CANKDESKA CIKANA COMMUNITY COLLEGE
Spirit Lake Dakota Nation
Fort Totten, North Dakota

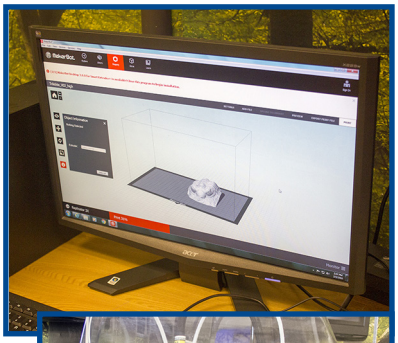
CCCC Research Summary

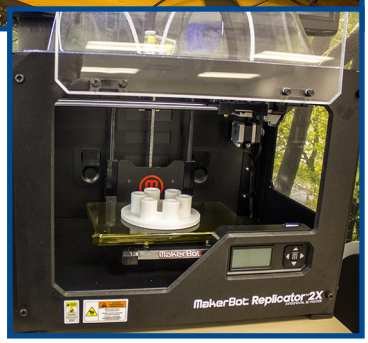
Advanced Manufacturing & 3D Printing

CCCC began an Advanced Manufacturing course series in January 2016 with Introduction to Advanced Manufacturing. The course will provide a survey of the major topics, technical skills requirements, and career opportunities in the manufacturing sector. Lab work will provide students an introduction to product design and production using 3D software and printers.

"This experience will give CCCC students another cutting edge technical option to consider as they prepare themselves to take advantage of workforce opportunities in science, technology, engineering, or math disciplines," stated **Karl Haefner,** 3D Auto-Cad instructor.

The new course series is made possible through a planning grant provided by the Department of Energy's National Nuclear Security Administration (**NNSA**) via the American Indian Higher Education Consortium (**AIHEC**). The grant provides the opportunity to partner with a major tribal employer, Sioux Manufacturing Corporation. According to CCCC president **Cynthia Lindquist**, *"Tribal College students need diverse paths that contribute to the vitality of our communities. We are collaborating with Sioux Manufacturing Corporation in Fort Totten as the program is designed, developed, and implemented."*

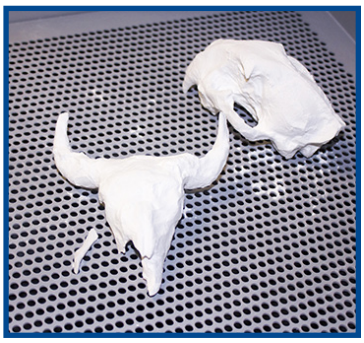


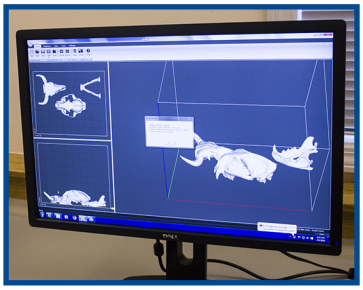


The industrial and commercial side of the Advanced Manufacturing Initiative involves a collaboration which includes Cankdeska Cikana Community College (CCCC), Navajo Technical University (NTU), Salish Kootenai College (SKC), Turtle Mountain Community College (TMCC) and Bay Mills Community College (BMCC) and AIHEC have begun planning initiatives for 2016 and beyond as shown in the following development areas:

Energy Systems: Microgrid Component Development

An area in this category includes various sources of energy apart from the giant utility energy grid which feeds us all electricity. One of these sources is the flywheel energy generator. This source of energy which is initiated by a mechanical startup and acceleration engine would ideally be biofuel based and have an inertia flywheel that may spin between 30K rpm to 50k rpm. Given these speeds the critical component of design is in high strength composites designed to withstand the rotational forces and resulting stresses leading to catastrophic failures. Their ability to maintain high speed with minimal load is essential to their viability. Certain composites are an important inroad to reaching this performance target specifically in long term durability. BMCC, CCCC, NTU, Sioux Manufacturing and Allied Composites Technologies have the technical expertise that in collaboration will develop this component with enhanced functionality and performance through composite/hybrid composite technology.





Nanosatellite and Drone Development

Advances in highly reliable commercial electronics, miniaturization techniques, and materials have enabled a new class of small nanosatellites, defined as having a total mass of 50 kg or less that offer miniature reliable satellites for a range of missions, including earth monitoring and communications. Involving low-cost technologies, nanosatellites offer an excellent educational vehicle for engaging students in design and engineering projects with possible commercial applications. The Inter-Tribal Space Agency was recently established by Native engineer Dan Hawk, providing the framework for a multi-campus and multi-Tribal community effort to design and develop nanosatellite technologies. The Advanced Manufacturing Initiative project team has decided to include nanosatellite development within their portfolio, with each college taking a different R&D focus.

BMCC and CCCC will focus on the following structural design using Kevlar from Sioux Manufacturing and other composite materials:

- Use of Kevlar sheeting on the inner satellite shell structure as a thermally stable (ultralow CTE), impact/penetration resistant material that is also a non-dissipative electrically inert insulator.
- Internal Electrical conduit and hydraulic/power thruster piping reinforcement
- Solar panel lightweight reinforcement-reduced power in repositioning for geo-stable and panel orientation adjustments
- Satellite fin internal lightweight reinforcement with thermal insulation during launch
- Kevlar sealing gaskets

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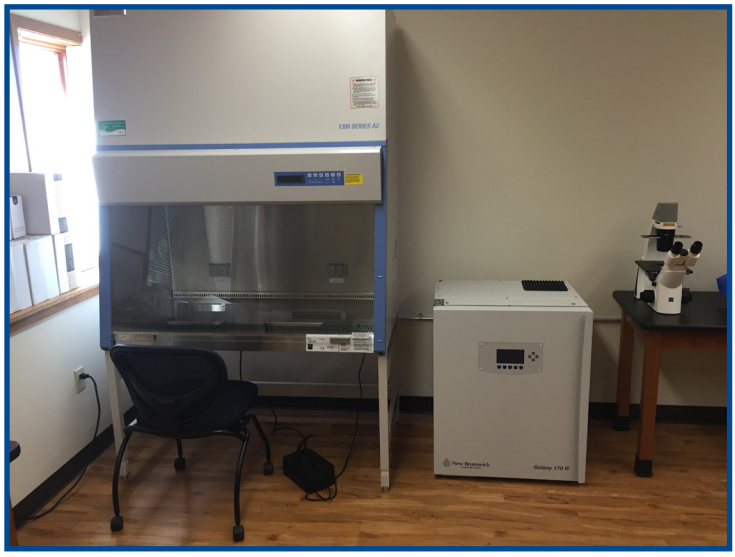
Malignant Transformation of Breast Ductal Cells

Dr. Brent Voels conducts research that analyzes the changes in gene regulation that occur upon malignant transformation of breast ductal cells by environmental agents such as heavy metals and xenoestrogens. These studies are in collaboration with the UND School of Medicine and Health Sciences. His research is examining gene changes that occur in response to the presence or absence of metallothionein-3 (MT-3) in the breast cancer cell line MCF7. This research utilizes several stably transfected mutants containing both or the N- or C-terminal of MT-3. Effects in regards to the presence or absence of the N- or C-terminal of MT-3 are being examined currently. Expression analysis has led to the investigation of MT-3's potential role in the expression of GAGE antigens. During the summer of 2015 research interns **Danae Black** and **Nashanda Bercier** examined the alteration in expression of GAGE12H, GAGE12G, GAGE6, GAGE5, GAGE4, GAGE2E-2, GAGE2E-1, and GAGE2C in the MCF7 mutant cell lines. An additional research project involves the use of promoter reporter assays to examine the expression of E-cadherin in HK-2 cells in the presence of MT-3 and MT-3 mutants containing either the N- or C-terminal domains of MT-3. This work will elucidate the relationship between the presence of MT-3 and the expression of E-cadherin in kidney cells.

In the past year CCCC has acquired extensive laboratory equipment and set aside a dedicated spaces for these research projects to occur. Students conducting research at CCCC are trained to advanced equipment helping them prepare for future careers in STEM.

This research is supported by the North Dakota EPSCOR, North Dakota INBRE, and IHS NARCH grants. There are ongoing collaborative efforts between CCCC, the University of North Dakota, and Valley City State University.



Think Dakota

Live Dakota

Male Parental Involvement of Wild *Canis latrans*

Little is known about male parental involvement in raising pups from birth to dispersal at about nine months of age. Studies have been completed on coyote behavior with captive coyotes but studying the coyotes' behavior in the wild is difficult. From these previous studies, it is known that males will bring food back to den sites when pups are born for the female to eat, as the female will not typically leave the den to find food until the pups are about one month of age. Observations of a male coyote assisting his offspring during the late fall and early winter has brought about the question of male parental involvement. **CCCC Land Grant program, Natural Resources** is proposing through research to finding out if male coyotes assist in the rearing and upbringing of offspring beyond the initial involvement of bringing the female food.

Coyotes, in general are elusive animals and during the denning season, can have multiple active dens in a territory to move the pups around to. This constant movement of the 'family group' and the elusive behavior makes it difficult to observe the coyotes using traditional methods. Natural Resources program is proposing using advanced technology to video coyote behavior and analysis this footage in the lab will give us greater insight to the daily patterns of this elusive animal. Insight of this nature will allow better recommendation into the management of this species in agricultural areas where coyotes are seen as pests and how to avoid future conflict with this predator.

Connecting Science, Nature and Culture

Cankdeska Cikana Community College is involving students and collaborating across programs on a research project with a potentially huge impact on land-based oil spills across the country. The research focuses on utilizing fungal bioremediation to clean soil that has been contaminated by oil spills.

Students of the Natural Resource Management, Environmental Science, and General Science programs have assisted in the technical aspects of the research. They work with instructor Mike Parker in creating a model system that simulates an oil spill for the mycelium spawn to colonize. They also participate in disseminating data, and writing and presenting posters explainting the research outcomes. Student may potentially present the findings at such forums as First Americans Land Grant Consortium (**FALCON**), Native American Research Centers for Health (**NARCH**), Society for Advancement of Chicanos/ Hispanics and Native Americans in Science (**SACNAS**), American Indian Science and Engineering Society (**AISES**), or the American Indian Higher Education Consortium (AIHEC) Student Conference.

Mike Parker, Pre-Engineering Instructor, has a rich heritage of farming in North Dakota. In the 1990s, Parker grew mushrooms commercially and saw an article about utilizing mushrooms for bioremediation. When he came to CCCC in the spring of 2013, he mentioned the article as a research possibility for the college. Parker's knowledge and experience with mushrooms plus the sudden growth of the nearby ND Bakken oil boom make the project an especially good fit for the college. The college also has a Science Department and a Natural Resource Depart,ent, enabling the two departments to complement each other with the project.

The Science Department concentrates on the detoxification of heavy metal laden fly ash. Fly ash is a byproduct of the lignite power plants, it is the noncombustible remains of the lignite and is high in heavy metals. The mushrooms are able to bio-accumulate heavy metals at a concentration much higher than the surrounding environment. The metals absorbed by the mycelia of the mushroom colony are no longer able to impact other plants growing in the same soil. **Dr. Brent Voels**, Science Instructor, initiated the fly ash experiments as a way to be able to grow cover plants on the fly ash to keep it intact in landfills.

The Natural Resource Department is home of CCCC's greenhouses plus lab space that includes a growing platform for the mushrooms. **Carrie Ann Duafala**, Land Grant Director, became involved in the project when one of her students wanted to find a way to remediate soil after crude oil spills, noting this is a stewardship responsibility.

PROGRAMS OF STUDY

Associate of Arts | Accounting/Business Administration | Dakota Studies | Early Childhood Education | Liberal Arts | Social Work | **Associate of Science** | Environmental Science | Health, Physical Education & Recreation | Pre-Engineering | Pre-Nursing | Natural Resource Management | **Associate of Applied Science** | Computer Applications | Construction Management | Fine Arts | Graphic Arts | Heating, Ventilation, Air Conditioning/ Refrigeration | Office Technology | Professional Driver Training | **Certificate** | Bookkeeper | Carpentry | Early Childhood Education | Entrepreneurship | Finish Carpentry HVAC | Office Technology | **Collaboration with LRSC** | Automotive Technology | CNA Certification