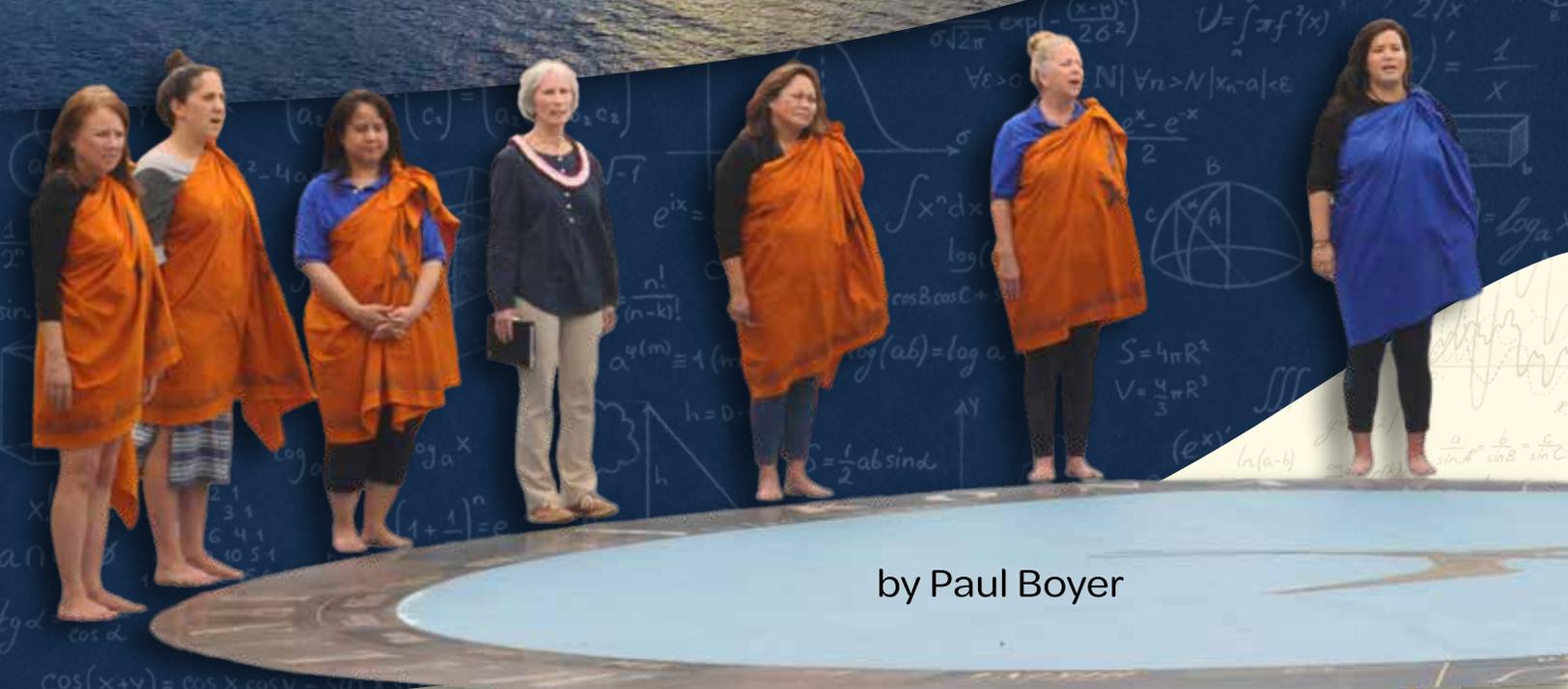
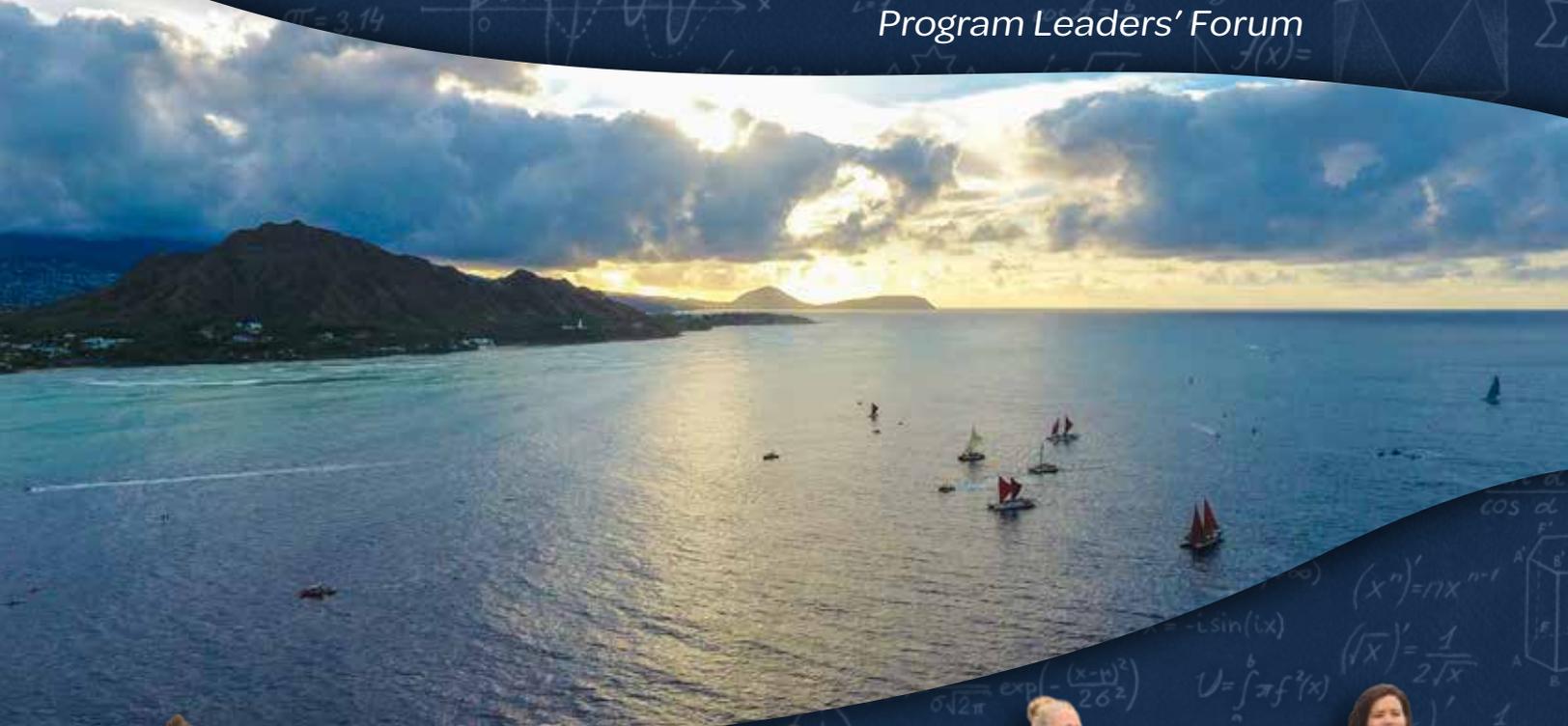


Native Pathways

Supporting the Journey
to STEM Careers for
Native Students

Findings from the 2018 Tribal
Colleges and Universities
Program Leaders' Forum



by Paul Boyer

THE PATH from school to work is often presented as a sequence of logical steps: start in kindergarten, continue to college, and walk out sixteen years later with a diploma and job offer. For some students, it does work this way. The affluent, the urban—those familiar with the conventions of academic life—often move easily through the education “pipeline.”

For many Americans, however, the journey from grade school to career is neither easy nor obvious. About 40 percent of the nation’s high school graduates don’t continue their education and nearly half of those who do attempt college leave before earning a degree. This disparity is strongly correlated with race and wealth. While half of Americans from high-income families complete a four-year degree by age 25, only 1 in 10 Americans from low income families will earn a baccalaureate degree by the same age, according to the U.S. Department of Education.

Without a college degree, however, low income families have little hope of advancing in the American economy. While it was once possible to rise into the middle class on the strength of a high school diploma, the majority of careers now require at least some postsecondary training. Those without the necessary credentials are increasingly pushed to the harsh margins of the nation’s economy, relegated to low wage jobs that lack security or benefits.

On the Cover:

Top: The 2017 homecoming of Hōkūle‘a after its three-year journey around the globe. A replica of traditional voyaging canoes that once traversed the Pacific, Hōkūle‘a’s crew used traditional navigational methods to reach 150 ports of call in eighteen nations.

Bottom: As is customary in Native Hawaiian protocol, guests conduct an oli kāhea, a request to enter by identifying themselves and their intentions. Chancellor Louise Pagotto and faculty, staff, students of Kapi‘olani Community College respond with an oli komo, a welcoming chant receiving the TCUP leaders.

Native Americans and the College Achievement Gap

NOWHERE are the effects of this corrosive relationship between poverty and low educational attainment more keenly felt than in the nation's Native communities. Five hundred years after colonization and 150 years after formation of reservations, American Indians and Native Alaskans remain both the poorest and least educated of all ethnic and racial groups in the United States. The federal government's own statistics confirm that American Indians and Alaska Natives have:

- the highest high school dropout rates of any ethnic group in the country;
- the lowest college enrollment rates;
- and one the nation's highest college dropout rates.

The end result: only 14 percent of American Indians and Alaska Natives have earned a baccalaureate degree, which is less than half that of the general population, according to the American Indian College Fund. The consequences of this gap are apparent within Native communities, where unemployment rates often exceed 50 percent and can approach 80 percent. Without a skilled workforce, tribal economies languish and tribal members find themselves unqualified for jobs that are available.

Sandra Boham, president of Salish Kootenai College.



The Role of STEM

THE gap is particularly acute in STEM-related fields. While STEM careers represent the fastest growing and highest paid segment of the American economy, American Indians and Alaska Natives represented a mere .3 percent of employed individuals with science and engineering as their highest degree and .2 percent of the nation's workers in science and engineering occupations, according to the National Science Board's 2018 *Science and Engineering Indicators* report.

Limited participation in STEM programs not only restricts employment opportunities, it also affects the health and well-being of whole communities. Many reservations do not have enough health care providers, social workers, or science teachers. Nor do they have enough trained technicians and engineers needed to maintain the infrastructure of reservations. While tribes are sovereign nations, many are unable to meet the essential needs of their citizens.



Building Pathways at Tribal and Native-Serving Colleges

WITHOUT question, significant progress has been made. Until the mid-twentieth century, a few years of formal schooling was all that was expected of Native students. Government and missionary-run boarding schools enrolled thousands of children, but the goal was to “civilize” and assimilate Indians, not nurture scholars. Until the late 1960s, many tribes did not have a single college graduate.

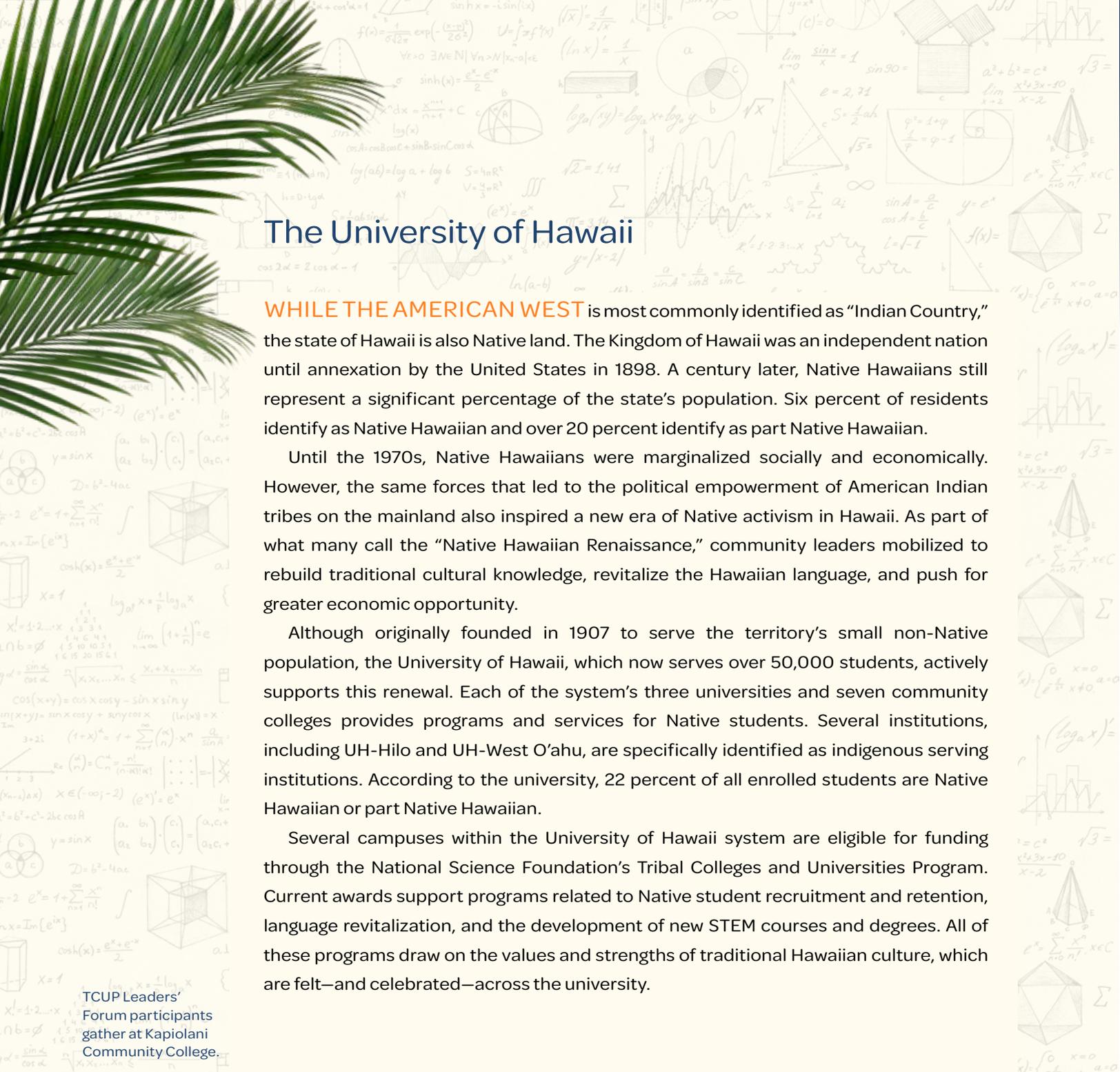
In the wake of the civil rights movement, however, colleges and universities began opening their doors to Native students and developed programs to support their success. At the same time, tribal leaders also began promoting higher education as part of the movement for greater tribal self determination. In response, the number of American Indian and Alaska Native students rose rapidly. In 1935 there were only 52 American Indian college graduates in the entire United States, according to one survey completed at the time. By 2006, however, the National Center for Education Statistics reported that over

181,000 American Indian and Alaska Native students were enrolled in higher education.

Tribally controlled colleges and universities played a particularly important role in building this new era of opportunity. The first—Navajo Community College (now Diné College)—was established on the Navajo Reservation over fifty years ago. Today, more than three dozen tribal colleges are now operating on or near reservations across the country.

Although they began with shoestring budgets and limited facilities—many classes were held in rented storefronts and double-wide trailers—they proved their value by providing training for work available locally and preparing students for continued study at mainstream universities. Today, many tribally controlled colleges now offer four year and even graduate degrees in fields ranging from elementary education and business to environmental science and engineering.

Corin Kim of Leeward Community College with Carty Monette of the Tribal Nations Research Group.



The University of Hawaii

WHILE THE AMERICAN WEST is most commonly identified as “Indian Country,” the state of Hawaii is also Native land. The Kingdom of Hawaii was an independent nation until annexation by the United States in 1898. A century later, Native Hawaiians still represent a significant percentage of the state’s population. Six percent of residents identify as Native Hawaiian and over 20 percent identify as part Native Hawaiian.

Until the 1970s, Native Hawaiians were marginalized socially and economically. However, the same forces that led to the political empowerment of American Indian tribes on the mainland also inspired a new era of Native activism in Hawaii. As part of what many call the “Native Hawaiian Renaissance,” community leaders mobilized to rebuild traditional cultural knowledge, revitalize the Hawaiian language, and push for greater economic opportunity.

Although originally founded in 1907 to serve the territory’s small non-Native population, the University of Hawaii, which now serves over 50,000 students, actively supports this renewal. Each of the system’s three universities and seven community colleges provides programs and services for Native students. Several institutions, including UH-Hilo and UH-West O’ahu, are specifically identified as indigenous serving institutions. According to the university, 22 percent of all enrolled students are Native Hawaiian or part Native Hawaiian.

Several campuses within the University of Hawaii system are eligible for funding through the National Science Foundation’s Tribal Colleges and Universities Program. Current awards support programs related to Native student recruitment and retention, language revitalization, and the development of new STEM courses and degrees. All of these programs draw on the values and strengths of traditional Hawaiian culture, which are felt—and celebrated—across the university.

TCUP Leaders’
Forum participants
gather at Kapiolani
Community College.





Lehua Kamalu, Dr. Haunani Kane, and Ka'iulani Murphy, crew and navigators of the Polynesian Voyaging Society.

Serving Native Students in an Era of Accountability: The 2018 TCUP Leaders' Forum

TRIBALLY controlled colleges, along with mainstream universities committed to serving Native students, have fundamentally transformed the landscape of American Indian, Alaska Native, and Native Hawaiian higher education. Collectively, these institutions are providing diverse pathways to higher education for Native students and the opportunity for full participation in the American economy.

However, tribal and Native-serving colleges and universities are also part of a national educational system that is undergoing rapid change. Higher education's historic mandate to provide a broad liberal arts education is increasingly viewed as outdated and irrelevant. In an uncertain economy, Americans now see higher education as, above all, a door to employment. And as college costs rise, policy makers want to know exactly what students are

getting for the money spent—what they are learning, how degrees advance career prospects, and how much financial “value” a diploma actually provides.

In this climate of insecurity and increased oversight, educators from more than a dozen tribal and Native-serving colleges and universities gathered to discuss how they can strengthen the path to college and employment for Native students, especially in STEM programs. Funded by the National Science Foundation's Tribal Colleges and Universities Program (TCUP) and hosted by the University of Hawaii, the 2018 Leaders' Forum focused on:

- **Building connections with K-12 schools** by providing academic enrichment programs and dual credit courses that help high school graduates make the transition to college;

- **Promoting retention of Native students**, especially in challenging STEM-related courses and degree programs;
- **Preparing students for careers after graduation**, especially in or near Native communities;
- **Achieving goals with limited resources** and in a different cultural context.

Ultimately, the workshop revealed that tribal and Native-serving colleges are in

many ways model institutions; working in poor and underserved communities, they pioneered approaches to enrollment and paths to employment that policy makers are now asking all institutions to emulate. But participants also acknowledged that more must be done to assure the success of all students, especially in challenging STEM programs. By looking at best practices and next steps, the forum was part of an ongoing effort to serve these historically overlooked communities.

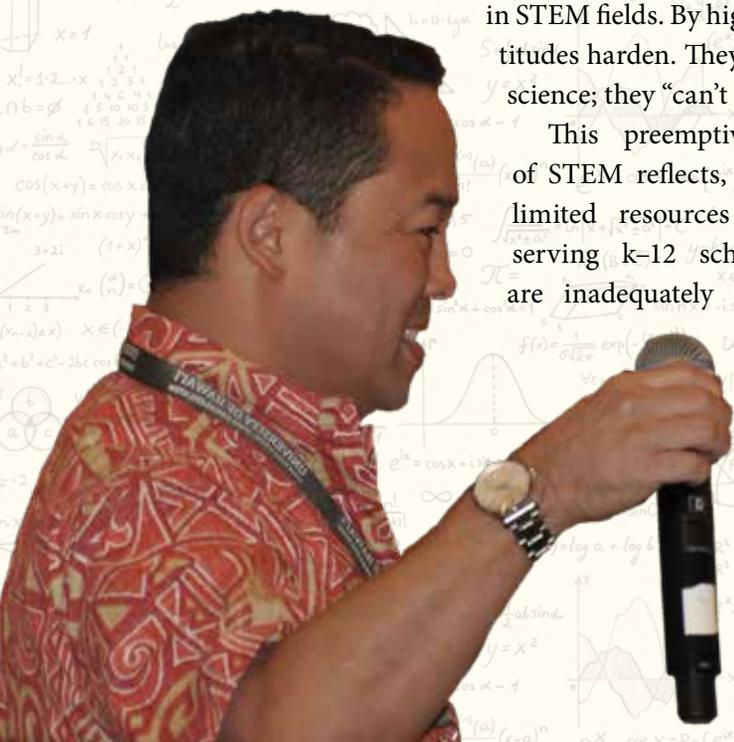
The Path to College: The Value of Dual Enrollment Programs

FOR many Native students, attitudes toward science, technology, engineering, and mathematics are formed long before college. By middle school Native students are more likely to struggle in math and science and are less inclined to talk about careers in STEM fields. By high school, attitudes harden. They “don’t like” science; they “can’t do” math.

This preemptive rejection of STEM reflects, in part, the limited resources of Native-serving k-12 schools. Many are inadequately funded and

cannot provide the higher level math and science classes found in wealthier school districts. Additionally, educators note that Native students often have little exposure to STEM professions. In rural and reservation communities, they see few scientists, don’t know any engineers, and wonder why anyone would need algebra or calculus in daily life. Math and science are simply classes to pass, not occupations to pursue.

In this setting, tribal and Native-serving colleges must do more to build skills and generate interest in math and the sciences, observed Mary Larson, director of the STEM Academy at Salish Kootenai



Dr. Charles Sasaki of Windward Community College.

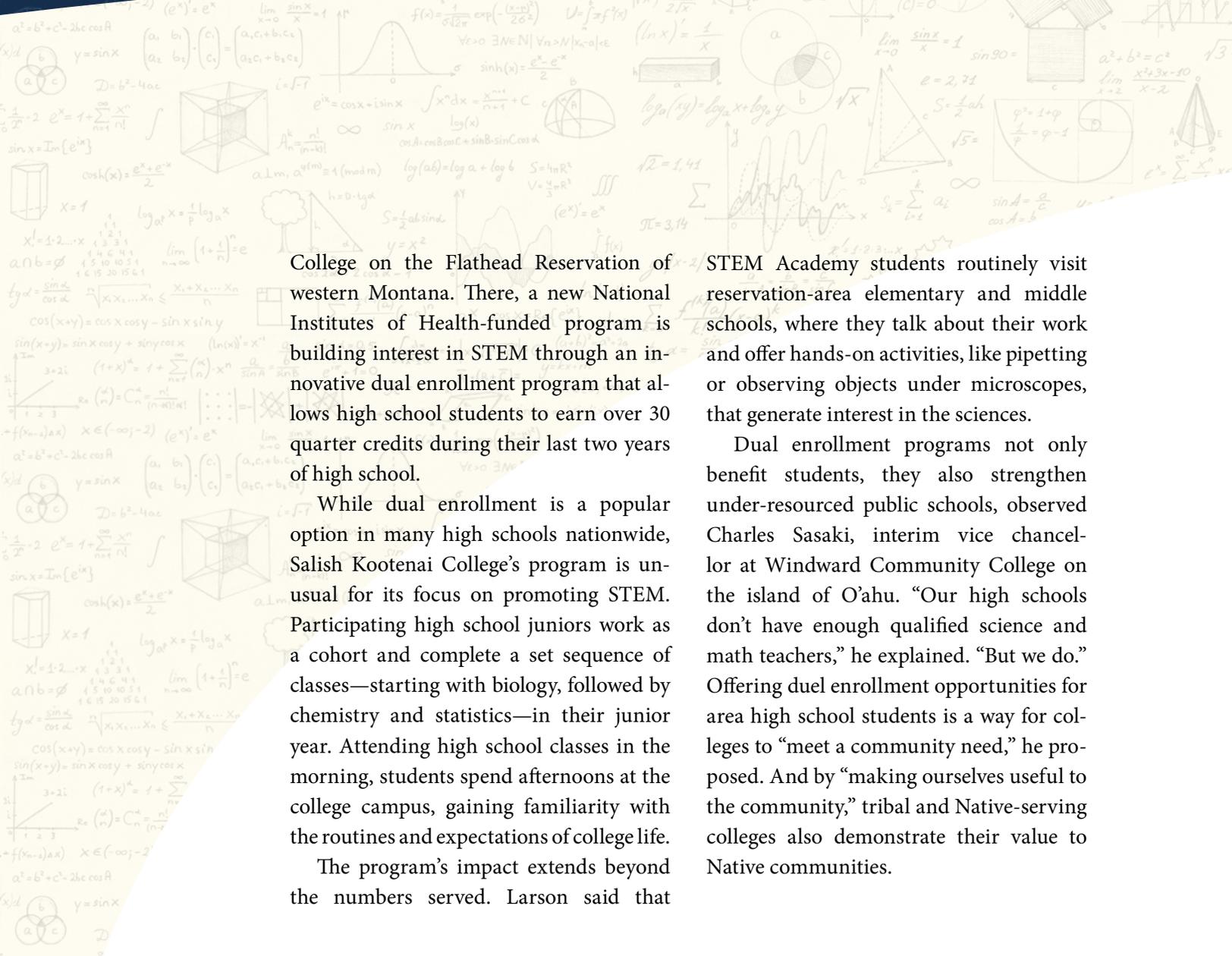
College on the Flathead Reservation of western Montana. There, a new National Institutes of Health-funded program is building interest in STEM through an innovative dual enrollment program that allows high school students to earn over 30 quarter credits during their last two years of high school.

While dual enrollment is a popular option in many high schools nationwide, Salish Kootenai College's program is unusual for its focus on promoting STEM. Participating high school juniors work as a cohort and complete a set sequence of classes—starting with biology, followed by chemistry and statistics—in their junior year. Attending high school classes in the morning, students spend afternoons at the college campus, gaining familiarity with the routines and expectations of college life.

The program's impact extends beyond the numbers served. Larson said that

STEM Academy students routinely visit reservation-area elementary and middle schools, where they talk about their work and offer hands-on activities, like pipetting or observing objects under microscopes, that generate interest in the sciences.

Dual enrollment programs not only benefit students, they also strengthen under-resourced public schools, observed Charles Sasaki, interim vice chancellor at Windward Community College on the island of O'ahu. "Our high schools don't have enough qualified science and math teachers," he explained. "But we do." Offering dual enrollment opportunities for area high school students is a way for colleges to "meet a community need," he proposed. And by "making ourselves useful to the community," tribal and Native-serving colleges also demonstrate their value to Native communities.



The Path from Enrollment to Graduation: The Need for Support

DUAL enrollment and other k–12 enrichment programs help build interest in STEM degrees, but speakers and panelists emphasized that more is needed to recruit and retain Native students in college. From academic tutoring to counseling, participants emphasized the need for what Mary Larson characterized as “support, support, support.”

To provide the right kind of support, college and university staff first need to know when students are struggling, argued Suzette Burckhard, a professor and assistant department head in the Department of Civil and Environmental Engineering at South Dakota State University. “We’re not big brother, but we do monitor a lot of what students do,” she said. “Are they going to class? Are they using the food service? Have they purchased books or accessed the online network?”

In other words, she said, “Has the student met some little benchmark” that can indicate that he or she is settling in, making use of institutional resources, and moving forward academically? If not, the student can be directed to the first-year student success center for counseling and support.

She called the first two weeks of school “critical” for retention, especially in her discipline of engineering. Students who

struggle in challenging gatekeeper courses too often preemptively decide to change majors. Women, in particular, lack confidence, she said, and can be easily swayed by a kindly faculty or staff member who suggests switching to the social sciences.

Building a strong academic support system is vital, and should include opportunities for students to work independently and on their own schedule, said Charles Sasaki. He noted that the number of students logging into the college’s online tutoring and support services tends to spike at night, after other family members have gone to bed. That’s when they can work uninterrupted and, he speculated, when they can focus on remedial work in private and without embarrassment.

Students also need encouragement and reassurance, Burckhard said. She noted that a growing reliance on computer-based instruction may not be enough for students who feel lost or lack confidence. Sometimes students just need reassurance. Even in an era of online learning, the need for strong one-on-one support remains.

Similarly, students need to know *why* they should pursue STEM, said Joanita Kant of the Department of Civil and Environmental Engineering at South Dakota State University. Instructors,



Left to right:
Emily White Hat,
American Indian
College Fund; Lui
Hokoana, chancellor,
UH Maui College; Randy
Smith, president,
Sisseton Wahpeton
Community College;
and Peter Quigley,
associate vice
president for academic
affairs, UH Community
College System.

immersed in their disciplines, can forget that their passion is not always shared by the uninitiated. College staff and instructors “have to show why someone would want to major in STEM in the first place,” she said.

Some fields, like nursing or the life sciences, do attract Native students. The reason, in part, is that first generation students tend to “pick what they know,” observed Sandra Boham, president of Salish Kootenai College on the Flathead Indian Reservation of Montana. For students from rural reservations, the career opportunities in these fields are more obvious.

However, engineering and the hard sciences can be a more difficult sell, noted Burckhard, not only because students lack role models but also because they are not viewed as “caring” professions. Female students, in particular, are drawn to careers that help families and strengthen communities, she argued.

Likewise, she said, engineering is too often seen as irrelevant to the needs of tribal communities. While “Native Americans have a long cultural tradition of STEM,” she said, students unfamiliar with engineering don’t automatically see its value in contemporary Native communities. In response, SDSU sponsors a variety of programs that introduce students to career options, focusing on ways that engineering and the sciences can build stronger and more caring communities.

Robert Pieri, a professor of mechanical engineering at North Dakota State University who works closely with tribal colleges in his state, agreed that the social value of engineering is poorly understood. Engineers play a vital role in building safe and healthy communities, he said, and pointed to the work of organizations like Engineers Without Borders as proof.

Bridging cultural barriers can be difficult in disciplines dominated by





David Lassner, president of the University of Hawaii system, welcomed NSF-TCUP Leaders' Forum participants. Noting that Hawaii was once an independent and self-sufficient nation, he stressed the importance of developing STEM capacity and building a sustainable economy within the state.

Peer mentoring can be a partial solution. "Tutoring and mentoring congruent with what the student believes or [how he or she] feels. . . is a natural fit," Pete said, arguing that "students should not have to change who they are or what they believe to enjoy the benefits of college."

non-Native faculty, however. There are very few Indian or Native instructors within mainstream universities. Even within tribal colleges, most instructors are non-Indian, said Shandin Pete, an instructor at Salish Kootenai College and a member of the tribe.

Non-Native faculty can be supportive and caring, but they don't always know how to meet the needs of Native students. Likewise, students don't always understand the values and assumptions made by faculty steeped in the western academic tradition. The result can be a climate of only partial comprehension: "I don't understand your life; you don't understand mine," Pete said.

STRATEGIES FOR STEM RECRUITMENT AND RETENTION:

- ✓ Demonstrate the value of STEM fields in Native communities;
- ✓ Track student engagement in the college or university, especially during the first weeks of school;
- ✓ Provide flexible options for academic support and one-on-one counseling;
- ✓ Develop and support peer tutoring and mentoring.

The Path from Diploma to Career: Making STEM Relevant

IT'S not enough to guide students to graduation, however. In this new era, colleges and universities are also held accountable for what happens after diplomas are awarded. Educators must help students identify and move strategically toward their career goals.

This requires faculty to look beyond the boundaries of their disciplines and, in some ways, rethink their role as educators, said John Rand, director of STEM education at the University of Hawaii. “As a faculty member I always thought my job was to get [students] through the course so they could be successful in the next course—and the next few courses,” he said. “I don’t think that’s what we’re thinking about any longer. Our faculty. . . have to think about career paths as much as they think about academic paths.” This is particularly true within the STEM disciplines, he said. “If you want to work in the STEM industry, you’ve got to start thinking about your career early on.”

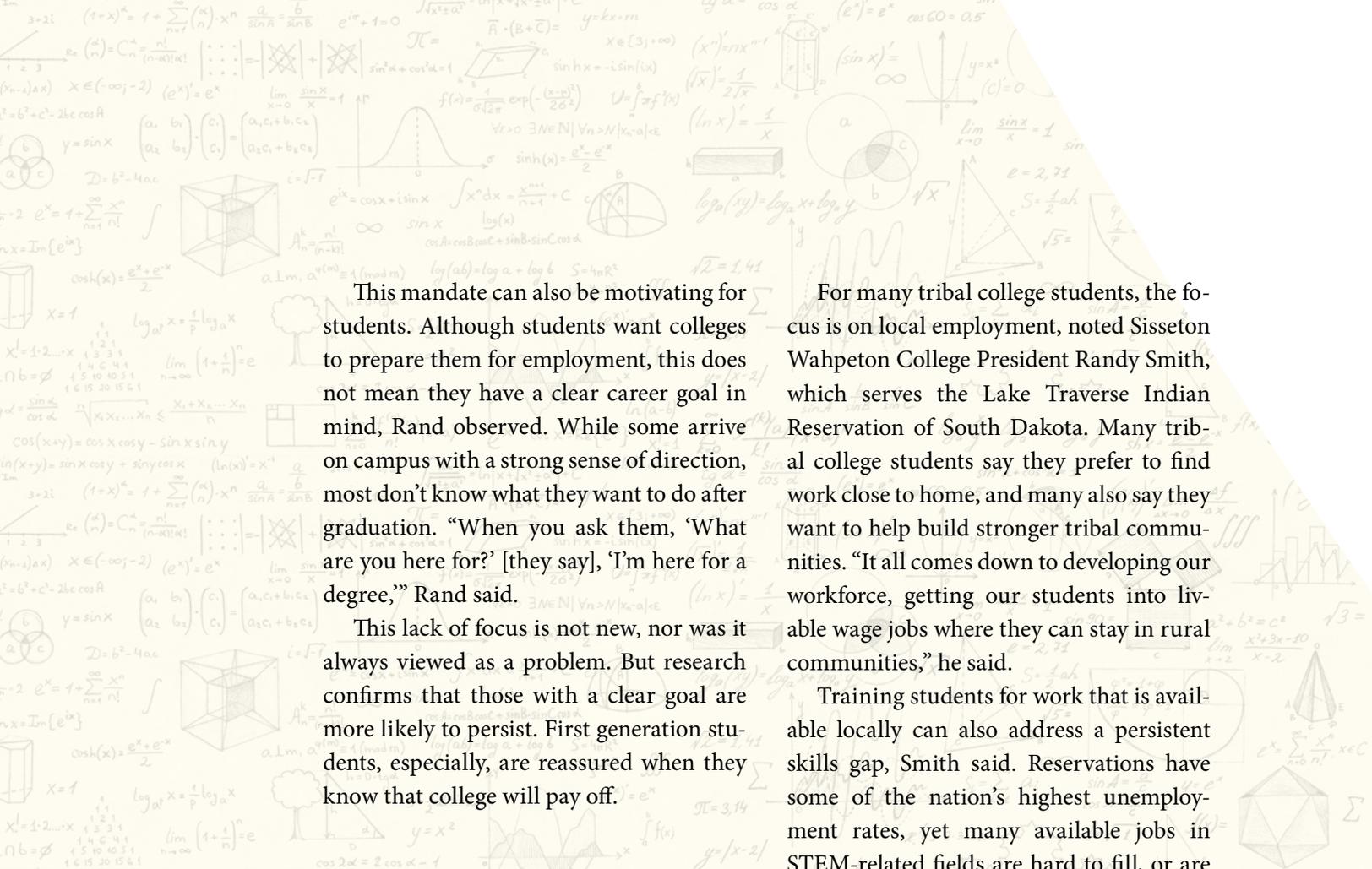
This mandate also changes the mission and structure of institutions, according to Peter Quigley, the university’s vice president for community colleges. Noting that

92 percent of students now say they are in college to get a job, he argued that colleges and universities must be “designed with the end in mind.” Educators “have to know what industry wants” and build degree programs around existing job opportunities.

For some, talk of career preparation sounds uncomfortably like a retreat to vocational and technical education—a narrowing of higher education’s historic mandate to advance knowledge. However, a career-centered approach can enrich student learning and even invigorate teaching, argued Charles Sasaki. Universities, he said, “often don’t provide a context for faculty to think larger than the class that they are teaching.” Engagement with communities and professions encourages instructors “to think about the ways that their courses fit into something bigger than themselves.”

John Rand, director of STEM education at the University of Hawaii.





This mandate can also be motivating for students. Although students want colleges to prepare them for employment, this does not mean they have a clear career goal in mind, Rand observed. While some arrive on campus with a strong sense of direction, most don't know what they want to do after graduation. "When you ask them, 'What are you here for?' [they say], 'I'm here for a degree,'" Rand said.

This lack of focus is not new, nor was it always viewed as a problem. But research confirms that those with a clear goal are more likely to persist. First generation students, especially, are reassured when they know that college will pay off.

For many tribal college students, the focus is on local employment, noted Sisseton Wahpeton College President Randy Smith, which serves the Lake Traverse Indian Reservation of South Dakota. Many tribal college students say they prefer to find work close to home, and many also say they want to help build stronger tribal communities. "It all comes down to developing our workforce, getting our students into livable wage jobs where they can stay in rural communities," he said.

Training students for work that is available locally can also address a persistent skills gap, Smith said. Reservations have some of the nation's highest unemployment rates, yet many available jobs in STEM-related fields are hard to fill, or are filled by non-Indians, simply because tribal members lack the required training and credentials. "Have you tried to find a dental hygienist in a rural community?" he asked. "I'm a rancher, but when my tractor goes down, it's hard to get it repaired." Offering training responsive to the particular needs of rural communities is essential for the overall growth of these overlooked regions.

When serving Native students, however, it's not enough to offer a selection of career-ready majors. Panelists noted that many American Indian students have limited exposure to formal employment. "We have relatives who have not experienced a worker in the family," said Emily White Hat, director of strategy and national



Robert Pieri, professor of mechanical engineering at North Dakota State University.



outreach for the American Indian College Fund. Based in Denver, the College Fund provides scholarships for tribal college students and, in recent years, supports other initiatives that promote student success and tribal development.

To build strong school-to-work pathways, White Hat said, colleges and universities must also introduce students to the culture of employment. For example, she said, "What does it mean to have a work ethic?" How do you advocate for yourself?" Students from families and communities poorly connected to the mainstream economy don't automatically know how to enter the job market, or how to fit in once they are hired.

For White Hat, building pathways means, ultimately, building connections to Native communities. Student success depends on support from families, she argued.

Conclusion

WHITE HAT'S comments are a reminder that the mission of tribal and Native-serving colleges is not simply to educate students or even to prepare "workers," but to build stronger Native nations. The paths they create are not for individuals alone, but for whole communities, and for genera-

SUPPORTING CAREER SUCCESS

1. Help students identify career options and career interests early in their education;
2. Introduce students to the culture of the workplace;
3. Provide exposure to work through internships and other outreach efforts;
4. Integrate research and community development projects into the undergraduate curriculum.

tions to come. The immediate goal is enrollment, retention, and employment, but the larger goal is to build strong, healthy, and hopeful societies.

For tribal and Native-serving colleges and universities, this is not a new mandate. But it is more important than ever.



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Lehua Kamalu participated in the NSF-funded Pre-Engineering Education Collaboratives (PEEC) program within the University of Hawaii and went on to completed a four-year program in mechanical engineering. She shared her work as an apprentice navigator with the Polynesian Voyaging Society. Kamalu was recently named a MIT Director Fellow.



Paul Boyer is founding editor of *Tribal College: Journal of American Indian Higher Education* and currently serves as editor of *Native Science Report* (nativesciencereport.org). Recent books and policy reports include *Ancient Wisdom, Modern Science: The Integration of Native Knowledge in Math and Science at Tribally Controlled Colleges and Universities* (Salish Kootenai College Press, 2010) and *Capturing Education: Envisioning and Building the First Tribal Colleges* (Salish Kootenai College Press, 2015). He holds a doctorate in Educational Theory and Policy from The Pennsylvania State University.