



**2026 Faculty, Staff, and Students
Research Poster Session**

April 21, 2026

Book of Abstracts

Table of Contents

Expanding and Validating CyberTweet Grader & Labeler: A Domain- Focused NLP Tool for Cyberattack Relevance Assessment 6
Muhammad Abusaqer
Department of Math, Data, and Technology

Early Anomaly Detection in Multivariate Well Signals 7
David Alonso and Daren Erisman
Department of Math, Data, And Technology

Enhancing Grant Discovery at Minot State University: Early Adoption Results from an AI-Powered Funding Platform 8
Amy Armstrong and Tomer du Sautoy
Office of Sponsored Programs, Atom Grants

Is Sharing Caring? Investigating Perceptions of Privacy within Sharenting Behaviors on Facebook 9
Kyle Bittle
School of Business, Math, and Technology

Geology, Culture, and War: The Historical Significance of Los Alamos 10
Jessica Brumbaugh
Department of Science

The Effects of Archery and Yoga on College Students’ Perceived Stress 11
Yung-Ju ‘Ruth’ Chen and Kelsey Higginson
Department of Science

Headset On, Stress Off: A Pilot Exploration of Virtual Reality for Mental Well-Being 12
Lacey Corneliusen, Zebulon Wallace, Sierra Schramm, and Addison Sorenson
Department of Behavioral Science and Criminal Justice, Department of Humanities, Social Sciences, and Interdisciplinary Studies

GEOL 290 Field Study: Hot Springs, History, and Highways 13
Zoe Desloges
Department of Business

Tracking the Dinosaurs of Picketwire Canyon 14
Christian Dryden
Department of Science

Being Human in a World of AI: Pedagogy and the role of AI in Student Agency 15
Daren Erisman and Nigel George
Department of Math, Data, and Technology, Department of Science

ML Based Antibiotic Recommendation for Escherichia coli (E.Coli) Using Antimicrobial Susceptibility Data	16
Fahim Farhan and Serena Pontenila Department of Math, Data, and Technology	
Population Density as the Primary Driver of Gun Violence: A Zero-Inflated Negative Binomial Analysis of U.S. Cities	17
Kale Farrington and Daren Erisman Department of Math, Data, and Technology	
The Role of Social Media in Shaping Corporate Social Responsibility Perceptions: A Literature Review	18
Megan Fixen and Paulette Dominguez Department of Business	
Predicting PGA Tour Round Scores Using Historical Player Performance Metrics	19
Abigail Goettle and Daren Erisman Department of Math, Data, and Technology	
Beyond the Book: Active Learning Tools, Techniques, and Examples	20
Kelly Hendershot and KateLynn Albers	
Zumbini for Schools: How Much MVPA Does It Provide for Children in Daycare Settings?	21
Mallory Hoogensen, Yung-Ju ‘Ruth’ Chen, and Hayden Tinker Department of Science	
Paleontology of Track Ways at Dinosaur Ridge	22
Bryce W. Jacobs Department of Geology	
Geology 290 Extravaganza.....	23
Isaac Keller Department of Science	
Visualization and Analysis of the Baseball Pitching Motion using Machine Learning.....	24
Hannah Landry Department of Math, Data, and Technology	
Rapid synthesis of N-[1-(4-pyridyl)ethyl]formamide	25
Mason M. Lemer, Lioudmila I. Bobyleva, and Mikhail M. Bobylev Department of Science	

Comparison of the Effectiveness of Conventional Antibiotics and Triangular Silver Nanoparticles against Clinically Important ESKAPE Pathogens.....	26
Cody Leonard, Genevieve Kahrilas, and Abiodun Ebenezer Odufuwa Department of Science	
Pilot Study of the Effect of Instrument Assisted Soft Tissue Mobilization (IASTM) and Therapeutic Exercise in the Treatment of Plantar Fasciitis	27
Beth Marschner, Kekoa Munos, and Heather Golly Department of Science	
Place-based Learning in the Geosciences: Methods and Outcomes.....	28
Katherine McCarville Department of Science	
The Antibacterial Effects of Triangular, Spherical, and Decahedral Silver Nanoparticles on clinically important ESKAPE Pathogens	29
Ethan Miller, Genevieve Kahrilas, and Abiodun Ebenezer Odufuwa Department of Science	
Elk Herd Habitation and Ecosystem Diversity at Valles Caldera National Preserve	30
Kirsten Nelson Department of Science	
Geology Field Study – Spelunking in Carlsbad and Hiking the Spanish Peaks	31
Nikita Neyshtadt Department of Science	
Improving Speech-Language Pathology Graduate Student Confidence in Evidence-Based Practice.....	32
Courtney Olson and Carla Tierney-Hendricks Department of Communication Sciences and Disorders, MGH Institute of Health Professions	
The MSU Student Retention Project.....	33
Elyzia E. Powers, Dylan E. Horner, and Heili J. Wiley Department of Behavioral Sciences and Criminal Justice	
The Effect Of Social Interaction Frequency On Emotional Well-Being In Assisted Living Residents	34
Ryen Simons and Krystal St. Peter Department of Behavioral Sciences and Criminal Justice	
Intersecting Narratives.....	35
Ryan Stander, Amadis Amaya, Charlese Bell, Misake Ishiwata, Evan Lovett, Kyler Meigs, and Ashley Vargas-Colima Department of Fine and Performing Arts	

Study Collection Development: New Acquisitions and Archival Practice with the David Driesbach and Michael Barnes Study Collections	36
Ryan Stander, Amanda Watts, Greg Vettel, Britt Rohn, and Kiley Anderson Department of Fine and Performing Arts	
Predicting Unreported Gas Flaring in the Bakken Formation Using VIIRS Nightfire Satellite Data.....	37
Justin Stevenson Department of Data Science	
Perception Vs Reality: Metamemory And Memory Performance.....	38
Krystal St. Peter, Ryen Simons, Heili Wiley, Noah Wright, and Ethan P. Valentine Department of Behavioral Sciences and Criminal Justice	
An Annotated Bibliography of Selected Solo Works for Marimba and Vibraphone by Artist and Composer Julie Spencer.....	39
Mariah Taller Department of Fine and Performing Arts	
Rapid synthesis of N-methyl-N-[1-(4-pyrimidinyl)ethyl]formamide	40
Tereza, Vrbánek, Lioudmila I. Bobyleva, and Mikhail M. Bobylev Department of Science	
Cultivating Critical Thinking Skills in Students with Special Needs Through Folktale-Based Curriculum.....	41
Wenjiing Zheng, Thalia Rattai, and Lauryn Wilkinghoff Department of Education and Inclusive Services, Department of Communication Sciences and Disorders	

Expanding and Validating CyberTweet Grader & Labeler: A Domain- Focused NLP Tool for Cyberattack Relevance Assessment

Muhammad Abusaqer

Department of Math, Data, and Technology

Cyberattacks on critical infrastructure generate large volumes of social media content, making it difficult for analysts and incident-response teams to quickly identify information that is relevant and actionable. This poster presents ongoing research on CyberTweetGrader&Labeler (CTGL), a domain-focused natural language processing tool developed to assess the relevance of tweets related to cyberattack incidents. Prior work on the 2020 Universal Health Services ransomware case study showed that CTGL achieved 97% accuracy in distinguishing and prioritizing cyberattack-related tweets. The current project expands and validates the tool across four incident datasets spanning healthcare, energy, and hospitality: Universal Health Services, Colonial Pipeline, Change Healthcare, and MGM Resorts. Human-labeled datasets are being created through manual annotation by undergraduate student researchers, who classify tweets into four relevance categories: High, Medium, Low, and Irrelevant. CTGL is then being tuned and evaluated against these ground-truth labels, and its performance is being compared with GPT-4 using precision, recall, and F1-score. This work extends validation of a domain-focused, rule-based approach to cybersecurity social media analysis and examines whether it can outperform or complement general-purpose large language models in identifying actionable cyberattack information.

Support: MSU Small Grants for Faculty Research & Creative Projects (2025–2026)

Early Anomaly Detection in Multivariate Well Signals

David Alonso and Daren Erisman

Department of Math, Data, And Technology

Background: Early detection of anomalies in oil well systems is important for preventing equipment damage, production downtime, and financial losses. Traditional monitoring methods based on static thresholds often fail to capture complex temporal patterns in multivariate sensor data.

Hypothesis: A model trained only on normal operating conditions can detect anomalies and their early precursors in multivariate well signals.

Methods: A Long Short-Term Memory (LSTM) autoencoder was developed using the Petrobras 3W dataset. The model was trained on normal well behavior (Event 0) and applied to multivariate time-series data including pressure, temperature, and valve-state variables. Data preprocessing, normalization, and sliding-window segmentation were used to prepare the data, and anomalies were identified through reconstruction error measured by Mean Squared Error (MSE).

Result: A case study on WELL-00005 showed that the model successfully detected severe anomalies such as flow instability. More importantly, reconstruction error increased before the onset of labeled failure events, suggesting the presence of early warning signals. Feature-level analysis also showed that pressure-related sensors were the most sensitive indicators of instability.

Conclusion: These findings suggest that LSTM autoencoders have strong potential as early warning tools for industrial well monitoring, with possible applications in safety, maintenance, and operational optimization.

Enhancing Grant Discovery at Minot State University: Early Adoption Results from an AI-Powered Funding Platform

Amy Armstrong^a and Tomer du Sautoy^b
Office of Sponsored Programs^a, Atom Grants^b

Purpose: Identifying relevant funding opportunities remains a significant challenge for faculty at primarily undergraduate institutions. Time constraints and the breadth of available grants often result in missed opportunities aligned with researchers' expertise. This project evaluated the implementation and early adoption of Atom Grants, an AI-powered grant discovery platform, at Minot State University.

Methods: The platform was deployed in September 2025, with faculty onboarding and training conducted on October 30, 2025. All 202 faculty and staff accounts were provisioned across departments. Engagement metrics were tracked over a 90-day period, including user activation rates, email interaction, grant viewing behavior, and content preferences.

Results: Within 90 days, 85 users were actively engaging with the platform, producing a 58% activation ratio among signed-in users and outperforming the platform benchmark by over 30%. Email subscription rates exceeded 94% across all communication channels, surpassing the 90% industry average. Users generated 478 grant interactions, with traditional grants (74%) and federal funders (64%) representing the primary areas of interest. Email engagement grew 250% between the first and second months of implementation.

Conclusions: These preliminary findings suggest that AI-assisted grant discovery tools can achieve meaningful faculty adoption within a short implementation timeline at a primarily undergraduate institution. High activation rates and sustained engagement indicate the platform effectively lowers barriers to funding discovery. Next steps include a 180-day review to assess whether increased discovery activity translates to grant application submissions.

Support: This project is supported through the partnership between Minot State University and Atom Grants.

Is Sharing Caring? Investigating Perceptions of Privacy within Sharenting Behaviors on Facebook

Kyle Bittle

School of Business, Math, and Technology

Purpose: Sharenting, or parents' sharing of information, images, and experiences involving their children on social media, is an increasingly common part of family digital life. This study examines how social media sharing practices are shaped by social, technological, and regulatory conditions that affect both parents and adolescents.

Methods: This grounded theory study draws on semi-structured interviews with families that include one or two parents or guardians and one or two adolescent children ages 13–18 who use social networking sites. Participants are recruited through purposive and snowball sampling. Analysis is conducted concurrently with data collection using iterative coding, with interview findings triangulated through a descriptive analysis of Facebook's sociotechnical characteristics, including privacy controls, audience structures, affordances, and potentially manipulative design elements.

Preliminary Findings: Early analysis suggests that sharenting is a negotiated sociotechnical practice shaped more by trust and informal boundary management than by open conflict. Adolescents generally appear comfortable with what their parents post and often trust their judgment, particularly when content reflects positive family moments. Parents commonly describe checking first when a post may be embarrassing, while routine or uplifting content is less likely to require advance discussion. When concerns arise, they are typically addressed through conversation or by removing the content. Preliminary patterns also suggest that privacy settings, audience controls, and other platform features can both complicate sharing decisions and reassure families that content is safe and limited to intended viewers, even though parents and adolescents do not always share the same understanding of how those features work.

Geology, Culture, and War: The Historical Significance of Los Alamos

Jessica Brumbaugh

Department of Science

Los Alamos, New Mexico is a unique place where geology, human history, and modern science intersect. The town sits on the Pajarito Plateau, a high mesa formed by volcanic eruptions linked to the Valles Caldera more than one million years ago. These eruptions produced thick deposits of volcanic tuff, which erosion later carved into the mesas and deep canyons that define the landscape today. Long before modern development, this environment supported human communities. Between 1150 and 1500 AD, ancestral Pueblo peoples inhabited the region, constructing homes, cave dwellings, and ceremonial spaces directly within the soft volcanic rock. In the modern era, Los Alamos became internationally significant as the site of the laboratory responsible for the development and construction of the world's first atomic bomb.

In Spring 2026, the GEOL 290 Regional Geology class took a ten-day study trip across five states visiting approximately 20 geological locations. This trip took the class on a geological journey that allowed students to observe and understand how Earth's geology evolved from billions of years ago to the present day. Each student was responsible for researching two geological localities and presenting information in the field on the area's geology, historical cultures, ecosystems, and human impacts that affect geology. In addition, each student maintained a field journal with detailed field notes and outcrop sketches that help each student capture the geologic details of each locality.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

The Effects of Archery and Yoga on College Students' Perceived Stress

Yung-Ju 'Ruth' Chen and Kelsey Higginson

Department of Science

Building on evidence that exercise—particularly yoga—can reduce stress, this study examines another mind-body activity, archery, as a potential alternative. Prior research suggests archery may improve mood and self-confidence in college students. Therefore, this study compared the effects of yoga and archery on perceived stress among college students. A total of 29 college students participated in the study, with both interventions delivered once weekly for three weeks. Perceived stress was measured using the Perceived Stress Scale. In the yoga group, perceived stress ranged from 2.9 to 3.2 (out of 5) over the three-week intervention. Their perceived stress remained statistically unchanged during the first two classes and then significantly decreased from the second to the third class ($p < .05$). In the archery group, perceived stress ranged from 2.6 to 3.2 points (out of 5.0) over the three-week intervention. Their perceived stress significantly decreased from the first to the second class ($p < .05$) and remained statistically unchanged from the second to the third class. There were no significant differences between groups in average PSS scores at classes 1 and 3; however, the archery group had a significantly lower average PSS score than the yoga group at class 2; $t(16) = 3.36, p = .004$. In conclusion, perceived stress decreased significantly in both groups, with no differences between them at the end. These preliminary findings suggest that, beyond yoga, other body–mind exercises may also help reduce stress in college students.

Support: This project was supported by Minot State University's Small Grants for Faculty Research & Creative Projects (SGFRCP)

Headset On, Stress Off: A Pilot Exploration of Virtual Reality for Mental Well-Being

Lacey Corneliusen^a, Zebulon Wallace^b, Sierra Schramm^a, and Addison Sorenson^a

Department of Behavioral Science and Criminal Justice^a, Department of Humanities, Social Sciences, and Interdisciplinary Studies^b

This pilot study explored whether a brief virtual reality (VR) mindfulness experience could reduce anxiety, stress, and depressive symptoms among college students. With increasing levels of stress and anxiety reported on college campuses, there is growing interest in accessible tools that support emotional regulation and mental well-being. Virtual reality offers immersive environments that may enhance mindfulness practices by reducing distractions and promoting focused relaxation.

Participants completed a 7- to 10-minute immersive relaxation experience using *Nature Treks VR*, an application designed to simulate calming natural environments that encourage sensory engagement and relaxation. Pre and post assessments were administered using the State Trait Anxiety Inventory (State Subscale) and the Depression Anxiety and Stress Scale (DASS-21) to measure immediate changes in emotional state following the VR experience. A one tailed t test was conducted to examine differences between pre and post scores.

Results indicated significant reductions in anxiety, depression, and stress following the VR experience. Mean state anxiety scores decreased from 40.06 (SD = 12.5) to 29.9 (SD = 8.9), $t(31) = 7.3$, $p < .001$, $d = 1.3$. Overall DASS-21 scores decreased from 19.1 (SD = 10.5) to 10.3 (SD = 8.15), $t(31) = 7.5$, $p < .001$, $d = 1.3$. Subscale analyses also indicated reductions in depression, anxiety, and stress.

Findings suggest that a brief immersive VR mindfulness experience may support short term reductions in emotional distress and shows promise as an accessible mental health support tool in high stress environments.

GEOL 290 Field Study: Hot Springs, History, and Highways

Zoe Desloges

Department of Business

During the early spring of 2026, the 290 Regional Geology class travelled over 2,000 miles visiting various areas of geologic interest from Minot, North Dakota, to the Guadalupe Mountains in Texas. The purpose of this excursion was to integrate concepts learned through the geology program with field evidence. The goal for me was to appreciate the geologic treasures of the United States in a new, more detailed and comprehensive, way. Learning and understanding the concepts studied by my classmates came easily. At every locality, a student was assigned to provide a short lecture on the historic and geologic information they researched prior to the excursion. Each student participated in recording observations in their notebook, communicating with experts at localities, and using the informative materials provided at the localities to expand their knowledge base. Although the class originally planned to visit the Ojo Caliente Hot Springs and the Sand Creek Massacre Site, our itinerary shifted, taking us instead to the Indian Springs Hot Springs and Bandelier National Monument in Colorado. The research completed for the hydrothermal geology of Ojo Caliente remained applicable, as many concepts aligned with geothermal features at Indian Hot Springs and Cascade Springs in Nebraska. Likewise, the Sand Creek Massacre Site informed my understanding of Bandelier, where Native American history is closely connected to the surrounding geologic landscape.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Tracking the Dinosaurs of Picketwire Canyon

Christian Dryden

Department of Science

Picketwire Canyon is the home of the largest set of dinosaur tracks in North America. This area exhibits multiple sets of sauropod and theropod footprints from the Jurassic period along the Purgetoire River that runs through this canyon. The trackways exhibit behavioral patterns that are rarely observed in other recorded trackways. In order to view these footprints, it is an 11 ½ mile hike down into the canyon. Along the trail path, one can find the ruins of the Dolores Mission and Cemetery founded by Mexican immigrants in 1898. Along the canyon walls, there are Native American petroglyphs that are approximately 4500 years old. The GEOL 290 study trip focused primarily on the natural processes that preserved the dinosaur trackways and what the environment may have been during that time. Being able to see the site in person and observe the oolitic sand-limestone of the Jurassic helped with understanding just how diverse and turbulent the landscape used to be and how we can observe similar environments today.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Being Human in a World of AI: Pedagogy and the role of AI in Student Agency

Daren Erisman^a and Nigel George^b

Department of Math, Data and Technology^a, Department of Science^b

As generative AI reshapes the academic landscape, the challenge for educators is to transition from a posture of defense to one of empowered integration. This poster presents a developmental curriculum through two courses—*AI 101: AI for Everyone* and *AI 201: AI for Personal and Professional Use*—that redefine the student-AI relationship.

In AI 101, the focus is on "being human in a world of AI." Students explore the mechanics and limits of the technology to reclaim their agency, learning to use AI as a tool for efficiency without allowing it to "short-circuit" their own critical thinking. The course culminates in students using AI to build functional games, demonstrating how the technology can remove traditional barriers—like complex programming—to achieve personal creative goals.

This foundation leads to the studio-style environment of AI 201, where students act as independent investigators. Here, they utilize AI to define, research, and solve problems specific to their unique interests, creating simulations and deploying autonomous agents.

By showcasing these student outcomes, we illustrate a shift toward a studio-style model where students lead with their interests. We found that achieving a sophisticated product early on—assisted by AI—often serves as the hook that pulls students deeper into the technical details of their interests, offering a glimpse into how pedagogy can evolve to prioritize both high-level output and human agency.

ML Based Antibiotic Recommendation for Escherichia coli (E.Coli) Using Antimicrobial Susceptibility Data

Fahim Farhan and Serena Pontenila

Department of Math, Data, and Technology

Antimicrobial resistance in *Escherichia coli*(*E.Coli*) is a growing problem in healthcare sector, and over time it is becoming harder to choose the right antibiotic for treatment in case of sepsis. This study's goal is to create a machine learning-based recommendation system that predicts which antibiotics are going to be effective against specific *E. coli* strains and that if it will help doctors to make a quick decision in case of sepsis.

For this study the dataset I used is a large clinical antimicrobial susceptibility records that I found in BV-BRC. Then I cleaned the data to find out key information. Later, I trained a logistic regression model(ML model) using a pipeline that adds one-hot encoding for categorical variables and median imputation for missing values. And to avoid data leakage I split the dataset at the genome-level using GroupShuffleSplit so that single strain doesn't appear in both the training and test sets.

Finally, the results shows that in identifying effective antibiotics the model performed well on the test set. It has strong ROC-AUC and precision-recall scores. Precision@5 and Recall@5 metrics also shows that the system is able to rank effective antibiotics in its top recommendations with good confidence. The final system I built in colab as a interactive system where users can input a strain number and receive the top five recommended antibiotics ranked by their predicted effectiveness. Future work could look into adding genomic features to improve model performance.

Population Density as the Primary Driver of Gun Violence: A Zero-Inflated Negative Binomial Analysis of U.S. Cities

Kale Farrington and Daren Erisman

Department of Math, Data, And Technology

Gun violence in the United States is frequently attributed to state firearm legislation, yet population density as a determinant remains underexplored. This study investigates whether population density is a stronger predictor of city-level gun violence rates than gun law restrictiveness, as measured by the Brady Campaign scoring methodology. Incident-level data from the 2024 Gun Violence Archive were merged with the SimpleMaps U.S. Cities database and the RAND State Firearm Law Database to construct a city-level dataset spanning tens of thousands of U.S. municipalities. Cities were classified into four density categories: Remote Rural, Rural, Suburban, and Urban, using a hybrid classification system incorporating population thresholds and Haversine-based proximity to population centers. A hybrid population offset corrected for denominator mismatch between urban and rural jurisdictions. Four nested Zero-Inflated Negative Binomial (ZINB) regression models were estimated, progressively introducing density, Brady scores, and control variables. Across model specifications, the density incidence rate ratio strengthened consistently, while the Brady Score coefficient collapsed to near-zero and lost statistical significance once density was controlled. A Simpson's Paradox effect was identified, no aggregate difference between high- and low-restriction state groupings, but significant rural-specific firearm law effects emerged under density stratification. These findings suggest that population density is the dominant structural predictor of city-level gun violence rates, with firearm legislation effects largely confined to rural contexts. Implications for policy and future research are discussed.

The Role of Social Media in Shaping Corporate Social Responsibility Perceptions: A Literature Review

Megan Fixen and Paulette Dominguez

Department of Business

The popularity and expansion of social media has changed how businesses promote their corporate social responsibility (CSR) initiatives and how stakeholders are able to view and perceive them. Social media platforms allow companies to communicate with their audience in an immediate and interactive way. Through the use of posts, videos, and campaigns, organizations can show their CSR efforts in real time. Additionally, CSR communication is no longer one-sided. Customers are able to engage with content and provide feedback. This literature review will examine the role of social media in shaping consumer perceptions of social media. Consumers may be influenced by social media, which may have an impact on purchasing intentions, trust, and loyalty. Therefore, information on the impact of social media on shaping CSR perceptions is purposeful. Businesses may use the information from this review as a basis for understanding the implications of incorporating CSR initiatives into social media platforms.

Predicting PGA Tour Round Scores Using Historical Player Performance Metrics

Abigail Goettle and Daren Erisman

Department of Math, Data, And Technology

For many, the sport of golf is a simple pass time activity to enjoy leisurely in the warm summer months; for others, it is a different story. The Professional Golfers' Association (PGA) is the platform where the world's best athletes in golf can compete to show their abilities of focus, strength, stress management, and performance. This study is directed to predict a PGA player's next round score relative to par, or how many strokes it should take to finish a hole, using their historical data while including their career and rolling averages to par. In order to do so, the study must examine PGA tour data to find whether certain variables can predict a next round score to par using a linear regression model. To do so, 60 PGA golfers' stats were used from their most recent 40 rounds in tournament play. The rolling average was calculated using the 5 most recent rounds to show their current performance. With these conditions, the model explains the 38.5% of variance and reduces the typical round-to-round variation from 3.3 to 2.67 strokes. I found that recent performance was the strongest predictor of the next round's performance. While the model reduces prediction uncertainty, golf remains inherently variable. Combining long-term skill and recent form captures meaningful variation in scoring. PGA Tour round performance can be moderately predicted using historical statistics, with recent performance serving as the strongest predictor of next-round scoring relative to par. However, professional golf remains inherently variable.

Beyond the Book: Active Learning Tools, Techniques, and Examples

Kelly Hendershot and KateLynn Albers

Department of Business

Most faculty have a common goal of creating a positive, engaging classroom environment. This poster supports that goal by focusing on active and experiential learning through tried and tested classroom examples, including strategic use of textbook resources, scaffolded simulations, and integration of personal and professional experiences to promote student engagement, reflection, and applied analysis.

The poster will focus on three main strategies:

Strategy 1: Implement active and experiential learning across various disciplines by illustrating practical, adaptable instructional strategies.

Strategy 2: Demonstrate how textbook resources and scaffolded simulations can be incorporated into instruction to deepen student engagement and critical thinking.

Strategy 3: Illustrate how an instructor's professional experience can be effectively integrated into pedagogical practices to enhance active learning, student participation, and critical analysis.

The success of these strategies has been demonstrated by increased classroom engagement, stronger faculty-student relationships, and higher levels of student satisfaction.

Evidence of this success can be found in Student Perceptions of Learning – Course Evaluations (SPLs). When these techniques were implemented, students rated the instructor section of the SPLs highly and provided positive comments in response to the question, “What things in this course were done particularly well to enhance your learning?” Specifically, students positively recognized and valued faculty efforts to increase engagement, improve understanding, and connect course concepts to meaningful applications. Overall, these strategies contributed to enhanced overall comprehension of topics.

Zumbini for Schools: How Much MVPA Does It Provide for Children in Daycare Settings?

Mallory Hoogensen, Yung-Ju ‘Ruth’ Chen, and Hayden Tinker

Department of Science

This study aimed to examine children's physical activity levels in Zumbini for School. Zumbini is a commercial fitness program that combines music and dance movements for infants and toddlers (0-4 years). Zumbini for School is the version designed for school and daycare settings, where children participate in the program with peers rather than with their parents. Although the company claims the program supports children's music and movement experiences and provides physical activity, there is no data showing the amount of moderate-to-vigorous physical activity (MVPA) children receive through Zumbini for School. Fourteen classes of children (2-5 years; N=105) from four different daycares participated in this study. Each class completed four 30-minute Zumbini for School lessons delivered once per week over four weeks by a trained instructor. Lessons were video-recorded. Children's physical activity intensity was coded at the class level using the physical activity subscale of the System for Observing Fitness Instruction Time (SOFIT). Results showed that children engaged in MVPA for 17–40% of lesson time (M = 28.44%, SD = 5.96%). For a 30-minute lesson, that equals 5 to 12 minutes of MVPA. These findings suggest that Zumbini for School promotes a wide range of MVPA in daycare settings. Further research is needed to understand whether other factors (e.g., age, class size, gender) influence variations in children's MVPA during Zumbini for School.

Support: This project was supported by Minot State University's Small Grants for Faculty Research & Creative Projects (SGFRCP) and the Undergraduate Research Opportunities Program (UROP), funded in partnership with North Dakota EPSCoR.

Paleontology of Track Ways at Dinosaur Ridge

Bryce W. Jacobs

Department of Geology

Dinosaur Ridge on the Dakota Hogback near Morrison Colorado. Dinosaur Ridge preserves Jurassic and Cretaceous trackways that offer insight into dinosaur movement and behavior. This project examined tracks on both the east and the west sides of the ridge to understand how distinct species moved across wet, sandy environments. Field observations included theropod, ornithopod, and crocodylian tracks on the Cretaceous east side, and a Brontosaurus trackway and an isolated raptor print on the Jurassic west side. Sketching helps understand foot anatomy for Theropods, Ornithopods and Crocodylians. Analyzing the track depth, toe impressions, and weight distribution patterns infer walking patterns and foot differentiation. Results showed distinct walking habits, including weight-bearing differences in Ornithomimids and characteristic footpad impressions in Edmontosaurus. The distribution and orientation of trackways support the interpretation that Dinosaur Ridge functioned as a migratory highway along the Western Interior Seaway. These findings highlight how sedimentology and paleontology together reveal dinosaur behavior and environmental conditions in ancient coastal settings.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Geology 290 Extravaganza

Isaac Keller

Department of Science

In the Spring of 2026, our GEOL 290 Regional Geology class followed a rigorous itinerary March 5-14 visiting nearly 20 geologically fascinating localities across five states. Field-based courses, including GEOL 290, emphasize experiential learning environments where we as a class create knowledge and ideas rather than simply consume it from textbooks and webpages. Before the study trip, each student in the class prepared two short talks on localities we visited. During this geology extravaganza, students took field notes and sketched the outcrops at designated localities, connecting what they had learned ahead of time with what they saw real time at the site. This poster will explore the scientific, cultural, and economic features that define the Turkey Creek Uranium Outcrop and the Agate Fossil Beds and briefly describe the learning outcomes associated with these localities.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Visualization and Analysis of the Baseball Pitching Motion using Machine Learning

Hannah Landry

Department of Math, Data, and Technology

The aim of this project was to investigate whether a system to gather kinematic data from athletes during complex motions, could be developed to allow for more access to this data for research, and develop a real time tool to provide feedback to athletes during training. To prove feasibility a script was written to pull publicly available video clips of MLB pitchers during games and use MediaPipe, an open-source library, to create a 3D model of the pitcher in every frame of the video, creating a skeletal model of the athlete. From that pose data, biomechanical values, such as velocity of the throwing hand, or angle of the pitcher's torso at ball release, were calculated and a data was exported into a clean csv to be used in the machine learning model. A Random Forest Classifier model was used to predict whether a pitch was a ball or a strike using the body movement values as features. The resulting model was accurate, and feature importance was used to interpolate which body movements are having the most effect on their game. By breaking the analysis into time series, we could see if any movements are changing which could indicate fatigue or risk for injury as the player keeps pitching in the game. This data pipeline system could be used in real time or with more camera angles to create more effective and accurate analysis for players at any level without the large price-tag that this type of analysis usually comes with.

Rapid synthesis of N-[1-(4-pyridyl)ethyl]formamide

Mason M. Lemer, Lioudmila I. Bobyleva and Mikhail M. Bobylev

Department of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of a series of substituted N-(1-phenylethyl)formamides. Depending on the type of substituent on the benzene ring of the starting acetophenone, most of the reactions were completed in 10 to 20 minutes, which is much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours.

Hypothesis: Acetylpyridines are close analogs of acetophenones. The nitrogen atom in the pyridine ring works similarly to an electron-withdrawing substituent on the benzene ring; this electron-withdrawing action should make the adjacent carbonyl more electrophilic, resulting in a faster reaction. Thus, the reaction time of acetylpyridines should be close to that of acetophenones with electron-withdrawing substituents. In this work, the hypothesis was tested in the reaction between 4-acetylpyridine and formamide.

Methods: The reaction was conducted on a 10 mmol scale at 180-189°C. Extraction and column chromatography were used for the isolation of the product of the reaction. NMR spectroscopy and elemental analysis were used to determine the structure of the product.

Result: The reaction was completed in 2 minutes. The isolated yield N-[1-(4-pyridyl)ethyl]formamide was 87%.

Conclusion: The results of the reaction support the initial hypothesis. The reaction time of 4-acetylpyridine was faster than the reaction time of 4-nitroacetophenone, the fastest reaction among the substituted acetophenones. N-[1-(4-pyridyl)ethyl]formamide is a new compound.

Support: Research presented in this presentation was supported by NIH Grant 8 P20 GM103442-12 from the National Institute of General Medical Sciences and by the National Science Foundation under NSF EPSCoR Track-1 Cooperative Agreement OIA #1946202.

Comparison of the Effectiveness of Conventional Antibiotics and Triangular Silver Nanoparticles against Clinically Important ESKAPE Pathogens

Cody Leonard, Genevieve Kahrilas, and Abiodun Ebenezer Odufuwa

Department of Science

Antibiotic resistance is a growing global health crisis, particularly due to multidrug-resistant *ESKAPE* pathogens (*Enterococcus spp.*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter spp.*), which account for a majority of all healthcare-associated infections. Conventional antibiotics are becoming less effective against these organisms as resistance mechanisms continue to evolve. Silver nanoparticles (AgNPs) have shown to be a promising alternative due to their broad-spectrum antimicrobial activity and multi-target mechanisms, including membrane disruption, induction of reactive oxygen species (ROS), and intracellular damage to DNA and proteins.

This study evaluated the antimicrobial effectiveness of triangular silver nanoparticles (tAgNPs) compared to several commonly used antibiotics, such as penicillin, ampicillin, and erythromycin, against clinically relevant bacterial species. Bacterial cultures were grown and tested using Kirby-Bauer disk diffusion assays. Zones of inhibition were measured to assess antimicrobial activity. Control conditions included nanoparticles diluent blanks to ensure experimental validity. It was hypothesized that tAgNPs would demonstrate greater inhibitory activity than the conventional antibiotics used due to their increased surface area and enhanced interaction mechanisms with bacterial cells.

Our results indicate that tAgNPs produced larger zones of inhibition than several antibiotic drugs, suggesting greater antimicrobial effectiveness. Furthermore, tAgNPs exhibited activity against both Gram-positive and Gram-negative bacteria, demonstrating broad-spectrum antimicrobial potential. These findings suggest that triangular silver nanoparticles may be a promising alternative strategy for combating multidrug-resistant infections and addressing the global threat of antimicrobial resistance.

Pilot Study of the Effect of Instrument Assisted Soft Tissue Mobilization (IASTM) and Therapeutic Exercise in the Treatment of Plantar Fasciitis

Beth Marschner, Kekoa Munos, and Heather Golly

Department of Science

Background: The purpose of this study was to examine the effect of instrument-assisted soft tissue mobilization (IASTM) and therapeutic exercise in the treatment of plantar fasciitis.

Design: Fourteen volunteers with plantar fasciitis were recruited. Each participant was randomly assigned to either the therapeutic exercise only group or the therapeutic exercise and IASTM group. Participants completed the Foot and Ankle Ability Measure (FAAM), a medical questionnaire including pain ratings, ankle joint range of motion (ROM), and Trendelenburg testing. Measures were repeated at the end of eight sessions.

Results: Data were analyzed using SPSS. Outcome measures included FAAM scores, ankle ROM, and pain. Paired t-tests demonstrated significant within-group improvements with large effect sizes for right ankle dorsiflexion, plantarflexion, and inversion. Pain decreased significantly, $t(5) = 7.319$, $p < .001$, $d = 2.988$. A repeated-measures ANOVA revealed a significant main effect of time (pre vs. post) but no significant interaction, indicating similar improvements across groups.

Conclusion: Lack of a significant interaction effect suggests that IASTM did not provide additional benefit on pain outcomes beyond exercise alone. Both groups showed improvement for pain, as indicated by a large effect size and evidenced by the subjects' reported pain at the beginning versus the end of the study.

Significance: The lack of a significant interaction effect suggests IASTM did not provide additional benefit on pain outcomes beyond exercise alone. Clinically, both groups improved overall, as indicated by a large effect size and changes in subjects' reported pain levels from baseline to the end of the study.

Place-based Learning in the Geosciences: Methods and Outcomes

Katherine McCarville

Department of Science

The integration of Place-Based Education (PBE) within undergraduate geoscience coursework is inescapable, as students must “encounter the rocks where they are” to really learn geology. In Spring 2026, the GEOL 290 Regional Geology class followed an ambitious itinerary and visited approximately 20 geologically interesting localities across five states. Field-based courses, including GEOL 290, emphasize experiential learning where students create knowledge rather than simply consume it. Each student in the class prepared two short talks to introduce their colleagues to particular localities in the field. During the study trip, students took field notes and sketched outcrops at designated localities, integrating what they had learned ahead of time with what they saw at the site. Following a summative activity that required reflection on what they had learned, students prepared and presented posters explaining some aspect of their experience in the class.

The costs in time and funding for such courses may seem high, but PBE has been shown to foster a robust professional skill set, specifically improving information seeking, critical thinking, and collaborative teamwork. Students were involved in all aspects of the trip, from initial planning to cleanup and each student assumed at least one role with responsibilities comparable to those of a job. Evidence suggests that students who participate in field-based courses and other PBE curriculum achieve higher academic performance and exhibit increased motivation in their academic studies.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

The Antibacterial Effects of Triangular, Spherical, and Decahedral Silver Nanoparticles on clinically important ESKAPE Pathogens

Ethan Miller, Genevieve Kahrilas, and Abiodun Ebenezer Odufuwa

Department of Science

The continued rise of multiple antibiotic-resistant bacteria is a major public health concern globally that requires urgent attention. The ESKAPE bacteria are of clinical importance because they have been implicated in hospital-acquired infections and are often resistant to multiple antibiotics. Nanoparticles are extremely small particles with at least one dimension less than 100 nanometers. They have shown promise as likely candidates in the search for alternative to conventional antibiotics. Although, many questions remain unanswered. Therefore, the overall aim of this study is to determine the antibacterial activity of triangular, spherical, and decahedral, green-synthesized silver nanoparticles (AgNPs) against ESKAPE bacteria. To achieve my aim, the antibacterial activity of various shapes of AgNPs synthesized was tested against ESKAPE bacteria using Kirby-Bauer disk diffusion method. Our result showed that the AgNPs have antibacterial activities against the tested bacteria, as measured by the diameter of inhibition (DOI). The average DOI are 10.50 mm, 10.26 mm and 9.46 mm for spherical, decahedral and triangular respectively. Therefore, spherical AgNPs were most effective against majority of the ESKAPE bacteria. In the future, the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) will be determined. In conclusion, this study suggests that the AgNPs we have synthesized is a potential alternative solution to the growing antibiotic-resistant concerns in the treatment of infections caused by ESKAPE bacteria.

Elk Herd Habitation and Ecosystem Diversity at Valles Caldera National Preserve

Kirsten Nelson

Department of Science

The Minot State University GEOL 290 Regional Geology class visited approximately twenty geologically significant localities in March of 2026. This class, being a field-based course, had the purpose of emphasizing experimental learning, which gives students the opportunity to be involved in hands-on field research techniques. Our methodologies included research of two localities on our path beforehand, and presenting what we learned to our colleagues at each site. We also took field notes and sketches at our localities. We were able to directly connect what we learned in the classroom with what we saw in the field.

Through this opportunity, I learned about the Valles Caldera National Preserve in New Mexico. This location is home to a wide variety of ecosystems, ranging across grasslands, conifer forests, and riparian wetlands. These ecosystems support the second largest elk population in New Mexico. Evidence of elk is abundant in this area, droppings and tracks indicate herds of elk traveling from food sources in the grasslands, to sheltered bedding areas in the forests.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Geology Field Study – Spelunking in Carlsbad and Hiking the Spanish Peaks

Nikita Neyshtadt

Department of Science

The objective of GEOL 290, amongst others, is for students to apply classroom education to real-life localities. In this field-based class we studied approximately 20 study areas across five states, taking detailed field notes and sketches at each locality in addition to each student doing pre-trip research on two localities as the class “expert”. Students were then challenged to relate our observations to the greater geographic region. One locality I focused on are the Spanish Peaks in Colorado. These mountains, though neighboring the Rocky Mountains, were formed by different geologic forces. Upwelling magma fractured the existing bedrock 25 million years ago but did not break the surface, so the magma cooled underground. Erosion and uplift later exposed the peaks as the igneous material is more resistant to erosion. This geologic structure is called a “stock” and forms many natural landmarks in the United States including the Henry Mountains and Shiprock. In each iteration of this class that I have taken, I have received invaluable training from professionals on spotting and reading naturally preserved implicit clues. Classroom content can be cut and dry at times. Understanding fault-block diagrams is fairly simple, but identifying faults in the real world can be a challenge. Studying the Carlsbad Caverns provided great practice for doing just that. The caverns formed in the Capitan Reef formation which is buried or exposed throughout the area in part because of the extensive faulting which is characteristic of the Basin and Range province that spans Oregon down to Mexico.

Support: Student travel funding was provided by MSU Vice President for Academic Affairs and MSU Department of Science.

Improving Speech-Language Pathology Graduate Student Confidence in Evidence-Based Practice

Courtney Olson^a and Carla Tierney-Hendricks^b

Department of Communication Sciences and Disorders^a, MGH Institute of Health Professions^b

Evidence-based practice (EBP) is widely acknowledged to be beneficial and necessary for the treatment of patients. However, a gap between evidence-based practice research and use is present. One way to improve EBP implementation is by focusing on incorporating explicit EBP instruction at the graduate student level. This study describes the development of a series of learning modules based on key EBP principles in order to increase graduate student confidence in EBP. Twenty-four first-semester graduate students were followed over the course of 8-weeks, with one group of twelve students receiving structured supplemental learning and the other group receiving only their traditional education. The two groups were given a pre- and post-test to measure confidence in evidence-based practice. An ANOVA analysis was conducted, indicating a significant interaction on the confidence levels of those receiving the structured learning modules while taking their typical class. While further research is warranted, this pilot study suggests that the addition of supervisor delivered supplemental structured learning modules increase the EBP confidence for graduate student clinicians, which has potential to facilitate novice clinicians use of EBPs within real-world clinical care.

The MSU Student Retention Project

Elyzia E. Powers, Dylan E. Horner, and Heili J. Wiley
Department of Behavioral Sciences and Criminal Justice

This study aims to understand and address retention issues that MSU is experiencing by understanding student cognitive, behavioral, and social factors. The BPNSF-Higher Education, LASSI, Presence of Meaning, Existential Isolation, Identification with Institution, Academic Experience Questionnaire, Symbolic Immortality, Index of Autonomous Functioning, One Item Self-Efficacy Scale, College Adjustment Scale (CAT), and demographics were administered to 96 freshmen enrolled in MSUs FYE classes. Fifty-nine individuals were analyzed due to completeness of the data. We also looked at academic success, measured by GPA. Age ranged from 17-23 (M=18.61 years, SD=1.07 years). Age, gender, and race were representative of the university population. An exploratory factor analysis of the LASSI was performed as well as correlations between key variables. Most of the correlations between key variables were good, with some needing to be re-considered for updating or removal in the future. The variables chosen may provide adequate information about student retention, although we may need to simplify the survey in order to receive more complete responses.

The Effect Of Social Interaction Frequency On Emotional Well-Being In Assisted Living Residents

Ryen Simons and Krystal St. Peter

Department of Behavioral Sciences and Criminal Justice

Older adults in assisted living are at an increased risk of social isolation due to physical limitations, fewer outside contacts, and a higher isolation risk. Loneliness is associated with increased mental health risks, including depression, anxiety, and cognitive decline (Lapane et al., 2022). Participation in social interactions is important in building companionship (Mauldin et al., 2021). The purpose of this study is to examine whether more frequent social interaction is associated with better emotional well-being and fewer depressive symptoms among assisted living residents. This study is being conducted with adults aged 65 and older across one to three assisted living facilities in Minot, North Dakota. Participants completed a one-time, 15-minute paper survey consisting of demographic questions, the (World Health Organization) WHO-5 Well-Being Index, the Geriatric Depression Scale-15 (GDS-15), and a 5-item Social Interaction Frequency Survey. Data collection is still ongoing. Preliminary analyses suggest that greater social interaction frequency is associated with better emotional well-being and fewer depressive symptoms. These findings highlight the importance of everyday social engagement in assisted living settings, and increasing opportunities for social interaction may support emotional well-being among older adults.

Intersecting Narratives

Ryan Stander, Amadis Amaya, Charlese Bell, Misaki Ishiwata, Evan Lovett, Kyler Meigs, and Ashley Vargas-Colima

Department of Fine and Performing Arts

This research poster documents the 2025-26 Art Capstone courses in which art majors pursue independent research projects culminating in a collaboratively produced group exhibition. Structured as a two-semester sequence (ART 492 and ART 493), the Capstone Experience guides students from creative ideation through production, and to a professional exhibition over a nine-month period. This journey helps students to 1) synthesize their course learning, 2) build research skills, 3) develop an independent voice and long-term project, 4) model and prepare for professional practices, and 4) prepare for their next steps beyond Minot State University.

The poster highlights this year's cohort of 6 students and their research, artistic process, and contribution to the group exhibition. While the exhibition is developed collectively, each student presents a unique body of work supported by sustained inquiry, technical development, and conceptual investigation.

Study Collection Development: New Acquisitions and Archival Practice with the David Driesbach and Michael Barnes Study Collections

Ryan Stander, Amanda Watts, Greg Vettel, Britt Rohn and Kiley Anderson
Department of Fine and Performing Arts

Under the guidance of Flat Tail Press (FTP) as a creative research engine within the art department and Minot State's Northwest Art Center, this proposal outlines a faculty-led research trip to Chicago focused on the acquisition and management of two significant print donations. Faculty and students are working with estate of David Driesbach and Northern Illinois University for the last of 3 sizable donations (2016, 2017) which will put our study collection of this renowned printmaker over 120 pieces. Secondly, we will be starting a new study collection of work from renown printmaker Michael Barnes.

Through direct engagement with NIU faculty and collection managers, the research examines professional practices related to new artwork acquisitions and institutional study collection development. Activities will include cataloging, packing, and shipping artworks, collections documentation and condition assessment, and accessioning procedures for works on paper. Outcomes from this project will inform best practices for sustainable collection growth while strengthening experiential learning opportunities for students engaged in collections research and archival practice.

Predicting Unreported Gas Flaring in the Bakken Formation Using VIIRS Nightfire Satellite Data

Justin Stevenson

Department of Data Science

This project investigates the use of satellite-derived nightfire data to predict unreported gas flaring activity in the Bakken Formation. While reported flaring volumes in North Dakota are relatively high, uncertainty remains regarding the accuracy and completeness of self-reported data. The purpose of this study is to develop a predictive model capable of identifying wells that may underreport flaring activity using geospatial and observational data.

Two primary datasets were utilized: North Dakota Department of Mineral Resources (ND DMR) well production data and VIIRS Nightfire satellite data. These datasets were integrated using a geospatial merge to account for coordinate discrepancies. Selected features included oil and water production, days of operation, run counts, VIIRS detection frequency, average temperature readings, and distance to detected flaring events. Data preparation involved imputing missing values and scaling numerical variables within a preprocessing pipeline.

Two modeling approaches were evaluated: linear regression as a baseline and a random forest model to capture non-linear relationships. Results show that linear regression had low explanatory power, indicating that flaring behavior is not well explained by linear assumptions. The random forest model performed better overall, particularly for clustered low-to-moderate values, though extreme values remained difficult to predict.

These findings suggest that petroleum production data is inherently noisy and non-stationary, and that satellite-based monitoring can enhance detection of potential underreporting. This work contributes to improved regulatory oversight, environmental monitoring, and transparency in energy production reporting.

Perception Vs Reality: Metamemory And Memory Performance

Krystal St. Peter, Ryen Simons, Heili Wiley, Noah Wright, and Ethan P. Valentine

Department of Behavioral Sciences and Criminal Justice

Individuals often hold beliefs about their memory abilities, but these perceptions may not always align with actual performance on memory tasks (Provost et al., 2025). The current study aims to examine whether perceptions of memory abilities are aligned with actual memory performance. As part of a larger study, participants completed the Metamemory in Adulthood (MIA) Questionnaire (Dixon et al., 1988), measuring several aspects of perceived memory abilities. Participants also completed several memory tasks, including Visual Paired Associates I and II from the Wechsler Memory Scale Revised (WMS-R; Wechsler, 1987) and Verbal Paired Associates I and II from the Wechsler Memory Scale-III (WMS-III; Wechsler, 1997). Both assessments examined immediate (I) and delayed (II) tests of memory functioning. Data collection for this study is still ongoing. Preliminary analyses will examine the extent to which participants' perception of their own memory abilities, general utilization of different memory strategies, and anxiety relating to memory performance individually predict subsequent immediate and delayed memory performance.

An Annotated Bibliography of Selected Solo Works for Marimba and Vibraphone by Artist and Composer Julie Spencer

Mariah Taller

Department of Fine and Performing Arts

Julie Spencer is an internationally known performer, visual artist, and keyboard percussion composer. In her almost fifty-year career as a composer and performing artist, Spencer's catalog features over forty works for keyboard percussion. Her collection includes solo works as well as small chamber pieces and even concerti. She continues to compose for herself and to receive commissions from known ensembles and soloists around the globe with premiers at renowned venues. The goal of this study is to create an annotated bibliography of Spencer's vibraphone solos written before 2024 and marimba solos written after 2004. To achieve the goal, a more standardized method for assessing difficulty needed to be created.

Eleven annotations included in this study contain basic compositional information, analysis of four-mallet technique, and, for the first time in regard Spencer's solo keyboard percussion music, an assigned difficulty rating based on the use of four-mallet technique. A difficulty rating is influenced by stroke type and factors such as tempo, interval changes, and use of extended techniques. Extended techniques include pedaling, mallet dampening, one-handed rolls, preparation of the instrument, and vocalization. The difficulty rating is identified in five levels: beginning, advanced-beginning, intermediate, advanced-intermediate, or advanced. This study benefits percussion pedagogy by expanding knowledge of Julie Spencer's vibraphone solos written before 2024 and marimba solos written after 2004. The methodology used to examine and assign difficulty in works written by Julie Spencer can be extended for use with all four-mallet keyboard percussion works.

Rapid synthesis of N-methyl-N-[1-(4-pyrimidinyl)ethyl]formamide

Tereza Vrbanek, Lioudmila I. Bobyleva and Mikhail M. Bobylev
Department of Science

Background: Earlier, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of a series of substituted N-methyl-(1-phenylethyl)formamides. Depending on the type of the substituent on the benzene ring of the starting acetophenone, most of the reactions were completed in 30 to 50 minutes, much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. Recently, we extended our investigation to acetylpyridines and 2-acetylpyrazine, which showed that the reaction can be completed even faster, in 15 and 9 minutes, respectively.

Hypothesis: 4-acetylpyrimidine and 2-acetylpyrazine are close analogs. The 1,3-position of nitrogen atoms in the pyrimidine ring may provide even stronger electron-withdrawing action compared to the 1,4-position in the pyrazine ring. The stronger electron-withdrawing action should make the adjacent carbonyl more electrophilic, resulting in a faster reaction. Consequently, the reaction with 4-acetylpyrimidine should proceed faster than the reactions with 2-acetylpyrazine. In this work, the hypothesis was tested in the reaction between 4-acetylpyrimidine and N-methylformamide.

Methods: The reaction was conducted on a 10 mmol scale at 180°C - 189°C. Extraction and column chromatography were used for the isolation of the product. NMR-spectroscopy and elemental analysis were used to determine the structure of the product.

Result: The reaction was completed in 5 minutes.

Conclusion: The results of the reaction support the initial hypothesis. The reaction time of 4-acetylpyrimidine was faster than the reaction time of 2-acetylpyrazine. N-methyl-N-[1-(4-pyrimidinyl)ethyl]-formamide is a new compound.

Support: Research presented in this presentation was supported by NIH grant 8 P20 GM103442-12 from the National Institute of General Medical Sciences and by the National Science Foundation under NSF EPSCoR Track-1 Cooperative Agreement OIA #1946202.

Cultivating Critical Thinking Skills in Students with Special Needs Through Folktale-Based Curriculum

Wenjing Zheng^a, Thalia Rattai^b, and Lauryn Wilkinghoff^b

Department of Education and Inclusive Services^a, Department of Communication Sciences and Disorders^b

This project aims to develop and refine a folktale-based curriculum to enhance critical thinking skills among students with special needs. Grounded in the need for more explicit instruction in higher-order thinking within special education, the study focuses on integrating culturally diverse folktales with evidence-based instructional strategies. The curriculum includes adapted materials, visual supports, and structured “think-aloud” activities aligned with students’ individualized education program (IEP) goals.

A collaborative design approach was employed with special education teachers to co-develop and adapt curriculum units. Methods included collaborative curriculum planning sessions, alignment with state standards, and incorporation of classroom-specific accommodations. Data sources consisted of teacher feedback, planning reflections, and documentation of instructional adaptations.

Results indicate that collaborative curriculum planning strengthened the relevance, feasibility, and adaptability of the instructional materials. Teachers reported that the folktale-based lessons increased student engagement and provided meaningful opportunities for practicing critical thinking skills such as inference, comparison, and problem-solving. Teachers also emphasized the value of culturally responsive content and flexible instructional design in meeting diverse learner needs.

In conclusion, this project demonstrates that collaborative curriculum development with practicing teachers is an effective approach to designing accessible, engaging, and instructionally effective materials for students with special needs. The findings highlight the importance of teacher input in ensuring practical implementation and suggest that folktale-based instruction is a promising avenue for fostering critical thinking in inclusive educational settings.

Support: Minot State University Small Grants for Faculty Research