT preparation workshops; and
- cultural and recreational activities that reflect many realities of university and college life.

College Summer Programs

Wu and Gentry (2014) point out that university-based summer enrichment programs have proven to be effective in encouraging Native students to explore college and careers as options for their future. These summer programs provide opportunities to "experience accelerated and advanced curriculum; experience life on a college campus; and in some cases even earn high school credits" (p. 68). The authors explain that "students also experience both short- and long-term benefits of these programs including positive peer relationships, sense of acceptance and belonging…and increased content knowledge, motivation, self-confidence, and self-expectations after program participation" (p. 68).

> Studies of gifted students who attended residential programs multiple times showed that these programs played an important role in shaping students' career choices.
> (Wu and Gentry, 2014, p. 68)

Web-based Programs

While it may seem obvious that web-based programs can offer pathways to careers beyond those locally available to Native students, it is important to consider issues of access and focus. Adcock (2014) "highlights current efforts to use educational technology in Indian Country with K-12 students, situated within the larger discourse on digital equity" (p. 104). The author notes the need for literature on digital equity that provides a broader analysis of the current state of educational technologies in Indian Country. The author asserts the need for more examples of modern technologies being used successfully with Native students, regardless of access, leadership, funding, and infrastructure. These examples would increase distinctions between tribes and provide additional strategies, beyond economic development, to bridge the digital divide among Native communities (p. 105).

> Currently, the question for many tribes is not so much if modern technologies should be employed with Native students but how to best appropriate digital tools to

The author proposes that, while in the recent past many researchers have focused on the digital divide, "many educational leaders now find the debate less about access and more a question of how underrepresented groups are using technology in school" (pp. 107-108). The author states, "There are issues with connectivity, appropriating resources for infrastructure upkeep, developing standards for preserving the sanctity of tribal cultural information, and ensuring that the technologies are used to promote rather than to undermine tribal goals" (p. 109).

Increasing Interest in STEM

Connors-Kellgren, Parker, Blustein, and Barnett (2016) discuss the National Science Foundation's Innovative Technology Experiences for Students and Teachers (ITEST) program. They note that "ITEST focuses particular attention on building STEM [science, technology, engineering, and mathematics] interest, motivation, and persistence among groups underrepresented in the STEM workforce" (p. 826). The authors note that the National Science Foundation's Innovative Technology Experiences for Students and Teachers (ITEST) program provides best practices, contexts, and processes to motivate K-12 students to participate in STEM activities and pursue STEM careers. "The outcomes from these projects have contributed significantly to the national body of knowledge about strategies, successes, models, and interventions that support and encourage youth to pursue STEM careers" (Connors-Kellgren, Parker, Blustein, and Barnett, 2016, p. 825).

In 2019, Eglash et al. published an article focused on a generative framework to translate Native knowledge systems into STEM studies.

Generative STEM is about bridges between several different domains: between the virtual and the physical; cultural knowledge and scientific knowledge; schools and communities; pasts and futures"
(Eglash et al., 2009, p. 3).

Eglash et al. (2019) said their study originates in collaborations between the Northern Michigan University (NMU) Center for Native American Studies (CNAS) and a group of interdisciplinary researchers (p. 2). The collaborations were based on the use of Culturally Situated Design Tools (CSDTs) in multiple summer Native youth programs at NMU. "CSDTs are a suite of online simulations, hardware kits, and other technologies that are based on the idea that math, computing, and concepts from other STEM disciplines are already embedded in indigenous and vernacular knowledge systems and cultural designs" (p. 2).

The 4 principles of Culturally Situated Design Tools (Eglash et al., 2019, p. 4):

- **Respectful contextualization –** Elders, artists, or other representatives of the tradition must approve any candidate practice or artifact, and the practice or artifact must be presented to students through its cultural/historical context to ensure respectful use.
- **Emic, not etic –** Interview practitioners to start with their views and knowledge, rather than imposing Western meanings through translations, which will always be partial at best. The vast depths of Native knowledge cannot be simply "ported" to Western classrooms as if they are a formula in a book.
- **Contact zones –** The technology interface design process inhabits a "contact zone" (Haraway 2016), which evolves toward an acceptable design for teachers, community collaborators, and students through iterative feedback (Lachney 2017a).
- **Design agency –** Student learners are not merely simulating older designs, but discovering "heritage algorithms," which are found in cultural arts and designs, such as Native quilting (Bennett 2016), to create new patterns of their own. A result can be the blending of localized knowledge and STEM to develop new, community-relevant innovations (Bennett et al. 2016; Eglash et al. 2017; Lachney et al. 2019)."

Eglash et al. (2019) further explain that "Prior CSDTs created in collaboration with Native nations included a virtual bead loom developed with a Shoshone Nation school and a virtual rug loom created with the Diné Environmental Institute (Navajo Nation)" (p. 4). The focus of the current study was based on a request from faculty of CNAS and Hannahville Indian School for the development of a "virtual wiigiwaam to represent a distinctly Anishinaabe CSDT, with the pedagogical aim of providing connections between indigenous knowledge and a high school level curriculum. This became the CSDT we refer to as 'Anishinaabe arcs.'" (p. 4). The researchers further describe CNAS' Reimagine STEM summer program's use of Anishinaabe arcs with a mix of 48 Native and non-Native high-school students (p. 10).

Figure 2. A youth shows the result of using a heritage algorithm

The differences between pre-survey and post-survey answers, for both quantitative and qualitative measures, showed increases in students' understandings of Indigenous knowledge, their ability to utilize it in moving from heritage algorithms to physical constructions, and their visions for new hybrid forms of Indigenous futurity. These findings support our initial

> hypothesis that Anishinaabe arcs would create the conditions for a generative cycle, where young people could engage STEM for the purposes of Indigenous futurity. (p. 20)

The authors also explained that "in an effort to have students' responses and reflections recursively inform future work, the high number of respondents expressing interest in greenhouses specifically and sustainability more generally prompted the direction of" (p. 20) the collaborators' plans for the subsequent workshop he following year.

Onsite Visits

Providing Native students with opportunities to visit businesses, college campuses, and government institutions is also an important way to help them discern pathways to careers beyond those that are locally available. College recruitment and admissions offices offer campus tours and can provide information about requirements for entry into college. Many businesses are willing to provide workshops or tours of their facilities and are also good sources of support for technical materials for curriculum development. Government officials are also generally willing to provide presentations or facilitate field trips for students.

Conference Participation

Lastly, it is important for Native students to take advantage of student participation in state, regional, national, and international conferences. Conferences provide opportunities for Native students to interact with people from a variety of communities and professions on a number of topics. The National Indian Education Association (NIEA) annual convention, the American Indian Science and Engineering Society (AISES), and the Society for American Indian Government Employees (SAIGE) are three examples of national conferences that focus on Native education and include youth tracks.

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