

# MINNESOTA UNDERGRADUATE SCHOLARS



Posters at St. Paul

February 28, 2018



# Welcome

Welcome to the 5<sup>th</sup> annual Minnesota Undergraduate Scholars Poster at St. Paul! This event provides undergraduate students the opportunity to share their scholarly work with state legislators and other state government officials. These student researchers have been selected to share their work because of the important messages their research can share with the state of Minnesota and the community. It is our hope that this experience will showcase the incredible influence that research has on preparing students in becoming leaders in their future accomplishments. This year's event welcomes projects from 29 students across 8 different campuses.

Through the combined efforts of the Minnesota Undergraduate Scholars Council, this event was made possible. We are appreciative for the dedication of the faculty mentors to their students. In addition, we want to recognize the student presenters for their commitment to excellence.

Sincerely,

A handwritten signature in black ink that reads "K. Agarwal". The signature is written in a cursive, slightly slanted style.

Kuldeep Agarwal  
MN Undergraduate Scholars Posters at St. Paul

# MINNESOTA UNDERGRADUATE SCHOLARS



Minnesota Undergraduate Scholars is a consortium of institutions that supports the research, scholarly works and creative activity of undergraduates by providing avenues for funding, presentation resources and opportunities for undergraduates to present their work. We are committed to engaging undergraduate students throughout the Minnesota State Colleges and Universities system in scholarly activities that will enrich their collegiate experience, open doors to career opportunities and lead to a life-long love of learning.

# Minnesota Undergraduate Scholars Council

## **Anoka-Ramsey Community College**

Angie Anderson and Kristen Genet

## **Bemidji State University**

Mahmoud Al-Odeh

## **Inver Hills Community College**

David Higgins

## **Metropolitan State University**

Alex Layne

## **Minneapolis Community & Technical College**

Renu Kumar

## **Minnesota State University, Mankato**

Kuldeep Agarwal

## **Minnesota State University, Moorhead**

Oscar Flores

## **Rochester Community and Technical College**

Heather Sklenicka

## **Southwest Minnesota State University**

Emily Deaver

## **St. Cloud State University**

Jennifer Howland, Jodi Kuznia and Megan Robillard

## **Winona State University**

Mingrui Zhang

# Participating Colleges & Universities

Anoka-Ramsey Community College

Metropolitan State University

Minneapolis Community and Technical College

Minnesota State University, Mankato

Minnesota State University, Moorhead

Rochester Community and Technical College

Southwest Minnesota State University

St. Cloud State University

Winona State University

# Schedule of Events

Wednesday, February 28

8:00 – 9:30 am	Arrival and Poster Set up
9:30–11:30am	Poster Session in Capital Rotunda
11:30-12:00pm	Conclusion and Certificate Distribution
12:00pm- Evening	Students can meet with Legislators

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## **The Effect of Buffer Zones, Flower Variety, and Flower Coverage on Beneficial Pollinating Insects**

Meg Gable

Melanie Waite Altringer, *Faculty Mentor*

Anoka-Ramsey Community College

Over 120 counties realize the important role pollinators have in our global economy; yet the crisis of their decline continues. Combating the negative effects of pesticides and herbicides along with protecting and restoring habitat is vital to supporting these species into a healthy future. The purpose of this study was to compare the positive effect of various flowering environments on the population and diversity of beneficial pollinating insects. The main question addressed was: "Does the variety of flowering plants, in buffer and non-buffer zone areas, effect beneficial pollinating insect counts?" The prediction was that if the variety of flowering plants in buffer and non-buffer zones influence beneficial insect counts, then a site planted in the buffer zone, with the greatest diversity of flowering plants, would attract a greater variety (eH') and higher counts of beneficial pollinating insects. Insect counts were gathered at three sites of various acreages every 5-7 days from June 29 until July 31, 2017. Data analysis indicates that an increase of plant variety did not have a significant impact on the quantity or variety of pollinators, but an increase of flowering plant coverage did increase the variety of beneficial pollinating insects with the greatest amount of pollinating insects being at the buffer zone.

## **Prevalence of Antibiotic Resistant Genes in Environmental Isolates**

Mohamed Mohamed, Abdigadir Khalif, and Anna Lytle

Renu Kumar, Faculty Mentor

Minneapolis Community and Technical College

The majority of U.S meat, poultry, eggs, and milk factory farms uses feed-additive antibiotics. These type of factory farms utilize non-therapeutic amounts of antibiotics as feed-additives to enhance animal's health and meat production. However, these factory farms create enormous amount of animal waste that contaminate the water and soil, thus creating a harmful environment for both animals and humans. Recent studies indicated a relationship between the uses of antibiotics in these factory farms with the rise in antibiotic resistance bacteria and increase numbers in untreatable infections in our society. Human micro flora bacteria are exposed to these additives and becoming resistant to several antibiotics. This study focuses on studying prevalence of antibiotic resistance bacteria in soil and water samples collected from a fence-line near an animal farm in Minnesota. More specifically, we focused on detecting a group of ampicillin-resistance genes. Forty-seven bacterial colonies were isolated from the soil and water samples, and purified by using streak plate technique. Bacterial strains were categorized based on gram stain morphology. Most of the strains were gram-positive bacteria. Kirby Bauer method was performed to determine antibiotic profile of these bacterial isolates. The preliminary results revealed that several of these bacteria strains were resistance to ampicillin, penicillin and susceptible to tetracycline. DNA was isolated from bacterial colonies and polymerase chain reaction was used to identify the presence of three beta-lactamase antibiotic resistance genes. The information acquired from this research will enhance our understanding of prevalence of antibiotic resistance bacteria and the farming industry in the U.S. Having more detailed analysis in faming environment will help understand the relationship between clinical outbreak of antibiotic resistant bacteria infection and the environmental reservoirs of resistant bacteria.

## **Solar Roads**

Sydney Alberts

*Brian Wasserman, Faculty Mentor*

Minnesota State University, Mankato

In this it will talk about the benefits and disadvantages of solar roadways and what companies are producing these solar panels that allow vehicles to drive on them. It talks about what they are capable of doing. How they are able to save energy and help with weather such as snow and ice on roads. There are many advantages and disadvantages to solar panels as roadways such as saving energy, being able to charge vehicles as they are driving on the road, getting rid of dangerous weather conditions on the roadways, and being able to get rid of some visible power lines.

## **The Stigma of Sex Work and Criminalization: It's Impact on Victim Blame and Empathy**

Elliott Kunerth and Kelsi Pettit

Eric Sprankle, *Faculty Mentor*

Minnesota State University, Mankato

The purpose of this study was to explore sex worker stigma, specifically regarding the effect their job title and criminalization status may have on victim blame and empathy. Although the negative effects of sex work criminalization have been well-documented in qualitative research, it has been minimally experimentally tested. Utilizing a 2 (professional dominatrix, professional naturopath) x 2 (legal, illegal) experimental design, 183 undergraduate participants were randomly assigned to 1 of 4 conditions. Participants were asked to read a news article describing a sexual assault in which the aforementioned variables were manipulated to describe the survivor's job and her job's legality. After reading the article, participants completed the Victim Empathy Scale. Results indicated significant main effects for both independent variables. The women working as sex workers (i.e., professional dominatrices) were blamed for their own assault significantly ( $p < .05$ ) more than non-sex workers (i.e., professional naturopaths). Additionally, those working illegally were blamed significantly ( $p < .05$ ) more for their assault than those working legally. There was no significant interaction. The results of this study add to the qualitative data regarding the reality of sex work stigma, it's real-world consequences of victim blaming, and the effects of criminalization. Limitations include using a convenience sample, especially toward the end of the semester when careless reading and responding were evident (although these invalid responses were identified and removed). Future research should focus on more targeted sampling to reduce validity concerns.

## **Effect of Binder Saturation and Sintering on Cobalt Chrome – Hydroxyapatite Biocomposite Manufactured by 3D Printing**

John Ruprecht

Kuldeep Agarwal, *Faculty Mentor*

Minnesota State University, Mankato

Currently about 500,000 knee implant surgeries are performed each year. US demand for implantable devices will increase 8.3 percent annually through 2025. One of the major factors limiting use of implants is their failure prematurely. Most common biomaterials for implants are metals, alloys and ceramics. Bones have tensile strength of 70 – 150 MPa. However, mechanical properties of metals differ from bone: Stainless steel (SS) - tensile strength 586-1352 MPa. These differences lead to stress shielding resulting in loosening of implants due to degradation of human tissues around them. Calcium phosphates have best biocompatibility and properties closest to natural bones: tensile strength 38-48 MPa. However, they have poor fracture toughness that limits their application in implants. Therefore there is a need for materials that combine mechanical performance of metals such as SS with biocompatibility of calcium phosphates. This work studies the effect of binder saturation and sintering on stainless steel – hydroxyapatite (HA) biocomposite during the 3D printing process. ExOne 3D printing system is used to create samples of porous SS-HA composite. In first step, 3D Printing creates SS samples by adding a binder to the layer. This binder saturation (% of binder in each layer) is varied to create different porosities in the samples. These samples are cylindrical with a diameter of 10 mm and height of 25 mm and two samples at each setup are produced at layer thickness of 100  $\mu\text{m}$ . Once the samples are “printed” they are subjected to two different time temperature curves during sintering. The sintering helps in changing the density and porosity of the material to match the desired properties of the bone. A total of 8 experiments are done by having 2 levels each of the binder saturation, sintering time and temperature and the results are reported comparing them to bone properties.

## **Cyberbullying: Coping Strategies in Elementary and High School Students**

Jenna Macziewski

Carlos Panahon, *Faculty Mentor*

Minnesota State University, Mankato

Technology is always developing, and new apps are constantly being created. With the rise of technology, cyberbullying is becoming more prevalent in today's schools. Cyberbullying is becoming the new way to bully because individuals are more comfortable saying things behind a screen that they are not comfortable saying in person. Cyberbullying is most common in middle school, through social media apps such as; Snapchat, Instagram, or Twitter, however, it is starting to emerge in 3<sup>rd</sup> grade. For this study, parents of students between 3<sup>rd</sup> through 12<sup>th</sup> grades were contacted seeking permission for their child to complete a brief online survey. The students were asked to identify common responses of how one responds to being cyberbullied. Then, they rated the effectiveness of their responses to being cyberbullied helped. It was hypothesized that acts of being cyberbullied are beginning to occur at a younger age than previously reported. In addition, we predicted that students will indicate the interventions are not as effective as intended.

## **Earnings Restatements and Crisis Communication Patterns**

Jenna Kalthoff

Thomas A. Hanson, *Faculty Mentor*

Minnesota State University Moorhead

Earnings restatements represent significant market events for firms, because they acknowledge and correct past accounting irregularities. Therefore, restatements can alter financial forecasts, damage credibility, and ultimately affect stock market valuation. Companies often issue a press release that explains the cause of the restatement, and these statements have previously been analyzed for various traits that can influence the market reaction. We employ a multi-disciplinary approach by classifying quotes from press releases according to Image Restoration Theory to analyze the impact of different communication strategies on stock market returns. The results are presented using an event study methodology to gauge differential market impacts.



## **Backtesting Equity Risk Parity Portfolios**

Cameron DuBore

Thomas A. Hanson, *Faculty Mentor*

Minnesota State University Moorhead

Risk parity is an investment strategy that departs from traditional Modern Portfolio Theory (MPT) by focusing solely on risk measures, rather than estimates of expected returns of individual securities. The most common approach employs portfolio weights that are the reciprocal of the standard deviation of each asset. However, this method ignores covariance among the assets. We consider alternative portfolio formation strategies by using the reciprocal of the average covariance as an alternative weighting scheme. Additionally, we employ Spearman's  $\rho$  and Kendall's  $\tau$  as robust measures and compare performance of the strategies over a 36-year backtest period. The portfolio performance is compared to results using Pearson's correlation and Markowitz mean-variance optimization.

## **Development of Engaging Labs for the Two-Year College Curriculum**

Lul Sharif and Munira Alimire

Heather Sklenicka, *Faculty Mentor*

Rochester Community and Technical College

Successful completion in labs is crucial for early success in scientific fields. Engaging students in chemistry labs early in their career is critical to their continued interest in the course. Engaging labs bring elements of the real world into the teaching classroom and allow students to make decisions about the lab as well as mistakes. Two current concentrations in our group include a thin layer chromatography lab that provides insight into forensic chemistry, the goal is to find a solvent and stain for clear visualization in TLC, and a lab focusing on the kinetics of blue dye, which will provide understanding on the workings of kinetics as well as practice on laboratory equipment. Completion of these projects will positively impact undergraduate chemistry labs. Progress on these projects along with future goals will be presented.

## **Exploring the Use of Computational Chemical Software at the Two-Year College**

Nicholas Elliott

Heather Sklenicka, *Faculty Mentor*

Rochester Community and Technical College

The use of computational chemistry software is a growing trend in academia at the undergraduate university level and has been a great complement to existing labs within curricula. Advancements in software provide students at each level the capability to calculate, interpret, and apply data that supports chemical phenomena they see in a lab and in their textbooks. The use of these programs is not widely used at the two-year college level, because of the smaller student population. This study aims to determine if the software would be beneficial to students at the two-year college level. The purpose of this research was to find software that could potentially be incorporated into the Rochester Community and Technical College Chemistry Department's course sequences. After researching multiple sources for a program, Spartan software was chosen, based on its aesthetic layout and easy-to-use interface, depth of calculations and functions, and was cost effective for the institution. Surveys will be used to gauge the interest in computational chemistry from both the students and faculty's perspective. Tutorials are being developed to assist students understanding the directions and purpose of each experiment before they are completed in lab. The study will be used to present to the administration at RCTC to support the expenditure of getting site licenses for school computers. The goal of this study is to introduce computational chemistry to students and give them the opportunity to delve deeper into their understanding of the chemistry needed to be successful in their future studies in the field.

## **Distribution of Lichen on Granite Outcrops in the Minnesota River Valley**

Brayden Anderson

Thomas Dilley and Emily Deaver, *Faculty Mentors*

Southwest Minnesota State University

Lichens are a symbiotic association between an algae or cyanobacteria and a fungus. This study was done to identify lichen distribution and abundance growing on five different granitic outcrops in the Minnesota River Valley to determine if slight chemical changes in the rock influenced lichen growth. Lichen were identified and species' areal distribution were sampled in two randomly separated grids at each outcrop. Eleven species of lichen were found with Cumberland rock shield being the most abundant on 4 of the 5 rock types. Several lichen species showed no statistical differences between the sites while others were unique to a particular site. Lichen at all 5 sites did differ to varying degrees suggesting rock chemistry may control lichen distribution. However, other factors such as topography, microclimates, site disturbances, and fire frequency must be considered as well.

## **Characterization of Tree Species in the ADM-SMSU Environmental Learning Area at Southwest Minnesota State University**

Melissa Klecker

Emily Deaver and Thomas Dilley, *Faculty Mentors*  
Southwest Minnesota State University

Studies on trees demonstrate their ecological importance to plants and animals. Overtime, the composition of tree species change as forests mature. In Marshall, MN the ADM-SMSU Environmental Learning Area provides an opportunity to study these types of changes. The purpose of this study was to document species, diversity and density of the current forest and to evaluate the changes in forest species since it was first planted. Tree species were identified, species relative abundance (SRA), relative dominance and age were determined. Out of 192 trees measured, 20 different tree species were identified, with red pine, quaking aspen and green ash being most abundant and dominant. The ages measured did not correlate to the year of the initial plantings, which suggest that native, re-generational growth or undocumented plantings were measured. In the future, tree species will continue to change within the forest community and be studied in order to document those changes.

## **Prosthetics in Film and Television (1967-2017)**

Jordan Stangeland

Sheila Tabaka, *Faculty Mentor*

Southwest Minnesota State University

In a world where acting in front of a green screen with effects, backgrounds, and sometimes even entire characters generated by CGI has become commonplace, it's important to know the history and basic processes behind practical effects that we used to use in movies and television. Taking a look back through the last 50 years at some of the most prolific special effects artists, we can rediscover and appreciate the effort and care that went into the making of prosthetics for use in films. Movie magic lies in the creation and use of these prosthetics. You'll find that the extra time and effort that went into making these prosthetics was worth it and is a tradition that we should remember and use more in the future.

## **The SMSU Writing Center: Then and Now**

Sariah Cheadle

Sheila Tabaka and Ruthe Thompson, *Faculty Mentors*

Southwest Minnesota State University

The purpose of this study was to determine, as closely as possible, the origins of the SMSU Writing Center as well as how it's evolved. Most research focused on documents found within the Striegel Archives, here at SMSU, and within the Writing Center itself. These documents include, but are not limited to: inter-department memos, budget sheets, grant requests, academic catalogs, and student directories. Several gaps in documentation of Writing Center events make it difficult to create a full history. Most evidence points toward the center first opening in 1978 under the direction of charter faculty member Mary Hickerson. From its inception to now, it is estimated that the center has provided close to 30,000 tutoring sessions.

## **Statistical Analysis of the SMSU Women's Basketball Team**

Alana Christianson

Heather Moreland and Wije Wijesiri, *Faculty Mentors*

Southwest Minnesota State University

The purpose of this presentation is to analyze statistics from the SMSU women's basketball team. By analyzing statistics from the last seven seasons, we are able to determine if there is a correlation between different variables that would lead to winning more games. We started the analysis by constructing boxplots for each variable. Then we investigated the correlation between each variable. A chi-square test was completed and we concluded that there was no significance to SMSU playing at home. Lastly, a logistic regression was completed and we were able to find a statistically significant model based on game statistics to predict the chance of winning the game. Utilizing these results will hopefully assist the team in producing better results, thus translating into victories!



## **SCSU Sense of Belonging Research**

Erik Nordmeyer, Andrea Richards, and Joshua Toftey

Melissa B. Hanzsek-Brill and David H. Robinson, Faculty Mentors

St. Cloud State University

As St. Cloud State University's enrollment and retention rates have declined in recent years, the University has both worked to find the causes and to reverse this negative trend. Through research by scholars like David S. Yeager at the University of Texas, the sense of belonging has been found to have an effect on student success, and in particular the retention rate. The sense of belonging is how accepted and valued a student feels on the campus and by the people with whom the student is in contact. Our research is focused on developing and understanding how to measure the sense of belonging of first-year SCSU students. We began by analyzing a university survey with over 200 questions, called Mapworks, which was taken by first-year students in the Fall 2014 and 2015 semesters. A "Belonging Index" was created by averaging one's responses to survey questions that related to their sense of belonging at SCSU. This index proved to be a useful predictor of first-time students' retention rate; providing insights into differences in retention for students based on financial situation, living arrangement, and other demographic characteristics. Building on the importance of the previous Belonging Index, a new survey unique to SCSU was developed to measure the sense of social belonging. A subset of ten questions was chosen to be in the new survey, the ten questions most associated with retention based on the Mapworks data. In addition, new questions were added to gauge students' sense of academic belonging. This revised survey was first administered in Fall 2017, and will continue to be given to first-time students annually. This measure of a sense of belonging will provide SCSU with insights into which students are most likely to succeed and which students would most benefit from interventions aimed at social integration and community.

## **Spherical Lens vs. Microlens for Laser Propulsion**

Tyler Baxter

John E. Sinko, *Faculty Mentor*

St. Cloud State University

The application of spherical lenses in the field of laser propulsion is fairly common and well understood, however, the utilization of arrays of microscopic lenses (microlens arrays) within the same field is not very well documented in the literature. Additionally, there are certain physical drawbacks (such as plasma shielding) that could potentially be mitigated using a microlens array in place of a spherical lens. This study develops the understanding of laser-mediated chemical propellants intended for laser propulsion using a microlens array. The immediate intent is experimentally testing space-based laser 'tractor beam' propulsion using this method. The suggested process would produce reversible thrust on distant macroscopic objects via confined ablation for development of a retrieval system for astronauts, space assets, or satellite deorbit. We believe this process may hold niche utility for beamed energy propulsion in sensitive operations by providing negative chemical feedback to prevent a runaway reaction that could lead to propellant explosion.

## **Understanding Commuting Patterns of St. Cloud State University Students**

Nathan Porttiin

David Wall, *Faculty Mentor*

St. Cloud State University

St. Cloud State University (SCSU), Minnesota is attended by a surprising number of students who commute considerable distances to attend classes. With 15,461 total students and only 2,097 living in residence halls during the Fall 2015 semester, the majority of students live off campus. Its central location within the state, close proximity to a US Interstate and two US highways, generous offering of online and hybrid classes, designation of commuter-based parking lots, and bus services, make SCSU an attractive choice for commuter students. Drawing on randomly administered student surveys, this research aims to locate and map the catchment area of SCSU's commuter-student body and, considering factors such as housing, non-school related obligations, distance, and number of online classes taken, explain why so many SCSU students decide to commute.

## **Variable Temperature Thermochromic Switching Under Varying Illumination**

Alexis Corbett

John E. Sinko, *Faculty Mentor*

St. Cloud State University

Thermochromic materials are those which change color as a result of a temperature change. The specific thermochromic pigments used for this research make this change at different temperatures (20, 25, and 30° C). Below these temperatures, the thermochromic coating formed from the pigments is black, but once they reach their critical temperatures, the pigment becomes translucent. While this has often been used for whimsical purposes, such as painting a table which turns clear after sitting down or coating a vehicle to display a message when a certain temperature is reached, with this research, more practical applications are being explored. A coating using a thermochromic pigment can help regulate the temperature of the surface it is on, which could be used for buildings to help reduce the cost and energy used for heating and cooling a building. This may also be used in other situations where heat retention is necessary to hold a device or component within a desired temperature range. Measuring the temperature over time at different light intensities will show how well the thermochromic coating avoids temperature change compared to the material without a coating. Further analysis will also be done to put the thermochromic coating in real world scenarios and test the limits of the coating.

## **Characterization of the Phosphoribosyl Transferase ToyH; an Essential Enzyme in the Production of the Antibiotic Sangivamycin**

Cody Ashton

Nathan Bruender, *Faculty Mentor*

St. Cloud State University

Antibiotic resistance is an increasing threat to the young and the elderly in the world today. As the current antibiotics lose their utility, new medications with different mechanisms of action need to be developed in order to face this challenge. One method to discover new medications is the discovery of new metabolite biosynthetic pathways in nature. For example, *Streptomyces rimosus* naturally produces secondary metabolites that have antibiotic and antitumor therapeutic properties. However, it is unclear how *S. rimosus* synthesizes these 7-deazapurines, known as toyocamycin and sangivamycin. Recent work showed that guanosine 5'-triphosphate is the precursor to toyocamycin and sangivamycin and through the action of 4 enzymes *S. rimosus* produces PreQ0, which is proposed to be a precursor to both toyocamycin and sangivamycin. The exact pathway in *S. rimosus* transforms PreQ0 into toyocamycin and sangivamycin is currently not known, but a 2008 report by McCarty and Bandarian has proposed that PreQ0 can be converted to toyocamycin through the action of 5 enzymes. This poster focuses on the purification and enzymatic characterization of a putative phosphoribosyl transferase (ToyH) that has been proposed to catalyze ribosylation of PreQ0.

## Computers Playing Connect Four at Any Skill Level

Ben Andrews and Jimmy Hickey

Nina Marhamati, *Faculty Mentor*

Winona State University

Connect 4 is a two player, adversarial game in which the players take turns placing pieces on a board; the first player to connect four pieces in a line wins. It has since been mathematically solved, that is there is always a definite correct move. For a user, however, playing against a machine that always makes the perfect move does not create a meaningful experience. Thus, there is a need for a computer player that is good, but not perfect. We have implemented a minimax algorithm to provide this service. It can be adjusted to make better or worse decisions; however, this process takes a lot of time. Each move can take minutes to make for higher level minimax players. This wait is unacceptable for user, so instead we generated data using the minimax algorithm and used it to train a neural network. Through supervised learning algorithms and our data, we taught a machine to play Connect Four amply, but with some inherent flaws due to the stochastic nature of the network training. Applying these methods introduces a procedure to generate computer players that can compete at different skill levels with quick response times, offering an enjoyable experience to any user.

The code base and instructions are available at  
<https://github.com/JimmyJHickey/Machine-Learning-Connect-Four>

## **Curriculum of Assimilation: The Chemawa Indian Boarding School**

Sarah Fischer and Emma Tomb

Juandrea Bates, *Faculty Mentor*

Winona State University

The Chemawa Indian Boarding School was built with the intention of breaking down the culture of its Native American students. On February 25th in 1880, in Salem Oregon, the Chemawa Indian Boarding School opened its doors as the second federally funded Native American Boarding school in the United States. Thousands of students were sent to the school to be assimilated into White American culture. Those students experienced the traumatic process of culture loss through assimilation, and often died in the care of the school's administration.

Historians have written some scholarship on the history of the school and the processes of assimilation at Chemawa, but there is a lack of documentation on the lasting effect of the assimilation techniques on the school's students and their families. This project seeks to fill the holes in exploring the historical trauma caused by Native American boarding schools in the United States today.

## **Reinterpreting the Oldest Rocks in the Black Hills, SD; a Textural and Geochemical Classification**

Kyle Colbert and Elizabeth Evenocheck

Stephen Allard, *Faculty Mentor*

Winona State University

This project is a microhistory of the Chemawa Indian School, the second federal Indian boarding school in the country that is still running to this day. The school was built with the intent of “civilizing” Native American children from reservations all over the midwest and western part of the country, and assimilating them into White culture. There were several techniques that the school used, which had a number of severe consequences still present in the lives of alumni to this day. This project will be discussing topics such as punishments, job training, and music. Through contemporary news articles and historical records from Chemawa this project will also explore how historical trauma was instilled into the Native American culture. It will show how cultural ties were cut from students and how death of students became a common occurrence from when the boarding school began even until today.



## **What is Merchant's Banks Staffing Organizational Strategy?**

Taylor Ranta Oborski, Tanner Lammers, & Morgan Ziegler

Jing Han, *Faculty Mentor*

Winona State University

The staffing strategy is defined as making decisions about a company's workforce staffing plan. It will focus on either staffing levels or staffing qualities. The staffing levels will look at whether we should: acquire or develop talent, hire yourself or outsource, external or internal hiring, core or flexible workforce, hire or retain, national or global, attract or relocate, overstaffed or understaffed and short or long-term focus. The staffing qualities will look at: person/job or person/ organization match, specific or general KSAOs, exceptional or acceptable workforce quality, and active or passive diversity. These staffing qualities will help us to make sure that the individual fits with the organization's values and goals. It will help HR to see employee satisfaction and why Merchant's Bank employees stay with the company for as long as they do. We will begin by collecting data from Merchants Bank employees. To focus our research, we will be collecting data specifically from managers and bank tellers at Merchants Bank. The information will be collected through surveys that the HR department will distribute to the Winona and Rochester locations. Our research will examine their staffing levels and quantities, while helping us determine if those locations are understaffed, overstaffed, or fully staffed. Through our research we hope to find ways to improve the current staffing strategy.

## **Mood, Attitude, and Change: An Investigation of Mood and Attitude on Handling Change**

Amy Dahlen

Metropolitan State University

Change is a consistent part of life, but people's willingness to accept change may be influenced by one's attitude and mood. The current study explored the influence of mood and attitude on accepting change. It is hypothesized that those having a positive mood and attitude will be more accepting of change than those with negative mood and attitude. The sample consisted of 20 participants (50% female) ranging from 18 to 70 years of age. Participants completed pre-test measures on mood and attitude. Next, participants were randomly assigned to complete a three-minute coloring task that was either interrupted (change condition) or uninterrupted (control condition), and then completed post-test measures on mood and attitude. Results indicated that those with a more positive mood and attitude were better able to accept change as compared to those with a more negative mood and attitude. The implications of the current study suggest that having a more positive mood and attitude gives one the tools to better manage the major and minor changes that occur throughout life.

## **A Stand for Change**

Jonathan McClellan

Metropolitan State University

The United States in 2017 is as divided a country as it ever has been when it comes to political, economic, and social issues. In 2016, a professional football player named Colin Kaepernick decided to take a stand, or in this case a knee for what he believes in. Before the football game began, Kaepernick decided to take a knee during the national anthem to protest what he feels is the treatment of black people by the police. Since 2016, numerous athletes have followed the example that Kaepernick started by kneeling during the national anthem. The decision to kneel has become a topic all over the United States, specifically with the President Donald Trump. Instead of talking about the progress the country should have with a new President in 2017, the discussion is not about what an average person would expect. Our country discussion is not focused on economics, social programs, education, or healthcare for all. The President instead is talking about athletes kneeling during the national anthem before a professional football game. The national anthem in the United States has a fascinating history. There are specific rules that should be followed when the national anthem is performed, but people pick and choose what rules for the song fit their specific political agenda. Understanding the national anthem's history, Supreme Court cases about freedom of speech, and the position of Colin Kaepernick, people can begin to grasp both sides of this argument.

## **The Effects of Caffeine on Short-term Information Retention**

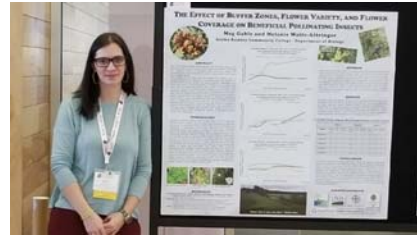
Clark Furlong

Metropolitan State University

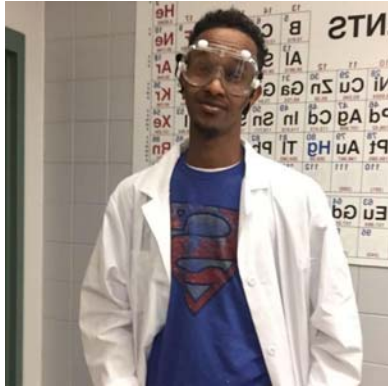
Caffeine is the world's most popular drug. The experiment was designed to examine the effects of caffeine on short-term word retention. Not much is known about the benefits or negative impacts of caffeine for memory. There have been a limited number of experiments with various limitations leading to results that are ambiguous. For this experiment the researchers compared caffeinated participants word retention abilities directly with a control group as well as a group administered a placebo. A note card based task was administered to examine short-term cued recall. Participants were asked to recall the second word of two word sets. 20 sets were presented for 5 seconds each, then 15 sets were randomly assigned to "quiz" the participants. Caffeine should have hindered the participant's ability to recall words efficiently. This experiment did not provide evidence to support the hypothesis that caffeine would impair the short-term memory abilities of humans.

## Student Presenter Biographies and Pictures

**Meg Gable** graduated from Anoka-Ramsey Community College last Spring, but continues to take conduct research at ARCC through independent study classes. She is currently a full time student the University of Minnesota, CFANS, majoring in Agriculture and Food Business Management with a minor in Environmental and Science Policy Management.



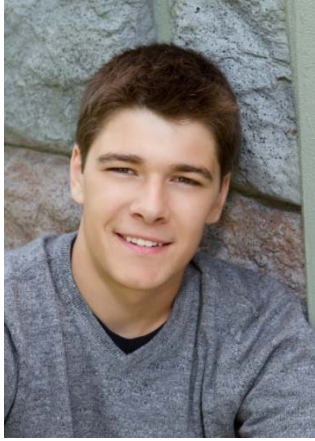
**Mohamed Mohamed** has a Bachelor of Science in Clinical Laboratory Scientist from Winona State University. He is currently doing an independent research study at Minneapolis Community and Technical College with Dr. Renu Kumar. Mohamed works at Allina Health Central Laboratory in hematology/coagulation, microbiology, and urinalysis. He is also in the process of applying to medical schools and wants to become an Anatomical/Clinical Pathologist.



**Abdigadir Khalif**

**Jenna Macziewski** grew up in a small town in Minnesota. Currently, she is an undergraduate at Minnesota State University, Mankato. Jenna is pursuing a Bachelor of Science degree in Psychology with a minor in Child Development and Family Studies and plans to graduate May 2018. Throughout her psychology courses, she realized that the field of school psychology is the right path for her. Throughout the past two years she has been a part of a research team, where she has conducted studies on cyberbullying and students with emotional and behavioral disorders. After graduation, she hopes to attend graduate school to earn a specialist degree in school psychology.





**John Ruprecht** was born and raised in Paynesville, Minnesota. While in grade school, he participated in various activities such as karate and baseball. During high school, he enjoyed classes as well as extra curriculars such as a jazz band where he played trumpet as the first chair, and bought his first collector vehicle. Since then, he has been restoring and improving that car to where it is today. Before going to college, he had two jobs. One at the local hardware store, and the other was his own lawn service. He spent the first semester of his college career at St. John's University in Collegeville, thinking he wanted to become a biologist, but then transferred to Minnesota State University, Mankato. He is a senior in the Automotive Engineering Technology major with a Manufacturing Engineering Technology minor, and, during his time as an undergraduate, he has done many things to take his education to the next level and distinguish himself from other students. He has learned how to program and operate computer numerical control (CNC) machines as well as done 3D printing research and even started his own 3D printing company.

**Kelsi Pettit** was born and raised in Mankato, MN and graduated from Kato Public Charter School (formerly RiverBend Academy Public Charter School) in 2015. In 2016 she enrolled at Minnesota State University, Mankato as a first-generation student, and is currently a sophomore. Being a first-generation student has been a major influence in her academic goals, and she is currently working towards degree(s) in Clinical Psychology and Sexuality Studies. After graduation she hopes to work with a focus group of at-risk individuals, and the LGBTQ+ community. Aside from her education she is currently working part-time as a sales associate at Torrid! When she's not working at Torrid you can usually find her working from home making different jewelry/craft items and baking! She spends most of her free-time drinking coffee, enjoying a good show on Netflix, hanging out with her little sister Kalina, boyfriend Elliott, and rescue pit bull Raven!



**Elliott Kunerth** was born and raised in New Ulm, Minnesota, and he and his father moved to Mankato in the summer of 2012, where he transferred to Mankato West High school for his sophomore and junior years, ultimately graduating from Kato Public Charter School in the spring of 2015. He is currently enrolled in his second year at Minnesota State University, Mankato, majoring in Psychology and minoring in Sexuality Studies. Upon graduating, he plans on attending graduate school and pursuing a career in Marriage and Family Counseling. He is currently employed at the Coffee Hag in old town Mankato, where he's worked as a barista for the past four years. In his spare time, he enjoys reading, playing guitar, longboarding, and spending time with his girlfriend Kelsi and rescue pit bull, Raven.



**Sydney Alberts** has been around construction her whole life. She grew up with it because her dad started his own electrical company, A&A Electric and Underground Construction Inc., in 1994. When she was younger she always wanted to go to work with him. Sydney has always had an interest in the construction field. She had the privilege to work with the residential and commercial electricians during her high school career because they were around the area, and in the summer she had the privilege to work with the drill and plow underground crews, which she really enjoyed. She also would work in the office when the office manager needed help because it was so busy which she enjoyed as well. This past summer she was fortunate enough to shadow the head estimator at Alvin E. Benike and a project assistant at Knutson Construction. She recently started an internship at Mayo Clinic as a Construction Manager. It is a huge learning experience for her. She loves a challenge and she thinks the construction field is always challenging, which is keeping her intrigued.



**Cameron DuBore** is a junior at Minnesota State University Moorhead (MSUM) majoring in Business Administration and Finance with a certificate in investment management. He is originally from Warren, MN. He is currently researching Risk Parity Portfolio Strategies under the direction of Dr. Thomas Hanson. He is involved on campus in the Dragon Investment Fund and in the Financial Management Association (FMA). In his spare time, he enjoys hunting, fishing, staying active and spending time with family and friends. He hopes to have a career in equity management.



**Jenna Kalthoff** is a junior at Minnesota State University Moorhead (MSUM) majoring in Finance and minoring in Statistics. She is originally from Richmond, MN. As an Honors Apprentice Scholar at MSUM, she is currently researching the impact of earnings restatements on stock valuation under the direction of Dr. Thomas Hanson. She has previously published collaborative research with MSUM faculty in the *Academy of Strategic Management Journal* and was awarded top prize in her session at the November 2016 Academy of Business Research conference in San Antonio, Texas, for a paper on financial literacy and investment biases. She is the president of the Financial Management Association (FMA) chapter at MSUM and a mathematics tutor. In her spare time, she enjoys camping, hiking, playing tennis, and reading. She is very grateful for all the support she has received from family, friends, and professors.

**Munira Alimire** is a high school senior at Rochester STEM Academy and a second-year PSEO student at RCTC. She also currently works in the Mayo Clinic CT Lab as a high school mentee, on phase contrast shifts. Apart from scientific research, she is a representative of District One on the Minnesota Youth Council and will be attending Stanford University next fall.





**Lul Sharif** is a PSEO student attending RCTC. She will be getting her engineering degree and go into chemical engineering. Lul is currently doing research at Mayo Clinic, she has worked in the physiology lab and is currently working with Public Affairs. Apart from her scientific endeavors, Lul is also in the Minnesota Youth Council giving a voice for the underrepresented youth in Minnesota.

**Nicholas Elliott** is a prospective mathematics major currently enrolled at Rochester Community and Technical College, and will be transferring to the University of Minnesota-Twin Cities in fall of 2018. He is interested in pure mathematics and wants to further his education after graduation at his dream school, the Georgia Institute of Technology in their graduate program at the School of Physics. Aside from his chemistry research, Nicholas is currently assisting researchers at the Mayo Clinic in developing a wellness and athletic program for patients with spinal cord injury.





**Brayden Anderson** is a senior Environmental Science major at Southwest Minnesota State University. He has been hunting and fishing all of his life which is why he chose to study environmental science. He plans to find a job after graduation, possibly in the hydrological field.

**Jordan Stangeland** is currently majoring in Psychology, minoring in Theatre Arts. Hopefully, in the future he will be able to find something he enjoys doing in one of those fields. Some of his interests are watching movies, playing video games, appreciating art and animation, and just having fun with friends!



**Amy Dahlen** is a psychology major and I'm interested in mental health. I'm from Roseville MN and I love being outdoors, running, biking, yoga, and trying new things

**Clark Furlog** is a junior in Psychology at Metro State University.

**Jonathan McClellan** is a senior in Individualized Studies at Metro State University.



**Melissa Klecker** is a senior at Southwest Minnesota State University in Marshall, MN. She has a passion for the outdoors, which is one of the reasons she picked to major in Environmental Science. From hiking, identifying plants and animals, hugging trees, fishing and camping, she has always had a connection to the outdoors, especially in Minnesota. She cares about how we treat our environment and the techniques used to preserve resources for the next generations. Two summers ago she was a park security/operations Intern for the Department of Natural Resources (DNR) at Tettegouche and Temperance River State parks in Minnesota. This past summer she was a forestry Intern in Grand Rapids, MN that also reported terrestrial invasive species in Southeastern, MN. The experiences that she has developed from both internships will apply to other jobs in the future. After graduation she hopes to find a job working in either the Department on Natural Resources, the National Park Service, or with city pollution or energy. After graduation she will strive to continue to learn through experiences and training, but she is still leaving the door open to possibly continuing with a master's degree in Environmental Science. Over the next 20 years there will be an increase in need of those educated with a degree in Environmental Science because on the ongoing issues of climate change. Many decisions will have to be made in order to adapt to the changing climate and some of these decisions involve controlling what we put into our environment we live in and to preserve land for future uses. As John Muir once said, "The clearest way into the Universe is through a forest wilderness."



Alana Christianson is currently a senior at SMSU pursuing a degree in Mathematics. After graduation she plans on completing an internship and searching for jobs. Also, there is a possibility of attending graduate school at South Dakota State University for Data Science. She love sports so finding a job that is similar to what she completed for her research project would be awesome!

**Sariah Cheadle** is a junior English major, theater minor from Fulda MN. After graduation she plans on using her degree to become a book editor and publisher. She would like to specialize in children's literature and use her theater background to also become an audiobook reader to provide more ways for young kids to experience and fall in love with reading.



**Cody Ashton**



**Alexis Corbett** is a senior undergraduate student at St. Cloud State University, majoring in Mathematics and Physics. She is interested in physics education research and intends to pursue a career in academia. She was awarded several student research grants and coauthored an article on color-changing materials in a peer-reviewed conference proceedings volume of MRS Advances in 2017.

**Nathan Porttiin** will be graduating in the spring of 2018. Gaining an interest in Geography and more specifically Geographic Information Systems (GIS) through county launched interactive maps, Nathan has integrated GIS into many areas of his coursework. Through studying the distribution of commuter students attending St. Cloud State University (SCSU) and experimenting with unfamiliar software extensions, he has both mapped the catchment area of SCSU and become familiar with new techniques in GIS. Nathan hopes to use his skillset in GIS within a utility based setting.





**Tyler Baxter** was born in Albany, Minnesota and moved to Fairmont, Minnesota where he graduated high school. Tyler enlisted in the military shortly after graduation, working as a Signals Intelligence Analyst for the U.S. Army and the NSA. Upon finishing his service, Tyler applied to Saint Cloud State University with the intention to graduate as a double major in astrophysics and mathematics. He is expected to finish his degree in the spring of 2019, and intends on continuing research in the fields of cosmology, large-scale structure astronomy, and high-energy astrophysics.

**Erik Nordmeyer** sees himself as a resilient individual who adaptively plays the cards he was dealt. One of the most stable beliefs he has held throughout his life is that his future career would heavily involve the use of numbers. He has always favored problem-solving, decision-making, arguments, solutions, etc. to be heavily based on quantifiable data that can be deciphered in a more objective manner rather than in an interpretative manner.







**Andrea Richards** is a student currently attending St. Cloud State University for Mathematical Statistics. She plans on graduating this spring and is trying to become an actuary. Andrea has also had gained a lot of statistical consulting experience working with Dr. Robinson on various projects. She hopes to continue to improve her statistical knowledge and look forward to applying it in various environments.

**Taylor Ranta Oborski** and I am a senior at Winona State University. She is majoring in Accounting and Human Resources Management, with a minor in Business Law. Taylor is originally from Minnetonka, MN. She is involved with the Accounting Associations club and Society of Human Resources Management club. During tax season she volunteers at Live Well Winona helping to prepare taxes for low income individuals. She currently works part time for Fastenal in the HR payroll department. Her goal after college is to begin the CPA and pursue a career in public or private accounting.



**Morgan Ziegler** is a senior at Winona State University majoring in Business Administration and Human Resources Management. She grew up in a small town outside of Madison, WI on a beef and dairy farm. Morgan is the president of Beta Gamma Sigma and a member of the Society of Human Resources Management club on campus. Her goal after college is to pursue a career as a Human Resources professional in the Health Care industry.



**Tanner Lammers** is a senior at Winona State University and will be graduating in May with degrees in Business Administration & Human Resources, while also minoring in Finance. Plans after graduation include, continuing his career at Merchants Bank, while also being active within the community.

**Jimmy Hickey** is a senior at Winona State University studying Computer Science, Physics, and Mathematics. He enjoys studying the intersections of these fields and is currently pursuing projects in machine learning and computational physics.



**Sarah Fischer** is from White Bear, Minnesota. She is a senior History major and English Literature minor at Winona State University. She is the Vice President of the History Association at Winona State, and a member of Phi Alpha Theta, a history honor society. Her senior seminar project this semester will focus on early modern medical practice in England and its relation to the English Reformation. This fall she began an internship as a student mentor for National History Day, which is a national program to get middle school and high school students involved in historical research. After graduating in May, she plans on continuing her education this fall in graduate school to study early modern medical history. For her future career she hopes to become a university professor of history and a published author.



**Emma Tomb** is from Roseville Minnesota. She is in her fourth year of her undergraduate studies at Winona State University, double majoring in Studio Art and History. In the near future she plans on going onto grad school in order to study Native American art history in the hopes of working in an art museum or a historical society. She is also an artist and loves applying what she learns in both her history and art history classes into her artwork. Before transferring to Winona State University, she spent her first year of college at the University of Kansas and in 2015 she received an Amsden Award from the Art History department for her work in her survey classes. After moving to Winona State, she was able to participate in the 2017 Interdisciplinary Student Research Symposium at the Museum of Russian Art in Minneapolis, presenting a research paper on Mikhail Vrubel and the Rise of Russian Symbolism. Later that year, she participated in Winona State's eleventh annual Ramaley Research Celebration, showcasing her research on The Mexican Revolution's Transformative Effect on Mexican Art. Finally, in the summer of 2017 she worked as an intern at the Minneapolis Institute of Art in the Africa and the Americas department, working with Dr. Jill Ahlberg Yohe and doing ongoing research for an Art Story on a Joseph No Two Horn's piece in the MIA's permanent collection.