

Supporting Native American Students along STEM Education Pathways:

Findings from an Exploratory
Study of South Dakota's
Educational Landscape

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Findings from an Exploratory Study of South Dakota's Educational Landscape

During the 2008-09 school year, 13,092 Native American students were enrolled in public school districts across South Dakota. That's about 11 percent of the student population. In addition, Native American students were enrolled in non-public, Bureau of Indian Education (BIE) and Tribal schools. Currently, only 61 percent of Native American students who attend public high school in South Dakota graduate. And of the Native American students who enroll in one of South Dakota's state universities as freshmen, between 80 and 85 percent will not obtain a degree. Only two percent of the students enrolled in the state's public universities are Native American.¹

Introduction and Background

In 2006, South Dakota received an EPSCoR² grant focused on strengthening the state's capacity for science and engineering research.³ A portion of the budget was earmarked for educational outreach efforts through the Center for the Advancement of Mathematics and Science Education at Black Hills State University in Spearfish. Among the education-related goals, the PIs on the EPSCoR project were seeking ways to more successfully serve Native American students—to recruit and retain Native American students into the sciences and post-secondary education. The first step was to learn more about the current landscape of education for Native American students across the state.

¹ South Dakota Department of Education;

<http://doe.sd.gov/SECRETARY/indianed/documents/IndianEd.pdf>

² EPSCoR stands for Experimental Program to Stimulate Competitive Research. From NSF's website, "The mission of EPSCoR is to assist the National Science Foundation in its statutory function to strengthen research and education in science and engineering throughout the United States and to avoid undue concentration of such research and education."

³ This grant was a \$6.75 million Research Infrastructure Improvement grant, "The 2010 Initiative: Science-Based Leadership for South Dakota," designed to help advance and develop alternative sources of energy generation; develop new ways to manufacture electronic devices using nanoscale-based inks; identify new ways to protect and repair the environment; and provide for investments into institutional infrastructure improvements at Sinte Gleska University, a tribal university. For more on this, see <http://www.sdepscor.org/about.html>.

Inverness Research, Inc.⁴ was contracted to conduct an exploratory study focused on the learning experiences of Native American students in mathematics and science in South Dakota, barriers in continuing on to post-secondary education in math and science, and the supports that currently exist. Our goal in this study was to identify issues and opportunities, to examine the experience of students in high school and college in math and science, and to a lesser extent, study the broader context leading up to high school. We wanted to look closely at the kinds of supports and resources that are, or would be, most useful to students in helping with the transition from high school to college and in promoting continued study of math and science.⁵

Inverness Research was hired to conduct this study primarily because of our knowledge of math and science education, gained from evaluating hundreds of projects across the country aimed at improving the teaching and learning of math and science. We have evaluated and consulted on several projects in South Dakota, and have some experience with Native American populations. We acknowledge that we do not live in South Dakota, nor are we Native American. What we offer is a fresh eye, an outsiders' perspective grounded in years of experience studying math and science improvement efforts.

Over the course of three years, our study included telephone interviews with representatives from the South Dakota state government, universities and Tribal Colleges throughout South Dakota; and site visits to universities, colleges and Tribal Colleges, school districts serving Native American populations, and two reservations. The site visits included classroom observations, as well as interviews with students, teachers, university professors, school district administrators, program leaders, and parents. We observed students in math and science classes in several locations in the state. We also conducted in-depth focus groups and interviews with Native American students in high school, in Tribal Colleges, and in Regents institutions. Most of the students we interviewed were those that were utilizing or benefiting from supports and resources designed to encourage Native American students to stay in school and/or pursue post-secondary work in math and science.

Some common themes and interesting findings emerged from this work. In order to fully grasp their meaning and understand their importance, we believe it is important to share some of the student stories we heard. In fact, we are convinced that real, working solutions to the issues related to success in education for Native American students can only be found by talking with students, and those who work closely with them, and listening to what they have to say.

⁴ For more on Inverness Research, Inc., see our website at <http://www.inverness-research.org>.

⁵ See *Appendix: Program/Resource Descriptions*.

The next section of this report contains the stories of four college students who graciously met with us and generously gave of their time to talk about their experiences in school and their paths through college. The last section is a summary of what we learned from this study.

We envision this document as a discussion piece, one that provides multiple perspectives on the unique cultural contexts, and the opportunities and barriers that exist for Native students to pursue math and science education. We feel the findings that emerge from this study, while not prescriptive in nature, paint a portrait that we hope is useful.

The Experience of Native American Students: Four Vignettes

In this section of the report, we present the voices of Native American students. We observed students in math and science classes in several locations in the state, as well as conducted focus groups and interviews with Native American students from secondary school to college and university level. Most of the students we interviewed were those utilizing supports and resources designed to encourage Native American students to continue their education and/or pursue post-secondary work in math and science. In this section, we present four vignettes of students who have been successful in their pursuit of post-secondary math and science degrees.⁶ While each is unique, their individual stories illustrate the different paths students take, the supports that helped them along the way, and the barriers they have encountered.

Black Hills State University: Melissa

We met Melissa in the Center for American Indian Studies on the campus at Black Hills State University (BHSU) in Spearfish. Tall, soft-spoken, confident, and charismatic, Melissa is not a traditional college student, fresh out of high school. She is 34 years old with three children ranging in age from 10 to 16. Now a senior at Black Hills State, dual majoring in biology and American Indian studies, with a minor in earth science, her path to and through college has been a long and winding one.

Born in Minneapolis, Melissa lived in Albuquerque, New Mexico for a number of years. In 1992 she graduated from high school in Flandreau, South Dakota, and then moved to Nebraska. She earned a medical business specialist certificate shortly after high school and worked for several years in hospitals in New Mexico. In 2000, when the hospital she was working at closed, Melissa tried something different and worked in security at casinos until 2005.

⁶ These vignettes represent students' stories and experiences at the time of our interviews, spring 2009. Each of the vignettes has a slightly different tone and structure. We did not intend for these to be completely parallel in tone, structure or format.

She reached a point where she realized that without a college degree, life would offer her limited opportunities. So, she decided to go back to school:

It was dead-end, more or less. You could go work somewhere, but if you don't have a degree, you are not going to get very far up. My kids were getting older, so I figured I could go to school during the day while they were in school.⁷

Going back to school with three children was challenge enough; deciding what to study and where offered yet another dilemma. Hearing her mother speak about tribal issues and coming across an article in a newspaper about the intersection of environmental issues and tribal economic needs struck a chord with her:

There was a tribe in Arizona that was using reclaimed water to make snow for their ski resort, and I just thought, what kind of impact would that have on the environment? That really interested me.

She decided to pursue natural resources and tribal relations at the Southwestern Indian Polytechnic Institute (SIPI), a National Indian Community College and Land Grant Institution in Albuquerque, New Mexico. There were several factors that influenced her decision to attend SIPI. First of all, her mother knew the natural resources coordinator there. She had also lived in Albuquerque before and felt comfortable there. And she liked the small, community feel of SIPI. Even with all these supports in place, she acknowledged that going back to school as an older student was intimidating at first.

However, at SIPI, Melissa thrived in science classes that engaged her in hands-on activities and field-based work.

One thing that I found, with SIPI being a small, Native American community college is that we had more hands-on there. We had more field trips. For geology class, we went to caves and mines.

One of her most memorable experiences at SIPI was a summer internship that combined these field-based science activities with work that was directly of service to local communities. She spent two summers with Pueblo Santa Ana, working with the department of natural resources on restorations, doing population density, wildlife diversity, and vegetation studies.

With the support of family and faculty, Melissa was very successful at SIPI. She was a prominent student, receiving fellowships, making the Dean's list for academic achievement, and graduating in 2007.

⁷ The quotes in this report have been lightly edited for clarity without changing the intended meaning of the speaker.

Throughout her life, a key source of support and inspiration for Melissa has been her mother, who grew up on the Rosebud reservation in south-central South Dakota. Melissa is very respectful of her mother and awed by her strength:

I owe a lot of my success to my mom. She had hardships, but she left the reservation. That's why I am faithful to my mother. I never had to grow up on the reservation and I never had to need or want. It was always her strength and her stride and how she provided for myself and my little brother.

Melissa's mother is an extraordinary role model. She is the Superintendent of Devils Tower National Monument in northeastern Wyoming, the first Native American to hold that position. On a day-to-day basis, she balances the spiritual needs of the local Native American people with the desires and demands of tourists and the national park system. Her mother's support was so important to Melissa that, despite her success at SIPI, Melissa decided to continue her education at Black Hills State University to be near her mom.

At first, Melissa found BHSU's large campus and class sizes, and its diverse student population, to be overwhelming. She was troubled by her experiences in huge auditoriums with hundreds of other students and the lack of relationship with professors. She was also initially intimidated by the lecture- and test-based classes, and found far fewer of the hands-on science opportunities she thrived on while at SIPI.

Prior to enrolling at BHSU, Melissa had done some research and learned about the Center for American Indian Studies on campus. The Center has been an ongoing and important source of support for her. Center staff members have connected Melissa with support services on campus that provide tutoring and financial aid, and helped her locate and obtain scholarships. Most importantly, the Center has provided a smaller, family-like, Native American community within the larger institution.

I wanted to see the Center for American Indian Studies right away when I came to Black Hills State. And when I first came here, the staff was excellent and they took me in right away and I got work-study. So I still got to be around my Native Americans every day.

Melissa's resilience and determination to continue her education is striking. She took on the challenge of moving from a college environment where she had been highly successful to a large university where she did not know anyone. She told us about a semester at Black Hills that would have derailed anyone, let alone a single mother with three children, during which she had several surgeries and dealt with family issues. When she mentions these, it is not to point out how difficult her life had been, but rather in the context of describing how supportive one of her professors had been at that time.

My instructor was pretty awesome. He gave me an incomplete for my lecture and he is going to help me more one-to-one this summer with that.

In fact, Melissa has found the majority of professors at BHSU to be supportive and understanding of Native American students.

A lot of the instructors here are pretty good and work with the Native American students. They understand traditional tribal and spiritual ways, and why sometimes we can't be in class.

Although she wasn't raised on the Rosebud reservation, she feels a deep connection to the place where her mother was raised. Black Hills State provided her with the opportunity, through a paid internship experience, to spend a summer working at the land office on the Rosebud, as part of a newly established environmental commission. Like the experience at SIPI, the internship combined fieldwork in natural resources with tribal relationship building. She found the work interesting and compelling, knowing she was learning and helping the tribe at the same time.

While her experiences at the university have, for the most part, been positive, her experiences in the larger community have not always been so. She noted that racism is something she has encountered in this community, and something she experienced very little of in New Mexico. It bothers Melissa that her own children have to confront it:

Dealing with the racial issues here in the community is a big thing. I never was exposed to that [in New Mexico] and I don't want my kids exposed to that either. I never had so many people look at us when we all walk into a restaurant. I don't understand it. My mom grew up here on the Rosebud reservation and she said it was worse back then. I have a hard time with the racism... I don't think one ethnic group should sit there and say that they are better than another.

There have been many barriers that could have prevented Melissa from pursuing her post-secondary science education. But there have also been many opportunities and supports that she was resourceful enough to find and utilize. For example, this past summer, she worked as a Park Ranger at Pipestone National Monument. Due to this excellent opportunity to work for the National Park Service, Melissa now has plans to move to Minnesota to pursue a master's degree with support from the National Park Service, as well as other tribal scholarships. She hopes to pursue a career that allows her to combine her experience working with natural resources and helping local tribal communities.

Pahin Sinte College Center, Oglala Lakota College: Helene and Rich

The Pine Ridge Reservation is an Oglala Lakota Native American Reservation in the southwest corner of South Dakota and at approximately 3468 square miles, is the eighth largest reservation in the United States. The Pine Ridge Reservation was once part of the Great Sioux Reservation and originally encompassed approximately 60 million acres, including parts of Wyoming, Nebraska and South Dakota. This reservation is known to most as the site of the Wounded Knee Massacre, the killing of over 300 men, women and children by the United States 7th Cavalry in 1890, and the Wounded Knee Incident, a

stand-off between the Oglala Lakota Grass Roots People and the United States government in 1973.

The road from Rapid City to Pine Ridge travels through a wide expanse of open prairie and cultivated fields, through an abundance of tiny towns, skirts the edges of the Badlands National Park and then dips into the town of Porcupine, South Dakota. Past the new complex where the grade school and community center are located, and on a small rise, is the Pahin Sinte College Center. Pahin Sinte is one of the thirteen branches of the Oglala Lakota College (OLC) campuses, one of the first Tribal Colleges in the United States.

Pahin Sinte is a small and homey college center, decorated with plants, advertisements, notices, and photographs of students with their group or club posters. I listen to the hum of conversation in the kitchen where the administrative staff made breakfast while I wait for Dr. Hannan LaGarry, the co-chair of the Math and Science Department at OLC and the instructor of the two classes I am visiting this morning—Renewable Energy and Junior/Senior Research.⁸

The Renewable Energy class focuses on the social, economic, political and spiritual impacts of global, national and local energy policies on reservation life impacts. There are six students in this class, two present in the room and four participating via Pictel (a video conferencing service) from the OLC branch in Rapid City. Hannan, originally from upstate New York, is a geologist and has done extensive field research on the reservation and surrounding states. He lives in Nebraska and alternates between teaching the courses here in Porcupine and in Rapid City. Hannan generously gives me time to speak with his students in Rapid and then uses the remaining class time discussing the Renewable Energy Conference many of the students had just attended, as well as a field trip to see an off-the-grid, self sustained house in Rosebud, South Dakota.

HELENE

First, I speak with Helene, a vivacious 29-year old woman with a bright smile. We have a lively and warm conversation as she tells her story.

Helene grew up on the Pine Ridge Reservation. She graduated from Little Wound High School in the nearby town of Kyle, South Dakota. Helene has always been interested in science and has been a member of American Indian Science and Engineering Society (AISES) since the 5th grade. She has remained an active member of AISES throughout high school and college, participating every year in national science fairs starting in 6th grade and national science conferences starting in 8th grade. When she was a junior in high

⁸ In large part because of Hannan's enthusiasm and leadership, OLC currently has a strong undergraduate research program that focuses on research projects on and off reservation land. This program is described in more detail in the Landscape section of the report.

school she made it to the world nationals in Kentucky where she was a finalist. Helene describes AISES and some of its benefits:

The whole experience with AISES... whenever they have it in high school and elementary, it is a good way to teach kids how to get out there and work science into your every day life.

Helene explains how involvement in AISES was spearheaded by her science teacher Misty Brave, who currently teaches at OLC:

She would say, "Okay, science fair is coming up. Who is going to do what? They had the facilities (OLC and South Dakota State University) and they would transport you to the facilities that you would need to do your science projects.

When Helene was in high school she attended a six-week apprenticeship program at South Dakota State University called "2+2+2 Native Americans into Science" with five of her classmates from Little Wound. There she completed a project in an Immunology Lab, the project she took to the AISES world nationals.

Dr. David Hurley, mentored me there, helped me go through the proper channels of gathering all the required forms and using the labs I needed for my project. I would work on my science project on the side in the evenings after our apprenticeship.

After high school, Helene was accepted into Black Hills State University where she spent only a summer before she was drawn back to the Pine Ridge Reservation. OLC had just received a Model Institute of Excellence grant and had created the department of Math and Science. Stacy Phelps, the department chair and director of GEAR-UP (Gaining Early Awareness and Readiness for Undergraduate Programs and formerly known as SKILL) called, contacted Helene and informed her of the program.

He said, we have this program and there is a degree called Earth Sciences. I came back to OLC and started in Earth Science and then was recruited by the Nursing Department and finished the associate arts degree for RN.

After graduating, Helene became a nurse researcher for the Strong Hearts Study, a study conducted by the Missouri Breaks Industries on the genetics of heart disease. The study was based on the reservation and had begun in the 1980's on a generation of people in their 60's. Helene was responsible for collecting updated information about this generation and new information about their children and grandchildren.

I collected data for the research where I performed the physicals, the EKG's and the blood draws. All of this information was placed into their big database on families across the reservation. I started working on their third generation... to see if heart disease was hereditary.

Helene went from working on this study to briefly working with hospice in Kyle. This was the job that changed her career outlook in the nursing field. Helene was only 22 at the time, and some of her patients were her age. It was too sad, she told me, so she quit.

For your first job and that kind of money, you are going to take it, but it was really sad and I didn't want to be a nurse. To me, what we did was, we admitted people to watch them pass away, to watch them leave...

After this difficult experience, a serendipitous phone call led Helene to her next career choice.

I was at my grandma's and answered a wrong phone call and it was for a job interview for somebody else, and it was for a health liaison. I said, "Ob, can I apply?" They said, "Yes." I went down and then I got the job.

Her new job was working as a child care health liaison at a daycare center where she gave the children their physicals and worked with community prevention. She was promoted to director of the center and held the job for a year and a half. She then took time off to pursue her dancing at Native American Powwows.

I have always danced at Powwows, Native American dance but for two years I just Powwowed. No work, no school, just danced and that is how I made my living.

Helene smiles brightly as she tells me about her time dancing Powwows. She describes how she started learning when she was a small child.

When you are old enough to walk, they just put an outfit on you and put you out there.

After two years of the Powwow life, a conversation with her nephew, whom she had helped raise, caused her to reflect on what she wanted to do with her life.

He stayed with me again when he was in Kindergarten and by the time he was in 1st grade, he realized, "Gee, these guys just Powwow people and they don't have to work." And we asked him, what are you going to be when you grow up? He said, "I am just going to dance when I grow up." I thought, "Hmmm." You can dance but you should always pursue an education also.

Helene decided then to get her master's degree in Nursing, but needed to get her bachelor's first. She went back to the Math and Science Department at OLC, in the spring of 2007 when she was 27, and enrolled in a statistics course. The chair of the department gave her the new course catalogue; this, along with the advice from her father who said, "You'd better do what you want to do, otherwise when you grow old, you are going to regret it," resulted in Helene pursuing her Bachelor's degree in Natural Sciences with an emphasis in Earth Science.

Helene explains that even with her strong science and math background, after being out of school for 10 years, her re-entry into academia was tough. But the community at OLC, from students to staff to tutors, provided strong support and after the first six months she was up and running.

Everyone helps each other with tutoring. I went to tutoring every Wednesday night and Sunday for the first semester with Thedna and her brother, Paul Zimiga... They would tutor me for hours to refresh my memory to help me and so I could get back up by myself.

She found her tutors through OLC's Student Support Services, which advertises with posters on the walls of the colleges and also through weekly announcements on the local radio station.

One of the unique components of the undergraduate program in the Department of Math and Sciences at OLC is that the students have the opportunity to conduct research projects that investigate issues and qualities of the reservation lands. Helene's research is a study of the geology of Ghost Canyon.

It is like an undiscovered area with only one entrance into the canyon. It took me a long time to figure out where to start. The way I look at it, [it will be] an inventory, with the geology, and then in the future it might be an inventory of the plants that are there. It is very diverse. Truthfully I have never known about the place.

Helene's project is an unusual blend of family history and current research. She is collecting scientific data and at the same time learning about the reservation land and the history of her family and people. She describes with delight the genesis of her project:

I was asking my Dad [saying] I need a senior project, something that will impact the Rez and something that has to do with environmental science. My Dad said, 'Why don't you do the geology of Ghost Canyon?' I said, 'What is Ghost Canyon?' He just looked at me. Come to find out that it was a place where his great Grandpa built their history, right there, and the majority of the history of different families from the eastern side of the reservation. Come to find out that my great, great Grandpa and my great, great Grandma were originally Oglala Lakota, and migrated down here towards the end of the 1800's. Then they built their life here and a bigger history was formed. The significance of that place isn't just different kinds of fossils... but it was a burial ground. It was a place for shelter for our people who ran from the United States government. I figured, give me directions and I will get down in there.

Helene is eight months from finishing her degree. She plans to go on to graduate school eventually, but wants to work first. She would like to study earth science, environmental science, hydrology or soils—all in service of learning how to improve the health of the Earth and therefore, its people.

I thought there are different kinds of health for people and there are different kinds of health for a nation, but in order to help people, you have to start from the beginning—it's prevention. That is what they teach you in nursing—prevention is the cheapest. From what I have seen from the different places that I have worked, it would be best to start with the Earth... In order to have healthy people, you have to have a healthy Earth.

I thank Helene for her time, getting a big smile in return. Sitting just across from her was another student, Rich whom she had grown up with—a fellow compatriot of the Little Wound chapter of AISES. There is an easy camaraderie between these two; it's clear they are friends. Recently, both had presented their research at the National American Indian Higher Education Consortium (AIHEC) Conference. Rich had won 1st prize and Helene had won 2nd prize for their presentations. Rich proudly displays his prize to me—a new iPod touch.

RICH

I sit down with Rich, and as with Helene, feel immediately welcomed and at ease. Rich is outspoken, friendly and has a clear sense of where he has been and why, and what he still wants to accomplish.

Like Helene, Rich had been involved with AISES since a young age. He also was part of the NASA program, SKILL (Scientific Knowledge for Indian Learning and Leadership), which has since become GEAR-UP. Through SKILL he spent every summer at the South Dakota School of Mines and Technology (SDSM&T) in Rapid City, since 7th grade all the way through high school. Rich is a month away from graduating with his AA in Science, Engineering and Math (SEM) from OLC. In the fall, he will transfer to the School of Mines where he plans to get a degree in Civil Engineering and will be part of the Tiospaye in Engineering program.⁹ His cousin Beau, who is also graduating from the OLC SEM program, will enroll at the School of Mines and Technology with him. He told me that he (Rich), Helene and Beau were part of the “nerd” class in high school. When I asked him if he chose SDSM&T because his summer experiences made him feel comfortable there, he says:

It doesn't have to do with [the fact] I have been there. It gets good reviews and it is one of the top engineering colleges and so, I look at that too, because I do want a good education.

Rich has already graduated with honors, with an Associate of Applied Science (AAS) in Environmental Science and is the first student certified mechanic with an AAS in

⁹ The South Dakota School of Mines and Technology Department of Engineering started the Tiospaye in Engineering grant in September 2008. This grant, funded by the National Science Foundation, provides a full-tuition, four-year scholarship to 15 Native American students. Tiospaye is a Lakota word that translates roughly to "extended family" and the aim of this grant is to create a network at the School of Mines and Technology that will give these 15 students all of the supports they need to graduate from the School of Mines and Technology.

Automotive Technology—both programs at the United Tribes Technical College (UTTC) in Bismark, North Dakota where he lived for a number of years. I ask what motivates him. He explains:

I always wanted to be in science, because I always liked to study things. I like to know how things work and, just like mechanics, you can find the science aspect of anything, Plants, anything. Everything is science and so I thought, “Why not?” You can always see yourself going higher in science and so I set my goals high... My major goal in life was to become an engineer. So now I am slowly cutting down my goals and everything is falling into place and I am just pursuing my goals, ever since I was young. They are still the same; they haven’t changed.

He describes how many of his friends have been content to find jobs after high school, while he has always wanted to push himself and learn more.

I don’t judge them... but for me, my priority is my schooling. After you get out of high school most of my friends think “Oh yeah, finally out of school and they don’t see themselves going any higher and so they just try to find jobs. I just never have seen myself as just being able to settle for that... My instructors used to call me a professional college student all the time because I was always so interested and I dedicated everything to it. That is what I like to do, get the best grades that I can and try to do the best I can, because you are always going to look back on what you did. I try to make the best of it.

Rich has received funding from the tribe for all of his education, and he has made their investment worthwhile, graduating with honors from both programs out of UTTC. He credits the NASA summer program with preparing him for college through a hands-on approach to learning and by allowing him to explore topics of interest.

It was pretty much hands-on for anything. For me, I was kind of edging towards electrical engineering at the time and so I was doing anything with meteorology and I was studying cements and different elemental things that pertain to engineering. That was really interesting and that is what I am still doing today. I help run the lab at OLC and I pretty much study soils, water, and plants for elemental contaminants.

Rich has also conducted research on the reservation as part of his undergraduate program. I ask Rich to describe the research for which he had recently won first prize. He tells me he studied the potential environmental impacts of sediment runoff from abandoned uranium mines and ashing sites on the Bowman-Haley Reservoir in North Dakota.

Last summer we went out and we were camping for five, six days at a time, out in the middle of nowhere. We would actually go out [and] find the abandoned uranium mines by GPS, sight the drainages, and from there we would find the flow symmetry of the drainages. There are three creeks that come into the Bowman-Haley Reservoir—we went up, down and studied all of these different areas, all along the lake.

Rich has done a lot of tutoring during his college career and after finishing his masters or Ph.D. at SDSM&T he would like to teach there.

Eventually, with my experiences I had with college and my background, I do want to go back to teach. I don't just want to take all of my knowledge and run. I don't care if I am an old man or whatever. I want to get out there and work somewhere for a while and see how it is. But eventually, I do want to come back and help out in the community. Our young Native American youth can use the knowledge too. Not everybody is interested in math and science. That is what we are trying to change. Knowledge is power and I want to empower the youth of tomorrow.

Black Hills State University: Andrew

As I walk across the campus of Black Hills State University (BHSU), the sky sheds a few late season snowflakes. I hurry inside Jonas Hall, to the Center for American Indian Studies. The Center is the hub of American Indian life on campus, yet it's a simple room with a few desks and a big table. It serves the needs of the American Indian students — from academic counseling to finding gas money for a trip home for a funeral. I arrive during Indian Awareness Week, the annual event sponsored by the Center that includes a Wacipi (Pow-wow) that draws up to 4,000 people each year. The Center is busy with speakers and students coming in and out. It is here that I meet Andrew, a biology major in his last year at BHSU. Andrew and I sit down together at the big table in the middle of the Center and he tells me his story.

I grew up on the Northern Cheyenne Reservation with my grandparents and lived kind of far out and so I had more of a traditional background. School for me was a two-hour drive and so sometimes if I missed school it was no big deal to my grandparents. Education wasn't the strongest point, whereas sports like basketball and stuff were. We were keeping up our traditions. I played basketball; in fact my dad coached me through all four years.

After graduating from the K-12 tribal school, Andrew joined the military.

I had no dreams of even going to college. I didn't want to, and after high school, I thought I was tough enough. I figured I was done. In the military I did encryption of satellite codes.

Andrew spent eight years in the military and then tried to get a non-military job doing similar work—at least in technology. He described to me that, much to his surprise and disappointment, he was told that even with his training, he would need to get a college degree.

It was kind of a disappointment there. Otherwise the only thing that was open was probably something in law enforcement and being in the military, I felt like I had done that already.

At that time, Andrew was living in Albuquerque, New Mexico with his girlfriend who was at Southwestern Indian Polytechnic Institute (SIPI), a National Indian Community College and Land Grant Institution in Albuquerque, New Mexico that serves American Indian and

Alaska Native American Students. He explains how he realized he enjoyed helping her with homework.

One night, I thought, "This is kind of fun!" and so the next semester, I enrolled. SIPI being a low-cost college, getting the Pell grants and other loans, it was almost better than actually working. I didn't even know what to choose at first. I took their aptitude test and I passed everything, pretty well. In high school, I was pretty much an 'A' student, even though my attendance was down, I was still an 'A' student.

Andrew describes without hesitation that his pre-college education was "basic" and he thought he had probably graduated at a 10th or 11th grade level. One of his instructors at SIPI recognized his potential and provided him with tutoring to help him brush up on his skills.

In a tribal school at that time, there wasn't a whole lot to study. We had really low funding. In the school itself, it was grades K through 12 and it was probably a total of almost 200 students. My graduating class was just me and two of my cousins. So the education that we got wasn't quality. There weren't really any projects or anything else to go with math and science. In the sciences, the teachers were always revolving.

SIPI gave Andrew the means to continue to develop his strong interest and skills in technology. Andrew applied himself and finished the program in less than two years.

I was interested in technology a lot and there was a GIS program there. So I took summer courses and then finally graduated, it took me about a year and a half to graduate with my associate degree.

During his time at SIPI, Andrew did more than just take courses and complete assignments. He got involved in an NSF STEM program and the NASA STARS program through which he was granted several internships at the University of New Mexico (UNM).

I was able to get an internship in their Department of Meteoritics. I was able to get one of my projects published [and showcased nationally and internationally] and that was quite an experience. They provided me with mentors as well. It gave me a taste of what a four year college was like, going in there and working with them and for them. We actually worked on real world projects that actually help people, like farmers.

This real work was part of the CREATE program, the Center for Rapid Environment and Agricultural Terrain Evaluation. CREATE uses remote sensing, and real time satellite photogrammetry to take pictures of the environment. Local farmers use the data to make decisions about where to plant crops and graze cattle. Andrew's enthusiastic description of this work conveys his love of using his technological skills to help people.

At least every two weeks, we would update them on their grazing capacity in one area and then they would know if they were over-grazing, and they could move over to another spot. We could tell by the growth we

could see on satellite imagery. It fit right into what I was doing in the military, which I enjoyed and I knew right away how to get onto it.

After graduation, Andrew moved to South Dakota to attend Black Hills State University. It was not an easy transition. There was only a four-week window between graduating from SIPI and the start of the school year at BHSU.

I talked with the financial aid [department], which was my main concern, and made sure that my credits would transfer and found out what they had to offer here. It was such short notice with the moving and we actually arrived here about a week and a half late, after classes had started. Getting into that role was even a little harder, because we were already behind.

Through connections from his reservation, Andrew met the Associate Director of the Center for American Indian Studies at BHSU. She, and others at the Center, helped to smooth the transition. He explains:

[She] is from my reservation as well. I knew her family. I didn't know until I got here that she was working here. I was a bit surprised, but it was comforting to also know someone else from my reservation was here. We are not too far apart in the age bracket, so we know a lot of the same people. She provided help and some guidance so we weren't so lost, because they [the Center] were helping out other Native American students. It helped the transition to be a little bit easier and she introduced us to people here.

Another source of support for Andrew has been the BHSU chapter of the American Indian Science and Engineering Society (AISES), which he revitalized during his first year on campus.

Even with these supports, the transition was still difficult for Andrew. As he talks, his words, the tone of his voice and facial expression convey how hard it was to leave his considerable connections to the University of New Mexico behind and start over.

I felt a little distraught when I first came up here, because I already had the connections made at the UNM and wasn't ready to transfer. I was established with a lot of the professors, within the CREATE program, and the Meteoritics Department and so I had my science covered. That is what my plan was, going to the University of New Mexico. Coming up here, I just kind of felt cheated, 'I threw all of that away.' I had a full ride scholarship going to UNM as long as I worked for that CREATE program still. Here it felt like I was starting all over again and it was uncomfortable.

Not only did he have to start over building relationships with his professors, but more difficult still he had to contend with the challenge of attending a university where the majority of the students are white. At BHSU, 4.5% of the student population is American Indian, the highest percentage of all the South Dakota state universities.

SIPI was an all Native American college, you know. The University of New Mexico is also diverse: Hispanic, Native American, black and white... I just felt normal there. Whereas when I came up here, the majority of the people are Caucasian. There are a few Native Americans here, but we see the reluctance and even the [lack of] drive for some of them. It is kind of disappointing because where we came from, the Native Americans are always strong; it is probably because there is strength in numbers.

Andrew tells me frankly that he understands this social climate because he grew up two hours from Spearfish, but he doesn't like it and it is markedly different from what he experienced living in New Mexico. Andrew shared his insights, based on keen observation and life experience, of how the history of the region and the number of reservations tend to preserve the separation between Native Americans and whites.

I know what it is like to be up here. We are still dealing with a lot of the racism and even here I still see it. Not here so much at the school, but in the towns, in some areas. I can see the difference between the Native Americans from down south and those from up here. In New Mexico they are more cultivated within the system already, whereas here, they are not. A lot of it has to do with the history here. What happened here in the area with Wounded Knee in '73, it has a lot of impact on it also. I think a lot of people still remember that and a lot of them for the good, but then there are still some who look at it as negative. There is also a higher rate of people going back to the reservation, where they felt a little safer instead of actually getting out there. How many reservations are there in South Dakota? Seven I think. With that massive amount of reservations, you still have a lot of separation. I see that and it bears down on the students here, who are Native American and even the ones who are not. You see a separation and still see, 'Oh we have to be treated a certain way', or 'You are treated a certain way'.

Andrew explains that he has had to be more cautious in social situations at BHSU than what he would be naturally. It's not hard to imagine how this complex social climate kept Andrew from integrating into his new school with ease.

This climate made the transition here a little bit hard, and brought back a lot of memories from when I was in high school. I had to switch to kind of a different mode again. Down in the bigger cities, I could be a lot friendlier, a lot more open and right away. Here, I can still be that, but I still have my guard up a little bit. I think I had that when I got here with some of the professors. I can still see that some students look at me, especially having long hair.

With stoic dignity, Andrew describes how he has experienced the uncomfortable feeling of knowing that other students make automatic judgments about him that have nothing to do with the reality of who he is, but rather are based on the stereotypes held about Native American people.

I am former military and I have been decorated twice with the Rangers and ended up in Special Forces. I know all of this, and I know about being respectable in the community and blending in. Coming here, I got the sense that people thought, 'Well you are only a Native American,' whereas that is not really true. I have

been there, I can say I have been decorated in the military and I got my associate's degree in something that a lot of people don't even understand. They are still treating me like that.

Andrew strongly believes that these attitudes keep a lot of Native American students from succeeding.

I think that is where a lot of other students get shut down as well, having to deal with that. And having to say, either you are going to have to get past it and go rise above it, or you are just going to accept it and stand back in the shadows. For me, I want to get past it, and to bear that kind of stuff, it makes me drive more.

Andrew credits much of his strength to what he learned from his Grandfather.

I was raised by my Grandparents. My Grandfather taught me the lessons about what my people were. He taught me never to give up. It is not in our history to do that. You always strive to be the best that you can be, not to prove to people or to anybody else—because that is kind of like showing off—but to prove that it can be done, you set an example. Not just for your people, but for other people. You've got to get past all of the looks, the stares, the sayings, the this and that and what is expected of you and what isn't expected of you and just say, 'I am doing this because I am going to be helping other people, in the end.'

Andrew will graduate with a major in biology and a minor in earth science. He plans to work for the federal government in wildlife biology.

I want to work within the government, for several reasons. One, because of my past military history, it counts towards my retirement and I get a higher pay grade. The work is stable. I am pretty sure that I can get into an area that I enjoy, instead of having to work in something I don't. I want to work between tribes and the federal government as a liaison, for the wildlife statutes. There are still a lot of people running over each other and somehow they don't understand each other. Simple. I want work with them.

Common Themes

In this section of the report, we present some common themes that surfaced during our interviews with a number of Native American high school and college students, and faculty members, program leaders and counselors that work closely with them. We begin by describing some similarities among the Native American students we interviewed and their college and career plans. Next, we highlight what we learned in terms of the types of learning experience they value most, significant opportunities and supports, and additional supports that would be helpful. Then, we discuss important issues and contextual factors that can affect Native American students' path to and through post-secondary education. We complete this section with a brief description of the current landscape of programs and resources in South Dakota supporting Native American students.

It is important to reiterate that the voices and perspectives presented here represent a small portion of the students who have succeeded in navigating the system and finding the

support they need. In an effort to synthesize what we learned, we do make some generalizations from the experiences of the students we interviewed. We know Native American students come from many different backgrounds and experiences and thus cannot be categorized all together as one “Native American experience”. These are the findings from a small, focused, exploratory study, not a comprehensive landscape study.

Similarities across the Native American students we interviewed

Non-traditional pathways through education

In contrast to entering college right after high school and obtaining a degree in four years, most of the college students we spoke with took a more non-traditional, somewhat lengthy path to and through post-secondary education. They did not go directly from high school to tribal college or four-year universities. Some had gone to technical schools, others had gone into the military, while still others had joined the workforce and/or started families. Most of the college students we interviewed were in their late 20’s or early 30’s. Many had held a variety of jobs before and during their enrollment in college. These students are coming to college with different skill sets and needs. They want to be in college and are motivated to do well. Some may need help with academic preparation in math and science; others may need additional social supports—that is, those supports related to the personal life and cultural background of the students.

A tendency to be reserved

We heard from faculty, program leaders, and Native American students alike that Native American students tend to be reserved and “come off as shy”. Sometimes, interviewees reported that this could be misinterpreted by professors that the students don’t care or are uninterested in their courses. This characteristic was corroborated by resources we found online: a handbook for non-native adult educators working with Native students lays out several characteristics of Native American learners, and includes the following:

... At the beginning, some may be reluctant to ask questions but through the trust building relationship and time they will open up and be more willing to share and ask questions. Some may not be as verbal as non-Native Americans.¹⁰

In addition, we heard from several program leaders that sometimes Native American students are reluctant to ask for help when they need it:

A lot of kids are just afraid to go see the instructor and they think it is a sign of weakness or something. They wait too long to ask for help; then they end up having to withdraw and start over the next semester.

¹⁰ From *Teaching and Learning with Native Americans: A Handbook for Non-Native Adult Educators*. See <http://www.literacynet.org/lp/namericans/strategies.html>.

Limited opportunities for experience with the world outside the reservation

One issue we heard from those who work with Native American students is the lack of experience many students have with other contexts, especially those who live on reservations.

There are almost invisible walls between reservation communities and mainstream communities, and part of that is just the design of the state. In other western states, you have to drive through the reservations because that's where the road goes. In South Dakota, you can completely avoid reservations if you wanted to. And it affects people going both ways—people don't interact and then there is ignorance and fear and distrust.

This makes it difficult when students head off to college in different areas of the state. As one high school counselor who grew up on the reservation where she now works said:

We don't offer real world experience here. So when the kids go out in the real world, they feel completely lost. I remember my first year of college. I wanted to come home but my parents wouldn't let me. After the first year, I was fine. And if you go from the high school here to the local tribal college, it is the same fight as staying here – you are still isolated. It takes time to establish yourself. You have to stick it out. That's the step into the real world.

Strong personal drive and resilience

Another thread that ran strongly through the interviews was the personal drive and resilience of the students. Even those utilizing programs and supports relied immensely on their own personal initiative to keep moving forward; they researched scholarships, looked into schools, sought supports and resources. As one senior in high school who had received a full-ride scholarship to college noted:

I had help and support, but I really relied on my own self-drive to figure things out, to fill out the application and do what I needed to do.

Another spoke of how he had pursued his desire to become a firefighter:

I want to be a firefighter, so I looked around the region and found the closest place [where] I could do that.

They overcame obstacles that would have prevented others from going on to college or continuing with their studies. Students have dealt with surgeries, childcare challenges, family emergencies, lack of transportation, and lack of financial resources for college, none of which derailed them. One high school counselor we interviewed noted:

There is a certain amount of resilience in some kids... Others are just in survival mode.

Interest in jobs focused on helping local communities

Many Native American students we spoke with want to find jobs where they can serve their local communities—thus, nursing and education tend to be popular courses of study at the Tribal Colleges in particular. Environmental science is also an area that is attractive to Native American college students, and several of the Tribal Colleges offer four-year degrees in environmental science. As one tribal college faculty member said,

One of the reasons why environmental science often has a bigger turnout is because they can see it in their backyard.

One high school student also noted:

One of the reasons I am interested in the medical field is there's a shortage of people in public health service. I want to support people here.

For some, jobs that offer opportunities to serve their local communities have led them to pursue math and science-related degrees in college. One university student related her experience working for Indian Health Services:

I loved my job. I loved coming back to where I grew up and providing basic needs, like water and sewer. That is when I really got the engineering bug because it combined my love of helping people with engineering.

For many of the students we interviewed, environmental science and natural resources were areas of study that allowed them to combine their interest in science with potential careers that would allow them to work for their local communities. One Oglala Lakota student said:

I want to work at our tribe's EPA program. Right now, they have like six people in the EPA program to cover our entire reservation. I would look to see if guidelines are being met and do research on water and air quality.

The types of science and math experiences students value most

Both the high school and college students we interviewed had much to say about educational experiences in science and math that were valuable and those that were not.

Active, field-based learning experiences

Emerging strongly from all of our interviews with students was the importance of hands-on, field-based science experiences. Science and math learning that is rigorous, active, and engages students in solving problems are highly valued. Particularly important were those experiences where their science learning and work were tied directly to the needs of local communities. As one student said:

Throughout my four years of college here (at OLC), they have found ways to take it out of the classroom, and you get your nose out of the book and actually apply what you are learning. With the lagoon project, I was taking hydrology and a wastewater treatment class while I was working through the school project and it was like every class built on the class I had just finished taking.

Small-scale learning experiences are valued over impersonal, large-scale learning experiences

Students were articulate about the negative science and math experiences they have had. Many of the college students noted that they found it difficult to be in large classrooms with hundreds of other students. High school students at one reservation school generated the following list of characteristics of classroom learning experiences that don't work well for them:

Teachers who talk most of the time, who know too much but don't know how to explain things well, and block scheduling with 90 minute classes that are both too long and too short at the same time. What happens is you get two lessons fast... It's an overload of information.

Important to all of the students, high school and college, was the opportunity to have a strong, working relationship with their instructors. The college students we spoke with prefer settings where they can have direct access to and a connection with the professor and a small cohort of other students. As one tribal college student said:

I started at the School of Mines for a semester. It was real big, but it wasn't a whole lot of interaction with me and the teachers and I really didn't care for it that much. I like the small classes a lot better here. I like to be able to talk to the teacher.

Opportunities and supports that made a difference to Native American students

Most of the students we interviewed noted that throughout their education, having a supportive relative or other adult who valued education was a critical factor in providing encouragement for continuing their schooling. Once in college, students noted two areas of support that seemed most important: smaller community structures within larger universities, and understanding and empathetic professors.

People who value education

For most of the students we spoke with, having family members who value education makes a huge difference. Many of the students we spoke with had parents and grandparents who are educators themselves or value education. They felt that having the support of parents (or other relatives) who encouraged them to further their education was important. As one student said:

I owe a lot of my success to my mom.

A student at one of the Tribal Colleges spoke of the differences he had seen for other students who did not have that support:

I think kids don't have solid mentors and people to look up to. Their family members are not setting good examples for them.

Because many Native American students are first-generation college students, coming from families where parents or other family members have not attended college or worked in jobs related to science, math and engineering knowledge, these students may also lack family support for their endeavors. As one program leader noted:

I don't think our kids understand why math and science would be important in their lives. These kids grow up in homes where a lot of adults haven't had gainful employment. These homes don't make the connection of why math and science and writing and reading skills are important to what [the students] are going to do down the road because they don't grow up in that atmosphere.

For other students, guidance counselors at school and program leaders in the community played this supporting role. Students at one reservation high school credited their counselor and staff from the Math & Science Initiative Program (MSIP) at the University of South Dakota for helping them to find scholarships and learn about how to pay for college.

Small community structures and understanding professors

Once in college, ongoing support is also important, including structures within large campuses that create smaller communities, and relationships with professors who understand Native American culture and issues. Particularly important to the college students we spoke with were structures within the larger campuses that created smaller, Native American communities. Having a place where they feel comfortable, where they know they can seek support, seems especially important to many Native American students. For example, one AISES member at the South Dakota School of Mines & Technology (SDSM&T) described the impact membership in AISES has had on her college experience.

Having at least one person that you know and you can do study groups with and can build off of that—it makes a huge difference. For me, in learning, I have to have a group environment. You can't do it by yourself at this school. I honestly believe that.

A student actively involved in AISES at another university also noted the important role AISES mentors can play in supporting Native American students:

I was talking with one of the AISES mentors, he is actually out there working for the government and he asked me, 'Have you checked into this and this? You may have [these requirements], but you may not. So I looked and I didn't. So I contacted the Wildlife Forestry Service and they informed me that he was right. There are different things that you have to look at and you have to keep your eyes open for everything. For me, AISES helps a lot.

Many of the students, both at the Tribal Colleges and at the Regents universities, also told us of how supportive their professors had been. As one student noted:

I like the instructors here. They are lenient, helpful, and professional. They have helped me get this far.

One science professor from a tribal college told us of a student who was enrolled in a lab class but who could not find a babysitter. Most college professors are not prepared for this scenario, but she provided coloring sheets and activities and allowed the child to come to class with her mother. Another spoke of how when finances got tight one semester, his professors had helped him to stay in school:

I went through a semester where I couldn't afford the books and my science professors actually pulled together and got me the books and I borrowed other students' books. That helped a lot.

Additional supports that would be most helpful to Native American students

Native American students and faculty indicated that more one-on-one support would be useful, as would greater attention to retention of Native American students once they are enrolled in college.

More one-on-one support and attention

Some students we interviewed acknowledged that more could be done to support Native American students, especially on the campuses of the bigger universities. They felt like students participating in support programs such as Upward Bound and GEAR UP received a lot of one-on-one attention during recruiting that then diminished once the student enrolled and was on campus. One student who has been involved in giving presentations to Native American students who come to campus for summer programs, said:

I really promote my school. I know that they can come here and accomplish things. But once we do all of this stuff in the summer and we recruit them, once they get here and school starts, there is no more individual attention and it is like they are nobody and they feel unimportant. I think the school should pair incoming students up with upper level students who can help them. A lot of students have a lot of questions about the simple things that we take for granted. Where is the classroom building? And because Native Americans are so shy, they don't want to ask the questions. I would do it. I would meet with them weekly so they don't fall off the face of the earth.

Several faculty members from Regents institutions also noted that one barrier Native American students face is in finding Native American elders who can help them work through issues and challenges. This is particularly important for Native American male students. As one female faculty member said:

This is a white male institution. The males from the reservation will fall through the cracks pretty quickly, because they will not ask for help and they won't come to me. They are a male dominant society and if there are not elders here, Native American elders here, they are going to have difficulty asking for help from anyone else.

More attention on retention

Focusing not only on recruiting but retention of Native American students was an area of focus for many of the college students we interviewed:

Even though we have the highest Native American population in school here, in South Dakota, the retention rate is pretty sad. Sometimes the organizations like AISES or the Lakota Omnicitye aren't enough for them. There are tutoring services here, also, with some of the AISES members, but for Native Americans in the sciences, it is a tough program, a really tough program and I think discourages a lot of them. Even though they might have the dedication and the drive to do it, a lot of times, it just takes staying in it and getting the extra help. A lot of them are too shy to do that. Too shy to go and ask for help, or afraid of being looked at as 'Oh yeah, that dumb Indian kid.' I think that is where a lot of them start to drop out. They get discouraged right away.

Another noted that Native American students need to know that someone is there to help them, and not just during the recruitment process, but for at least the first year of college.

They need someone to be there, just on call for them anytime, any question, and to make them feel comfortable. And I think maybe for the first couple of days, when recruiting is on, that is all good. But then after that, it is forgotten a little bit.

Important issues and contextual factors that can affect Native American students' path to and through post-secondary education

Academic preparation of Native American students

In our conversations with Native American students, as well as those in programs, colleges, and universities who work with them, we began to hear a common theme related to the academic preparation of Native American students. Colleges and universities throughout South Dakota are actively recruiting Native American students. However, students and those operating these programs told us that some Native American students lack the preparation to succeed in math and science courses once they are enrolled. As one university student noted:

If you are letting people in with ACT scores of 17 and giving them scholarships, you are setting them up for failure. They are not ready.

Another student echoed her sentiments:

They want to recruit that Native American population and then it gives them unrealistic expectations. They may have a 4.0 from high school, but wow, it is like a freshman level curriculum when they graduate. It is unfortunate, because there is money out there for us, so you get a lot of incoming freshmen and then they drop off the face of the earth.

One Native American student noted that his academic preparation was not adequate when he entered college:

The education that we got wasn't quality... In the sciences, the teachers were always revolving. We even had teachers that weren't certified in our school.

One faculty member from a tribal college explained:

At the college level, probably our biggest obstacle in science is the preparedness of our students. Our students are becoming younger, but a lot of our students—the average age is over 30. A lot of them have dependent children. About 70% of our population is female. A lot of them are single mothers too. All these things play into this. We have a fair number that actually never graduated high school; they have gone the GED route. And even if they did go through high school and graduate, you have several years between them graduating and entering into the college. If you have been out of education for awhile, you have to struggle to catch back up. So we have a lot of students who really struggle at first and the biggest problem is, even with the sciences, is the math. A lot of our students have to take two or three kinds of fundamental math classes to get to college-level algebra, and so they are often behind in that. [And] because they can't get into biology II until they have college-level algebra, that could be two or three semesters down the road, and by then, they are so far behind in their science courses, it is almost impractical to do it. And [then] it is very hard to teach chemistry to students who are at the basic math level.

Still others question the academic preparation of students in math and science, especially those coming from reservation schools. As one university faculty member said,

The quality of education on the reservations is not good. They may come in here with A's but that is not a good indicator.

A related issue reservation schools deal with is staff turnover and retention. The reservation schools we visited often had high turnover for both administrators and teachers. One high school we visited had had three principals in six years. Some of these districts recruit teachers heavily from Teach for America which can be a double-edged sword. While they find young, enthusiastic and empathetic teachers to fill jobs that are otherwise difficult to fill, the most inexperienced teachers end up teaching where the need for excellence in teaching is greatest. In addition, these teachers tend not to stay long once

their Teach for America contract expires.¹¹ This issue runs through the whole system, as one person described:

The educational systems aren't real smooth flowing for these kids on the reservations. It is tough to retain quality teachers, especially in the upper levels in math and science. We have the same issue with administrators, getting them to stay in schools and develop a quality system. A lot of the school board members that you would hope have at least a high school degree don't. It is tough for them to understand what their role is and how to run an effective school.

Lack of resources

One of the barriers facing Native American students, according to those who run programs designed to support them, is a lack of resources. The need for resources is a multi-level challenge. Native American students not only need money to fund tuition and books, but also sometimes lack the resources simply to get to and from college. Thus, the issue of resources spans funding for additional scholarship programs at the Regents institutions that might encourage students to pursue math and science, to more basic resources, such as money for vehicles and gas. As one Tribal College faculty member noted:

We don't have student housing and a number of our students come 20, 30, 40 miles each way to school... some are coming 90 miles each way. So with gas at 4 bucks a gallon, with car breakdowns because they are not driving new cars – all of this has an impact on attendance.

The desire for work opportunities in local communities

Some students living on reservations told us that in thinking about their college and career plans, they felt pressured to leave, while others said they felt pressure to stay. It seems, outside of education and nursing, that there are few opportunities for students to apply college degrees in their home communities, particularly those in math and science. Yet many students expressed that contributing to and working with the people of their home communities was something many of them would like to be able to do.

A number of students told us they would stay closer to home if there were jobs in the fields they were interested in on the reservation. In particular, some of the students we spoke with want more math and science related work opportunities in their local communities. We heard from both professors and students that more efforts are needed to generate these types of jobs. As one professor said:

¹¹ We discuss turnover and retention rates in K-12 settings in more detail in the conference summary, *How do we get the numbers to dance? Effective Educational Practices in Mathematics for Native American Learners: A Conference Summary*, which can be found at www.inverness-research.org/abstracts/ab2007-09_Rpt-Native Americanamconf.html.

Students are also interested in the more environmentally friendly, nature-oriented jobs, but it is tougher to find a job here.

The complex intersection of different cultures when Native American students go away to college

Different cultures come together when a Native American student—particularly one from a reservation in South Dakota—enters a college or university to study math and science. The Native American, reservation culture encounters the formal, mostly white, college culture. Colleges and universities are highly structured places, designed to funnel large numbers of students through the educational system. Generally, they aren't designed to take into account the needs of an individual student, or any one group of students. When Native Americans enter this setting, there are a number of ways in which these two cultures can collide.

For example, when Native American students miss class to attend a funeral on the reservation, professors sometimes mistrust the need to miss multiple class meetings. On the other hand, students sometimes don't fully understand the ramifications of missing so much time in a high-level math or science class and the negative impact that can have. A faculty member described the complexity of this type of issue well:

We have students that have to go back home for funerals of family members. Well, in the culture, sometimes that process takes a week or two. Or they might say my grandmother died and they might have six different grandmothers. And instructors don't understand that. So we hope our advisors can help them to communicate better with their instructors and to also help them understand that they can't be gone for two weeks during the most intensive part of their Calc 2 class. We try to figure out if there are any other options.

In addition to the cultural differences between reservation life and life on a college campus, Native American students who are studying math and science must also learn to navigate the language and culture of these disciplines, with their specific ways of doing and understanding things. This can be a culture shock for Native American students as well.

There is the Native American culture and there is a kind of engineering and campus culture. We want to get the students and their families to understand more about the culture on campus... but yet also embrace the Native American culture.

Science is a very western pursuit and it is framed in a rigorous framework where you have the scientific method. So you have something that is concrete that you are supposed to follow and I think there is a bit of a cultural gap for some... They have to conform to this standard of science that they are not really accustomed to, and I don't think they get that in their high school or junior high classes.

Further complicating the picture is racism. Native American students described incidents they had experienced. The following quotes from two college students highlight the issue:

Dealing with the racial issues here in the community is a big thing. I never was exposed to that [in New Mexico] and I don't want my kids exposed to that either...I don't understand it...I have a hard time with the racism...I don't think one ethnic group should sit there and say that they are better than another.

We are still dealing with a lot of the racism...not here, so much at the school, but in the towns, in some areas... How many reservations are there in South Dakota? Seven I think. With that number of reservations, you still have a lot of separation. I see that and it bears down on the students here, who are Native American and even the ones who are not. You see a separation and still see...

The current landscape of programs and resources in South Dakota supporting Native American students

Across South Dakota, there is an array of programs, resources and activities aimed at assisting Native American students with continuing their education, and more specifically, with pursuing math and science studies at the college level.

Programs and supports

These programs are run by an energetic, caring, and empathetic group of individuals, some at the State Department of Education, some in school districts that serve Native American students, and some in universities and colleges that are hoping to recruit and retain more Native American students. The range of programs we learned about cover middle school through college-aged students; some single programs cover the entire spectrum. In the appendix to this report¹² we present brief descriptions of the programs and resources we learned about during our study; while this list of supports and resources is not comprehensive, it gives a representative sample of the kinds of programs currently available to assist Native American students in some places in South Dakota.

Some of these programs have been in place for quite some time, while others are relatively new. Most of these programs are funded through foundations and grants. Each of these programs recruits a slightly different population of students, although several of the programs are recruiting first-generation college students likely to be successful in college.

Some efforts, like the Todd County math contest, Girls Day at the School of Mines and Technology, and the Knowledge Bowl at Sinte Gleska, are aimed at encouraging students to pursue an interest and excellence in math and science. Some focus specifically on math and science experiences, like the Build a Computer program at Central High School, the Math & Science Initiative Program (MSIP) at the University of South Dakota, and the American Indian Science and Engineering Society (AISES) chapters. Still others offer

¹² See *Appendix - Program/Resource Descriptions* for additional details on the programs and resources we learned about while conducting this study. The details provided in this report reflect the status of these programs as of the spring of 2009.

programs and scholarships to support Native American students' pursuit of science and engineering degrees at universities, such as the Tiospaye in Engineering program at the School of Mines and Technology, the Undergraduate Research Program at Oglala Lakota College, and the Undergraduate STEM scholarships at Black Hills State. Others, such as the statewide GEAR UP and TRIO programs, the Academic Café at Central High School, The Center for American Indian Studies at Black Hills State, and the transition counselors at Todd County High School, offer a broad range of support services to Native American students to encourage them to stay in and continue on in school; these supports include counseling, tutoring and academic coursework, and on-campus college experiences for high school students.

Work in isolation

These programs are being operated by a relatively small number of individuals across South Dakota, all of whom work primarily within their institutions and rarely between institutions. They are very knowledgeable and deeply familiar with the landscape and context. Yet there was not much connection across these people and their programs.

Some people involved in running programs knew about the efforts of others in South Dakota doing similar work, but more often than not, most people did not know much about each other's programs. We saw little evidence of communication from one program to the next, few mechanisms in place to encourage the exchange of ideas and successful strategies, as well as other barriers that likely hinder better communication and collective efforts.

Connections between Tribal Colleges and Regents institutions

In our interviews, we heard repeatedly that in the past, there was little effort made by the Board of Regents institutions to connect with the Tribal Colleges. Some expressed feelings of skepticism and mistrust related to proposals indicating that the work would serve the Native American population; some felt that these proposals were only put forth in order to gain funding, but without serious commitment and action required to address key issues. We also heard that the difficulties in communication run both ways—Tribal Colleges feel like they aren't being communicated with; Board of Regents institutions feel like they have tried to make connections with key people at Tribal Colleges and did not get a response.

More specifically, we heard from faculty at Tribal Colleges and others that the state and Board of Regents institutions have not done enough to create mutually beneficial partnerships and opportunities with them. Sometimes partnerships are put in place through funding opportunities, and the relationships end when the funding ends. Sometimes the partnerships exist more on paper than anywhere else.

The biggest issue that faces our system is that there are no relationships between the Tribal Colleges and the Board of Regents institutions.

Faculty at Tribal Colleges in particular expressed feeling used by a system that thus far has brought them on as partners in name only. As one faculty person noted:

There is a lot of resentment with a number of people in Tribal Colleges because we are just a way for them to get access to some funds that are paid for minority institutions. And it isn't relevant to us and it isn't even involving us in some cases. A lot of times, we get listed as a partner on a grant and we don't even hear about it until the last six months of a five-year grant.

More could be done to learn from successful projects and those who have years of experience supporting Native American students in school. Significant, long-term funding and support for effective programs is important for maximizing success, capacity building, and sustainability.

It would be nice for them... to invest in stuff that is already working... You can't shortchange things all of the time, you know. You can't unearth \$200,000 worth of issues and throw 10 grand at it and feel good about it. Sometimes that is worse, because you get efforts started and then people kind of get put off, because you don't really see them through.

Summary

The purpose of this exploratory landscape study was to learn about the experiences of Native American students in math and science in South Dakota, with a particular emphasis on the challenges in, and resources and opportunities for, supporting Native American students at the college level. In no way is it meant to thoroughly document or represent the numerous programs in South Dakota that seek to support Native American students at the high school and post-secondary levels. We have talked with students, faculty and program leaders across the state. This report describes what we learned, grounding our findings in the voices of Native American students themselves and those who support them in their educational endeavors.

There are similarities across the Native American students we interviewed. Many took a longer and non-traditional pathway to post-secondary education. They may tend to be reserved and often have limited experience with the world outside of the reservation or their local community. All have a strong personal drive to persevere with their education and are resilient. Most are interested in a career that will serve their local communities.

Students clearly articulated the types of math and science experiences that work best for them. These include active, field-based learning experiences; small-scale, more personal learning environments; and direct access to and close working relationships with instructors. They identified important supports that contributed to success in school,

namely family members, mentors, or guidance counselors who value education and encourage them to continue; small community structures within the college setting; and understanding, culturally sensitive professors. Two types of support they would like more of are one-on-one attention and a focus on retention once in college.

A number of issues and contextual factors affect Native American students' educational progress. Two key issues are academic preparation and lack of resources. Many of the students we interviewed desire work in their local communities but find a lack of job opportunities. Not to be underestimated are cultural differences and misunderstandings, historical tensions, and racism that still exists today.

Across the state there are programs, resources and supports designed to support Native American students in high school and college. These efforts represent a range in terms of specific focus, design, size, reach, locale and years in operation. All have met with some degree of success and all are learning how to best meet the needs of Native American students. What emerged from our study was a picture of a landscape of individual programs and resources, funded through various agencies, all working in relative isolation from other efforts. Often people did not know very much about other programs. This was even more pronounced between efforts at Tribal Colleges and Regents institutions. We heard about the need to increase awareness of programs, develop genuine working partnerships, and have long-term funding to support successful initiatives already in place.

There is much agreement about the need to support Native American students prior to and during their post-secondary education. A range of supports is necessary that take into account students' backgrounds and needs, from the financial to the academic to the personal and cultural. A number of efforts at the Board of Regents institutions and the Tribal Colleges focused on the issue of providing support. Much is already known about the issues and barriers, and what supports and strategies are helping Native American students be successful. And more work is needed.

We offer the following reflections and ideas based on what we've learned. We do not intend them to be prescriptive nor do we presume them to be exhaustive. We hope they will provide a starting point for discussions that draw upon the knowledge and expertise within South Dakota to support Native American students.

Students and faculty alike agree that retention of Native American students in college is a key issue. This is an area where more support and work is needed. While the high school programs provide much useful information and supports, many students still feel disconnected when they get to college, where often there are many more students, and a more diverse student population, in attendance.

The complex system and cultural barriers to overcome are not insignificant. There are multiple tribes, multiple types of school systems—such as public schools, Bureau of Indian Education schools, private schools, Tribal Colleges, Board of Regents institutions—and the cultures of each of these to be navigated. Creating additional opportunities where these different cultures can intersect successfully—where they can be understood, valued, nurtured and co-exist—is an important step in addressing this issue.

There are a number of operational needs, including more capacity and financial support of existing programs, in order to address the magnitude and complexities of the work and to sustain them over time. More infrastructure, technology, and in some places, additional science and math faculty at the Tribal Colleges are needed.

A more detailed statewide method of record keeping and tracking students that is inclusive of all kinds of schools could also yield useful data about attendance and enrollment patterns, both in the public schools and private schools, in the colleges and universities, and in technical and tribal schools. A better system for tracking students could provide a more realistic picture in terms of the drop-out and retention rates.

Rather than fund new programs with each new grant proposal, more funding could go to support existing efforts that are already working, and to building and maintaining an infrastructure within the state.

We encourage this diverse array of institutions and agencies to find ways to work productively together. Work is needed to bring all parties together to develop a strong, authentic working rapport that acknowledges and draws upon the expertise that each brings in order to best serve Native American students across South Dakota, and that leverages and supports existing efforts. In particular, it is critical to improve communication and genuine working relationships among the Board of Regents institutions and the Tribal Colleges. All parties need to be involved early on in proposal writing, planning and decision-making.

The resilience of the Native American students we spoke with, and their interest in math and science studies, are highly encouraging, as are the diverse array of programs and resources supporting Native American students in South Dakota. What is needed now is for these individual threads of effort to be woven into a more coherent fabric of opportunities across the state in order to maximize the investments made to date, and to increase the sharing of lessons learned from one program to another.

Appendix: Program/Resource Descriptions

GEAR UP program

South Dakota's GEAR UP¹³ program (Gaining Early Awareness and Readiness for Undergraduate Programs) is a federally-funded program that provides academic preparation programs to middle and high school students to help ready them for college. Led by the Indian Education Department within the South Dakota Department of Education, in partnership with schools and colleges throughout the state, SD GEAR UP builds on a successful SKILL Program started 15 years ago. In addition, it provides scholarships for students, professional development for educators, and college information for students and their families. As the program's website states, "In short, the focus of the South Dakota GEAR UP program is to get middle and high school kids and their parents ready for college." Cohorts of students in the seventh grade are recruited each year from the program's 24 partner schools and districts throughout South Dakota. Students are involved in the program for six years, with a new cohort of students coming on board each year. The keystone activity of the program involves bringing hundreds of students to college campuses for six-week summer programs. In addition, academic-year programs and other summer activities on home reservations are provided. Keith Moore, the Director of Indian Education for the State of South Dakota through mid-2009, described the summer program:

During the summer program, the kids live in the dorms, meet college professors, work through what we call an accelerated curriculum, and generally get ready for the next year of school. They do a lot of fun academic work in the summer that is different than the normal school year work.

For more information on the South Dakota GEAR UP program, see <http://www.sdgearup.org>.

MSIP

At the University of South Dakota (USD) in Vermillion, a federally funded Math & Science Initiative Program (MSIP) is part of a collection of US Department of Education funded programs (TRIO programs that include Upward Bound, Student Support Services, and Talent Search) designed to support first generation, low-income students to pursue four-year college degrees. The MSIP program, which began in 1997, specifically focuses on science and mathematics, offering in-depth, challenging science and math experiences on

¹³ The information in this appendix reflects the current status of these programs as of the spring of 2009 when we conducted our interviews.

campus to 50 students statewide every summer that are designed to encourage youth to continue their educations in science, math or technology.

Like GEAR UP, the core of the program is a six-week, intensive experience on campus at USD. Students participate in a rigorous science and math curriculum and engage in research projects. Research projects include topics such as ecology, environmental science, population control, habitat management, and are selected based on student interest and availability of faculty and scientists.

Academic year activities and supports closer to home engage students in continued preparation for college and STEM careers. Maggie Cox, the Upward Bound and MSIP Advisor for the Rosebud Reservation, described her role supporting MSIP students during the academic year:

During the school year, I am the mommy. I check on grades, talk with teachers, and help the students with ACT prep and scholarship applications.

Students participating in the program are tracked for eight years. For more on the MSIP and Upward Bound programs at USD, see <http://www.usd.edu/academics/institutional-diversity/trio/>.

Center for American Indian Studies

The Center for American Indian studies was established at Black Hills State University by an act of the South Dakota Legislature. The mandate of the Center is to recruit and retain Native students, to conduct research about Native America, to serve as a liaison to the Native community and to provide cultural awareness activities. The Center administers four academic programs in American Indian Studies.

The Center actively supports two student organizations: Lakota Omniciye and the American Indian Science and Engineering Society (AISES). Lakota Omniciye promotes relationships among Indian and non-Indian students, and organizes an annual Indian Awareness Week and Wacipi (pow-wow) in early April that is now in its 25th year. AISES supports Indian students who are preparing for careers in the areas of science, engineering, and technology.

The Center serves as a hub for Native students on campus and for the programs that support them. The Center focuses on providing services that range from academic counseling and tutoring to career, internship and scholarship services. Urla Marcus, Assistant Director of the Center at the time of our study describes their work as follows:

It could be anything from making sure that they know who their advisor is, to explaining financial aid, to making sure they are aware of support service programs that they qualify for and that they should be taking advantage of. Also there might be some communication problems with a professor. I might have to step in and make sure that the communication is open. We might even deal with finding gas money for a student to go home for a death.

Most importantly, as Marcus describes, the Center provides a community for the students, a place where they are not alone.

Some students come here from a very rural area. We have about 4,000 students on campus; it is a relatively small rural university, but it is still a large change from their two-to-three hundred population town. We help them get used to the university life. They might walk in and know that they are not going to be successful, unless they have a Native roommate. We might see what we can do to get them into the right room. Something that simple can cause a student to drop out within days.

For more on the Center for American Indian Studies, see <http://www.bhsu.edu/Research/Centers/AmericanIndianStudies/tabid/104/Default.aspx>.

BHSU Undergraduate STEM Scholarships

The program in Integrative Genomics at BHSU provides 40 scholarships averaging \$3,000 a year to Native American undergraduates who are majoring in Science, Technology, Engineering and Math (STEM). The program also provides mentoring, academic support and research opportunities for the students. Scholarships are renewable on an annual basis. For more information on the scholarships, see <http://www.bhsu.edu/Admissions/PayforCollege/Scholarships/tabid/556/Default.aspx>.

Build a Computer

The South Dakota School of Mines is currently piloting a version of the Alaska Natives in Science and Engineering Program (ANSEP) that was begun at the University of Alaska in Anchorage. The School of Mines pilot is called American Indians in Science and Engineering Program (AISEP) and is funded by ANSEP and the 3M Corporation. The full ANSEP program involves the Build a Computer program for high school students, summer internships as a bridge for these students to college and then support at the college level. The AISEP program has just completed its first year of the Build a Computer program, serving 13 students, and in September 2008 started the college level program, Tiospaye in Engineering, which is described below.

The Build a Computer portion of AISEP involves a partnership with Central High School in Rapid City. Each semester, Native American students in 9th-12th grade are invited to apply for the program. Students who have a grade point average of 2.5 and agree to the terms of the program are accepted. Each student must agree to attend two hours every

week of math and science tutoring from the day they start the program until they graduate from high school. They must also take and receive a 2.0 in Physics, Chemistry and Trigonometry. The students also must attend four sessions where they build a computer from the ground up. Once the computers are built they are moved to the Lakota Room at Central and only the student who built each computer is allowed to use it. Students who complete all of the program requirements by high school graduation are given the computer they built to take home. The program starts and ends with a gathering where family and friends celebrate their students.

Tiospaye in Engineering

The South Dakota School of Mines Department of Engineering started the Tiospaye in Engineering grant in September 2008. This grant, funded by the National Science Foundation, provides full-tuition, four-year scholarships to 15 Native American students. Tiospaye is a Lakota word that translates roughly to “extended family” and the aim of this grant is to create a network at the School of Mines that will give these 15 students all of the supports they need to graduate from the School of Mines. As part of this network, the grant provides the students with an advisor, whom they meet with weekly for academic support and support with navigating any family or social issues that might prevent them from graduating. For more on this program, see <http://tiospaye.sdsmt.edu/>.

Girls' Day

The South Dakota School of Mines and Technology hosts an annual Girls' Day for middle school girls in South Dakota to raise their interest in STEM fields. This event is part of the Women in Science and Engineering program (WISE) and hosts 200 young women annually, half of whom are Native American. The girls spend a day at the university where they attend workshops and talks hosted by the faculty. For more on this event, see <http://sdsmt.edu>.

AISES

The American Indian Science and Engineering Society (AISES) supports American Indian/Native American students in high school and college who are preparing for careers in the areas of science, engineering, and technology. There are active college chapters of AISES at Black Hills State University, the School of Mines and Oglala Lakota College. AISES provides scholarships, internships, and mentorships with working professionals. AISES also hosts regional and national conferences where students have the opportunity to present their research as well as network with potential employers and attend break-out sessions focusing on skills such as interviewing and resume design. The active AISES chapters, much like the Center for American Indian Studies, also provide students with a social home on campus. For more on AISES, see www.aises.org.

Sinte Gleska Knowledge Bowl

The Knowledge Bowl was created by Dr. Subodh Singh, a science professor at Sinte Gleska, a tribal college in Mission, South Dakota, as part of the educational outreach efforts of the EPSCoR grant. Once or twice a month, Dr. Singh hosts a two-hour event at the multipurpose center on campus. The competitions are open to the public of all ages. During each Bowl, Dr. Singh asks 50 math and science questions of the crowd; correct answers earn \$20 in cash. Attendance at the competitions ranges from 40-70 people per night and has grown steadily since the contests began in 2008.

Oglala Lakota College Undergraduate Research Program

The Oglala Lakota College (OLC) Math and Science department has a strong undergraduate research program. Until recently, research was minimal and focused on topics that were unrelated to the context of the reservation. Hannan LaGarry, the Co-Chair of the Department who has carried out geologic research near the reservation for years, has helped to significantly increase the amount of undergraduate research and to shift the emphasis to research on the Pine Ridge Reservation, the home of the college. Undergraduates learn research skills in their science classes and then conduct research with a mentor and/or as part of paid internships and work life. The faculty require the students to present their research to the department and strongly encourage the students to present their research at conferences. Publication of the research is now being actively pursued as well. As described by Hannan LaGarry some examples of current undergraduate research include:

- “Fossil vertebrate trackways from the Chadron Formation (Eocene) of southwestern South Dakota”
- “The effect of the Kyle Dam on cottonwood population growth and recruitment, Pine Ridge Reservation, South Dakota”
- “The geology of Ghost Canyon, Pine Ridge Reservation, SW South Dakota.”
- “The effects of fire and its management on vegetation of the Pine Ridge Reservation, southwestern South Dakota”
- “Contamination of surface waters by open-pit uranium mining, Harding County, South Dakota”

Two students recently presented their work at the National American Indian Higher Education Consortium (AIHEC) Conference and won 1st and 2nd prize for their research presentations. AIHEC is a consortium of Tribal Colleges that work together to establish

programs, network, mentor new initiatives and advocate for policy changes. For more on the math and science department at OLC, see http://www.olc.edu/local_links/smet/.

Math Contest in Todd County

In March 2009, Todd County School District held its first-annual district-wide mathematics competition. Nearly 70 students in grades 3-8 competed, playing the games of 24 and closest to 100. Awards were given to the top three students at each grade level, and these students represented schools throughout the district. The winners were also honored at a school board meeting. For more on the math contest and program at Todd County High School, see <http://www.tksdk12.org>.

Transition Program, Todd County High School

The Transition program started six years ago at Todd County High School and is designed to help middle school students make the transition to high school. Todd County High School draws students from feeder schools throughout Rosebud County including six rural K-8 schools and a nearby middle school. The transition program involves the guidance counselors from the high school talking with 8th graders about what they can expect at the high school, both in terms of academics and scheduling. The program also provides tours of the high school and shadow programs, where 8th graders can tag along with high school students for a day, as well as a half-day at the high school where students run through a mock schedule. The program also is informed by an annual survey of middle school students about their concerns about coming to the high school. One transition counselor reported that the primary concerns from the survey every year are getting lost and scheduling.

Academic Café at Central High School

At Central High School, guidance counselors run an Academic Café, supported by a Bush grant, where Native American students in grades 9-12 are supported in successfully completing high school and preparing for post-secondary education or work. Each participating student is assigned to one of four graduation counselors. The counselors monitor the students' academic progress, inform students of career and scholarship opportunities, and generally support students in identifying career interests and connecting them with one of the career clusters at the high school. Students attend the Academic Café at noon during their off block. They are served lunch and use the time to study.