# 2025 Ramaley Celebration
# Program and Book of Abstracts

## Thursday April 24, 2025

### Poster sessions- Kryzsko Commons Ballroom

**Session 1** – 9:00 to 11:00 AM
Welcome Remarks: President Kenneth Janz - 8:55 AM
8:55 AM and 12:55 PM - https://openriver.winona.edu/rca/2025/welcome/
**Session 2** – 1:00 to 3:00 PM
Welcome Remarks: WSU Faculty Association President Patrick Clipsham – 12:55 PM

### Panel Discussions - Kryzsko Solarium

Panel 1 – Research Experiences at WSU - 12:30-1:30 PM
Panel 2 – Impacts of Generative AI - 2:00-3:00 PM

### Oral Session –1:00-2:40 PM - Kryzsko Oak Rooms E/F

### Videotaped Oral Presentations:

**https://openriver.winona.edu/rca/2025/ondemand/**
These will also be displayed continuously in Kryzsko Oak Room G

### Faculty Research Oral Session – 11:00-12:40 Kryzsko Oak Rooms E/F

*Note: Instructions for student presenters can be found on page 3 of this program.*

# Welcome to the 2025 Ramaley Celebration!

This year marks the 19th anniversary of Winona State University's (WSU) celebration of student research and creative achievement. The Ramaley Celebration (originally called the WSU Research Celebration but eventually renamed after WSU's 14th President, Judith Ramaley) began as a half-day student symposium held each spring. The event expanded in 2022 to a full-day symposium as part of the newly established Research & Creative Achievement (RCA) Day. RCA Day is a no-class day that was established in order to accommodate the expanding scope of the day, which includes poster sessions, oral presentations, presentation recordings, panel and round table discussions, musical performances, art exhibits and more.

RCA Day highlights the diverse academic, artistic, and scholarly contributions of our students, reinforcing the central role that research and creative expression play in the educational experience at WSU. This year's RCA Day includes over 100 student poster presentations, recorded presentations, faculty research presentations, a Research Experiences Panel, an Artificial Intelligence (AI) Round Table, and a variety of other engaging events. You'll also find senior exhibitions from Studio Art, Art Teaching, and Design students, as well as music and theatrical performances. For a full list of events, please refer to the RCA Day 2025 schedule and the the WSU Events Calendar.

Thank you to all that make RCA Day possible:

- To all of our student presenters: Thank you very much for presenting at RCA Day 2025 and congratulations on your accomplishments!
- To the faculty mentors: Thank you for including students in your continuing research and creative scholarship!
- To the students in the WSU Psychology and Physics Clubs: Thank you for your assistance with event logistics and check-in. We deeply appreciate your dedication and enthusiasm.
- A special thank you to George Micalone, Phil Steffes, and the entire Student Union staff at Kryzsko Commons for your support with event day logistics.
- RCA Day and the Ramaley Celebration would not be possible without the generous support of the WSU Office of Academic Affairs and the ongoing commitment of the WSU Administration, which funds RCA Day and student Research and Creative Projects grants.
- Thank you for joining us as we celebrate the creativity, curiosity, and scholarly excellence of the WSU community!

*Sincerely,*

*The RCA Day All-University Committee: Begum Aybar-Damali, Adam Beardsley, Amanda Brouwer, Dana Engel, Julie Furst-Bowe, Jacob Gareis, Ken Graetz, John Holden, Robin Honken, Kendall Larson, Kara Lindaman, Laura McCauley, Thomas Nalli, Amanda Pruka, Andrew Ruhland, Renee Stowell, and Violet Yoon*

# Instructions for Student Presenters for the 2025 Ramaley Celebration

## Videotaped Oral Presentations

Use Kaltura Capture to record your 10-20 minute PowerPoint slide show or poster. Instructions on how to submit your file to the event website can be found at https://libguides.winona.edu/openriver/rcainstructions

## In-Person Oral Presentations

Plan for a 15-minute presentation followed by a 5-min period for questions. For PowerPoint presentations, you can either use your own laptop if it has the Airtame app installed on it or bring a thumb drive with your file on it and use the session moderator's machine.

## Presenting Your Poster

You will be assigned a poster number in the program which indicates the location to set up your poster. There will also be a check-In desk just inside the main entrance to Kryzsko Ballroom. The check-in desk will be staffed by student volunteers from the WSU Psychology Club who will be able to assist you.

**You should check in and put up your poster sometime between 8:30 and 9:00 am for the morning poster session (Session 1) or between 12:30 and 1:00 pm for the afternoon sessions (Session 2).** Clips, poster boards, and easels will be provided. Posters need to be taken down immediately after the end of each session: 11:00 am for the morning sessions and 3:00 pm for the afternoon sessions.

- You will be assigned to be with your poster during either the first or second hour of each session; Session 1a at 9:00-10:00 am, Session 1b at 10:00 am, Session 2a at 1:00-2:00 pm, and Session 2b at 2:00-3:00 pm. **You are expected to be with your poster for the entire duration of your assigned session.**
- **All posters should be set up and available for viewing for the full two hours of the morning/afternoon sessions.** For example, if you are assigned Session 1a, then your poster should be displayed from 9:00 am to 11:00 am, and you need to be standing in front of it from 9:00 am to 10:00 am.

This event is usually very well attended, so plan on a lot of great interactions with other students and faculty.

## Other

We strongly encourage you to check out other students' presentations when you are not assigned to be presenting yours.

Thank you for your participation, and we look forward to seeing you at the Celebration!

# Index of Posters

**Session 1, 9:00-11:00 AM (1A presenting at 9:00-10:00, 1B presenting at 10:00-11:00)**

**Session 2, 1:00-3:00 PM (2A presenting at 1:00-2:00, 2B presenting at 2:00-3:00)**

*Posters should be on display for the entire two hours of each session!*

| Presenters | Sess | # | Dept | Title | Page |
|---|---|---|---|---|---|
| Gareis, Jacob B | 1B | 30 | MATH | A Comparison of the Bacterial Communities of the Yamuna River (India) and Mississippi River (USA) | 67 |
| Gerlach, Megan | 1A | 69 | CHEM | Searching the crystallographic structure databases in support of targets for chemistry CURE projects | 37 |
| Gibbs, Alexander F | 1A | 31 | CHEM | Advances in the attempted first ever synthesis of ebtellur | 28 |
| Gibbs, Alexander F | 2A | 17 | CHEM | Development of a gas chromatographic method for the determination of alcohols in hand sanitizers | 33 |
| Goodnow, Steven R | 2B | 18 | PSY | IPAR Internship | 82 |
| Gray, Gabrielle G; Roh, Cheol Hyeon; Koster, Samantha K; Nguyen, Nulia M; Iverson, Alyssa R; O'Dell, Caroline M; Post, Olivia M | 2A | 19 | NURS | Education on Advanced Directives in Rural Communities | 70 |
| Gunderson, Will; Glendenning, Lillian M; Dang, Kevin O | 2B | 20 | CHEM | 1H NMR analysis of sulfanilamide-based imines synthesized from aromatic aldehydes. | 28 |
| Harmon, Rebecca R | 2A | 21 | POLS | Socioeconomic Status and Political Opinion | 80 |
| Haumont, Elle K; Bolduan, Jenna | 2A | 55 | CHEM | Modeling SOD1 Enzyme Mutations: Biochemistry II Lab Class Project | 35 |
| Hinkle, Eion D | 1A | 33 | CHEM | An exploration of simple methods for the purification and separation of natural curcuminoids | 30 |
| Hoglund, Shawn; Aguilar, Mayra G; Paulson, Owen; Nelson, Logan | 2B | 22 | CHEM | Catalytic testing of Sn(IV) complexes for the formation of polylactide | 31 |
| Junker, Jenna; Appicelli, Anthony J | 2A | 23 | Biology | Development of a qPCR for detecting Borrelia burgdorferi and Ixodes tick DNA simultaneously | 24 |
| Kadrie, Tyler S | 1B | 34 | GEOS | Experimental Impacts Into Sloped Targets | 55 |
| Kaufenberg-Lashua, Meagan M | 1A | 35 | CHEM | Synthesis and characterization of cationic PTA complexes with ruthenium | 38 |
| Kaufenberg-Lashua, Meagan M | 2B | 24 | CHEM | An Analysis of Diversity in AI Image Generators | 29 |
| Kaufenberg-Lashua, Meagan M; Gibbs, Alexander F | 1B | 36 | CHEM | Synthesis, characterization, and exploration of binding mode preference for the complex of iron with the antibiotic cefdinir | 38 |
| Kennedy, Audrey | 2A | 25 | PSY | Family and Children's Center Internship Experience | 81 |
| Ketterling, Madison J | 1A | 37 | Art & Design | NerveX | 19 |
| Knoble, Shelby A | 2A | 27 | RTTR | Moo-Moo Care Program | 87 |

| Presenters | Sess | # | Dept | Title | Page |
|---|---|---|---|---|---|
| Korneck, Brenna K; Koehler, Kole C; Dietz, Michael A | 2B | 28 | CHEM | Synthesis and characterization of bis(β-diketonato)dichloridotin(IV) complexes | 38 |
| Krzyszkowski, Luke W; Oh, Kyurim | 1B | 38 | Art & Design | Operation Dumbass | 19 |
| Kubitschek, Liam K; Sleypen, Ryan J | 1A | 39 | PSY | Sign Tracking Behavior in Long Evans and Sprague-Dawley Rats | 83 |
| Kuehn, Thaddeus R. | 2B | 54 | PSY | Project Compass: An Internship for the Able-Adults | 86 |
| Kuhnly, Danielle L | 1B | 40 | COMS | *The Notebook*: A Rhetorical Analysis of Feminism in Romance | 46 |
| Laborde, Wyatt N; Dietz, Michael A | 2A | 29 | CME | Panel Impact and Compressing Strength Testing | 54 |
| Lamont, Gabriella M | 1A | 41 | COMS | Phone, Text, Media; Different types of communication methods/media and their influence on father daughter relationship satisfaction | 44 |
| Lamountain, Kelsey | 2B | 30 | Special Educ | Changemakers for Students with Severe Disabilities | 88 |
| Lane, Sofia N | 1B | 42 | COMS | How Groups of Psychological Abuse Use Communication to Manipulate and Coerce Victims into Joining and Staying in Their Groups | 43 |
| Lehner, Connor J | 2A | 31 | CHEM | Late, 3d transition metal complexes of bis(diphenylphosphino)methane dichalcogenide ligands | 34 |
| Lemke, Kezia J | 2B | 32 | CHEM | Development of a Hybrid Synthetic and Computational Teaching Lab Exercise Featuring Budotitane | 33 |
| Liddell, Jocelyn K; Ehling, Audrey M; Dreckmann, Zoe; Henneman, Madison J; Mulcahy, Abigail T; Braun, CeCelia C; Boen, Joshua; Salvetti, Janae | 2A | 33 | NURS | Medication Card Implementation in Public Health Clinics to Increase Health Literacy within Older Adults in Rural Communities | 73 |
| Lingen, Drew O | 2B | 34 | COMS | The Relationship Between Player Age and Reporting Injuries to Coaches and Medical Personnel | 47 |
| Lopez, Ashley; Ziel de Cruz, Ella; Bijnagte, Elliott A; Roos, Emily E | 2A | 35 | CHEM | Bioactivity assays of synthesized sulfanilamide-based imines. | 31 |
| Lueken, Athena B; Xiong, Isabella T; Harvey, William J | 1A | 43 | Biology | Classification of Trematode Species of Wisconsin Ducks Using Morphological and Molecular Methods | 23 |
| Ma, YuBo; Niu, Shuoyan | 2B | 36 | CME | Performance of Quasi-isotropic GF/PET Laminates in Impact and compression after Impact Loading | 54 |

| Presenters | Sess | # | Dept | Title | Page |
|---|---|---|---|---|---|
| Maddio, Micah W; Kerkow, Bailey; Wise, Ashley M; Murphy, Logan M | 1B | 44 | CHEM | Deep Tissue Massage-Induced Muscle Damage is Associated with Delayed Onset Muscle Soreness (DOMS) and Rhabdomyolysis | 32 |
| Martin, Allen R | 1A | 45 | CS | Comparing Performance of Parallel Implementation of Sorting Algorithms Versus Standard Implementations | 48 |
| Matzke, Taylor L | 2A | 37 | COMS | Intercultural Communication Competence and Interpersonal Communication Skills in Working Abroad and Study Abroad Alumni in the Global Workplace | 43 |
| Meyers, Hailey J | 2B | 38 | HERS | Differences in Peak Relative Landing Forces in Division II Women's Gymnastics, Basketball, and Soccer | 60 |
| Michaud, Samuel D | 2A | 39 | Physics | Using the EPIC Algorithm for Radio Astronomy | 79 |
| Morris, Austin M | 1B | 46 | POLS | Inconsistent Application of American Foreign Policy | 80 |
| Mulvihill, Marcus F | 2B | 40 | NURS | Chronic Cannabis Use and the Effects on General Anesthesia | 68 |
| Murray, Olivia C | 1A | 47 | POLS | The Effects of Misinformation on Survey Recipients Satisfaction with Americas Political Atmosphere | 80 |
| O'Connor, Jack | 1B | 48 | MATH | Causal Inference for ICU Patients | 67 |
| Odegard, Jasmine L | 1A | 49 | PSY | Internship With the Winona School District and Project Compass and What I Have Taken From It | 81 |
| Olson, Kaylee E | 2A | 41 | Art & Design | Threaded Locations: Sustainable Custom Hoodie Brand | 22 |
| Onyx, Drake W; Larsen, Caitlin M; Seidel, Grace A; Robins, Grace A; Tischler, Elizabeth A; Tima, Alivia A | 1B | 50 | Art & Design | From Seurat to Skynet - Pros and Cons of AI in the Studio Arts | 18 |
| Oudekerk, Charlotte N | 2B | 42 | PSY | PSY 404 Internship Presentation | 83 |
| Paulson, Taylor M | 1A | 51 | Biology | Effect of Rain and Habitat on Bat Calling Activity in Winona | 24 |
| Pavlat, Luke B | 1B | 52 | HERS | Perceived Effectiveness of Recovery Strategies in Division III Athletes | 62 |
| Pell, Simon J | 1A | 53 | Art & Design | Swell: A Sustainable Surf Brand | 22 |
| Pelowitz, Thomas J | 1B | 54 | CS | Plasma Profiling Reveals Proteins Specific to Primary Disease Origin of Retroperitoneal Fibrosis | 49 |

| Presenters | Sess | # | Dept | Title | Page |
|---|---|---|---|---|---|
| Perez, Dominic L; Ficker, Matt K; Misukanis, Noah; Poglayen, Luke E; Kosmoski, Jacob | 1A | 55 | CME | A Novel Fixture Development to Characterize Compression After Impact Damage of Unidirectional Thermoplastic Composite Laminates. | 53 |
| Peterson, Kaia L | 1B | 56 | Art & Design | FEN Accessible Eating App | 17 |
| Pflamminger, Amelie H; Hartman, Alanna; Anderson, Isabelle A | 1A | 57 | PSY | Perceptions of Psychological Distress by Target Gender and Disorder Type: Preliminary Findings | 83 |
| Pretzer, Mason M | 2A | 43 | PSY | Internship Experience at Hiawatha Valley Mental Health Clinic | 81 |
| Rau, Laurel A | 1B | 58 | Art & Design | ADHD Planner | 16 |
| Reitano, Marguerite C; Betcher, Elise A; Kolstad, Karalyn M; Marks, Ashley K; Train, Alexander J | 2B | 44 | Biology | Comparison of Morphological Characteristics and DNA Sequences of Platyhelminthes within Dabbling and Diving Ducks Species | 23 |
| Remolina, Celeste | 2A | 45 | CHEM | Development of a RAPTA complex synthesis and characterization lab for an upper-level inorganic chemistry course. | 34 |
| Ring, Jarrod D | 1A | 59 | CHEM | Molecular Dynamics Simulations of Curcuminato-($\eta^6$-p-cymene)ruthenium(II) Docking in the Minor Groove of DNA: Evaluating Equilibrium Stability via 2D RMSD Analysis | 35 |
| Rising, Luke L; Miller, Olivia; Terrill, Braelyn M | 2B | 46 | CHEM | NMR analysis of Sn("acac")$_2$Cl$_2$ complexes | 36 |
| Rising, Luke L; Sunsdahl, Hanna; Burrows, Matthew; Feregrino Ponce, Juan Carlos | 2A | 47 | CHEM | Modeling cis/trans preferences of Sn("acac")$_2$Cl$_2$ complexes | 35 |
| Rodriguez, Luis M; Hilo, Alex; Conniff, Tanner J; Kauphusman, Max R; Courneya, Eric M | 1B | 60 | CME | Carbon Club Carrier: A Lightweight Motorized Golf Pushcart | 53 |
| Ruch, Nicholas C | 1A | 61 | Biology | The Economic Impact of the Emerald Ash Borer in Inver Grove Heights MN. | 25 |
| Ryan, Brianna E | 2B | 48 | NURS | The Impact of Physical Activity on Mental Health Disorders in Children | 77 |
| Sato, Sho | 2A | 49 | MATH | Geospatial Analysis of Flood Risk on Housing Price in Fargo, ND | 68 |
| Shaughnessy, Daniel J; Bolduan, Jenna; Olson, Emma L | 1B | 62 | Biology | Using DNA Barcoding to Determine if Minnesota Ornate Box Turtles are Native or Introduced | 25 |
| Sonnleitner, Allie | 2B | 50 | NURS | Disparities in Women's Healthcare | 70 |
| Stouffer, Leighton D | 1A | 63 | CHEM | A modern evaluation of crystal field theory | 28 |

# Oral Session – Oak Room E/F – 1:00-2:40

| Presenters | Time | Dept | Title | Page |
|---|---|---|---|---|
| Gunnink, Sadie R | 1:00-1:20 | Education | From Dissertation to Innovation: How Research Fueled the Development of Gamified Educational Software | 51 |
| Dischinger, Samantha | 1:20-1:40 | CMST | Exploring How Pronoun Disclosure on Resumes Results in Differing Evaluations of Hireability | 42 |
| Ogunwole, Aanuoluwapo | 1:40-2:00 | ACCT | Promotional Barriers to Women in Professional Services | 16 |
| Schimenz, Mattie | 2:00-2:20 | Education Leadership | Position Utilization and Effectiveness of SWAs in the NSIC | 51 |
| Farina, Erin | 2:20-2:40 | PSY | Socioeconomic Status During Upbringing and Academic Performance as a College Student | 84 |

# Recorded Video Presentations – Online and Oak Room G

| Presenters | Dept | Title | Page |
|---|---|---|---|
| Braun, Carlee A; Thomas, Jaclyn S; Murayama, Miku | HERS | Balance Intervention vs. Strength Exercises for Chronic Ankle Instability | 58 |
| Dring, Molly M; Hansen, Payton A | HERS | In adults with plantar heel pain, does CSI provide better results than ESWT for decreasing pain? | 61 |
| Dring, Molly M; Hansen, Payton A | HERS | Corticosteroid Injections Versus Extracorporeal Shockwave Therapy for the Treatment of Plantar Heel Pain | 59 |
| Morris, Alec J | HERS | The Effect of Computerized Reaction Time Training on Collegiate Baseball Athletes | 64 |
| Niemeyer, Tristan; Borhart, Brittany L | NURS | Tackling Food Insecurity in the Collegiate Athlete: An Innovative Approach | 76 |
| Pieper, Mikayla J; Peterson, Montana A; Adkins, Madelyn | HERS | Open Versus Closed Surgery for Carpal Tunnel Syndrome | 62 |
| Russell, Jennifer M; Noble-Henden, Dominic A; Mauzer, Riley | HERS | Accelerated vs. Conservative Rehabilitation after ACL Reconstruction (ACL-R) | 57 |
| Schapekahm, Craig A; Mann, Justin L | NURS | Evidence-Based Education for Conducting Long-COVID Community-Based Screening | 72 |
| Simataa, Rebecca R; O'Connell, Jordan J; Dufault, Christopher M | Education | Listening to Learners: Ed.D. Student Perspectives on Asset- and Deficit-based Feedback Practices | 50 |
| Van Tassell, Kalli K | HERS | Preseason Changes in Peak Relative Propulsive Force, Takeoff Velocity, and Time to Takeoff in Collegiate Women's Gymnastics | 64 |
| Kilpatrick, Vera R | CS | Comparing Image Upscaling Quality Between Photoshop and Clip Studio Paint | 48 |

## Panel Discussion I – Research Experiences at WSU
## Solarium – 12:30-1:30

| Panel Members | Dept | Description |
|---|---|---|
| Pat Paulson | Business Administration | A panel discussion on the topic of research experiences of faculty and students at WSU.<br><br>This panel discussion is moderated by WSU Dean of the College of Liberal Arts, Dr. Kara Lindaman. |
| Lawrence Schrenk | Finance | |
| Mark Becknell, | Graduate Nursing | |
| Patrick Lichty | Mass Communication | |
| Jack Stromberg | Student | |
| Stacey Kanihan, | Mass Communication | |
| Ashley Flygare | Student | |

## Panel Discussion II – Impact of Artificial Intelligence on RCA
## Solarium – 2:00-3:00

| Panel Members | Dept | Description |
|---|---|---|
| Kayla Olson | Library | A panel discussion on the impact of generative AI on research and creative work. |
| Sadie Gunnink | Education | |
| Patrick Lichty | Mass Communication | |
| Steven Baule | Leadership Education | |
| Joseph West | Chemistry | |
| Ken Graetz | Academic Affairs/TLT | |
| Scott Sorvaag | Education | |
| Emily Ruff | Chemistry | |

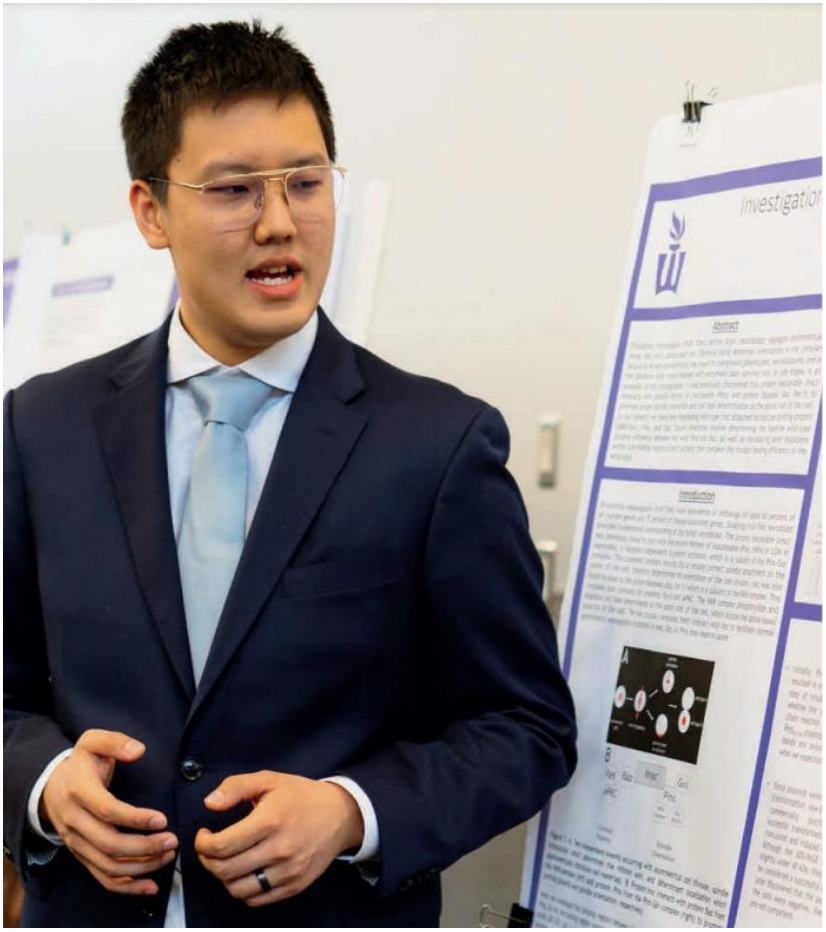
## Faculty Research Oral Session – Oak Rooms E/F – 11:00-12:40

| Time | Presenter | Dept | Title | Page |
|---|---|---|---|---|
| 11:00 | Pat Paulson and Larry Schrenk | Business | AI in Business Classes | 89 |
| 11:20 | Joseph K. West | Chemistry | CURE by Community: Course-based undergraduate research experiences capitalizing on involvement from departmental colleagues | 91 |
| 11:40 | Thomas Nalli | Chemistry | Analysis of phytosterols in two species of morel mushrooms: *Morchella tomentosa* and *Morchella americana* | 89 |
| 12:00 | Aurora Jacobsen | Library | Minnesota Nice: qualitative research and things we love | 91 |

| | | | | |
|---|---|---|---|---|
| 12:20 | Sandra Paddock | Nursing | Encouraging Self-care for Nurse Practitioner Students to Decrease Stress and Prevent Burnout | 90 |

# Abstracts by Academic Department

# ABSTRACTS



# Accounting

## Promotional Barriers to Women in Professional Services

Aanuoluwapo Ogunwole
Faculty Mentor: Kimberly Shannon

Today, women, especially Black, Indigenous, and People of Color (BIPOC) women, face significant challenges in advancing to leadership roles in professional services. Although they make up more than half of accounting professionals, they remain underrepresented in partnership positions, with women of color facing even greater obstacles (Becker Professional Education, n.d.). While awareness of these issues has grown (World Economic Forum, n.d.), meaningful progress has been slow (Galizzi et al., 2024). Systemic barriers such as biased promotion processes, pay gaps, and limited mentorship opportunities continue to hinder women's advancement (Hardies et al., 2021; Shrestha et al., 2023). Many do not reach partner roles but instead hold leadership positions with less authority and financial equity (Debeş et al., 2021). The pandemic worsened these inequalities, disproportionately affecting women of color through job losses and increased workplace risks (Covid-19 Impact on Women in the Workplace, n.d.). This literature review examines whether gender and racial disparities persist in accounting and financial management, particularly after the #MeToo movement (CFA Institute, 2018) and the COVID-19 pandemic. By synthesizing studies published since 2017, alongside industry data from organizations like the American Institute of Certified Public Accountants (AICPA), this review explores whether the "glass ceiling" results from institutional barriers or personal career choices. The findings suggest that structural challenges, rather than individual decisions, play a significant role in limiting women's advancement. This literature review illuminates the need for continued research on the effectiveness of diversity, equity, and inclusion initiatives and sustained organizational reforms to create equitable career pathways.

# Art & Design

## ADHD Planner

Laurel Rau
Faculty Mentor: Danilo Bojic

I created this ADHD planner because, as someone with ADHD, I know how overwhelming it can be to stay organized when your mind is always jumping from one thing to the next. I wanted a tool that felt supportive, flexible, and useful, so I designed it with extra space for notes, color-coded days to make planning easier, and weekly prompts to help you check in and stay on track. It also includes practical tips for improving focus and managing those chaotic moments. This planner was a labor of love, and my hope is that it brings a little more calm and clarity to the stresses of everyday life.

## Alien Out

Stephanie Dasbach
Faculty Mentor: Danilo Bojic

Alien Out is a space-themed pop-up board game where players complete mini challenges on different planets to help lost aliens return home, offering multiple ways to play: solo, competitive, or team-based. The goal is to create a versatile gameplay experience that accommodates different player dynamics, ensuring that individuals, small groups, or larger teams can engage with the game without limitations. The concept is inspired by a love for astronomy and a desire to incorporate interactive pop-up elements into board game design. By combining these elements, Alien Out aims to provide an immersive, strategic, and visually dynamic experience.

The development of the game required extensive research into pop-up mechanics, game design principles, and interactive storytelling. Foundational research involved studying books and online resources on paper engineering, exploring techniques to build engaging three-dimensional elements. Mind-mapping and sketching were essential in conceptualizing the overall layout of the board, the interactive features, and the narrative flow. The design process included testing various materials such as paper, poster board, wires, magnets, and hot glue to construct the first prototype, ensuring that the pop-up elements function effectively. These materials allow for flexibility in refining the mechanics while maintaining the game's structural integrity.

A key aspect of the design process was the use of Adobe Illustrator. Used to develop the board's layout, game pieces, and design supporting elements such as cards and packaging. The design plays a crucial role in reinforcing the game's theme, enhancing the user interface, and making gameplay instructions clear and accessible. The iterative process of prototyping and playtesting, was instrumental in refining game mechanics. Playtests were conducted with classmates and friends to gather feedback on the game's flow, usability, and overall engagement. These sessions helped identify areas that needed improvement, leading to adjustments that enhanced the game's overall balance, smoothness, and functionality.

The final product is a fully functional and visually engaging board game that provides an exciting experience while showcasing strong design and packaging skills. Through this project, valuable insights into game development, interactive design, and user-centered experiences were gained. All in all, this project contributes to my deeper understanding of both the creative and technical aspects of board game production.

## FEN Accessible Eating App

Kaia Peterson
Faculty Mentor: Danilo Bojic

Fen is a dedicated social hub and resource platform designed to support the gluten-free and dairy-free community in Winona, Minnesota. Living with dietary restrictions can often feel isolating and challenging, especially when it comes to finding safe dining options or reliable recipes. Fen aims to change that by offering a welcoming space where individuals can connect, share experiences, and access essential resources that make every day eating easier and more enjoyable.
This project serves as the senior capstone for the Advanced Design Project within the I–Design program. As a culmination of my design education, Fen represents my commitment to creating meaningful, user-centered solutions that address real-world needs. Through extensive research, user feedback, and thoughtful design, this project reflects the intersection of accessibility, community, and innovative design.

Fen's mission is to create an inclusive environment where users feel empowered to explore their dietary journey without the fear of accidental exposure to allergens. Fen bridges the gap between accessibility and community, ensuring that everyone, regardless of dietary limitations, has the opportunity to enjoy delicious meals with confidence. By combining user-generated content with curated resources, we provide a holistic approach to accessible eating.
Fen offers several key features designed to enhance the daily lives of gluten-free and dairy-free individuals. Our recipe database includes a diverse collection of dishes that cater to various tastes and nutritional needs, each vetted for safety and quality. Whether users are looking for quick breakfast ideas, hearty dinners, or indulgent desserts, our platform ensures that every recipe is both delicious and safe.

In addition to recipes, Fen serves as a guide to local dining in Winona, highlighting restaurants that accommodate gluten-free and dairy-free diets. Our community members can share reviews, rate their experiences, and offer tips on navigating menus, creating a reliable network of peer-to-peer recommendations. This feature not only promotes transparency but also fosters trust within the community.

Community engagement is at the heart of Fen. Our forum provides a space for users to discuss their experiences, ask questions, and support one another. Whether it's seeking advice on substitutions, sharing success stories, or simply connecting over shared challenges, the forum encourages meaningful interactions and a sense of belonging.

As a locally focused platform, Fen celebrates the uniqueness of Winona while addressing the specific needs of its gluten-free and dairy-free residents. By collaborating with local restaurants and community members, we strive to build a supportive ecosystem where everyone can thrive.

## From Seurat to Skynet - Pros and Cons of AI in the Studio Arts

Caitlin Larsen, Drake Onyx, Grace Robins, Grace Seidel, Elizabeth Tischler, and Alivia Tima
Student Coauthors: Dane Canario, Alysen Endres, Piper Fuller, Axel Hillis, Kari Plumley, Laurel Rau, David Stevens, and Saige Sullivan
Faculty Mentor: Alessandra Sulpy

AI generated imagery is now everywhere and accessible to almost everyone… for better or for worse.

There are many artists worldwide who have been using artificial intelligence / machine learning for years to create fascinating, research or experimentally driven art. There are also many artists who are using AI simply as a tool, and there is a long history of artists using tools to help them work more efficiently (camera lucida, photography, Photoshop, etc).

Conversely, many artists are concerned about the use of their original artwork being scraped without their permission to train these bots, and artists whose jobs have been taken or threatened by AI. There are broader arguments for and against the prevalent use of AI (do we want a doctor whose thesis was written by a computer? Do we want movies written by algorithms? Yet isn’t it also good to have a computer proof-read your work and offer suggestions? To save you a lot of time editing photos?). Even within the visual arts world, it’s a complicated subject.

In Fall 2024's ART 317: Contemporary Studio Practices (an upper level painting and drawing class), art students were asked to separate into groups as Pro-AI and Anti-AI based on their own initial feelings towards machine learning. Pro-AI groups explored generative AI and Chat GPT to find ways that these technologies could be used to aid a studio artist. Anti-AI groups used the same technologies to subvert what AI produced, and to showcase the disadvantages and biases the medium presents to artists.

## NerveX

Madison Ketterling
Faculty Mentor: Danilo Bojic

The NerveX fidget toy is a modern and stylish alternative to traditional fidget toys, designed especially for adults. Many fidget toys are made for children, which can make them feel out of place in professional or social settings. NerveX solves this problem by offering a discreet and effective way to manage stress, anxiety, and conditions like ADHD and OCD.
One of the key features of NerveX is its smooth, endless spinning motion. This repetitive movement helps people with ADHD stay focused and engaged in tasks. It can also provide comfort for individuals with OCD by giving them a calming action to manage compulsive behaviors. The spinning motion is simple yet effective, helping to reduce stress and improve concentration without being distracting to others.

To make sure NerveX meets the needs of its users, I conducted research and gathered feedback from adults aged 20 to 28. This helped shape the final design to be both functional and appealing. The feedback highlighted the importance of a high-quality fidget toy that is durable, effective, and comfortable to use in daily life.

NerveX is made using 3D printing with two different materials to ensure durability and performance. The spinning band is made from TPU, a flexible and long-lasting material that allows smooth motion without wearing out quickly. The outer frame is made from PLA, a sturdy material that gives the toy structure and strength. This combination makes NerveX both reliable and long-lasting. The 3D printing process also makes it easy to produce in larger quantities, keeping costs low and ensuring accessibility for more people.

As I work towards completing the project, I am focusing on finalizing the design, improving production, and getting ready for distribution. To track progress, I will compare my estimated costs with actual expenses to make sure the project stays within budget. I will also monitor sales to understand how well NerveX is performing in the market. This will help determine if any improvements are needed to increase its success.

NerveX is more than just a fidget toy it is a practical and stylish tool designed to help adults stay focused and reduce stress. With its smooth spinning motion, strong materials, and discreet design, it provides an effective way for people to manage anxiety and improve concentration in their daily lives.

## Operation Dumbass Blender & Unity Study

Luke Krzyszkowski
Faculty Mentor: Kyurim Oh

Operation Dumbass is a stylized multiplayer social deception game developed by Kyurim Oh and Luke Krzyszkowski as part of their Advanced Design Project at Winona State University. Inspired by the absurdity and charm of viral games like Fall Guys and the immersive environments of Super Mario Odyssey, the game was born from our shared frustration with limited party sizes in current multiplayer games—and a desire to make something we would genuinely love to play. The game is set in a lively city full of AI-controlled citizens, where up to 16 players take on the role of spies disguised as ordinary characters. Everyone looks exactly the same, and there are no name tags or visual cues—just behavior. Your job? Blend in, act dumb, and figure out who's not acting. The tension builds as players move, emote, and try to outsmart one another. At the end of the match, only one Dumbass is left standing. Designing Operation Dumbass wasn't just about creating a game—it was about learning how to build an entire experience from scratch. We started by exploring different engines and landed on Unity for its accessibility and flexibility. From there, we split our focus: Kyu took on Blender to learn 3D modeling, rigging, and animation, while Luke focused on scene setup, scripting, and input mechanics in Unity. Together, we worked across disciplines—art, animation, game development, and even marketing—to bring the Dumbass to life.

Character design was intentionally goofy and awkward. We wanted players to instantly connect with how silly the game feels, so the character has a large head, alien-ish body, and exaggerated movements. Expressive emotes—like the chicken dance—are an essential part of gameplay. They're not just funny; they're tools of deception. In a world where everyone looks the same, a dance can be a deadly tell. During development, we held a mini playtest where classmates explored the environment and played as the Dumbass for the first time. The feedback was hilarious and insightful, helping us understand how players interact with both the environment and each other. We also faced big challenges—debugging, animating believable movement, and adapting code when we had little experience. But we embraced every bit of it, learning through trial, error, and too many late nights. Looking ahead, we're working toward launching a beta version on Steam and Itch.io in August 2025, with plans for a full release soon after. We've even applied for grants and set up a Kickstarter campaign to support further development. Our goal is to build not just a game, but a community of players who enjoy the absurdity of deception, friendship, and chaotic fun. Operation Dumbass is more than just a dumb game—it's a celebration of creativity, collaboration, and chaos. We're proud of what we've made, and we hope to keep pushing it forward.

## Playdate. Discover your Community

Jadyn Bennett
Faculty Mentor: Danilo Bojic

For this project, I designed a wireframe mockup for **Playdate**, a social media app specifically created to foster connections within local communities. Playdate's primary goal is to provide a platform where both businesses and individuals can engage with their local area, discover new hobbies, and form meaningful connections. The app serves as a hub for people looking to meet others, explore activities, and get involved in their neighborhoods, ultimately aiming to create a more connected and interactive community experience.

The concept behind Playdate is rooted in the idea of building strong local connections, allowing users to easily find and participate in events, clubs, and social gatherings around them. Whether it's discovering a new fitness class, joining a local book club, or finding out about community events, Playdate serves as an all-in-one platform that helps users get involved and feel a deeper connection to the area they live in.

One of the key features of the app is the ability for businesses to showcase their offerings and engage with customers directly, creating a symbiotic relationship between users and local businesses. It provides businesses with a unique opportunity to reach a local audience by promoting events, sales, and special activities through the platform.

By creating an inclusive and engaging space, Playdate ensures that every user, regardless of their interests or background, can find something that appeals to them. The app features easy-to-use tools for discovering activities, joining social groups, and participating in local events, making it simple for users to stay connected and engaged with their community. The wireframe design I created focuses on user-centric functionality and streamlined navigation, allowing individuals to effortlessly explore new opportunities in their area. From browsing local activities to attending gatherings or meeting like-minded people, Playdate helps users build relationships and grow their social network.

The overall mission of Playdate is to promote a sense of community and belonging. By encouraging users to step out of their comfort zones, engage in new experiences, and meet people who share similar interests, the app fosters a stronger sense of unity. It's not just about discovering local events; it's about creating an environment where individuals and businesses can thrive together. Playdate is more than just a social media app—it's a tool for building vibrant, connected communities where everyone has the chance to engage and grow.

## Savor The Cycle

Kendal Banes
Faculty Mentor: Danilo Bojic

My project, Savor the Cycle, is a website I have been creating over this Fall '24 semester. This website intends to educate women on the phases of their menstrual cycle. This website talks about how hormones change throughout the menstrual cycle. It also talks about the foods and nutrients most important for women to put in their bodies during their cycle. In the website, these are portrayed through individual pages for each menstrual cycle phase. Along with these pages, there is a forum that allows women to talk about their experiences. The goal is to create a community where women can feel comfortable expressing their issues, questions, and encouragement with one another.

My hope is I can educate more women on their menstrual cycles. Through this website, I also mentioned my hope of creating a safe place for women to share their questions, experiences, and encouragement on this topic with other women in similar shoes. In conclusion, my expected outcomes are educating women and creating a safe place for community.

## Scrappie Jackie

Meghan Cooper
Faculty Mentor: Danilo Bojic

Scrappie Jackie is my senior capstone project where I take thrifted fabrics and transform them into unique, one-of-a-kind garments. I started this journey with no prior sewing experience, but through trial, error, and plenty of learning, I've developed a process that allows me to give new life to old clothing.

The core idea behind Scrappie Jackie is simple: I use donated clothing to create something new. This process promotes sustainability by upcycling fabrics that would otherwise go to waste, instead of contributing to the fast fashion cycle. The beauty of this project is in the transformation—each piece of clothing holds potential to become something completely different, and I love finding those possibilities. Whether it's a worn-out t-shirt or a vintage jacket, I see it as an opportunity to create something truly unique.

One of the main reasons I took on this project is because I've always been drawn to sewing. It's a skill that's been passed down through generations, and it's meaningful to me because it's often considered a "feminine" craft. Historically, sewing has been overlooked as an art form, even though it holds deep cultural significance and creativity. With Scrappie Jackie, I want to highlight that sewing is more than just a practical skill—it's a way to express oneself and create something personal and beautiful.
The name Scrappie Jackie comes from my own family connection. My grandmother, Jackie, taught me how to sew, and I wanted to honor her in the name of the project because she's been an important part of my creative journey. The focus of the project is on what I can create now, using the skills I've developed and the materials I work with.

At this point, Scrappie Jackie is run through Instagram, where I showcase my latest designs and offer commissions through a Google form. I'm still learning and figuring out the best ways to grow the project, but it's exciting to see it take shape and connect with people who want to be a part of this sustainable fashion movement.

Scrappie Jackie isn't just about making clothes—it's about creativity, sustainability, and upcycling. It's about taking something that would otherwise be discarded and turning it into something new, beautiful, and meaningful. I'm excited to continue learning and experimenting, and I can't wait to see where this project takes me.

## Swell: A Sustainable Surf Brand

Simon Pell
Faculty Mentor: Danilo Bojic

Most boards in the surfing community that are made for performance are made with non-sustainable materials. Many boards use resin that is harmful to the environment through its curing and sanding process as it releases harmful chemicals into the air. They also use foams that release harmful chemicals into the air when they are produced, and they also do not break down when the board is disposed of. Overall, surfboards when produced using resin and foam are harmful for the environment from start to finish.
In the project, I will first do my research to find alternatives to the harmful materials currently used in the making of surfboard. I have already found a direction I would like to go with by using plywood, rebond foam, and burlap sack in substitution for foam and fiberglass.

## Threaded Locations

Kaylee Olson
Faculty Mentor: Danilo Bojic

For my Senior Capstone project for the Art and Design Department, I created a clothing brand called *Threaded Locations.* The Brand's mission was to merge sustainability with personal memories, offering people a unique way to cherish meaningful places. The concept behind *Threaded Locations* is to connect the stories behind places in people's lives with custom embroidered designs.
People often have emotional attachments to certain places, whether that is the neighborhood in which they grew up or a beloved vacation spot. With Threaded locations, the goal was to give people an opportunity to carry a piece of those memories with them wherever they go.

Customers would share a place of significance to them, and I would embroider the silhouette of the streets of that location onto the back of a hoodie, turning beloved memories into wearable art. Additionally, to make the process highly customizable, I developed an online form our customers could submit their chosen location. The form would allow them to describe the place they wanted to include in any specific details along with colors and the size of the hoodie. From there they would submit the form, and I would start embroidering their custom location hoodie.

# Biology

## Classification of Trematode Species of Wisconsin Ducks Using Morphological and Molecular Methods

Athena Lueken, Isabella Xiong, and William Harvey
Faculty Mentor: Kimberly Bates

Trematoda is a class of flatworms and it encompasses approximately 20,000 species. Trematoda has two subclasses, Digenea and Aspedogastria. The families observed in this study were Echinostomatidae and Strigeidae from the subclass Digenea. Trematoda can be found in most species of animals, usually ingested from their food source. The Trematodes in this study were collected from three different duck species including *Aythya affinis* (Lesser Scaup,) *Anas acuta* (Pintail,) and *Aix sponsa* (Wood Duck) donated by hunters between 2023 and 2024. All ducks were harvested in the state of Wisconsin and the dissections were performed at Winona State University, Winona Minnesota. Identifying the most common species of Trematodes found in local duck species is an important step in understanding the spread of parasites and the effects they may have on infected waterfowl. The trematodes were identified using the Key to Trematodes Reported in Waterfowl published by the United States Fish and Wildlife Service (1981). Identifications were made by observing the species' morphological characteristics microscopically and then using the key to determine species. The morphology was then compared with the DNA that was extracted and amplified using PCR before being sequenced at Idaho State University Molecular Research Core Facility. Sequences were analyzed using the Blast Search function on the NCBI website.

## Comparison of Morphological Characteristics and DNA Sequences of Platyhelminthes within Dabbling and Diving Ducks Species

Elise Betcher, Karalyn Kolstad, Ashley Marks, Marguerite Reitano, and Alexander Train
Faculty Mentor: Kimberly Bates

Platyhelminthes, also known as flatworms, are among the most common parasites found in North American duck species. This phylum of parasites includes tapeworms and flukes. This study focused on identifying various Platyhelminthes found in Minnesota and Wisconsin wild ducks using both morphological characteristics and genetic sequencing. Both diving and dabbling species of ducks were used for this study, including green winged-teal (*Anas carolinensis)* and ring-necked ducks (*Aythya collaris*). Platyhelminthes were removed from legally harvested ducks and stained before examining and imaging under the microscope to identify key morphologic features for a presumptive identification. Subsequently, DNA was extracted and amplified, then sequenced at the Idaho State Molecular Research Core Facility to confirm the genus and species of each organism. This study's findings allowed for a better understanding of the various Platyhelminthes found in wild ducks across Minnesota and Wisconsin, as well as showing the benefits of integrating both morphological characteristics and genomic sequencing for an accurate identification of an unknown organism's species.

## Development of a qPCR for detecting *Borrelia burgdorferi* and *Ixodes* tick DNA simultaneously

Anthony Appicelli and Jenna Junker
Faculty Mentor: Kimberly Bates

Black-legged ticks (*Ixodes scapularis*) and Lyme disease, caused by the bacterium *Borrelia burgdorferi*, are prevalent in the upper Midwest. Accurate determination of the percentage of *Ixodes* ticks that carry Lyme disease could help physicians and health experts develop treatment and prevention plans to curb the prevalence of disease. The purpose of this study was to see if accurate results for both Ixodes DNA and *Borrelia* DNA could be analyzed in the same qPCR assay for faster Lyme disease testing. Current testing in humans is achieved by running two separate diagnostic assays, an ELISA and Western Blot, both of which are very time-consuming and temperamental lab procedures. By using qPCR, an automated result is achieved in a shorter amount of time with less errors because of the sensitivity of the assay. Throughout the two-semester long experiment, several adjustments were made to increase the accuracy of the qPCR, including changes to the primers, their concentrations, and DNA content. Additionally, the thermocycler conditions were frequently modified to accommodate the simultaneous use of both the *Ixodes* specific and *Borrelia*-specific primers for running the test. After nine months of trial, the results were inconclusive. This study encountered many difficulties, like contaminations in the primers that produced false positive results and condition complications causing both false positive and negative results. Currently, additional modifications are being assessed to improve the results of the qPCR.

## Effect of Rain and Habitat on Bat Calling Activity in Winona

Taylor Paulson
Student Coauthors: Natalie Bolstad and Amy Vang
Faculty Mentor: Noah Anderson and Amy Runck

Bats are an important member of a healthy ecosystem; however, we know very little about bat activity in the southeastern MN region. We used echolocation data to see whether bat activity differed between upland habitat at Garvin Heights and Lake Winona. We also tested whether time of night and

precipitation events affected bat call activity. There was significantly more bat calling activity at Lake Winona compared to Garvin Heights. Rain events caused a reduction in bat calls at both sites. There was no clear pattern of bat call activity throughout the night. This study highlights the impact of environmental factors, such as precipitation and habitat, on bat calling activity.

## Microbial Contamination in Cosmetic Products: Identification, Characterization and Safety Implications

Sophia Taarud and Infinite Yang
Faculty Mentor: Kimberly Evenson

The FDA has reported that microbes can get into cosmetic products through contaminated raw materials or water, poor packaging or storage conditions, ineffective preservation system and poor manufacturing conditions. The various bacteria or fungi found within these cosmetic products pose potential health risks. The FDA does not require approval before cosmetic/hygiene products go on the market only that they must be properly labeled. This demonstrates the lack of regulation and the importance of bacterial and fungal characterization to ensure product safety and compliance with safety standards. In this study, microbiological techniques were used to identify and analyze bacteria or fungi present in a lotion sample. By performing serial dilutions, plating, staining, and a series of biochemical tests, the study aimed to determine the quantity of bacteria or fungi present, morphology, metabolic characteristics, and antibiotic susceptibility. The findings provide insight into the microbial composition of the lotion sample, emphasizing the importance of quality control in cosmetic and personal care products.

## The Economic Impact of the Emerald Ash Borer in Inver Grove Heights MN.

Nicholas Ruch
Faculty Mentor: Noah Anderson

Emerald Ash Borer (EAB) is an insect that bores under the ash tree's bark. This effectively kills the tree by girdling its cambium. In this analysis of EAB, we looked at the financial effect it had on Inver Grove Heights, Minnesota. Expert Tree Service removed most of their ash trees and provided us with data to help calculate how much it cost. Brian Swoboda, the head forester for Inver Grove Heights, provided us with all of the information about their plan to reforest.
In total, for the years 2022 and 2023, the removals done by Expert Tree Service cost $83,690.68 USD. Over the ten years it will take to remove all of the ash trees, we predict that it will cost approximately $418,500 USD. Jobs with more trees cost significantly more, with a P-value of 0.00000194 and an F-value of 95.66.

Ash trees were planted after the mass death of elm trees. Inver Grove is learning from past mistakes and is now planting a variety of unrelated species, including White Oak, Honey Locust, Northern Catalpa, and Swamp White Oak.

## Using DNA Barcoding to Determine if Minnesota Ornate Box Turtles are Native or Introduced

Jenna Bolduan, Emma Olson, and Daniel Shaughnessy

Faculty Mentor: Amy Runck

The ornate box turtle (*Terrapene ornata*) is native to the southeastern U.S., with its range extending northwards into southern Wisconsin (with a disjunct population along the Wisconsin River). The ornate box turtle is not believed to exist in Minnesota, but several individuals were found in the Weaver Sand Dunes in 2024. The goal of this research is to determine if the Minnesota turtles are native or were introduced to the Weaver Sand Dunes. Partial cytochrome *b* (1097 bp) and cytochrome oxidase (140 bp) sequences were generated and compared to sequences of the same species across its range from GenBank to determine if the individuals found are native or introduced to Minnesota.

# Business Administration

## Improving Tutor Effectiveness through Simulation Training at WSU Tutoring Services

Sarah Bassler, Kelsi Kuchel, and Mirra Swenson.
Faculty Mentor: Huh-Jung Hahn.

This project introduces a simulation-based training initiative for Winona State University (WSU) Tutoring Services, aimed at enhancing tutor effectiveness, communication skills, and student satisfaction. WSU Tutoring Services provides free tutoring to students through peer-based, online, and specialized instruction programs, aiming to support students' academic success. Despite these efforts, the service has faced challenges with student retention and negative perceptions due to varied tutoring quality.
A thorough needs assessment—incorporating organizational, person, and task analyses—highlighted significant areas for improvement. Organizational analysis identified the key issue of inconsistent tutoring effectiveness leading to dissatisfaction among students, negatively affecting student retention and overall usage of the tutoring service. The proposed simulation training addresses these issues by equipping tutors with strategies to effectively engage and assist students across diverse learning styles. Person analysis, gathered through surveys and interviews with current tutors and supervisors, focused on characteristics important to effective tutoring, such as communication skills, comfort with technology, and adaptability in instructional methods. Findings emphasized a gap in tutor preparedness to handle varied student learning styles and technology-related queries, suggesting a need for experiential and interactive training approaches.

Task analysis outlined the tutors' primary responsibilities, including explaining academic concepts, actively listening to student concerns, effectively managing multiple students, and offering study strategies. Interviews and feedback from supervisors and current tutors validated the importance and difficulty of these tasks. This analysis indicated clear training needs in enhancing tutors' communication skills and reliability, thus improving overall student satisfaction and tutor confidence.
The developed training program utilizes experiential and social learning theories to actively engage tutors through simulation and group discussion methods. The simulations involve role-play scenarios with experienced tutors acting as students, enabling new tutors to practice realistic tutoring situations. Group discussions further reinforce learning by allowing tutors to share experiences, techniques, and feedback, fostering a supportive learning environment.

Evaluation follows Kirkpatrick's four-level model: reaction-level evaluations gather immediate tutor feedback through surveys; learning-level evaluations use interactive quizzes and tests assessing tutor knowledge and preparedness; behavior-level evaluations include surveys for both tutors and students to determine real-world application of training; and results-level evaluations analyze overall tutoring effectiveness, improved student satisfaction, and tutor performance. A cost-benefit analysis is included to determine the training's financial viability and return on investment.

Ultimately, this training initiative aims to enhance tutor capabilities, improve student learning experiences, increase student retention, and strengthen the overall reputation of WSU Tutoring Services.

## Enhancing Employee Retention and Workplace Safety at Midtown Foods: A Structured Training Initiative

Noah Decker, Cole Dretzka, and Blake Wolff.
Faculty Mentor: Huh-Jung Hahn.

This project presents a structured training initiative designed for Midtown Foods, a locally-owned grocery store in Winona, Minnesota, addressing high employee turnover rates and improving workplace safety standards. Midtown Foods primarily employs high school and college students, benefiting from cost-effective labor while facing challenges related to retention, inconsistent safety practices, and minimal standardized training.

A comprehensive needs assessment identified key organizational, personnel, and task-related factors influencing employee turnover and safety issues. The organizational analysis underscored the necessity for standardized training processes and improved safety measures to address turnover among young employees. The person analysis, conducted via surveys and interviews, highlighted demographic factors such as age, job flexibility, limited experience, and the simplicity of entry-level roles. It further emphasized that flexible scheduling and streamlined training significantly affect employee retention. The task analysis, based on employee feedback and managerial insights, covered essential tasks across several departments including grocery, meat, produce, deli, dairy/frozen, and front-end operations. Critical tasks identified for targeted training included machinery operations, customer interactions, product stocking, and adherence to food safety and hygiene standards.

The training program's primary goal is to clearly communicate safety procedures, clarify job responsibilities, and establish effective operational practices. Objectives include enabling employees to demonstrate correct safety practices, clearly articulate role-specific responsibilities, and accurately identify hazardous chemicals. The program integrates Gagné's Theory of Instruction for structured hands-on learning, alongside Reinforcement Theory to promote positive behavior and motivation in the workplace.

Implementation strategies comprise instructional lectures enhanced by visual presentations, interactive videos, group discussions, and practical, hands-on exercises. Employees practice essential tasks such as cashiering, stocking, and cleaning, which reinforce theoretical knowledge and enhance practical skills. Evaluation employs Kirkpatrick's Four Levels framework. Reaction-level evaluations involve trainee surveys immediately following the training sessions. Learning-level evaluations utilize pre- and post-tests assessing safety knowledge, chemical handling, and understanding of job responsibilities. Behavior-level

evaluations use observational methods and checklists post-training, confirming practical skill application and improved workplace behaviors. The results-level evaluation includes a cost-benefit analysis measuring increased efficiency, reduced turnover costs, and enhanced safety practices, thereby assessing the training's overall effectiveness and return on investment.

In summary, this training program aims to significantly reduce employee turnover, improve workplace safety, and enhance overall employee effectiveness at Midtown Foods, supporting sustainable operational improvements and fostering positive community relationships.

# Chemistry

## $^{1}$H NMR analysis of sulfanilamide-based imines synthesized from aromatic aldehydes

Lily Glendenning, Kevin Dang, and Will Gunderson
Student Coauthor: Meagan Kaufenberg-Lashua
Faculty Mentor: Joseph K. West

In this project, we focused on the $^{1}$H NMR analysis of seven different imines synthesized by combining sulfanilamide, a classic antibacterial agent, with various substituted benzaldehydes. Our $^{1}$H NMR analysis provided detailed insights into the precise structures of these compounds, confirming their successful formation and purity beyond what was capable for other characterization methods such as mass spectrometry and IR spectroscopy. Purity analysis and structural verification of these compounds was performed in support of several related projects as part of a CURE-based laboratory experience in CHEM 213.

## A modern evaluation of crystal field theory

Leighton Stouffer
Faculty Mentor: Joseph K. West

We have performed a modernized analysis of *d*-orbital splitting patterns and relative energies by modeling the $Zn^{2+}$ ion in a variety of crystal fields at the wb97x/def2-TZVP level of theory in Orca. This study aims to provide a comprehensive understanding of the electronic structure and behavior of $Zn^{2+}$ in different crystal environments. By employing advanced computational methods, we have been able to accurately predict the energy levels and splitting patterns of the d-orbitals. Our work appears to uncover findings that contradict established conventions of crystal field theory, which could have major implications across all of inorganic chemistry.

## Advances in the attempted first ever synthesis of ebtellur

Alexander Gibbs
Faculty Mentor: Joseph K. West

Ebselen, first synthesized in 1924, was used to mimic the antioxidant activity of the glutathione peroxidase enzyme which was being used to relieve oxidative stress. Ebselen was found to be an

effective anti-inflammatory and antioxidant agent, as well as being cytotoxic to yeast, fungi, and bacteria. In 2020, ebselen underwent several clinical trials where it proved to be highly active in inhibiting the SARS-CoV-2 main protease causing Covid-19. Due to these promising results, ebselen underwent evaluation for its ability to combat the SARS-CoV-2 infection. In these trials ebselen was observed to be highly unselective, thus it bound to a minimum of 462 different proteins that are apparent in cells. This is a driving factor for the research of ebselen derivatives. Despite the promising results of ebselen, the heavier chalcogen version with tellurium, ebtellur, has never been reported. As such potential bioactivities are currently purely speculative. Computational studies performed demonstrate ebtellur's similar reactivity behavior to ebselen (with respect to peroxynitrite degradation) though exact bioactivities can only be determined experimentally, thus requiring a successful synthesis and isolation of ebtellur. The goal of this project was to first perform the first ever synthesis of ebtellur by trialing multiple routes successfully used to produce ebselen and derivatives thereof.

## An Analysis of Diversity in AI Image Generators

Meagan Kaufenberg-Lashua
Student Coauthor: Jaime Kelly
Faculty Mentor: Joseph K. West
Other Authors (non-WSU): Valeria Stepanova, Viterbo University

Women, minorities, and people with disabilities have been and continue to be underrepresented groups in STEM fields, including chemistry. Representational bias in mass media reinforces stereotypical views of underrepresented groups and can amplify belonging gaps within the chemistry field. The increasing development and use of generative AI raises the concern over how it will impact representation of the chemistry field in the media ecology. In this study, four Artificial Intelligence (AI) image generators: Adobe Firefly, DALL•E2, Craiyon, and DreamStudio, were utilized to produce "faces" of chemists with varying occupational titles. Images were analyzed for representational biases and compared to data available from National Science Foundation (NSF). Presentational biases were analyzed within American Chemical Society (ACS) Diversity, Equity, Inclusion, and Respect guidelines with a particular focus on presentation of diversity and disability. Amplification of both representational and presentational biases was observed for all four AI generators despite alignment of demographic trends with NSF and ACS reporting. Influences of occupationally-tied prompts (specific to chemistry) on demographic distributions of AI-generated images were investigated. At least one AI image generator assigned women and racial minorities to "assistant" positions while males and whites occupied the "top" positions in the field. Our data also demonstrates erasure of people with visible disabilities in the AI-generated outputs.

Students in chemistry classes at Winona State University were also surveyed on their perspective of "what a chemist looks like" with results showing a disturbing prevalence of a 'white male' image even for students identifying as female or a person of color. This data emphasizes the concerns about the use of generative AI perpetuating both representational and presentational biases in the chemistry field where substantial NSF and ACS efforts are being put forth to diversify and revitalize the next generation of scientists.

## An exploration of simple methods for the purification and separation of natural curcuminoids

Eion Hinkle
Faculty Mentor: Joseph K. West

The separation of curcumin from other naturally occurring curcuminoids, such as demethoxycurcumin and bisdemethoxycurcumin, presents significant challenges due to their similar chemical structures. Conventional methods like column chromatography are energetically and environmentally costly, requiring large amounts of solvents and extended processing times. Alternatively, preparatory scale high-performance liquid chromatography (HPLC) offers high precision but necessitates expensive equipment, making it less accessible for routine laboratory use. This research explores simpler and more sustainable approaches to purify curcumin, aiming to reduce both the environmental impact and the financial burden associated with traditional separation techniques.

## An exploration of solvatochromism using anthranilic acid-based azo dyes

Kloe Dahl, Ella Denno, Ayla Sorg, and Nolan Spanier
Faculty Mentor: Joseph K. West

Solvatochromism, the influence of solvent on UV-visible spectra, was explored using an array of highly colored azo compounds (substances containing a N–N double bond). Visible absorption spectra of azo compounds formed from anthranilic acid and naturally occurring phenols were dissolved three different solvent types: polar protic, polar aprotic, and non-polar to ascertain their effects in terms of "red" or "blue" shifting of the observed spectra.

## Analysis of Rabies Neutralizing Antibody Titers in the Feline Population of Winona County

Elise Betcher
Olivia Hendrickson and Jensen Christensen
Faculty Mentor: Jonathon Mauser

Canine rabies vaccination, vital for both animal and human health, is well studied and understood. In contrast, the current understanding of feline rabies vaccinations, particularly with those that have a compromised immune status, is much less comprehensive. The purpose of this project is to enhance our current knowledge of feline vaccination states through a surveillance study on the feline rabies antibody titer in Winona County's cat population. Specifically, we seek to explore the relationship between an individual feline's immune status and their active anti-rabies antibody titer. To achieve this, a bicinchoninic acid (BCA) protein assay was conducted to determine the total protein composition in each sample. Afterwards, an ELISA (enzyme-linked immunosorbent assay) was performed to assess rabies antibody titer levels in each sample. In this presentation, we share the findings of this study and show how this data correlates with the feline's immune status and age.

## Assessing the Bioactivity of Ruthenium β-Diketonate Complexes Through Kirby-Bauer Disk Diffusion and Monitored Real-Time Growth Assay

Dylan Wolfe
Student Coauthors: Regan Stefanoni and Celeste Remolina

Faculty Mentors: Jonathon Mauser and Joseph K. West

Ruthenium(II) β-diketonate complexes present a novel approach for combating a wide range of pathogens. While similar complexes have shown some anticancer properties, their use as an antimicrobial has gone mostly unexplored. This study seeks to investigate the potential antimicrobial properties of a variety of these complexes including some curcuminoid-substituted complexes. Curcuminoids were specifically chosen as a ligand as they are analogues of curcumin, found in turmeric, which has shown some antimicrobial activity. Using Kirby-Bauer disk diffusion assays, we screened these compounds for activity against *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*. Compounds exhibiting antimicrobial activity were subsequently subjected to a monitored real-time growth assay to further evaluate their bioactivity. To date, one candidate has shown promising results against *E. coli* and *S. aureus* in preliminary screenings, with additional compounds being tested. As antibiotic resistance continues to rise, identifying new therapeutic agents becomes increasingly urgent. The results from this investigation may serve as a foundation for further *in vitro* and *in vivo* studies, advancing the development of these compounds as potential drug candidates.

## Bioactivity assays of synthesized sulfanilamide-based imines.

Ella Ziel de Cruz, Elliott Bijnagte, Emily Roos, and Ashley Lopez
Faculty Mentors: Jonathon Mauser and Joseph K. West

We have examined the bioactivities of imines synthesized from sulfanilamide and aromatic aldehydes. Assays including disk diffusion and cell growth inhibition were performed on *E. coli*, *P. aeruginosa*, and *S. aureus*. In conjunction with this, optimized structures of these imines were docked with dihydropteroate synthase using SwissDock to determine relative binding energies. Comparisons between docking results and bioactivity assays were made to evaluate the correlation between binding affinities and antibacterial efficacy.

## Catalytic testing of Sn(IV) complexes for the formation of polylactide

Mayra Aguilar, Owen Paulson, Logan Nelson, and Shawn Hoglund
Faculty Mentors: Robert Kopitzke and Joseph K. West

Polylactide is a biodegradable polymer commonly used in medical applications, packaging, and textiles due to its environmentally friendly properties and ability to be produced from renewable resources. Coordination complexes of tin are conventionally used for ring-opening polymerization of lactide. Several tin(IV) complexes of the form Sn(β-diketonate)$_2$Cl$_2$ have been tested for their ability to catalyze the formation of polylactide with comparisons made to the industrially used, bis(2-ethylhexanoate)tin(II). The catalysts' performance was assessed by yield and NMR analyses.

## Deep Tissue Massage-Induced Muscle Damage is Associated with Delayed Onset Muscle Soreness (DOMS) and Rhabdomyolysis

Micah Maddio, Bailey Kerkow, Logan Murphy, and Ashley Wise
Student Coauthor: Marisa Wood

Faculty Mentors: Kent Hansen and Jonathon Mauser
Deep tissue massages are a common form of recovery for those who undergo strenuous physical activity. Delayed Onset Muscle Soreness is often a result of cell damage and tissue inflammation. Rhabdomyolysis, the breakdown of muscle tissue into the bloodstream, is diagnosed via excess muscle protein content. This research assesses the effects of post-activity deep tissue massage on three biomarkers: myoglobin, interleukin-6, and creatine kinase M using enzyme-linked immunosorbent assays (ELISA), and the effects on skeletal muscle health were assessed.

## Detection of Carbaryl in the Southeastern Minnesota Watershed using HPLC Methods

Olivia Funke
Faculty Mentor: Jeanne Franz

After World War II, farmers were reliant on synthetic insecticides to control insects and increase crop yield. With an ever-growing human population, the demand for food, pesticides, and fresh water has increased. One such insecticide, carbaryl, has been heavily used since its commercial introduction in the 1960s. As of 2006, carbaryl was the second most frequently detected insecticide in water and has been detected in 50% of monitored urban streams. Due to this abundance in our natural waters, methods to detect carbaryl in such water is important. A method that uses a High-Performance Liquid Chromatography, or HPLC, instrument was created. HPLC was chosen due to its high sensitivity in detecting the number, amount, and purity of pollutants in water. A calibration curve and internal standard was constructed on the HPLC instrument. This was done by creating solutions of carbaryl and methanol in increasing concentrations of 2.5, 5, 7, and 10 ng/mL respectively. The internal standard chosen was naphthol because it would not normally be found in the environment and its peak appeared at a drastically different time than carbaryl. Carbaryl was found to display a peak at about 5.5 minutes and naphthol had a peak at about 8 minutes. To test carbaryl in natural water, integrating a method using Solid Phase Extraction is needed and still must be created. These steps were taken to hopefully determine if carbaryl exists in natural water in the Southeastern Minnesota watershed.

## Developing an Enzymatic Assay for Wine Analysis

Alexander Charles
Student Coauthor: Taylor Pagel
Faculty Mentor: Jonathon Mauser

Malolactic acid fermentation (MLF) is a secondary fermentation process that is an important refinement step in winemaking. In this process, bacteria degrade malic acid, a sour compound, to lactic acid which has a smoother flavor. This research aims to develop a quantitative assay that can accurately measure the progression of fermentation in close to real-time as supposed to traditional paper chromatography, increasing cost-effectiveness, efficiency, and reliability. The novelty in this approach involves the

enzymatic monitoring of malate and lactate concentration simultaneously, utilizing the UV-absorbance of NADH that is formed in the process. Here we describe a method for monitoring MLF using a malate-to-lactate ratio that allows for a quantitative approach to judging the completion of malolactic fermentation.

## Development of a gas chromatographic method for the determination of alcohols in hand sanitizers

Alex Gibbs
Faculty Mentor: Jeanne Franz

The purpose of this research was to determine which alcohols are present in commonly found hand sanitizers and what their unknown concentrations are. In addition to determining the concentration of alcohol in hand sanitizer, the research performed was implemented as a new piece of curriculum in the instrumental analysis class. This research allowed for the design of a lab that allows students to obtain hands on experience with the GC-FID while learning about its performance and capabilities. The GC-FID was used as the piece of analytical instrumentation for the determination of alcohol concentration in hand sanitizers. This test required the use of internal standards, calculations, dilutions, and proper instrument analysis. The GC-FID was chosen for this research due to its ability to accurately measure highly volatile chemicals at extreme precision. Each alcohol was initially tested alone with the internal standard to determine retention time and to give a known concentration value for an area under the curve. Many adjustments were made to the GC-FID method to obtain the most accurate values. The results show that both of the store-bought hand sanitizers do not meet FDA standards. The amount of ethanol measured in both samples was also less than what was listed on the hand sanitizer container. The Wish Peach Hand Sanitizer was measured at 46.6% ethanol concentration while the package said it contained 70% ethanol. This leads to a percent error of 50.21%. The Symmetry Hand Sanitizer had much more accurate results, the observed value was 59.08% and the package had a concentration of 62%. This yields a percent error of 4.94%. This signifies the accuracy of the method that is being tested. The large reason for error in the Wish Hand Sanitizer would be due to the consistency of the sanitizer. The micropipette struggled to pick up the hand sanitizer making it difficult to accurately quantify.

## Development of a Hybrid Synthetic and Computational Teaching Lab Exercise Featuring Budotitane

Kezia Lemke
Faculty Mentor: Joseph K. West

Budotitane is notable for its reported activity against cancer cells as well as its array of geometric structural possibilities. Preparation of budotitane, bis(1-phenyl-1,2-propanedionato)bis(ethoxy)titanium(IV), and its subsequent characterization by 1H NMR and IR spectroscopies as well as mass spectrometry has been implemented in an upper-level inorganic chemistry course. Computational modeling has also been utilized to predict the most energetically favorable isomer, as well as to generate modeled spectra for comparison to experimentally obtained results.

## Development of a RAPTA complex synthesis and characterization lab for an upper-level inorganic chemistry course.

Celeste Remolina
Student Coauthor: Meagan Kaufenberg-Lashua
Faculty Mentor: Joseph K. West

Ruthenium-arene-PTA complexes are rapidly garnering attention for their applications in medicinal chemistry. We have developed a multi-week teaching lab exercise conducted in CHEM 450 Advanced Inorganic Chemistry I in which students synthesize (p-cymene)(avobenzonate)(triazaphospha-adamantane)ruthenium(II) triflate as well as the triazaphosphaadamantane ligand itself. Characterization of the complex and ligand was completed using primarily NMR spectroscopy ($^{1}$H and $^{31}$P) and mass spectrometry. Molecular modeling of NMR spectra have proven effective at the modest r$^{2}$SCAN-3c level of theory, for accurately predicting chemical shifts. This lab development has paved the way for us to pursue new complexes with alternative β-diketonate ligands in lieu of avobenzone.

## Electronic structure analysis of sulfanilamide-based imines

Jennifer Murray, Luke Krall, Kora Webster, and Sam Fenske
Faculty Mentor: Joseph K. West

In this project, we focused on the properties modeling of sulfanilamide-based imines by modeling synthesized compounds in both *cis* and *trans* forms. Our aim was to mine properties for alignments with bioactivity results. The results, specifically the energies, were analyzed to determine the effects of substituents on isomer selection as well as other properties. Electronic properties, specifically population analyses of key atoms, have been conducted as well.

## Investigations of anthranilic acid-based azo dyes as chemical detectors for $Pb^{2+}$

Bethany Boerner, Grace Menke, Daniela Gutierrez Rubio, and Campbell Casper
Faculty Mentor: Joseph K. West

We have explored the use of azo compounds synthesized from anthranilic acid and natural phenols for the detection of lead(II) ions. These azo compounds, in their deprotonated form, bind to lead ions through the carboxylate and a nitrogen atom of the azo group. In some cases, visual detection is sufficient to verify the presence of $Pb^{2+}$ ion. Spectrophotometric analyses of solutions of the uncoordinated dyes and their $Pb^{2+}$ complexes were also compared.

## Late, *3d* transition metal complexes of bis(diphenylphosphino)methane dichalcogenide ligands

Connor Lehner
Faculty Mentor: Joseph K. West

Complexes of bis(diphenylphosphino)methane dichalcogenides (dppm$E_2$, E=O, S, Se) have been prepared for $Co^{II}$, $Ni^{II}$, and $Cu^{II}$ by combination with respective nitrate salts. These ligands are relatively

unexplored for 1st row transition metals - with no existing reports of metal complexes for $dppmSe_2$. All obtained complexes were paramagnetic precluding characterization by NMR spectroscopy. An array of methods have been employed to ascertain structural and electronic forms of all obtained complexes as both tetrahedral and octahedral geometries, corresponding to systems with two or three ligands, respectively, are plausible. Additionally, all octahedral $Co^{II}$ complexes, as $d^7$ systems, could potentially be found in either high spin or low spin configurations. All complexes have been characterized by magnetic susceptibility, IR spectroscopy, mass spectrometry, and UV-Vis spectroscopy. Initial analysis by X-ray crystallography is also underway.

## Modeling cis/trans preferences of $Sn(acac)_2Cl_2$ complexes

Luke Rising, Hanna Sunsdahl, Matthew Burrows, and Juan Carlos Feregrino Ponce
Faculty Mentor: Joseph K. West

Tin(IV) complexes bearing two chloride ligands and two symmetric β-diketonate ligands exhibit octahedral geometries. As such, they can theoretically present in two geometric isomer forms, *cis* and *trans*. Modeling of isomeric forms of these Sn(IV) complexes with five different β-diketonate ligands has been conducted to identify overall preference as well as to attempt to ascertain any influence the ligand's own electronic properties has on exhibited isomeric preference. Additionally, modeled IR spectra of *cis* and *trans* forms were compared to determine the utility of that characterization method in distinguishing these isomers.

## Modeling SOD1 Enzyme Mutations: Biochemistry II Lab Class Project

Jenna Bolduan and Elizabeth Haumont
Faculty Mentor: Emily Ruff

Superoxide Dismutase 1 (SOD1) is an enzyme that catalyzes the detoxification of reactive oxygen species that cause damage to the body. Mutations of this protein can cause diseases, such as Amyotrophic Lateral Sclerosis (ALS). The structures of the SOD1 wild type and two of its deleterious mutations (A4V and L126*) were digitally modeled using the AI program AlphaFold3. Although a literature structure exists for A4V, no experimental structure data has been collected for L126*. The wild type and A4V structures were virtually identical, whereas the wild type and L126* structures had quite different features, with the mutant being smaller and having more protrusions. The wild type and L126* structures had molecular surface models created, which were then 3D printed. Protein structure visualization using AI software modeling and 3D printing can be used to show how protein mutations can cause structural changes, which in turn alter protein function, causing disease.

## Molecular Dynamics Simulations of Curcuminato-($\eta^6$-p-cymene)ruthenium(II) Docking in the Minor Groove of DNA: Evaluating Equilibrium Stability via 2D RMSD Analysis

Jarrod Ring
Faculty Mentor: Hanah Leverentz-Culp

Molecular dynamics simulations were conducted to study the interaction between Curcuminato-($\eta^6$-p-cymene)ruthenium(II) and DNA, focusing on minor groove binding at the N7 position of guanine. The

system equilibrated at approximately 170 picoseconds, with the lowest potential energy configuration of -36.271 kcal/mol observed at 251 K at 464 picoseconds. The simulated Ru-N7 distance was 8.55 Å, contrasting with the literature-reported value of 2.824 Å, highlighting the influence observed over time evolution of the system on key interaction. The root-mean-square deviation (RMSD) matrix stabilized at approximately 2.30 Å at equilibrium, reflecting the conformational stability of the system. Temporal profiles of temperature, potential energy, and total energy further characterized the equilibration and stability processes. These findings advance the understanding of ruthenium-curcumin complexes in biomolecular systems and their potential therapeutic applications.

## NMR analysis of $Sn(acac)_2Cl_2$ complexes

Olivia Miller, Luke Rising and Braelyn Terrill
Faculty Mentor: Joseph K. West

In this project, we focused on the NMR analysis of five different Sn(IV) complexes synthesized by a β-diketone with $SnCl_2$. Our analyses provided detailed insights into the precise structures of these compounds, confirming their successful formation and purity beyond what was capable for other characterization methods such as mass spectrometry and IR spectroscopy. Additionally, these results were combined with modeled NMR to attempt to ascertain cis to trans ratios of the complexes in solution.

## Product selection analysis for azo group formation by computational modeling

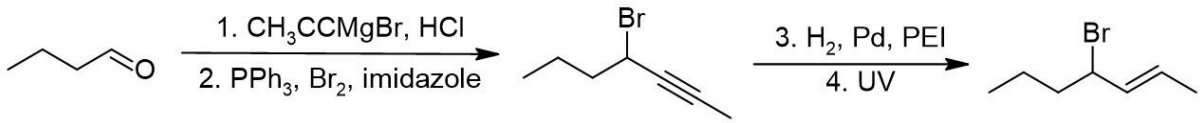
Ellery Appel, Mason Wadewitz, Katalena Hay and Wyatt Laborde
Faculty Mentors: Hannah Leverentz-Culp and Joseph K. West

Theoretical predictions of the relative stabilities (measured by Gibbs free energy values) and infrared (IR) spectra of structural isomers of several azo compounds were computed using molecular modeling software. Correlation between the location of the nitrogen attachment site to a phenol compound and relative isomer stability was investigated. Theoretical IR spectra were compared to experimental spectra for these compounds to assess the validity of the theoretical stability predictions.

## Progress Towards the Synthesis of trans-4-Bromo-2-Heptene

Ava Dillon
Faculty Mentor: Thomas Nalli

*trans*-4-Bromo-2-heptene **(1)** is a simple compound that has never been synthesized in pure form and could be a useful starting material for organic synthesis. Therefore, the goal of this research is to synthesize **1** with a multistep synthesis. The synthesis starts with the preparation of hept-2-yn-4-ol **(2)** via a Grignard synthesis with the triple bond acting as a masking group for the alkene. The alcohol is converted to 4-bromo-2-heptyne **(3)**. Step 3 is the most crucial step of selectively reducing the triple bond to the desired double bond. Finally, because the reduction should produce the *cis* alkene, the last step is isomerization, to produce **1** (Scheme 1). Our current progress through step 2 will be reported.




## Searching the crystallographic structure databases in support of targets for chemistry CURE projects.

Megan Gerlach
Faculty Mentor: Joseph K. West

We used Conquest to search the Cambridge Structural Database (CSD) for chemical structures related to ongoing Course-Based Undergraduate Research Experience (CURE) projects in the chemistry curriculum and the "Crystal Project" in CHEM 451 - Advanced Inorganic Chemistry II as well as CURE projects in CHEM 213 Principles of Chemistry II. Our goal was to verify if the target structures had already been reported or published as crystal structures. Additionally, we reviewed the Crystallography Open Database (COD) to ensure thoroughness. This search effort helps CURE projects by confirming that there are no previously reported structures, enabling students to hopefully pursue new crystal reports and publications.

## Synthesis and characterization of a range of imines carrying a sulfonamide functional group

Grayson Caron, Cuecueyatzi Ayauhcozamalotl, Noah Kleinwort, and Ben Pederson
Faculty Mentor: Joseph K. West

In this study, seven different imines were synthesized and characterized using mass spectrometry, IR spectroscopy, and melting point determination. All imines were made by combining sulfanilamide, a classic antibacterial agent, with various substituted benzaldehydes. The characterization techniques provided detailed insights into the structural properties of the synthesized imines, confirming their successful formation and purity. Synthesis of these compounds was performed in support of several related projects as part of a CURE-based laboratory experience in CHEM 213.

## Synthesis and characterization of anthranilic acid-based azo compounds

Josie Tieskoetter and Tatum Maves
Faculty Mentor: Joseph K. West

A series of highly colored azo compounds have been prepared from the diazotization of anthranilic acid followed by its combination with an array of naturally occurring phenols. These compounds have all been characterized by mass spectrometry, IR spectroscopy and melting point determination. In a few select instances, single crystals have been grown and analyzed by X-ray diffraction. This research was performed in support of several related projects as part of a CURE-based laboratory experience in CHEM 213.

## Synthesis and characterization of bis(avobenzoate)dichloridotin(IV) and attempted identification of its preferred isomeric form

Wallace Whelan
Faculty Mentor: Joseph K. West

Bis(avobenzoate)dichloridotin(IV) was synthesized and characterized to identify its preferred isomeric form. Avobenzone, an asymmetric β-diketone, was utilized in the formation of this octahedral complex, which follows the general formula type $M(AA')_2B_2$. This configuration gives rise to five different geometric isomer possibilities, each with distinct spatial arrangements. The research aims to identify the most stable isomeric form through various characterization techniques, providing insights into the complex's chemical behavior and potential applications.

## Synthesis and characterization of bis(β-diketonato)dichloridotin(IV) complexes

Brenna Korneck, Kole Koehler, and Michael Dietz
Faculty Mentor: Joseph K. West

Several tin(IV) complexes bearing two chlorides and two β-diketonate ligands have been successfully synthesized. These complexes were easily afforded by the open-air oxidation of $SnCl_2$ in either a solution of the β-diketone or in the neat liquid ligand itself. All complexes were characterized by mass spectrometry, and NMR and IR spectroscopies. In some cases, single crystals were isolated and analyzed by X-ray diffraction. These complexes have been produced in support of several related projects as part of a CURE-based laboratory experience in CHEM 213.

## Synthesis and characterization of cationic PTA complexes with ruthenium

Meagan Kaufenberg-Lashua
Student Coauthor: Dylan Wolfe
Faculty Mentors: Joseph West and Jonathon Mauser

1,3,5-triaza-7-phosphaadamantane (PTA) is a tertiary, cage-like phosphine that is often used to increase the aqueous solubility of transition metal complexes, most notably in the well-studied class of ruthenium-arene PTA (RAPTA) compounds, extensively studied for their antitumoral activity. Increasing solubility and maintaining structure in an aqueous environment are two approaches we are currently pursuing to find more active species. We have prepared novel, cationic PTA complexes with ruthenium-cymene. These have been characterized by NMR, MS, IR, and UV-vis spectroscopies. Additionally, preliminary analysis of their biological activities against common bacteria have been conducted.

## Synthesis, characterization, and exploration of binding mode preference for the complex of iron with the antibiotic cefdinir

Meagan Kaufenberg-Lashua and Alexander Gibbs,
Student Coauthors: Kaylee Beyer and Nathan Gentner
Faculty Mentor: Joseph K. West

Cefdinir is a common antibiotic used to treat an array of bacterial infections of the upper respiratory system. A common side effect observed in patients with high iron diets (typically formula-fed infants and supplemented geriatrics) is a distinctive non-bloody, red stool. This has been attributed to complexation of iron (III) by cefdinir. Cefdinir has multiple Lewis basic sites where iron could bind after deprotonation. The structure of the iron-cefdinir complex has been proposed with binding through the oxime group, however the structure has not yet been proven. An array of binding modes have been modeled to compare energies and predicted spectra (IR and UV-vis) alongside experimentally obtained spectra. Two different preparatory methods have been utilized providing distinctly different products bringing into question analyses from previous studies.

### Using Fluorimetry and Colorimetry for Quantitative Analysis for Biomaterial-Derived Carbon Dots

Kahun Vue
Faculty Mentor: Jeanne Franz

The pursuit of sustainability in nanomaterial synthesis has led to the exploration of biomaterial-derived carbon dots (CDs) as an eco-friendly alternative to conventional methods. This study investigates the synthesis, characterization, and application of CDs derived from various biomaterials, including shrimp shells, food waste, cellulose, keratin, and saccharides. By employing hydrothermal, microwave, and ultrasound-assisted synthesis techniques, this research aims to develop a green, cost-effective approach to producing CDs while reducing environmental impact.

Previous work used shrimp shells as a starting material for a green CD. This work starts with shrimp shells to ensure reproducibility. In the future, novel materials like food waste derivatives, cellulose-based sources, protein-rich materials, and sugar derivatives will be used. The physicochemical properties of these CDs will be assessed through fluorescence intensity, photostability, metal ion selectivity, and synthesis efficiency.

Fluorometric and colorimetric methods will be assessed to analyze the CDs' effectiveness in quantitative detection. Fluorescence spectroscopy will be used to assess the sensitivity and selectivity of the CDs for specific ion detections, while colorimetric detection will be applied for hydrogen peroxide and glucose analysis. The integration of these techniques will demonstrate the versatility of biomaterial-derived CDs in real-world applications, such as environmental monitoring and biomedical sensing.
This research aligns with the principles of green chemistry by repurposing waste materials into valuable nanomaterials, thereby reducing reliance on fossil fuel-based resources. The expected findings will provide insight into the feasibility of sustainable CDs, paving the way for cost-effective and environmentally friendly alternatives in green chemistry.

# Communication Studies

## "I didn't understand what it was to be a mom until I became one:" Gender and Cultural Influence on Hmong Mother-Daughter Relationships and Communication

Serenity Xiong
Faculty Mentor: Tammy Swenson-Lepper

The relationship between mothers and daughters is a complex bond that differs from person to person and is significantly shaped by cultural influences. The research in this area aims to reveal those cultural norms--the Hmong culture being the primary focus of the study--and values play a crucial role in defining the dynamics between mother-daughter relationships impacting their communication, expectations, and expression. To first understand the different dynamics that may exist between mothers and daughters in the Hmong culture, grasping the history of the importance of familial roles is essential. The Hmong demographic is an existing ethnic group part of various areas of Southeast Asia and a growing population in the west (Lor, 2013). The Hmong culture places great importance on family and community, viewing these elements as central to their way of life (Tatman, 2004), and to create structure the culture was dependent on a system that had men holding the primary authority in the household and women tending to domestic duties. These cultural practices create distinct roles, expectations, and responsibilities for both men and women. This then creates a domino effect as mothers in Hmong culture are typically the example for their daughters, being a primary factor in how communication occurs and thus affects the relationship and relationship satisfaction between mothers and daughters.

RQ: What is the influence of gender in culture and how does it affect the dynamic and communication between mothers and daughters?

To gain accurate and relevant data, the methods of research in this study inhabits qualitative research. Conducting an array of interviews with 13 Hmong daughters in between the ages of 18-28 years old through a snowball sample allowed for different perspectives and insight to the different mother-daughter dynamics that exist. In preparation of the interview, a list of 15 questions were formulated to gauge relationship satisfaction, communication satisfaction, conflict resolution, and cultural influences on relationships. Through thematic analysis on the interviews, common themes and patterns are being coded into various categories and examined. This research aims to expand perspectives and observe how different factors, culture specifically, affect communication and relationship satisfaction between mothers and daughters in ways that enlarges or minimizes that gap. Current themes that have been identified include: gender roles and expectations, miscommunication, values and beliefs, and motherhood. Final analysis of the themes will be completed by the Research and Creative Achievement Day.

## Examining the Relationship Between Media Literacy and Susceptibility to Misinformation

Cameron Domnick
Faculty Mentor: Tammy Swenson-Lepper

The purpose of this study is to analyze the relationship between media literacy and misinformation susceptibility. As technology has developed and continues to develop, the ways that people get their

news and information have changed immensely. With the rapid integration of AI into search engines and social media posts, misinformation poses an increasing threat to information consumption. The study of misinformation in an ever-evolving digital world is crucial to keeping up with how misinformation is spread, why it is spread, and how it can be combatted. Media literacy is more important than ever as new forms of media, such as social media platforms, are becoming increasingly popular. An example of why media literacy is so necessary is that "the top 25 per cent COVID-19 videos containing misinformation on YouTube collectively received over 60 million views" (Van der Linden, 2023, pp. 93-94). Because of how prominent the issue of misinformation is in present day society, the relationship between media literacy and misinformation susceptibility is an important and relevant area of study. RQ: How does media literacy affect susceptibility to misinformation?

The data for this study is being gathered through a quantitative Qualtrics survey that has been spread through social media, email, informational materials, and word of mouth. Though the only requirement to participate is to be over 18 years old, the majority of participants are undergraduate students under the age of 21. The survey questions consist of a basic demographic section, the Media Literacy Scale (MLS) to measure media literacy, and the Misinformation Susceptibility Test (MIST) to measure susceptibility to misinformation. This survey has 133 responses, with a minimum goal of 202 responses. All data will be collected and then analyzed using a Pearson's Product Moment Correlation Coefficient by the Creative Research Day.

## Explaining Academic Barriers of Two – Four Year and Four – Four-year Transfer Students and Their Academic Success in Higher Education

Hannah Boudreaux
Faculty Mentor: Tammy Swenson-Lepper

The purpose of this study is to find the academic challenges and barriers of transfer, lateral, and reverse transfer students. A transfer student is a student who transfers from a two-year college to a four-year institution. A lateral student is a student who transfers from a four-to-four year. Lastly, reverse transfer student is a student who transfers from a four-year institution to another for year institution. Marling (2013), Mikell and Davis (2022), and Chen and Hagedorn (2020). Marling (2013) examined the statistics of how many students are transfers, noting "One - third of all students transfer during their college career and of those transfers, 25% transfers more than once" and "it is important to note that 43% of students transfer from a four year to a two-year institution." Chen and Hagedorn (2020) examined reasons why students transfer find that "students transfer due to significant academic challenges at the four-year institutions; others may earn additional credits during the summer thus expediting the academic progress towards a bachelor's degree." Mikell and Davis (2022) examined the challenges of identity and belonging. As a student who transferred from a two-year college, I find it important to identify challenges and barriers that transfer students go through. Two research questions for this study outline the challenges that transfer students face. RQ1: What resources were most/least helpful for transfer students? RQ2: What role did effective communication play in the transfer, lateral, reverse transfer process?

In this study, in depth interviews were conducted with participants between the ages of 18 – 25 who have transferred between two – four-year colleges, four – two-year college, and four – four-year colleges. In this study 14 questions were asked to analyze the academic challenges and barriers of all transfer students. Two of the interview questions are, "What were challenges in the transfer process"

and “How did you overcome said challenges in your transfer process”? The results are being analyzed through a thematic analysis looking for repetition, forcefulness, and recurrence. The results thus far in the interviews have demonstrated a few following themes: advising approaches, mental health challenges, and reasons for transferring. Results will be fully finalized by the time of the poster presentations.

## Exploring How Pronoun Disclosure on Resumes Results in Differing Evaluations of Hireability

Samantha Dischinger
Faculty Mentor: Tammy Swenson-Lepper

It is impossible to deny that the use of pronouns exists in the English language, and it is almost as hard to deny the use of "they" as a singular or first-person pronoun. "They" as a singular pronoun has been traced back to 1375 in William and the Werewolf, a medieval romance, and the use of singular "they" may also date further back than that in verbal tradition (Baron, n.d.). Despite the fact that 'they' is used as a pronoun, there is still stigma and bias against those who do not conform to binary pronouns. While this could be studied in a multitude of applications, I have chosen to look at the effect that pronoun disclosure on resumes has on hireability evaluations.

The use of gender-neutral pronouns on resumes is a subject that is sorely lacking research. One major study that looks at the effects of they/them pronouns on resumes is a working paper by Eames (2024) that looks specifically at pronoun disclosure and hiring discrimination. Through this research it was discovered that 66% to 70% of discrimination is based on their nonbinary identity and pronouns (p. 37). Another study on pronoun use was conducted by Charette et al. (2024). The study analyzed how masculine/feminine/neutral stereotyped job listings would impact hireability evaluations. They did, discover a small interaction between interpersonal comfort scores and perceptions of hireability for she/her and they/them pronouns. Because of this interaction they predict that their study "could characterize a broader phenomenon where individuals who have more positive feelings towards both nonbinary individuals may also feel positively towards low status groups generally (i.e., women, trans individuals, etc.)" (Charette, 2024, p. 7). They also acknowledge and hypothesize that people who disclose neopronouns or multiple pronouns "would be perceived as less hireable than those using they/them pronouns due to unfamiliarity" (p. 8).

The hypotheses of this study predict a general bias against those who display pronouns and those use pronouns other than the traditional "he/him" and "she/her" on their resumes. This study used a Likert scale to measure hireability evaluations of respondents based on a sample resume. The sample resumes display a random treatment of pronouns (no pronouns listed, he/him, she/her, they/them, or zie/zir) with no other gendered information. Distributed through LinkedIn, other social media sites, and word of mouth, there are no limitations regarding age (other than respondents must be over 18), gender, race, or socioeconomic status, except that all participants will need technology to complete the survey. The survey currently has 289 responses. All data collection will be complete, and data will be analyzed using an ANOVA statistical test prior to Research and Creative Achievement Day.

## How Groups of Psychological Abuse Use Communication to Manipulate and Coerce Victims into Joining and Staying in Their Groups

Sofia Lane
Faculty Mentor: Tammy Swenson Lepper

Groups of Psychological Abuse (GPA's) include groups such as cults and religious extremist groups, where they inflict emotional, physical, and even sexual abuse on their members, and maintain a level of control over their daily decisions, communication and finances in order to manipulate members into staying in their GPA (Saldaña et al. 2024). Throughout this study there is a comprehensive review of literature, defining what a Group of Psychological Abuse is, how they use methods of manipulation and coercion to gain members and keep them loyal to their groups. This study also examines the effects of the abuse inflicted on these victims throughout their time as a member of a Group of Psychological Abuse. GPA's have hierarchal systems that ensure that only a select number of people in the groups get to make the decisions for the subordinate members involved in the GPA.

The purpose of this qualitative content analysis and thematic analysis is to code public court documents from groups that are commonly recognized as a Group of Psychological Abuse, and analyze the documents in order to code what methods of abuse are most commonly utilized. The GPA's that will be focused on are Scientology, fundamentalist Mormonism, and NXVIM, all groups that are still active today. Five public court cases from each GPA will be utilized in this study and coded using categories of abuse and the effects according to Scholar M. Saldaña (2024) and their colleagues. How communication is used in dark and manipulative ways and the lasting psychological effects on the victims involved will also be coded. Some specific categories that will likely be used are control over finances, communication and time, emotional abuse, and isolation. The qualitative analysis of these public court cases will be completed by Research and Creative Achievements Day.

## Intercultural Communication Competence and Interpersonal Communication Skills in Working Abroad and Study Abroad Alumni in the Global Workplace

Taylor Matzke
Faculty Mentor: Tammy Swenson Lepper

We are living in an interconnected world where individuals will encounter people from different cultures in the workplace. Employers seek employees that are culturally competent and open to working with people from different cultures. According to the American Association of Colleges and Universities (2024), studying abroad is a high-impact practice that significantly benefits students' education. Studying abroad fulfills the Diversity/Global Learning high-impact practice in higher education. Kilgo et al. (2015) emphasize that studying abroad increases critical thinking skills, cognitive development skills, openness to different cultures, intercultural effectiveness, and civic engagement. In 2021, Finley interviewed 496 business executives about what they look for when hiring employees; 53% of business executives strongly agree that candidates who can effectively communicate and work with people from different cultural backgrounds. In comparison, 36% acknowledge that it is somewhat important when hiring employees. These results show that studying abroad is a worthwhile investment and has long-term effects leading to employment. Farrugia and Sanger (2017) investigated how study abroad alumni developed interpersonal communication skills (ICS). 56.8% of respondents believe their interpersonal

communication skills exponentially increased, whereas 33.7% moderately increased. However, they did not include results or surveys from working professionals who had not studied abroad or non-study abroad students.

H1: Students who participated in longer short-term study abroad programs (longer than 2 weeks) or worked abroad developed more ICS that can be transferred to the global workplace.

H2: Students who have studied or worked abroad have higher levels of ICC than those who have not.

RQ1: How do the levels of ICC in students who have participated or worked abroad in study abroad programs (longer than 2 weeks) relate to the development of ICS that are transferable to the global workplace?

The purpose of this study is to investigate the intercultural communication competence (ICC) in non-study abroad students, study abroad alumni, and working abroad professionals (including Peace Corps Volunteers) and how strong interpersonal skills learned while abroad transfer to the global workplace. The study consists of two parts, a survey and in-depth interviews. For the survey part of the study, ICC consists of intercultural sensitivity (IS) and communication competence. (CC). IS is measured by utilizing Chen and Starosta's (2000) Intercultural Sensitivity Scale. CC is determined by Wiemann's (1997) Communication Competence Scale. ICS is measured through the Interpersonal Communication Competence Scale (Rubin & Martin, 1994). The goal is to have 150 people participate in the survey. Approximately, 10-15 study abroad alumni and working professionals abroad will be interviewed to reinforce how ICS learned while abroad in their careers and industries. The results from interviews will be examined using thematic analysis.

The goal of this study is to discover if studying or working abroad increases or decreases one's ICC by comparing non-study abroad students' results to study abroad alumni and working professionals abroad.

## Phone, Text, or Social Media: Different Types of Communication Methods/Media and Their Influence on Father Daughter Relationship Satisfaction

Gabriella Lamont
Faculty Mentor: Tammy Swenson Lepper

The purpose of this study is to see how methods/media of communication affect the satisfaction of father daughter relationships. I am looking to see if different media or methods increase satisfaction levels when it comes to father daughter relationships. For the literature reviewed it has been found that father-daughter communication is a big part of how daughters form relationships in the future with other people. It has also been found also that when fathers have a more open method of communication with their daughters, the daughters are less likely to be anxious and they are more likely to have better communication. Kim et al., (2015) suggest that when looking at different types of communication most research had been done on face-to-face communication rather than any other media types because texting and social media are still new and people are s starting to study these topics. When it comes to satisfaction of relationships I have found many different types of articles on this topic. What stood out most in this study was that when it comes to satisfaction of relationships

people can have different levels of satisfaction for the same relationship (Punyanunt-Carter, 2007). People can have different levels of satisfaction because satisfaction is based on whether people meet someone else's expectations in the relationship. So if people have different expectations they will have different levels of satisfaction based on what the other person is doing.

RQ1: Are there differences in satisfaction levels when fathers and daughters mainly communicate over the phone rather than communicating face to face?

RQ2: What impact does only communicating over the phone have on father-daughter relationship satisfaction?

Another question of focus in this study is whether social media either hurts or helps father-daughter relation satisfaction. It is believe that social media/different types of media help the satisfaction of father-daughter relationships because they allow fathers and daughters to stay in contact even if they are not physically together. Qualitative research and a thematic analysis are being done to collect and analyze the data for this study. Up to 15 18-24 year olds daughters are currently being interviewed about their communication with their fathers, how the communication is, and how it makes them feel. While doing the interviews it has been found there are specific themes that are providing answers the to research questions. One result we hope to find is whether daughters ability to talk or communicate using different media with their fathers helps the daughters' satisfaction within the relationship. Thus far the themes that have been found are about their preferred methods of communication and their satisfaction with the relationship. Research will be completed by the submission date for the posters for the research and creative achievement day.

## The Connection Between Fan Engagement and Social Media in Championship Teams

Ryan Beers
Faculty Mentor: Tammy Swenson Lepper

In their study exploring how female sports fans observe and select fan characteristics, Sveinson and Hoeber (2014) defined a “sports fan” as one “who follows many sports, leagues and/or teams.” (Sveinson & Hoeber, 2014, p. 406). In today’s digital age, social media has become a crucial platform for sports fans to express their fandom and connect with other like-minded individuals. A 2023 study by Matang, Suryadi, Darmawan, and Anggraeni found that social media is crucial for fans to be able express their fandom and engage with sports-related content (Matang, Suryadi, Darmawan, & Anggraeni, 2023). Fans use social media to share their opinions and experiences, creating a sense of community among supporters (Matang *et. al*., 2023). Overall, social media has reshaped the dynamics of sports fandom, making it more interactive and accessible (Matang *et. al*., 2023). A 2023 study by Steiner, Pittman, and Boatwright gathered survey data from 452 U.S. sports fans’ about their social media engagement with their favorite teams across six popular platforms for two different situations, in-game and out-of-game. In their study, they found a relationship between fans' social media engagement behavior (SMEB) and their purchase intention (PI). Interestingly, the type of engagement that best predicts PI differs based on the context of “In-game” or “Out-of-game.” Many major professional teams use social media campaigns for direct sales, capitalizing on fans' desire for immediate information and connection (Steiner et al,. 2023). A recent study by Romero-Jara et al., (2024) found that Instagram is the top platform for generating fan engagement in sports. Their study analyzed 10,772 posts and revealed that Instagram

consistently outperformed Facebook and Twitter in engagement (Romero-Jara et al., 2024). Various content formats on Instagram, such as image and video combinations, significantly enhance engagement levels (Romero-Jara et al., 2024). This is credited to Instagram's audio-visual nature, which fosters stronger emotional connections with users (Romero-Jara et al., 2024). However, nobody has compared NBA and NFL fan engagement.

RQ1: What types of posts drive the most fan engagement?
RQ2: Do different types of posts drive fan engagement more than others?

This study, a quantitative content analysis and thematic analysis; utilized 50 randomly chosen Instagram posts from the official Instagram accounts of teams who played in the 2024 NBA Finals (Boston Celtics and Dallas Mavericks) as well as both teams who played in Super Bowl LIX in 2025 (Philadelphia Eagles and Kansas City Chiefs). The posts were selected from the 2025 NFL playoffs and the 2024 NBA Playoffs. After randomly choosing the Instagram posts from each team, each post was analyzed using the coding system defined and designed by Romero-Jara et al., (2024), who used it to analyze the engagement metrics such as likes, shares, and comments of previous Championship contending teams. This study analyzed the account metrics of each of the teams, such as the total number of posts made by the account, total number of followers, and total number accounts that the team's account is following.

## *The Notebook:* A Rhetorical Analysis of Feminism in Romance

Danielle Kuhnly
Faculty Mentor: Tammy Swenson Lepper

The purpose of this rhetorical analysis of *The Notebook* is to examine how romance movies promote certain ideals to the audience and present a standard or norm for how relationships should look. Popular ideas within these movies center around gender-based ideologies and how the dynamic of masculinity and femininity should interact to show true love. This promotion of ideals didn't stop with the release of *The Notebook* in 2004. The romance genre continues to be one of the most popular film genres. *The Notebook* itself is being rereleased as a musical on a Broadway tour throughout 2025, further elevating the popularity of this film specifically to a whole new audience. To understand just how persuasive this perpetuation of gender-based norms is, I will be rhetorically analyzing *The Notebook* with feminist critiques to answer my two research questions. RQ1: How are romantic relationships portrayed in this film? RQ2: How are gender norms influenced and/or enforced within this film?

Kornfield's (2021) feminist critique is ideology-based and focuses on understanding the dominant values and beliefs promoted within a text. This critique asks a series of questions regarding how the text represents masculinity and femininity, and if it reflects the realities of women's lives. Furthermore, it asks how healthy modes of communication can be encouraged. I will also ask questions based on Brummett's (2019) research into close-reading texts. These questions from Brummett (2019) analyze what the audience is invited to assume and believe compared to what the authors of the text are promoting. This series of questions also asks for proof of these assumptions shown throughout the movie, as well as who is empowered or disempowered within these situations. Throughout this analysis, I hope to find a connection between a popular romance movie and the promotion of gender-based ideologies. By analyzing *The Notebook* through feminist critiques and close reading questions, I will be able to identify if this movie promotes specific gender norms, beliefs, and related values. This is especially relevant as this movie is regaining its popularity due to the previously mentioned Broadway

tour. If *The Notebook* does promote these beliefs, increasing the awareness of gender-based ideologies being perpetuated in media could lead to future romance films promoting healthier modes of communication.

### The Relationship Between Player Age and Reporting Injuries to Coaches and Medical Personnel

Drew Lingen
Faculty Mentor: Tammy Swenson-Lepper

It is estimated that there are 1.6 to 3.8 million concussions sustained each year in the USA. While most athletes recover from concussions in just a few days or weeks, prolonged symptoms can affect one's everyday life. This is an essential topic for me because I have first-hand experience with concussions. In 2021-2022, I had four concussions in nine months, with one concussion lasting six months. That concussion ended my college-catching career. I would never want someone to go through what I have gone through in this experience, which is why I have been conducting this study for the past eight months. Throughout the study, literature from the following areas was examined: (1) Injury Disclosure and Prevention with Athletic Training Staff, (2) Effective Communication Between Coaches and Players, and (3) Communication and Education of Injuries. Those main categories have led to another small section where brain development is discussed, focusing on the age at which most students are in college (18-30). With the literature guiding my research, the hypothesis to help me find the most adequate results, which is H1: Senior college athletes are more likely to communicate their injuries than freshman college athletes.

This hypothesis has led me and the head athletic trainer for the Winona State Baseball team, Jaren Defries, to create a set of questions to have college athletes fill out on my quantitative survey. The survey questions were formed from experiences Defries has had with college athletes firsthand. The survey is formatted in a Likert-Scale form, and when the participants read the statements, they choose 1,2,3,4, or 5, which is represented by "strongly disagree, disagree, neutral, agree, strongly agree." This format makes answering the statements with honesty as painless and easy as can be. Some examples of statements that will be provided in my survey are "I will communicate an injury to the head if it means I still will likely be able to participate in my event/game" and "I would not communicate my injuries to athletic training staff." The study examines if age affects how, if, and to who college athletes communicate their injuries. Data that is collected will be analyzed using a T-test. A T-test is a test that looks at two groups that are usually used for a certain measure. It uses statistical analysis of two groups to see if there is any significance between them. Currently, 161 people have responded to the survey and the results will be analyzed by the time of the event.

# Computer Science

## An Implementation and Comparison of NAT64 using eBPF and the Jool Kernel Module.

Arvinder Dhanoa
Faculty Mentors: Mingrui Zhang, Trung Nguyen Trung, and Sudharsan Iyengar

IPv4 exhaustion has been a prevalent problem for years, as organizations and service providers have fought against the scarcity of IPv4 address space on the internet. NAT64 is increasingly deployed as a solution to this problem. As a result, it becomes increasingly important that the deployment of NAT64 technologies is easy and performant. Numerous implementations of NAT64 technologies already exist, and some new implementations use eBPF as well. In this research, we implemented a CLAT with an eBPF TC classifier and compared its performance to Jool, a widely used kernel module. We did this using a series of virtual machines on two networks, and a VyOS router. Using iperf3, we compared throughput in TCP and UDP and analyzed throughput and performance loss. Deployment is trivial – essentially loading the program to the appropriate interfaces – and the overhead is minimized because both approaches stay entirely within kernel space.

## Comparing Image Upscaling Quality Between Photoshop and Clip Studio Paint

Vera Kilpatrick; Presented by Vera Kilpatrick.
Faculty Mentors: Sudharsan Iyengar, Mingrui Zhang, and Trung Nguyen

AI features in the digital art programs Clip Studio Paint and Adobe Photoshop have been increasingly marketed as AI becomes prevalent in all aspects of digital life. Both programs consist of AI upscaling features that they promote. In this paper, a set of images will be created and tested, starting at a base resolution and upscaled to several higher resolutions, as well as downscaled to a few lower resolutions. From the upscaled images, metrics will be qualified based on several aspects of image quality-specifically: sharpness, color preservation, detail preservation, and artifact reduction, all of which will be tested using the Python OpenCV library. The algorithms that will test the images are Histogram to measure similarities in pixel color, Peak Signal to Noise Ratio (PSNR) to measure if any artifacts were created in the scaling, and Structural Similarity Index Measure (SSIM) to measure sharpness of the scaled image. While the program is running, impact on the system will be recorded to compare at the end of the testing phase. The expected outcome is in favor of Adobe Photoshop.

**Keywords:** Upscaling, downscaling, image quality, AI image processing

## Comparing Performance of Parallel Implementation of Sorting Algorithms Versus Standard Implementations

Allen Martin
Faculty Mentors: Mingrui Zhang, Sudharsan Iyengar, and Trung Nguyen

In this research, sorting algorithms that utilize parallel programming were implemented to determine if parallel programming can be utilized to create an algorithm with a faster execution time. An implementation of the quick sort was developed that utilizes parallel programming via the Fork Join class in Java, and it was compared to the sequential quick sort algorithm. The comparison was made by using arrays of different sizes with unsorted integers. The arrays were sorted through both algorithms

and parallel algorithms with various threads. The best algorithm and the best thread count were determined. The efficiency of the algorithms was judged based on the calculated speedup. From preliminary tests using a large dataset of two million values, there was a speedup of 2.6 when using a max of 6 threads in the thread pool.

## Impact of Containerization on the Performance Web Applications with Docker

Amin Elkhalifa
Faculty Mentors: Mingrui Zhang, Sudharsan Iyengar, and Trung Nguyen

This study aims to evaluate the performance impact of running a web application as a Docker container compared to running it natively. As Docker gains popularity in industry, it becomes increasingly important to understand the performance impact of containerization. This study aims to provide data that contributes to the decision-making process of building performance-sensitive applications. Gathering data consisted of building a web application, exposing an API endpoint, running tests and measuring the relevant performance metrics – CPU utilization and network response time – both in a native environment and within a Docker container. These findings confirm the introduction of overhead by Docker Containers by showing a 10% increase in both response time and CPU utilization.

## Plasma Profiling Reveals Proteins Specific to Primary Disease Origin of Retroperitoneal Fibrosis

Thomas Pelowitz
Coauthors (non-WSU): Benjamin Hur, Matthew Koster, and Jaeyun Sung (Mayo Clinic)

Retroperitoneal fibrosis (RPF) is a rare inflammatory disease characterized by the formation of scar-like tissue in the retroperitoneum, which can lead to life-threatening obstructive nephropathy. RPF is typically a secondary disease, arising from various underlying conditions. Currently, no objective and highly accurate diagnostic methods exist. Identifying blood protein biomarkers specific to RPF could facilitate the development of objective minimally invasive diagnostic tests.

In this study, blood plasma samples were collected from 45 participants spanning 5 different primary causes of RPF, including idiopathic cases where no underlying condition was identified. Six participants without significant diseases at the time of sample collection served as healthy controls. From these plasma samples, the abundances of 7,293 proteins were measured.

A total of 176 proteins were found to be significantly differentially abundant in individuals with RPF compared to healthy controls. Additional comparisons identified distinct differentially expressed proteins associated with specific primary causes. Proteins shared across multiple comparisons offer insights into the common pathogenesis of RPF, while those unique to a single primary cause suggest mechanistic links between the underlying disease and RPF development.

Further analysis compared the blood proteomes of individuals with idiopathic RPF to individuals with a known related primary cause, assessing whether idiopathic cases are biologically distinct. A similar analysis examined whether RPF secondary to IgG4-related disease results in a significantly different plasma proteome than idiopathic RPF.

Finally, a machine learning approach was applied to classify individuals with RPF versus healthy controls. A machine learning pipeline was developed that trained a random forest classifier on 100 differentially expressed proteins, which achieved an average ROC-AUC of 0.809 (out of 1.000) across 100 bootstrapped trials. The pipeline was also used to test the potential of classifying various other comparisons that are of clinical interest. The success of this pipeline demonstrates the potential for blood-based classification of RPF for clinical use.

These findings highlight key proteomic differences associated with RPF and its primary causes, providing a foundation for improved diagnostic strategies and a deeper understanding of disease mechanisms.

### Using Keystroke Dynamics Behavioral Biometrics to Identify Users

Bradley Budach
Faculty Mentors: Mingrui Zhang, Sudharsan Iyengar, and Trung Nguyen

This study explores the use of keystroke dynamics as a behavioral biometric for user identification. Unlike physiological biometrics, such as fingerprints or facial recognition, keystroke dynamics leverages the unique typing patterns of individuals to create a distinctive signature. This research was to develop a machine learning-based system that utilizes keystroke dynamics for continuous and unobtrusive user authentication. By collecting and analyzing keystroke data from multiple users, relevant features were extracted and used to train a machine learning model to identify user keystroke signatures with an equal error rate of 0.11. This model allows for reliable and scalable authentication that can provide an additional layer of security on top of traditional security measures. This study was done as part of my Computer Science Research Seminar course.

### Using Multilayer Perceptron (MLP) to predict crop yields

Thomas Donnelly
Faculty Mentors: Minigrui Zhang, Sudharsan Iyengar, and Trung Nguyen

This study aimed to develop a Multilayer Perceptron (MLP) that accurately predicts crop yields within 10% of ground truth in 80% of cases using weather data, region, soil type, temperature, fertilizer, irrigation, days taken to harvest, and rail fall. The dataset has 1 million unique data points and 10 columns. In order to process the data, all Boolean data had to be converted to integers, Numerical data standardized, while Categorical data was checked for non-null values. The model will be trained using a random selection of 90% of the data for training and 10% for testing. The effectiveness of the model will be derived from the accuracy and the Mean Square Error (MSE) of the model. The learning rate of 0.001 was chosen so as not to overfit the data. As of the writing of this abstract, the best model has an MSE of 0.3992, a percentage of predictions within 10% of the actual of 62.10%, and a percentage of predictions within 20% of the actual of 88.02%.

# Education

## Listening to Learners: Ed.D. Student Perspectives on Asset- and Deficit-based Feedback Practices

Rebecca Simataa, Jordan O'Connell, and Christopher Dufault
Faculty Mentor: Steve Baule
This virtual presentation will share how feedback practices can shape student experiences. Participants will engage with insights from a study that surveyed 28 doctoral students' perceptions and preferences around instructor feedback. Through an exploration of this research study, attendees will:

- Learn about asset and deficit thinking
- Examine the intersection between feedback and equity
- Recognize the complex dynamics around feedback in advanced educational settings
- Reflect on their relationship with giving and getting feedback
- Consider how to craft feedback in ways that affirm student identity and academic potential

By bridging research findings with action steps, this session hopes to equip educators, administrators, and academic leaders through engaging in conversation around meaningful feedback.

## From Dissertation to Innovation: How Research Fueled the Development of Gamified Educational Software

Sadie Gunnink
Faculty Mentors: Steven Baule, Danielle Schock, and Norb Thomes

This presentation describes the journey from research to patent, demonstrating how dissertation findings on the impact of gamified learning in an MTSS Tier 2 reading intervention directly influenced gamified educational software design and development. The research explored how gamified software affected student achievement and engagement compared to traditional intervention methods. These findings shaped the creation and patent of an adaptive educational game process, aligning with Self-Determination Theory (SDT) and the Technology Acceptance Model (TAM) to foster motivation, autonomy, and engagement.

This session discusses the challenges of moving from research to securing intellectual property, offering insights into the patenting process and the obstacles faced along the way. Gain insight into how academic research can drive EdTech innovations and translate them into real-world educational solutions.

# Educational Leadership

## Position Utilization and Leadership of Senior Women Administrators in the Northern Sun Intercollegiate Conference

Mattie Schimenz
Faculty Mentor: Joel Traver

The purpose of this study was to complete an investigation regarding SWA’s within the NSIC regarding their job position utilization and career confidence. Originally, women’s collegiate sports were

administered by women. Once female and male sports were represented under a single association, significant female representation in leadership was lost. In 2022, female NCAA athletes made up for 44% of the athlete population (Statista, n.d.). However, 72.8% of the athletic directors governing these athletes are men (Zippia, n.d.). Following the dearth of female representation in athletics administration, it was clear that something needed to change. This study aimed to reveal whether the creation of the SWA is serving its original purpose.

The senior woman administrator position was created to give women a seat at the decision-making table in athletic departments. The inclusion of women with the SWA position was a start to shrinking the gender gap that exists in collegiate athletic administrations. Proper use and implementation of this role would highlight the importance of a female voice in athletic administration. Recommendations regarding SWA utilization would do nothing but benefit universities' athletic departments. A female's voice cannot be replicated by a man. A female's experiences will always be different than their male counterparts. Therefore, it is crucial that the SWA position continues to be analyzed and improved so that it serves its original purpose: to promote meaningful representation of women in the leadership and management of college sports (National Collegiate Athletic Association, 2013).

This study was created with the overarching goal of understanding the degree to which Senior Woman Administrators in DII athletic departments are satisfied with their job positions and to gauge changes in their perceived level of confidence over their career. The survey and interview content were created with the intent to adequately answer the following research questions:

RQ 1: How do the experiences of female athletic directors in DII athletic departments impact their level of confidences as an SWA?

RQ 2: How do senior women administrators perceive their effectiveness in DII athletic departments?

This study centers around a Division II college athletic conference in the NCAA. The Northern Sun Intercollegiate Conference (NSIC) is home to 15 teams located in Minnesota, North Dakota, South Dakota, and Nebraska. Participants in this study must be the Senior Woman Administrator (SWA) at their respective university. 14 of the 15 teams in the NSIC have SWAs. The study had a participation rate of 85.7%, gathering information from 12 of the 14 SWAs.

This study's research design will follow a mixed method's approach. Quantitative and qualitative data will be collected through Zoom interviews and a Qualtrics survey. Information collected from zoom interviews enriched the survey data and provided a clearer understanding of how the SWA role is being used within the NSIC. It also provided insight into female athletic directors' perceived level of job confidence and use of the SWA designation in the NSIC. The implications of this study and recommended applications of the results will present themselves following the completion of the data collection process.

# Engineering

## A Novel Fixture Development to Characterize Compression After Impact Damage of Unidirectional Thermoplastic Composite Laminates.

Matthew Ficker, Dominic Perez, Noah Misukanis, Luke Poglayen, Jacob Kosmoski
Faculty Mentor: Eric Kerr-Anderson

Impact testing of unidirectional thermoplastic composite materials is a challenge due to the Mode I shear of the primary tows on the impact side. Thermoplastic composite products manufactured using laminate stacking are bonded together with films of polymer on both sides of oriented fiber in typically a cross-ply or quasi-isotropic stack. The resulting failure from the distortion field imposed by a hemispherical tup is debonding along the interface between layer 1 and layer 2 oriented in the layer 1 direction from impact site to edge of panel. This failure mode results when the sample is too small relative to the weave pattern and fixturing resulting in more damage than will be witnessed on a large panel. The conservative estimate of impact strength would be appropriate for designing near edges of panels. In order to characterize an effective mid-panel impact toughness with standard Compression After Impact (CAI) fixturing, samples were created with additional length of the primary tows while still being able to fit in the CAI fixturing. Impact Energy was obtained using a Drop Tower Testing Machine. Damage zones were measured using backlit photography after the impact event. Specimens were machined post impact to allow for ASTM D7137 CAI testing to be conducted.

## Carbon Club Carrier: A Lightweight Motorized Golf Pushcart

Tanner Conniff, Eric Courneya, Alex Hilo, Max Kauphusman, Luis Rodriguez
Faculty Mentor: Keith Dennehy

The Carbon Club Carrier is a lightweight, motorized golf pushcart designed to enhance convenience and ease of use for golfers. Traditional golf push carts can be cumbersome and require significant effort to maneuver across varying terrain. Our design integrates a carbon fiber frame for durability and weight reduction, coupled with an electric push-assist motor to reduce strain on the user. The use of carbon fiber composite materials ensures a strong yet lightweight structure, optimizing portability and performance. The push-assist motor system is designed to provide variable-speed assistance, allowing golfers to move their clubs effortlessly across the course. The carrier is also equipped with ergonomic features for enhanced user comfort and ease of control. This innovation aims to improve the golfing experience by combining advanced materials with practical mobility solutions.

## Durafold Premium

Parker Buth, Grace Eischens, Regan Harvey, Lucas Stadler, and Hendrik Welti
Faculty Mentor: Keith Dennehy

Current folding table designs are made to be lightweight, but the table surface made of high density polyethylene (HDPE) can break and is not repairable. Our team designed the DuraFold Premium as an alternative to the traditional folding tables. The table surface and legs use a sandwich construction consisting of top and bottom face sheets made with carbon and glass reinforcing fibers in an epoxy resin system. In between the two face sheets is a honeycomb core material. This approach results in the DuraFold Premium being extremely durable while remaining lightweight. Over the past academic year, our team has been working to turn Durafold Premium from an idea into a reality. The design process has

included identifying customer concerns, SolidWorks part design, material selection, finite element analysis, economic analysis, tooling design, and part fabrication, and testing.

## Panel Impact and Compressing Strength Testing

Michael Dietz and Wyatt Laborde
Faculty Mentor: Eric Kerr Anderson

**Intro/Purpose**: This project was conducted to investigate how a material's compressive strength is affected after being impacted while supported on three sides. This has broader implications, helping us understand how military equipment, such as battleships, have their compressive strength affected when impacted by projectiles like bullets, shrapnel, or other objects.

**Methodology**: This test was conducted using panels made of multiple layers of fiberglass pressed together to form a solid sheet. We then cut these sheets into multiple panels. These panels were rectangular, with a tab coming off three sides. The three tabs simulated a wall supporting the material around it. We developed five groups, with three panels per group. We then impacted the center of the panels with varying levels of force for each group. Afterward, we documented the damage and tested the compressive strength. Once this was completed, we collected all our data to analyze the relationship between impact force and compressive strength.

**Results/Findings:** From this, we expect to find that the impact on the panels reduces their compressive strength. Each group had different levels of damage based on the amount of force taken from the impact. The panels subjected to a greater impact force are expected to have the least compressive strength. This is because greater amounts of force lead to more cracks and structural defects, lowering the compressive strength. This information will help us understand the relationship between how impact affects compressive strength.

## Performance of Quasi-isotropic GF/PET Laminates in Impact and compression after Impact Loading

YuBo Ma and Shuoyan Niu
Faculty Mentor: Beckry Abdel-Magid

The impact resistance and residual compression strength of two types of glass fiber/ polyethylene terephthalate composites are investigated in this research project. The first materials are glass fiber/ polyethylene terephthalate glycol (GF/PRTG) and the second material is glass fiber/ amorphous polyethylene terephthalate (GF/PETa). Both matrix materials are ductile thermoplastic polymers. The ductility of the matrix is expected to improve the impact resistance of the composites. The advantage of the first material is higher ductility and improved fire resistance, and the advantage of the second material is high bonding strength with the reinforcing fiber glass. Both matrixes and low cost engineered polymers.

Quasi-isotropic samples of both materials were fabricated and tested under impact and compression after impact. The obtained data is being analyzed and results of the research, including comparison with the performance of similar continuous fiber reinforced thermoplastic composites, are presented in this poster.

# English

## Satori

Madeline Avila and Lucy Severson
Faculty Mentor: Liberty Kohn

ENG 324 is a three-credit class focusing the production of Satori, Winona State University's literary journal. In this course, we got hands on experience that will help prepare us for the world of literary publishing. We have been exposed to each facet of production, from judging which pieces will make it into the journal, to ordering them, to designing the journal itself. We have gained valuable practice in crafting professional emails and working with faculty at the university. The process began with the class garnering fiction, poetry, and art submissions from the WSU student body. Throughout the production process, we have gotten a glimpse into how journals are printed and have been in the past. From the WSU literary archives to the campus print shop, we've been guided through the process of book creation. We've also learned about the history of bookmaking to provide important context and inspiration to help propel us through the course. We've studied old editions to make observations to help inform decisions about paper quality, margins, text size, etc. We've become familiar with Adobe InDesign and learned the conventions of online book design and formatting.

# Geoscience

## Experimental Impacts into Sloped Targets

Tyler Kadrie
Student Coauthor: Ashley Miller
Faculty Mentor: Jennifer Anderson

Other Coauthors (non-WSU): Mark Cintala, Christopher Cline II (NASA Johnson Space Center)
Impact craters are an important process in planetary surface evolution that can be studied from orbit on planetary surfaces, in the field on Earth, through numerical modeling, and by making impact craters in the laboratory. High resolution imagery can be used to observe small craters on sloped surfaces. My research aims to compare results obtained in a laboratory setting to craters observed on planetary bodies specifically craters formed into a sloping surface.
Lowell H is a10-km impact crater on the Moon that formed on an older crater's sloped rim. Due to the impactor hitting a sloped surface, you can see obvious morphological differences in the crater, such as extensive slumping, than what is expected for a small bowl-shaped crater on the Moon. Dr. Anderson and her colleagues at the NASA Johnson Space Center's Experimental Impact Laboratory created a series of experimental impacts into targets with sloped surfaces of 0, 5, 10, 15, and 20 degrees above horizontal. After each experiment, the resulting craters were scanned, and the 3D data was manipulated using CloudCompare software. I measured the crater diameters and deepest points for 8 transects through the center of each experimental crater. With these data, I was able to analyze how crater diameter and the location of the deepest point were influenced by the slope of the surface.

In addition, I downloaded the Lowell H topographic data provided by the Lunar Reconnaissance Orbiter Camera. I used ArcGIS Pro to create transects across Lowell H which I compared to the transects of our experimental craters. In the experimental results, we can see the deepest point migrating downslope as the slope of the pre-impact surface increases. However, Lowell H's deepest point is not as far downslope as we would expect. In our experiments, we used fine sand that has very little cohesion, but the Moon's surface is made up of more angular materials that has a higher cohesion than sand. We suspect that the material difference between the experiments and the Moon is what explains the difference between the morphology of Lowell H and our experimental craters.

### Geomorphic Monitoring of Cedar Valley Creek: Investigating the Impact of Restoration Projects and Stream Systems Over Time

Kyle Borske
Faculty Mentor: Dylan Blumentritt

Fluvial systems are important natural environments that help shape nearby landscapes. These systems are formed and changed with natural processes, such as erosion, deposition, and sediment transportation. Human activities, such as urbanization, dam construction, restoration projects, etc. have a profound impact on these natural systems. This project looks at the geomorphic changes within stream systems and focuses on the interaction of these natural and human impacts within a stream. With the use of Cedar Valley Creek in Minnesota, this project also explains the process of monitoring streams/rivers and how geomorphic processes change over time in a stream that recently went through a restoration project. This is valuable because it will help evaluate the success of the restoration project and allow further adaptations to be made to restoration techniques, which will advance the overall effectiveness of restoration projects in the future.

## Global Studies

### Mazahua Literacy Project

Kassandra Zapata and Ahnna Burkhart
Faculty Mentor: Mary Hudgens Henderson

Mazahua is an indigenous language of Mexico that currently has about 100,000 speakers. What this language and many other indigenous languages need are literacy curricula and materials to help speakers of this language learn to read and write in their first language. Research has demonstrated that students who learn to read and write in their home language will be more successful when it comes to learning to read and write in the language that is dominant in society (in this case, Spanish in Mexico). This project details a coordinated effort to create initial literacy materials for first-grade students who are learning to read and write in Mazahua in Mexico. The presenters used Canva.com to create templates using the Mazahua alphabet for items such as letter booklets, tracing documents, and simple reading exercises. The presenters worked with Mazahua linguists and educators to create lists of words that could be used in the templates; this required ongoing communication between the presenters and the speakers of Mazahua in order to avoid errors in vocabulary or spelling. Presenters used WhatsApp to communicate with speakers of the language. Challenges of this project include not knowing Mazahua; the presenters relied entirely on the information provided by the Mexican colleagues. Not being

speakers of a language that one is creating literacy materials for is a challenge in that the timeline for revisions is affected; the presenters had to send questions and ask for feedback to Mexican colleagues who may not have been able to respond immediately. Additionally, there is not a lot of resources for Mazahua online. Items presented include letter booklets for each letter of the alphabet, in which students must trace the letter, read words that include the letter, and then copy the letter. Other items include a fill-in-the-blank sheet for each letter of the alphabet, in which students must fill in the missing letter of a familiar word. These sheets required finding appropriate clip-art pictures to accompany the words and appropriate, high-frequency words for the sheets themselves. Mazahua vocabulary was tracked using a shared spreadsheet to inform future efforts. There are many challenges remaining for creating literacy materials for indigenous students, including the process of literacy acquisition in Mazahua, lack of funds to foster the creation of materials, and the need for research in best practices around indigenous literacy.

# Health, Exercise & Rehabilitative Sciences

## Accelerated vs. Conservative Rehabilitation after ACL Reconstruction (ACL-R)

Riley Mauzer, Jenny Russell, and Dominic Noble-Henden
Faculty Mentors: Brandon Donahue and Nora Kraemer

**Focused Clinical Question:** In individuals aged 18-60 post ACL reconstruction, what is the effect of an accelerated rehabilitation program compared to a conservative rehabilitation program on instability rates?

**Clinical Scenario:** Anterior Cruciate Ligament Reconstruction (ACL-R) is a common procedure for individuals returning to high activity levels post injury. While accelerated rehabilitation may lead to faster recovery, concerns about increased knee laxity and re-injury persist. This critical appraisal aims to compare the effects of accelerated and conservative rehabilitation protocols on knee instability rates following ACL-R.

**Search Strategy:** We aimed to identify peer-reviewed evidence relating to different forms of rehabilitation following ACL-R and their effects on knee instability. Searches were conducted in PubMed, National Library of Medicine, Journal of Clinical Medicine, ResearchGate, and Google Scholar. Search terms included: *Accelerated vs Conservative ACL rehabilitation*, *ACL rehabilitation, Reconstruction, and ACL-R*. Studies were included if they comprised patients with ACL reconstruction, utilized participants ages 18-60, used accelerated or conservative rehabilitation programs, and evaluated joint laxity and instability outcomes. Exclusion criteria included patients with multiple knee injuries and those using rehabilitation programs not considered accelerated or conservative. After reviewing several studies, nine met the inclusion criteria and were included in our final review.

**Evidence Quality Assessment:** The quality of the nine articles was assessed using the PEDRO scale, with scores ranging from 5/10 to 10/10. The Oxford Level of Evidence resulted in primarily a Level 2b with one study scoring a Level 3b, meaning the review was comprised of lower quality randomized control trials and one cohort study.

**Results and Summary of Search:** One study found a significant difference (p=0.039) in knee laxity after 12 months, with greater joint laxity resulting in the accelerated rehabilitation group. However, eight of

nine studies reported no significant differences (p= .33-.98) between the two approaches over longer follow-up periods of 2 years. These findings suggest that early differences in knee laxity may exist but do not persist in the long term.. Most studies show no significant difference in knee laxity between conservative and accelerated rehabilitation protocols over 24 months.. A key limitation is that the available evidence is insufficient to definitively answer the clinical question. Further research with larger sample sizes and longer follow-up is necessary to determine which rehabilitation protocol is more effective.

**Clinical Bottom Line:** Our research findings were inconclusive with no statistically significant difference in knee laxity over time between accelerated and conservative rehabilitation protocols for patients undergoing ACL-R. Based on the Strength of Recommendation Taxonomy (SORT), our findings fall under category B, indicating that recommendations would be based on inconsistent evidence.

**Implications:** Our findings challenge the current understanding of ACL-R rehabilitation, showing no significant difference in laxity between accelerated and conservative approaches after 2 years. Further research is needed to determine the most effective rehabilitation method for preventing long-term instability and re-injury after ACL-R.

## Balance Interventions vs. Strength Exercises for Chronic Ankle Instability

Authors: Carlee Braun, Jaclyn Thomas, and Miku Murayama
Faculty Mentor: Nora Kraemer

**Clinical Scenario:** Recurrent ankle sprains and instability are common concerns, especially among physically active individuals. Without proper intervention and management, patients can develop chronic ankle instability (CAI), which is a condition of recurring "giving way" of the ankle that can negatively affect function and quality of life. Research currently suggests that CAI can be managed through rehabilitation. However, it is unclear what the most beneficial intervention is for reducing CAI symptoms and regaining function. The purpose of this critical appraisal is to investigate the difference between the impact of balance-based and strength-based interventions on the range of motion of patients with CAI.

**Clinical Question**: In patients with Chronic Ankle Instability what is the effect of balance interventions compared to strength-based exercises on increasing ROM?

**Search Strategy and Evidence Quality:** The database, PubMed, was used to find randomized control trials (RCT). The inclusion criteria were CAI, balance, strength, and physical activity. Elite and collegiate athletes were excluded. The search terms utilized were: CAI, ankle balance exercises, ankle strength exercises, improvement, ankle rehabilitation, and recurrent ankle sprains, (ROM). Seven qualifying scholarly articles were identified. An evidence quality assessment resulted in PEDro scores ranging between 4/10-9/10, Oxford Score was 2 for all the studies.

**Results:** The existing research shows **c**onsistent findings for increases in dorsiflexion and eversion with balance interventions. The use of strength interventions showed consistent increases in dorsiflexion, plantarflexion, and eversion. The research strengths are indicated by consistent measures of increased range of motion and function. The limitations were small subject pools, lack of standardized exercise

programs, and limited long-term studies. Overall, the results of the existing literature show ankle ROM increases from both balance and strength interventions.

**Clinical Bottom Line:** Both interventions produce increases in dorsiflexion and eversion range of motion, with strength interventions also increasing plantarflexion of patients with CAI. To answer the proposed clinical question, it is suggested that balance interventions may produce more meaningful improvements, however, the use of a combination of intervention strategies is recommended to improve the range of motion, and therefore, the overall function of patients with CAI. (SORT score); A.

**Implications:** The findings of this critical appraisal may have practical implications for implementing a combination of interventions effective management strategies for symptoms and functional improvement for CAI. Educational implications suggest the consideration of the effects of using combined intervention strategies to maximize rehabilitative outcomes and patient quality of life. Further investigation is recommended to determine broader population and long-term outcomes.

## Corticosteroid Injections Versus Extracorporeal Shockwave Therapy for the Treatment of Plantar Heel Pain

Molly Dring and Payton Hansen
Faculty Mentor: Brandon Donahue

Heel pain, particularly due to plantar fasciitis, can be managed through various treatment options. Among these, extracorporeal shock wave therapy (ESWT) and corticosteroid injections (CSI) are commonly used interventions. This appraisal examines the outcomes of ESWT and CSI to determine which treatment is more beneficial for adults experiencing plantar heel pain. In adults with plantar heel pain, does CSI provide better results than ESWT for decreasing pain? Eight articles were included in the appraisal from a literature search of the PubMed database and Google Scholar search engine. Key search words included: *RCT, corticosteroid injections, extracorporeal shockwave therapy, plantar heel, and plantar fasciitis*. Inclusion criteria consisted of patients aged 18 and above undergoing CSI or ESWT for plantar heel pain, with pain assessment based on patient-reported outcomes. Exclusion criteria included patients utilizing injection types other than CSI, those undergoing treatment areas other than plantar heel pain, and studies lasting less than eight weeks. The quality of the eight articles was assessed using the PEDro scale, with scores ranging from 5/10 to 7/10. Seven of eight articles scored a Level 2a on The Oxford Level of Evidence scale with one article scoring a Level 4 as a case series. The key outcome measured in this analysis included the Visual Analogue Pain Scores (VAS). Four of eight studies concluded that both ESWT and CSI are equally effective in treating heel pain ($p<.001$). Three studies found that CSI is more effective than ESWT with one linking the presence of edema as a factor ($p<.001$). Two studies concluded that ESWT is more effective than CSI with one noting that obese subjects prefer ESWT ($p<.001$). Weaknesses of the appraisal included small sample sizes, variability in patient populations, and the subject nature of pain, which may have influenced the results. Our findings were inconclusive in favoring one treatment, as both CSI and ESWT were found to effectively treat plantar heel pain. Our research received a Strength of Recommendation Taxonomy (SORT) score of Level B, indicating inconsistent or limited quality patient-orientated evidence. Currently, no single treatment is considered the "gold standard" for heel pain. Our findings suggest that both CSI and ESWT are effective treatments for plantar heel pain. Educating patients on these choices allows them to select the best fit for their needs. Future research should include larger, more diverse sample sizes to improve accuracy

and applicability, as some studies were limited to specific populations. Expanding research with broader interventions will help produce clearer, more definitive results.

## Differences in Peak Relative Landing Forces in Division II Women's Gymnastics, Basketball, and Soccer

Hailey J. Meyers
Student Coauthor: Kalli Van Tassel
Faculty Mentor: Becky Heinert

**PURPOSE:** Female athletes tend to be at high risk for lower limb injuries during non-contact landing. Relative peak landing force (RPLF) is the metric being monitored in this study to compare landing forces among three different women's sports teams. RPLF is the amount of force the athlete is landing with compared to their body weight. This gives insight into athletes that could be at risk for lower limb injuries.

**METHODS:** 16 gymnasts (height: 163.04 ± 4.84cm; BW: 62.17 ± 5.01kg) from the Winona State University gymnastics team participated in five weeks of countermovement jump (CMJ) testing using two force plates with a sampling rate of 1000 Hz. The gymnasts were tested twice a week for a total of 8 testing sessions. This study excludes participants who were injured, who missed two or more testing sessions in a row, or had frequent variability in their jump data causing inconsistent data for that athlete. The data was tracked and exported to a customized spreadsheet to compare with the Winona State University women's soccer (height: 167.96 ± 4.63cm; BW: 66.38 ± 9.31kg) and basketball (height: 177.8 ± 4.70cm; BW: 73.15 ± 6.49kg) CMJ data that was previously collected using the same protocol. SPSS was used to calculate descriptive statistics and group differences in RPLF using one-way ANOVA. Bonferroni post hoc tests were used to analyze differences between groups. A significant value of $p< 0.05$ was set for all analyses.

**RESULTS:** A significant group difference in RPLF was found among women's sports ($p= 0.021$). A significant difference in landing force was found between gymnastics and basketball (p-value = 0.026, d = 4.60). However, there was no significant difference in landing force found between gymnastics and soccer (p-value = 1.000, d = 1.198) or basketball and soccer (p-value = 0.092, d = -3.35). Gymnastics showed higher RPLF with a group mean of 473.40 ± 11.15N/kg. Soccer landed with a group mean of 455.21 ±18.36N/kg. Basketball had a lower RPLF with a group mean of 377.14 ± 27.43N/kg.

**CONCLUSION:** The findings in this study show that gymnasts and soccer athletes tend to land with more force compared to basketball athletes. High landing forces can have a large impact on the lower body, leading that athlete to be at a higher risk of injury.

## Differences in Positional Demands for a Collegiate American Football Team During In-Season Practices

Lucas Crouse, Brady Ferguson, and Logan Stauffer,
Student Coauthors: Lillian Brinkman and Miyako Deloney
Faculty Mentor: Becky Heinert

**PURPOSE**: This study analyzes the differences in positional group (PG) demands for a collegiate American football team during in-season practices (P). Previous research shows that skill PG cover more distance (D), run faster, and have greater acceleration loads than non-skill PG. Understanding these differences can optimize training and injury prevention.

**METHODS**: Eighteen 10 Hertz Global Positioning System (GPS) trackers were assigned to 7 PG: wide receiver (WR) (n=4), running back (RB) (n=2), tight end (TE) (n=2), cornerback (CB) (n=2), safety (S) (n=2), linebacker (LB) (n=4), and defensive linemen (DL) (n=2). External load metrics including D, sprint distance (SP), and distance/minute (DPM) were tracked and exported to a customized spreadsheet. SP/min, %SP, and SP/P, were then calculated. SPSS was utilized to calculate descriptive statistics for each PG and a Kruskal-Wallis H test was used to assess differences in load metrics with a statistical significance value of $p < 0.05$.

**RESULTS**: Group means ± SD are shown below. No significant differences across PG were found for SD ($p=0.063$), DPM ($p=0.234$), %SP ($p=0.12$), SP/P ($p=0.09$), and SP/min ($p=0.08$). **CONCLUSION:** The results provide insight into the external load demands of different PG in American football. Strength and conditioning coaches can use this information to tailor training programs that better prepare each PG for the physical demands of the season.

## In adults with plantar heel pain, does CSI provide better results than ESWT for decreasing pain?

Molly Dring and Payton Hansen
Faculty Mentors: Brandon Donahue and Nora Kraemer

**Clinical Scenario:** Heel pain, particularly due to plantar fasciitis, can be managed through various treatment options. Among these, extracorporeal shock wave therapy (ESWT) and corticosteroid injections (CSI) are commonly used interventions. This appraisal examines the outcomes of ESWT and CSI to determine which treatment is more beneficial for adults experiencing plantar heel pain.

**Clinical Question:** In adults with plantar heel pain, does CSI provide better results than ESWT for decreasing pain?

**Search Strategy:** Eight articles were included in the appraisal from a literature search of the PubMed database and Google Scholar search engine. Key search words included: *RCT, corticosteroid injections, extracorporeal shockwave therapy, plantar heel, and plantar fasciitis*. Inclusion criteria consisted of patients aged 18 and above undergoing CSI or ESWT for plantar heel pain, with pain assessment based on patient-reported outcomes. Exclusion criteria included patients utilizing injection types other than CSI, those undergoing treatment areas other than plantar heel pain, and studies lasting less than eight weeks.

**Evidence and Assessment:** The quality of the eight articles was assessed using the PEDro scale, with scores ranging from 5/10 to 7/10. Seven of eight articles scored a Level 2a on The Oxford Level of Evidence scale with one article scoring a Level 4 as a case series.

**Results and Summary of Search:** The key outcome measured in this analysis included the Visual Analogue Pain Scores (VAS). Four of eight studies concluded that both ESWT and CSI are equally

effective in treating heel pain (p<.001). Three studies found that CSI is more effective than ESWT with one linking the presence of edema as a factor (p<.001). Two studies concluded that ESWT is more effective than CSI with one noting that obese subjects prefer ESWT (p<.001). Weaknesses of the appraisal included small sample sizes, variability in patient populations, and the subject nature of pain, which may have influenced the results.

**Clinical Bottom Line:** Our findings were inconclusive in favoring one treatment, as both CSI and ESWT were found to effectively treat plantar heel pain. Our research received a Strength of Recommendation Taxonomy (SORT) score of Level B, indicating inconsistent or limited quality patient-orientated evidence.

**Implications:** Currently, no single treatment is considered the "gold standard" for heel pain. Our findings suggest that both CSI and ESWT are effective treatments for plantar heel pain. Educating patients on these choices allows them to select the best fit for their needs. Future research should include larger, more diverse sample sizes to improve accuracy and applicability, as some studies were limited to specific populations. Expanding research with broader interventions will help produce clearer, more definitive results.

## Open versus Closed Surgery for Carpal Tunnel Syndrome

Madie Adkins, Montana Peterson, and Mikayla Pieper
Faculty Mentor: Nora Kraemer

When diagnosed with Carpal Tunnel Syndrome (CTS), surgery can be necessary to alleviate the symptoms that can disrupt a person's life. CTS release surgery can be performed openly or endoscopically. The purpose of this critical analysis is to determine which if there is a difference between the two surgical techniques. In adults with Carpal Tunnel Syndrome what is the difference between endoscopic surgery and open surgery on pain and overall symptoms after recovery? PubMed was utilized to find the research studies. Search terms included: carpal tunnel, endoscopic, open surgery, closed surgery, minimally invasive, and traditional. Inclusion criteria were patients: Over the age of 18 with a CTS diagnosis and symptoms; and underwent open or endoscopic surgery. The exclusion criteria were patients who were splint during the study; had arthritis; had trigger finger. PEDro scores for all eight studies were 5/10-8/10. Oxford levels were level 2 and level 3. P-values for pain ranged from p=<0.0001 to p=0.10. Key findings were endoscopic surgery produced positive results initially open surgery produced positive results overall; and neither was significantly better than the other. Strengths of the studies were: the endoscopic group had minimal scaring, returned to work sooner, and had noticeable results in a quick amount of time. Weaknesses were that the small subject pool, workers' compensation affected return to work, and the non-dominant hand was rarely used. Endoscopic and Open CTS surgical techniques were both effective at reducing symptoms, patient satisfaction, and function restoration; however, endoscopic surgery produced positive results earlier than open technique. SORT score: B. Endoscopic CTS release surgery can be performed clinically more routinely with confidence of positive outcomes. Continued research may show more consistent results between the two techniques.

## Perceived Effectiveness of Recovery Strategies in Division III Athletes

Luke B. Pavlat
Faculty Mentor: Becky Heinert

**PURPOSE**: This study examines which aspect of recovery, sleep, nutrition, hydration, or physical therapy techniques is perceived as the most effective among NCAA Division III athletes at the University of Wisconsin River Falls (UWRF).

**METHODS**: A digital survey collected daily self-reported data from 94 UWRF athletes across multiple sports, including 41 males and 53 females, ranging 18-23 years of age, totaling 394 observations. The subjects were asked to take the survey daily. The survey assessed fatigue levels, sleep duration, nutritional intake, hydration, and the use of various recovery modalities which consist of rolling out, stretching, using heat/ice, massage/compression/cupping, resting/sleeping, walking/other physical activity. Fatigue level was reported as a score from one to five, with one indicating being less fatigued and five indicating being more fatigued.

**RESULTS**: Statistical significance was set at $\alpha = 0.05$. Regression models with a random subject effect indicated significant correlations between fatigue level and previous night's sleep ($p = 0.0034$), protein consumption ($p = 0.024$), and calorie consumption ($p = 0.0284$). Tukey's HSD tests confirmed that those with <6 hours of sleep had significantly higher fatigue levels than those with 7-8 hours ($p = 0.0334$) or 8+ hours ($p = 0.0023$). Similarly, those consuming <100g of protein or <2000 calories exhibited significantly higher fatigue levels than those consuming 150+g of protein ($p = 0.0225$) or 3000+ calories ($p = 0.0216$), respectively. No significant correlation was found between fatigue and water consumption ($p = 0.1909$) or most recovery strategies, except for marginal evidence with rolling out ($p = 0.0896$). A full multiple regression model accounting for all predictors confirmed that only previous night's sleep remained a significant predictor of fatigue ($p = 0.0387$, $R^2 = 0.24$).

**CONCLUSION**: These findings suggest that sleep is the most influential factor in perceived recovery, while other commonly used recovery strategies may have limited effectiveness in reducing perceived fatigue. This research highlights the importance of prioritizing sleep hygiene interventions to optimize performance and recovery in collegiate athletes, particularly within resource-limited environments.

## Positional Differences in GPS Derived Game Distance Metrics in Female Collegiate Soccer Players

Lillian Brinkman and Miyako Deloney
Student Coauthors: Lucas Crouse, Brady Ferguson, and Logan Stauffer
Faculty Mentor: Becky Heinert

**PURPOSE**: Monitoring positional differences in external load can be a key component of enhancing training programs and optimizing athlete performance. Specifically, load monitoring can be utilized to establish baselines, track performance, and aid both training staff and athletes in making educated and informed decisions. Therefore, the aim of this study was to quantify and compare external loads of National Collegiate Athletic Association (NCAA) Division II (DII) Women's Soccer players during 16 in-season competitions.

**METHODS**: Twenty-one NCAA DII female soccer players were tracked throughout the fall 2024 season using a Global Positioning System (GPS) with a sampling frequency of 10 Hertz. Metrics to quantify external load included: total distance (TD), average total distance (ATD), total sprint distance (TSP), average sprint distance (ASD), and average distance per minute (ADM). Descriptive statistics for each

group were calculated, and a Kruskal-Wallis h-test was run in SPSS. Significance was denoted with a p-value of $p<0.05$.

**RESULTS**: There were no statistically significant differences between positional groups for TD, ATD, TSD, ASD, or ADM ($p>0.05$). Means and standard deviations for each metric included: TD defenders (D) 162,273.7 ± 35,887.4 yards (yd), midfielders (M) 127,835.6 ± 43,370.7 yd, forwards (F) 119,549.7 ± 26,070.9 yd; ATD D 10,958.8 ± 2,340.7 yd, M 9,158.3 ± 2,650.8 yd, F 8,685.6 ± 1,609.3 yd; TSD D 5,491.1 ± 976 yd, M 3,916.8 ± 1,909.2 yd, F 6,231.9 ± 2,300.3 yd; ASD D 370.9 ± 63.1 yd, M 289 ± 131.1 yd, F 451.3 ± 129.9 yd; ADM D 64.1 ± 15.4 yards per minute (yd/min), M 53.5 ± 17.2 yd/min, F 52.9 ± 10.2 yd/min.

**CONCLUSION**: No significant differences were found in GPS-derived game distance metrics between the soccer positions. The large difference between means may indicate an advantage in individualization of programs between positions. Differences in external loads should be considered when planning player conditioning.

## Preseason Changes in Peak Relative Propulsive Force, Takeoff Velocity, and Time to Takeoff in Collegiate Women's Gymnastics

Kalli Van Tassell
Student Coauthor: Hailey Meyers
Faculty Mentor: Becky Heinert

**Purpose:** Lower extremity strength is crucial for the sport of gymnastics. Female gymnasts require explosive strength, quick speed, and flexibility for high competition performances. Muscular function is used to monitor fitness during preseason training to prepare athletes for in-season competitions. The primary focus of the CMJs is during propulsive phase which is the moment when an athlete propels themselves upwards into the air, creating an explosive jump. This motion measures force production and force transfer efficiency. The purpose of this study was to examine lower extremity strength of women gymnasts during 8 weeks of preseason training.

**Methods:** Eighteen NCAA Division III women's gymnasts (age 19.44±1.2 years, height 163±4.55 cm, body mass 62.2±4.73 kg) tested twice weekly. Each test session included three CMJs with hands on hips with feet shoulder width apart. Two portable force platforms (Hawkin,sample rate: 1000 Hz) were used to collect vertical ground reaction forces (GRF). The kinetic output of Peak Relative Propulsive Force (PRPF) and kinematic outputs of Time to Takeoff (TTT) and Takeoff Velocity (TV) were identified for analysis.

**Results:** Each dependent variable was influenced by Week 1 (PRPF $p<0.01$; TTT $p<0.01$; TV $p<0.01$). Data for each week are presented in Table 1 with paired t-test results in Table 2.

**Conclusion:** The key metric observed in this study was TTT shown in Table 2. This is a positive indicator of greater explosive power and neuromuscular efficiency. Faster time to takeoff allows for a more efficient use of force during a jump.

## The Effect of Computerized Reaction Time Training on Collegiate Baseball Athletes

Alec Morris
Faculty Mentor: Becky Heinert

**PURPOSE:** Reaction time is crucial for batting, fielding, and base running in collegiate baseball. Although emerging training technologies offer interactive methods to enhance reaction speed, their effectiveness in this context is underexplored. This study evaluates the impact of computerized, randomized reaction time training on college-aged baseball athletes.

**METHODS:** Thirty-nine athletes ages 18–24 from a local collegiate baseball team participated in a six-week training study. Participants were assigned to either a control group n=16, which continued regular training, or a treatment group n=23 that performed specialized reaction time drills. The treatment involved six light-up buttons fixed to a wall. During each 30-second round athletes were instructed to respond by hitting the blue button as quickly as possible among distractor colors. Each session consisted of 3 rounds of 30 sec with 10 second rest. Reaction times and total hit counts were recorded and averaged per session. Training sessions occurred twice weekly. Data was analyzed using SPSS mixed design ANOVA to determine changes in reaction time and hit count after training. Differences in reaction time of the training group were compared to the control with a statistical significance value of $p < 0.05$ for all analyses.

**RESULTS:** The treatment group demonstrated significantly faster reaction times Mean=638.39 ms, SD = 62.18 compared to the control group Mean = 771.73 ms, SD = 101.98 on the post-test. Total hit counts were also higher for the treatment group Mean = 37.88, SD = 2.78 versus the control Mean = 31.96, SD = 3.81, with large effect sizes Cohen's d = 1.58 and 1.78.

**CONCLUSIONS:** Computerized reaction time training appears to be an effective strategy for enhancing reaction time in collegiate baseball players. The significantly greater improvements observed in the treatment group support the integration of technology-based drills into training programs and highlight a promising future implementing technology-based training into everyday practice.

# History

## Comfort Women Surviving Sexual Slavery

Willa Carman
Faculty Mentor: Iris Wang

This research examines the cruelties of sexual slavery committed by the Japanese Imperial Army during World War II. Around 150,000 to 200,000 women were taken and used as sex slaves between 1928 and 1945, primarily in Korea and the Philippines. These women have come to be known as "comfort women," a former demeaning term suggesting that these women were comforting Japanese soldiers. However, "comfort women" were not voluntary prostitutes but young women and girls coerced, forced, and deceived into the comfort system. These women were kept in military brothels for multiple days up to numerous years, repeatedly raped by sometimes over 20 soldiers in one day. Throughout their lives, due to sexual slavery, they have had numerous physical issues such as venereal diseases, infertility, and

mental health disorders. They have also faced societal problems, many unable to marry due to being seen as "impure." This research will shed light on this largely overlooked case of government-organized and sponsored sexual slavery in modern history, which has had a lasting impact on its victims.
The exploitation and abuse these women endured was ignored and suppressed for decades. Comfort women were forced to stay silent because of the stigma attached to sex slave survivors in Asian countries. When they were finally able to speak out, the victims, along with their advocates, fought for justice and recognition for nearly 60 years to even receive a formal apology from someone in the Japanese government. By examining both historical accounts and testimonies of comfort women, this research will bring further attention to the long-lasting consequences of sexual slavery, specifically the survivors' struggles for healing and acknowledgment.

Additionally, this research will delve into the mindset of the Japanese soldiers who believed it was their "right" to have these comfort women. The Imperial Army systematically dehumanized both the women and men by engrained into their own soldiers' minds to detach from human dignity and hold and take lives without emotion. It is evident that even if a Japanese soldier disagreed with comfort stations on a moral level, there was no defying the military ranks and no speaking out against it. In contributing to existing literature, this research will show the importance of understanding and recognizing sexual slavery as a war crime and human rights violation. My goal is to have the stories and experiences of these women and those involved heard all around the world to ensure this never happens again.

# Mass Communication

## Parlez-vous français? You betcha: Revitalizing a French Cultural Center by Connecting to its Minnesota Roots

Ashley R. Flygare
Faculty Mentor: Stacey Kanihan

The Alliance Française Minneapolis-St. Paul (AFMSP) is an independent chapter of an international organization aimed at promoting the French language and various francophone cultures. It provides language instruction, cultural programming, social events, and access to a range of resources. However, participation in its events and courses has declined in recent years, putting the organization’s financial stability at risk. This project employs research and analysis to identify strategic and creative solutions to help AFMSP thrive.

A review of applied research was conducted, which included industry reports, performance data, and local cultural trends. Key insights revealed the need for enhanced community engagement, particularly through targeted communication efforts. The primary goal of this project is to help AFMSP increase community participation in its events and resources, which will enhance revenue and ensure financial sustainability. As the only cultural center in Minnesota focused exclusively on French language and culture, AFMSP is vital for the local community. This project is the first to gather data and detailed information about AFMSP to conduct a strategic analysis to address its challenges.

To develop the communication strategy, the project used Framing Theory (Goffman, 1974) and Aristotle's Theory of Persuasion (Aristotle, trans. 2004). Framing Theory focuses on how media and

messages can shape public perception. The campaign positions AFMSP as an accessible and essential resource for experiencing French culture locally. Aristotle's Persuasion Theory guides message development by using three modes of persuasion: logos (logical appeal), pathos (emotional appeal), and ethos (credibility appeal). These strategies aim to encourage individuals to engage with AFMSP.

Primary research included in-depth interviews with stakeholders—members, instructors, and staff—and a survey of community members. The data were analyzed to uncover patterns regarding audience engagement, perceptions of AFMSP, and barriers to participation. Findings revealed that the community faces challenges that prevent them from attending events and classes, including transportation issues, cost of attendance, and lack of time. These findings guided the establishment of specific goals and objectives, such as increasing event attendance and class enrollment. Additionally, research results informed the creation of strategies, including the "Bonjour, Minnesota" campaign and a detailed implementation plan. The project also includes a framework for evaluating the success of these strategies.

The "Bonjour, Minnesota" campaign invites the community to experience authentic French culture without leaving the state. Through a wide range of tactics, the campaign highlights how AFMSP makes French culture accessible to individuals and families in their neighborhoods. At AFMSP, the richness of French language, art, food, and history is brought to local audiences—no passport required. By promoting these diverse offerings through accessible channels, AFMSP can capitalize on the local enthusiasm for arts, culture, and language learning. Implementing these recommendations will ensure that the Alliance Française Minneapolis-St. Paul connects effectively with both new and existing members, ultimately boosting participation and financial sustainability while continuing its long history of enriching Minnesota with French culture.

# Mathematics & Statistics

## A Comparison of the Bacterial Communities of the Yamuna River (India) and Mississippi River (USA)

Jacob Gareis
Faculty Mentor: Osvaldo Martinez and Silas Bergen

This study compared the bacteria in the Yamuna River in India and the Mississippi River in the USA. Water samples were taken from 11 sites (2 in the Mississippi River and 9 in the Yamuna River). The bacteria were identified using 16S rRNA gene sequencing. Some phyla such as Proteobacteria and Bacteroidetes were seen in abundance regardless of country. However, principal-component analysis showed three distinct groupings: Mississippi/Ganga/Tons and other Yamuna River locations (7 sites), Yamuna River at Delhi (2 sites), Yamuna River below Glacier (2 sites) Additionally, the Yamuna River below Glacier had the highest bacterial diversity, with a Shannon index of 5.1 and a Simpson index of 0.986 when compared to both the Yamuna River below Glacier (Shannon p-value: <0.0001, Simpson p-value: <0.0001) and the Yamuna River at Delhi (Shannon p-value: <0.0001, Simpson p-value: <0.0001).

## Causal Inference for ICU Patients

Jack O'Connor

Student Coauthors: Monserrath Velez, Nicholas Della Pesca and Rio Baliga
Coauthors: Rahul Ladhania and Snigdha Panigrahi
Faculty Mentors: Silas Bergen

Sepsis is an infection that can lead to vital organ dysfunction, and it is estimated to occur in 30% of ICU patients. This research aims to assess whether receiving a Transthoracic Echocardiogram (TTE) has an effect on the 28-day mortality rate of ICU patients with Sepsis, as TTEs are currently widely used in medical treatment. Our data source containing ICU patients comes from the Electronic Health Records (EHR) database MIMIC-III. This is an observational data source, so we attempted to establish causality by addressing assumptions and using various causal effect estimators. Additionally, we estimated heterogeneity in treatment effects across different groups of sepsis patients. Ultimately, we established a causal effect and identified which covariates are associated with large treatment effects. This research can be used to better inform clinical decisions when providing care for ICU patients with Sepsis.

### Geospatial Analysis of Flood Risk on Housing Price in Fargo, ND

Sho Satos
Faculty Mentors: Tisha Hooks and Brant Deppa

Extreme weather events are becoming more frequent due to rising temperatures and a changing climate. Flooding, one of the most destructive natural hazards, causes millions of dollars in damage annually, with even historically low-risk areas becoming increasingly vulnerable. Fargo, ND, has experienced multiple floods in the past, highlighting the growing concern over flood risk in real estate markets. This study examines the impact of flood risk on housing prices in Fargo by analyzing transaction data from the past five years. Using flood risk classifications from FEMA and housing data from Redfin, this research evaluates the relationship between flood risk and property values. The findings will provide insights for homebuyers, real estate professionals, and policymakers navigating the financial implications of climate-related risks in the housing market.

## Nursing

### Chronic Cannabis Use and the Effects of General Anesthesia

Marcus Mulvihill
Faculty Mentors: Melodie Jolly and Jessica Hoy

A poster presentation to educate people on chronic cannabis use, how cannabis effects patients under general anesthesia, and the research gap within cannabis studies. These findings were found by doing literature reviews and interviews with Certified Registered Nurse Anesthetists. The poster will also include a survey done when educating Family Nurse Practitioners used to gather understanding of cannabis use and the effects on general anesthesia.

## Collaboration and Partnership Creation as a Method to Best Support Individuals with Intellectual and Developmental Disabilities (IDD).

Gretta Bergstrom, Jonas Bishop, Caitlin Curtin, Jesse Frank, Sheyenne Lor, Morgan Mueller, Isabelle Sunde, and GaoHmong Yang
Faculty Mentor: Kathryn Frie

**Background**: There is a growing need for inclusive healthcare for individuals with IDD. There is a gap in clinical training of care for individuals with IDD. Formal clinical training for IDD was lacking in 40% to 86% of healthcare providers [Khanlou et al., (2021); Friedman & VanPuymbrouck (2024)]. This lack of specialized training contributes to healthcare disparities. Individuals with IDD have a life expectancy of 66.1 years, which is approximately 20 years shorter than the general population [Roll & Bower (2017); Friedman & VanPuymbrouck (2024)]. Additionally, 17 to 36% of individuals with IDD experiences limited access to healthcare providers, further exacerbating health inequities [Jeste *et. al*., (2020); Friedman & VanPuymbrouck (2024)]. The financial burden associated with IDD care is substantial. The annual healthcare cost for individuals with IDD are approximately four times higher than the general population, underscoring the need for improved training, accessibility, and comprehensive care strategies (Shady et al., 2022).

**Problem**: Limited education and training in medical schools and nursing schools on caring for individuals with IDD create significant gaps in knowledge, awareness, and communication [Desroches (2019); Friedman & VanPuymbrouck (2021); Kemer & Appelbaum & Fremion (2024); Khanlou *et. al*., (2021); Rolls & Bowers (2016); Shady *et. al.*, (2022); Smith *e.t al*., (2021)]. Many providers do not feel confident in communicating or supporting individuals with IDD due to a lack of education [Shady et al., (2022); Smith *et. al*., (2021)].
**Methods**: This project incorporated the collection of qualitative and quantitative data. Students engaged in community action participatory research to assess the local Winona community through the eyes of an individual with an IDD. The groups participated in windshield surveys and actively explored the environment utilizing a wheelchair. Students assessed components of the environment and identified strengths and barriers of the community. Assessments were conducted through routine visits with individuals from HCO (Home & Community Options) over four weeks.
An IRB-approved survey was created to assess the WSU campus and local community's awareness of IDD. The survey was sent out to 1,000 randomly selected WSU undergraduates and nursing students. There were 121 responses that were analyzed.

**Outcomes**: Upon assessment of the Winona community as a wheelchair-dependent individual there is room for improvement in accessibility and safety. Through first-hand experiences with the IDD population, there was a continuous theme of the importance for education in the classroom setting and experiential learning to appropriately provide care for vulnerable populations.
Data collected from the brief survey indicates a significant gap in awareness and understanding of IDD and local resources.

**Conclusion**: The survey was used to inform about awareness and direct next steps with future nursing collaborations. HCO collaboration with WSU Nursing to establish a guide to clinical experiences providing opportunities to enhance nursing education while improving the care of individuals with IDD would be beneficial.

## Disparities in Women's Healthcare

Allie Sonnleitner
Faculty Mentor: Chrissy Feine and Stephanie Ryan

**Purpose:** Women's health care disparities remain an understudied topic within the scientific community, despite the emergence of the Women's Health Movement in the 1960s. It wasn't until 1986 that women were allowed to participate in clinical research and trials. In 2017, the National Institutes of Health launched its first dedicated program to address disparities among women. Studies have consistently found disparities between biological men and women in areas such as pain management, treatment and diagnostics, and inclusion in clinical trials. These studies highlight significant differences in care and provide substantial evidence to support their findings.

**Methods and Results:** To address the knowledge gap regarding disparities in women's healthcare, a hypothesis was formed to deliver education to nursing students, aiming to increase their awareness and ultimately reduce these disparities. To evaluate if education could enhance understanding of these disparities, an education session was delivered to 42 nursing students, accompanied by anonymous pre- and post-surveys.

The educational content covered previously identified topics, emphasizing the importance of informing future nurses on diverse patient needs. In addition to highlighting the existence of disparities, the session also focused on strategies to prevent and reduce these inequities in women's healthcare. The goal of this project was to enhance future nurses' knowledge, thereby aiming to lessen the disparities experienced by biological women.

The pre-education survey results indicated that fewer than 10 participants strongly agreed with most statements. However, in the post-education survey, over 30 participants strongly agreed with almost all the statements, demonstrating a significant increase in knowledge and awareness.

**Conclusion:** The results indicate a significant increase in knowledge about healthcare disparities and an enhanced ability to educate others on this topic. This project concludes that education focused on disparities in women's healthcare is essential for increasing awareness, which can ultimately help reduce the daily disparities faced by women in the healthcare system.

## Education on Advanced Directives in Rural Communities

Samantha Koster, Alyssa Iverson, Caroline Odell, Nulia Nguyen, Olivia Post, Gabrielle Gray and Cheol-Hyeon Roh
Faculty Mentor: Ann Boberg

**Background:** Rural communities have less resources and accessibility to healthcare services which causes a lack of knowledge regarding overall health and well-being. One deficit in knowledge surrounds advanced directives. In a meta-analysis it was found that 36.7 percent out of 795,909 individuals had advance directives completed and in place (Yadav, et al., 2017). Implementation of education about advanced care planning can lead to more individuals completing the proper documents and understanding them (Fink, et al., 2020). Programs such as *Prepare for Your Care* showed to increase the likelihood of understanding and creating an advanced directive in those with low health literacy (Fink, et al., 2020). Discussing legal documents and advanced directives early on can help to develop a plan for

patients in a timely manner and establish practice for those at risk of cognitive impairment or growing of older age (Lee, et al., 2019). It is important to create advance directives when one is in good health because their decision-making skills are clear and will provide accurate information as to what the individuals wants are (Lee, et al., 2019).

**Problem:** In rural communities, many older adults lack awareness and understanding of advanced directives, hindering their ability to make informed healthcare decisions. This knowledge gap, coupled with limited access to healthcare and legal resources, contributes to health disparities and may result in care that doesn't align with individuals' values. Families may also face emotional and financial strain when making healthcare decisions. Increasing education on advanced care planning can help more individuals create proper advanced directives and ensure their healthcare wishes are honored (Fink, et.al, 2020).

**Methods**: During our clinical shift at Bridges Health, we are handing out a survey for the client to fill out regarding their knowledge of Advanced Directives, how to create one, the community attitude towards them, availability of resources regarding them, and if there should be better resources available to the community members. The client will answer each question on a scale from strongly agree to strongly disagree, which an exception to the question about their knowledge, where they will answer from very familiar to not familiar at all. This will be used in a variety of Bridges locations, from very rural communities such as Blair, to more populated communities such as Winona.

**Outcomes:** We anticipate that the outcome of our project will reveal a significant lack of education on advance directives in rural communities. We expect to learn that, due to limited access to transportation and healthcare services, individuals in these areas are not receiving adequate information about the purpose and importance of advance directives.

**Conclusion:** The surveys at Bridges Health Clinic are expected to reveal a lack of understanding regarding Advanced Care Directives, highlighting the need for improved education. To further expand knowledge on this topic, it would be beneficial to extend this research to other Bridges Health locations.

## Effects of Prior Direct-Patient Care Experience on Undergraduate Nursing Students' Anxiety and Self-Confidence

Kierra Pickard and Lauren Cahalan
Faculty Mentors: Chrissy Feine and Lucy Johnson

**Purpose:** An extensive literature review indicates a gap in understanding how prior direct patient care experience affects undergraduate nursing students' anxiety and self-confidence during their program. The purpose of this project was to examine the impact of prior direct patient care experience on undergraduate nursing students' anxiety and self-confidence while in an undergraduate nursing program.

**Participants:** A total of 294 undergraduate nursing students were surveyed using Qualtrics. Students were from terms one, two, three, and four in the Winona and Rochester nursing program allowing for a population of diverse backgrounds.

**Methods:** A survey including the *Nursing Anxiety and Self-Confidence with Clinical Decision Making (*NASC- CDM©) scale was administered to assess both anxiety and self-confidence, with 27 questions for each. Self-confidence and anxiety were rated on a scale of 1 through 6: 1 = not at all, 2 = just a little, 3 = somewhat, 4 = mostly, 5 = almost totally, 6 = totally. Additional data were collected on participants' term in the nursing program, prior experience in direct patient care, age, and gender. For those with prior experience, further details were gathered on the number of years of experience and the time elapsed between the start of prior experience and the beginning of nursing the nursing program.

**Results:** Scores for anxiety and self-confidence were able to range from 27 (not at all) to 162 (total anxiety or self-confidence). Students who had direct-patient care experience showed increased self-confidence and decreased anxiety compared to students who did not have direct-patient care experience prior to admission to the undergraduate nursing program. Furthermore, results indicated that prior direct-patient care experience and term within the nursing program significantly improve self-confidence.

**Conclusions:** Having direct-patient care experience prior to undergraduate nursing program admission is effective in decreasing anxiety and increasing self-confidence in undergraduate students. Nursing programs may find it beneficial to require direct-patient care hours for undergraduate nursing students prior to program admission to assist in decreasing anxiety and increasing self-confidence.

## Evidence-Based Education for Conducting Long-COVID Community-Based Screening

Craig Schapekahm and Justin Mann
Faculty Mentor: Ashley Busch

**Problem Statement:** Lack of a consistently used community screening tool for long covid (LC), with associated training, was identified as a clinical concern within Winona State University (WSU) community outreach settings. We know this is a problem because of the lack of screening in practice and while conducting a Bridges Health, PC site assessment, it was identified that LC education of the illness and screening procedures are lacking for interprofessional students of various health majors. Training future health professionals (i.e., students) is needed because of the emerging knowledge and practice changes related to LC within community and primary care settings. Further, without a standard screening tool for healthcare teams, treatment and management of LC in affected clients could be delayed.

**Purpose:** Determine if a modified LC screening tool increases student screening use and confidence over their semester working with Bridges Health, PC clinics.

**Methods:** A two-group pretest-posttest design will be used. Participants will be given LC screening education at the beginning of their semester, before the pre-test and will take a post-test survey at the end of their semester, around March or April 2025.

**Inclusion criteria:** Students within an undergraduate or graduate healthcare educational program and completing clinical hours within a Bridges Health, PC clinical site within Southeast Minnesota. Students may or may not have participated in a Bridges Health, PC clinical opportunity prior to this quality improvement project.

**Analysis:** Paired pre-post survey of Bridges Health, PC students analyzed with McNemar's or Bowker's test for dichotomous or ordinal responses. Comparison of Bridges Health, PC LC screening rates in 2024 vs 2025 analyzed with Fischer's exact test, z-test and confidence interval, and odds ratio.

**Implications for Practice:** Creating a modified LC screening tool paired with an educational presentation about screening tool use and rationale for use has a positive correlation with LC screening among undergraduate and graduate students in healthcare-centric tracks.

## Implementation of Palliative Care in Relation to Quality of Life for Adults with Chronic Conditions

Zoe Dreckmann
Faculty Mentors: Autumn Cole and Elizabeth Green-Kronebusch

Palliative care is care focused on maintaining or improving one's quality of life. Many patients suffer from chronic conditions that impact quality of life due to high symptom burden and other factors that impact physical and emotional health. According to Calsina-Berna et al. (2022) in patients with advanced chronic conditions, 69-82% will need palliative care before death but only 12% will actually receive palliative care (Teixeira et al. 2023). Hence the majority of people with advanced illness need palliative intervention but fail to benefit from the services offered. Palliative care for these patients focuses on quality of life (QOL) which encompasses more than just symptom management; QOL can focus on spiritual and emotional wellbeing as well as increasing goals of care conversations to allow for patient centered care (Ansari et al., 2019; Beck et al,2022; Bernard et al., 2020; Calsina-Berna et al., 2022; Quinn et al., 2019; Rankin, 2018; Rogers et al., 2017; Tobin et al., 2022). The purpose of this presentation is to evaluate the following PICO: In adults with a chronic condition how does the integration of palliative care effect quality of life? Additionally, the purpose of this presentation is to educate students, specifically nursing students, on palliative care services, identify when a patient would benefit from palliative care, and be able to educate patients, families, and other healthcare professionals on palliative care after this presentation. The research in this presentation will evaluate the following concepts related to palliative care—symptom burden, spiritual wellbeing, goals of care conversations, and palliative screening. It was found that palliative care in patients with chronic conditions is essential to maintaining and improving QOL. Palliative care encompasses care that focuses on each patient individually to provide patient centered care and promote QOL. Symptom management, spirituality, and goals of care all ensure that each patient with a chronic condition is receiving care focused on their individual QOL (Ansari et al., 2019; Beck et al,2022; Bernard et al., 2020; Calsina-Berna et al., 2022; Quinn et al., 2019; Rankin, 2018; Rogers et al., 2017; Tobin et al., 2022). It is expected that after this presentation students would feel more confident in identification of factors that palliative care could assist in, feel more confident in providing education about palliative care, and overall, better understand palliative care services.

## Medication Card Implementation in Public Health Clinics to Increase Health Literacy within Older Adults in Rural Communities

Abigail Mulcahy, Audrey Ehling, CeCelia Braun, Janae Salvetti, Jocelyn Liddell, Josh Boen, Madison Henneman, and Zoe Dreckmann
Community Partner: Bridges Health

Faculty Mentor: Ann Boberg

Health literacy continues to be a barrier to care in rural communities especially within the older adult population. This is largely because of the lack of access, transportation, and reduced resources (Pailaha, 2023). Health literacy refers to the ability of an individual to understand and compare and contrast information to make informed decisions regarding their healthcare. It is known that when there are health literacy deficits clients are more likely to visit the ER frequently and have increased unplanned hospitalizations (Aljassim & Ostini, 2020). Therefore, improving health literacy within the older adult community in a rural setting is important in producing improved health outcomes for the entire community. This project aims to evaluate the following population health problem: Improving health literacy within older adults living in a rural community by offering a communication enhancement tool of a medication card that provides a clear and accurate list of client medications. In working with older adults in the rural setting, it is evident that there is a lack of health literacy related to medications. Therefore, offering a medication card that is accurate and clear will enhance and simplify communication between clients and their healthcare provider while also aiming to improve individual health literacy. If clients are interested in participating in creating a medication card, they will be encouraged to sign up for a "Medication Card Corner" event. This event will be held aside from the actual Bridges clinics to ensure adequate time for our services. The event will provide clients with the supplies to create a medication card with their primary care provider or with the help of Bridges Health volunteers. The effectiveness of this intervention will be measured through qualitative data received from clients who participate in the intervention. Clients will be asked to rate the medication card intervention one month after the intervention was completed. Clients will be asked whether the intervention was effective/helpful using a Likert scale of "not helpful", "somewhat helpful", "helpful", and "very helpful". Clients will also be asked if they better understand the medications, they are taking using a Likert scale of "did not improve my understanding", "somewhat improved my understanding", "improved my understanding", and "significantly improved my understanding". This information will then be used to evaluate the effectiveness of the medication card intervention. It is anticipated that clients will at least rate the helpfulness as somewhat helpful and rate understanding at somewhat improved my understanding. In conclusion, this project aims to improve health literacy throughout the older adult population in rural communities. It is recommended that more research is conducted in health literacy and its relation to medication card implementation. It is also recommended that more studies be conducted on the effectiveness of a medication card implementation for older adults in a rural community.

## Promoting Cardiovascular Health to Women 65 and Older

Ashtyn Newland, Malaina Buehler, Brianna Ryan, Serena Tatu, Emma Pagel, Kelly Blue, Naomi Breunig, and Addison Lyon
Faculty Mentor: Samantha Brown

Cardiovascular disease (CVD) is a significant health concern for women aged 65 and older. CVD is the leading cause of death for women in the United States. Cardiovascular heath can be complex and confusing with how much misinformation is spread online. Nursing students collected and reviewed literature related to cardiovascular health and the risk factors for women over 65. The top risk factors identified for CVD were poor nutrition, lack of socialization, living a sedentary lifestyle, and infrequent blood pressure readings. The objective of our evidence-based health promotion event was to educate women over the age of 65 on how nutrition, exercise, good mental health practices, and regular blood pressure readings can reduce the risk for cardiovascular disease.

Nursing students held an evidence-based health promotion event targeting women 65 years and older. The event included four stations: Nutrition, exercise, mental health, and blood pressure reading. The nutrition station focused on the importance of swapping unhealthy for healthy fats, focusing on decreasing cholesterol, having an adequate intake of protein, and consuming enough water. The exercise station assisted with modified chair exercises and gave further information on how exercise can reduce blood pressure. Mental health was one of the last stations that discussed with each of the women the importance of how mental health can directly affect heart health. The students at the mental health station focused on how reducing stress can directly reduce blood pressure, with suggestions such as volunteer work and socialization being the focus. Blood pressure readings were offered, and results were explained to each of the women with contingencies in place if further follow-up was needed. The nursing students collected qualitative data for the evidence-based health promotion education that was provided to participants. Forty-six women attended the event, and sixteen of the women completed the survey. Qualitative data from the surveys concluded that 100% of the women agreed they learned how to better manage their health and they would incorporate this information in their daily lives moving forward. Some women stated in their surveys that they had already heard some of this information but still appreciated the reminder, encouragement, and explanations. The importance of the event was established, which was that cardiovascular health education should be encouraged and reinforced to provide women 65 and older an opportunity to maintain and improve their cardiovascular health, enhance their quality of life, and reduce their risk for heart diseases.

## Scent-sational Aromas

Joshua Boen
Faculty Mentor: Susan Zeller and Sara Laker

This is a series of health educational videos developed for TikTok and Instagram Reels formulated from a literature review. The videos focused on essential oils, how to use them properly, and how to avoid misinformation surrounding essential oils. These videos used research provided by a licensed aromatherapist and were approved by professors before being filmed, edited, and posted. The videos' data points were then evaluated to adapt posting for better engagement.

## Stay Fit, Stay Safe: Sports Safety for Community-Dwelling Older Adults

Hanna Crabtree, Lauren Cahalan, Emily Myszewski, Kierra Pickard, Claire Privatt, Allie Sonnleitner, Emily Vargas, and Maya Vosters
Faculty Mentor: Maryann Abendroth

**Purpose**: With the growing older adult population, defined as 65 years and older, the importance of safety in activities, such as sports, is becoming more important. It is vital to address the needs of this population through increasing education to prevent or address injuries related to physical activity. The overall purpose of this project was to determine the impact of providing sports safety education at the Holmen Area Community Center (HACC). Moreover, we sought to explore and educate the clients at HACC on ways to prevent such injuries and what to do if an injury does occur.

Many older adults come to the HACC walking path in the gymnasium, participate in yoga, and exercise classes. Other participation opportunities include line dancing and playing pickleball. Participation in

several of these sports activities may lead to injuries. Older adult community members at HACC shared stories about their experiences participating in sports activities which included reflecting on previous sports-related injuries and potential knowledge gaps. The members desired more education on how to prevent falls and what to do if a fall occurred. A literature review was completed focusing on injury prevention, intervention, and subsequent follow-up to ensure proper healing of injuries among older adults.

**Methods and Results:** Findings from the review of literature were synthesized into five themes: warm-up, daily immersion, fall prevention, ability awareness, and post-fall treatment. The information gained from this project supported the creation of an educational resource for community dwelling older adults. The literature shows that warming up before activities can reduce injuries over time. Additionally, incorporating exercise into older adults' daily lives reduces the risk of falls and injuries by improving physical and cognitive function. While these older adults may have more physical and mental ability gained through exercise, falls may still occur. Studies revealed how to safely fall if one were to occur. Many older adults try to prevent an impending fall, which may result in a more serious injury. Education on post-fall treatment is vital for a successful recovery.

**Conclusion:** The resource developed from this project will educate older adults within the community on proper ways to prevent injuries. Such ways include how to fall safely, and what to do when a fall does occur. This information will be presented at a community education event in April to bring awareness to sports safety among older adults in the community. Fall prevention for older adults participating in sports is important to consider for nursing as falls can lead to deteriorating health outcomes and impact overall well-being.

## Tackling Food Insecurity in the Collegiate Athlete: An Innovative Approach

Brittany Borhart and Trisan Niemeyer
Faculty Mentors: Sandy Paddock and Ashley Busch

Globally, food insecurity is commonly seen in those from racial minorities or from families experiencing financial insecurities (Brown et al., 2023; Freudenberg et al., 2019). Additionally, food insecurity is an issue that is impacting those on college campuses. Students enrolled at the Rochester Community and Technical College (RCTC) recently were invited to participate in a Hope Center Basic Needs Survey, nearly 50% of respondents indicated they were experiencing food insecurity. A survey of the RCTC football team showed approximately 40% of the team reported food insecurity using a Core Health-Related Social Needs screening tool. Food insecurity has been found to be a large issue in the college athlete, in particular (Abbey et al., 2022; Brown, et al., 2023; Pacenta et al., 2024; Reader et al., 2022). Despite the existence of programs such as Supplemental Nutrition Assistance Program, student athletes often do not meet qualification criteria due to their inability to maintain 20 working hours in a week because of time demands surrounding their sport (College SNAP Project, 2021). When examining the race of individuals on the RCTC football team, most of the athletes are non-whites who belong to families with lower socioeconomic status. Fortin et al. (2021) suggest that this problem requires a wide variety of interventions that extend beyond food pantries and meal plans, such as general nutrition, cooking, time management, or financial management. To combat this growing issue, we decided to design a program that would teach student athletes how to plan nutritionally dense meals despite financial restraints. The goal of this project is to answer this question: In college football athletes experiencing food insecurity, how does attendance at one or more workshops on meal preparation affect food insecurity and self-reported academic performance compared to not attending workshops?

Participants of this evidence-based quality improvement project were selected based on active status on the football roster and being enrolled as an RCTC student. Students were asked to complete a pre/post-survey that included an adapted 6-item United States Adult Food Security Survey and Likert-scale questions relating to current academic performance and experience with meal planning. Through the creation of six meal planning workshops, student athletes can voluntarily learn about nutrition education and dietary considerations through dietician-created recipes. Donated food/recipe ingredients items are sent home with the athlete. By collaborating with community partners, the project team can help alleviate the burdens present in health inequities and support the student athletes' physical and mental wellbeing. Results of this project are still being collected, but predicted participation in this study will impact approximately 50% of the rostered RCTC football team.

## The Impact of Physical Activity on Mental Health Disorders in Children

Brianna Ryan
Faculty Mentors: Autumn Cole and Megan Anibas

**Purpose -** The purpose of this project is to highlight the effects physical activity has on children's mental health and to provide evidence-based insights on ways physical activity can and should be incorporated into the developmental stages of children's lives. Ultimately, the goal being to promote healthier and improved mental health statuses for the younger populations.

**Introduction -** The mental health crises among children are on the rise as more children each year are diagnosed with mental health conditions. It has been found that around 20% of children ages five through seventeen regularly experience symptoms of mental health disorders and this number continues to increase each year (Crichton et al., 2024). Due to the severity of the mental health crises in this population, it is important to look at alternative factors for treatment and interventions of these problems, which is where physical activity comes into play. Physical activity is an alternative, low-cost intervention for those who may be experiencing mental health problems and has been found to play a role in decreasing mental health symptoms (Andermo et al., 2020; Belcher et al., 2021; Crichton et al., 2024; Dale et al., 2019; Laurier et al., 2021; Li et al., 2023; McCann et al., 2022; Murthy, 2023; Pascoe et al., 2020). Educational and intervention programs to help promote physical activity may be effective in battling the mental health crises in children.

**Results -** During this review of literature, multiple studies were found supporting the importance of physical activity interventions in reducing mental health disorders in children. Murthy (2023) highlighted the significance of physical activity in reducing depression, anxiety, and stress, while also improving cognition and the ability to control emotions, supporting important developmental stages of children. Li et al. (2023) reported how lower levels of physical activity correlate closely with higher levels of depression, anxiety, and stress among the youth population; whereas higher levels of physical activity correlate closely with more positive outcomes like increased self-esteem, self-concept and resiliency (p.2). In a review completed by Pascoe et al. (2020), it was found that three studies assessing moderate-vigorous activity levels led to decreased depressive symptoms. Through various research studies examined in this project, physical activity showed to be a beneficial intervention regarding the increase in mental health disorders and crises in children.

**Conclusion** - Overall, this project emphasizes the significant role physical activity has in reducing the effect of mental health disorders such as depression, anxiety, and stress in children. Understanding the value of physical activity and incorporating corresponding interventions through caregiver education,

school and community-based programs, and family involvement are essential as effective alternative treatment options.

### The Impact of Vitamin D on Mental Health in College Students

Kelsey Hipenbecker, Brianna Carlson, Joshua Gullickson, Rylee Fredrickson, Abigail Andersen, Isabel Schottenbauer, Bryce Stoltz
Faculty Mentor: Grace Rassmussen

Mental illness can impact persons of all ages. A Healthy Minds study revealed that more than 60% of college students met the criteria for at least one mental health condition over the course of a year. Mental health issues such as generalized anxiety disorder (GAD) and major depressive disorder (MDD) have been associated with insufficient dietary vitamin D and sun avoidance amongst college students. Because mental illness is becoming increasingly prevalent in college students, we did a literature search to examine the association of vitamin D and mental health among college students. This topic is relevant as college students' busy schedules and other responsibilities may hinder safe sun exposure and a well-balanced diet, possibly leading to lower vitamin D levels.

Findings from a preliminary literature search revealed that college students had a limited understanding of the importance and the effect of vitamin D on health and well-being. For example, students, in general, do not know the recommended adult daily intake for vitamin D or its benefits. Our public health project focuses on students at the WSU Health Services clinic setting and the surrounding campus area. We aimed to raise university students' awareness about the recommended daily intake of vitamin D, educate them on ways to obtain vitamin D, and highlight the positive effects of vitamin D on mental health. We created an educational brochure containing information about signs of vitamin D deficiency, how vitamin D impacts mental health, where sources of vitamin D can be found, as well as additional resources to view regarding vitamin D. We plan to hand out the brochure in various settings around the Winona State Campus. For example, we will hand out the brochures at WSU Health Services and answer any of the students' questions. Also, the brochure will be emailed to all WSU nursing students including specific groups such as athletes. This is an important intervention to promote knowledge about vitamin D and help our university students to have the information that they need to make good choices about their own health.

# Physical Education and Sports Science

### Revisiting Least Restrictive Environment in Adapted Physical Education: A Framework for Evidence-Based Practice

Samantha Charron
Faculty Mentor: Dillon Martinez

This article addresses the implementation of Least Restrictive Environment (LRE) principles in adapted physical education. Despite the legal mandates established by the Individuals with Disabilities Education Act, the field faces significant challenges, including a shortage of qualified professionals, overemphasis on universal inclusion, and the exclusion of student voices from placement decisions. Through analysis of historical context, implementation challenges, and a proposed Student-Centered APE Placement

Model (SCAPM), this article provides a framework for making evidence-based placement decisions that prioritize student success. By integrating perspectives from preservice teacher education and current practice, the framework offers practitioners a structured approach to navigating the complex terrain of LRE implementation while maintaining focus on individual student needs.

# Physics

## Using the EPIC Algorithm for Radio Astronomy

Samuel Michaud
Faculty Mentor: Adam Beardsley

The EPIC (E-field Parallel Imaging Correlator) algorithm is a direct imaging correlator for radio interferometer arrays. Bypassing the expensive processing step of cross correlation and immediately computing a spatial fast Fourier transform allows it to generate extremely high framerate radio images. EPIC serves to efficiently process signals from a very high count of radio antennas in an array with parallel computing, scaling as Nlog(N). This research project investigates the advantages and limitations of using EPIC for astronomy. This was done by stress testing both the user interface and back-end database through SQL commands to validate the output data it processed from the signal generated by the Long Wavelength Array radio telescope in New Mexico. The presentation provides an overview of how EPIC works, along with some projects that have been done such as documenting solar radio bursts, searching for fast radio bursts, and validating output via comparison to a beamforming algorithm.

# Political Science

## A House Divided by Itself Cannot Stand: Partisan Divide, How Americans Vote, and Why It Matters in the Modern Era

Timothy Galvin
Faculty Mentor: Elissa Alzate

*Abstract:* From 2000 to 2016, there has been a sharp increase in the partisan divide among American voters, however, there do not exist many studies in the modern era describing how we have gotten to this point. It is my hypothesis that the divide was most prevalent in three key elections, those being the 2000 election between George Bush and Al Gore, the 2008 election between Barack Obama and John McCain, and the 2016 election between Donald Trump and Hillary Clinton, and that the levels of partisanship influenced how Americans voted in those elections. To measure this, I will be looking at the ANES data from those three elections and rating why Americans liked either the Democratic or Republican candidate on the ANES 7 point scale using six key categories: economic policies, foreign policies, campaign promises, policies, personality, and experience in politics. To measure the level of partisanship I will be looking at why respondents liked either the Democratic or Republican party and respondent views on the 2nd Amendment and gun control, abortion, the environment, and the economy.

## Inconsistent Application of American Foreign Policy

Austin Morris
Faculty Mentor: Elissa Alzate

Much literature on American Foreign Policy literature often brings the concept of isolationism into focus and how it's shaped our attitudes around the globe for all of American history. However, isolationism seems to come in waves where its applied, or at least attempted, and then ignored. I believe the reason for the waves of inconsistency we see in our history is not due to a true back and fourth belief in isolationism but that our literature and belief on the subject does define it well enough to adjust for a complex issues. I believe instead of a one size fits all definition, we need to incorporate multiple separate ideas of isolationism and that will help us better understand the waves of application. In a survey students will be asked to assess their ideal viewpoint of an overall American Foreign Policy and to be compared to their answers on exact foreign policy issues of today to see if there is a discrepancy to highlight the need for multiple categories of isolationism.

## Social Media's Influence on Political Opinion

Alizabelle Carman, American National Election Studies, Stanford University and University of Michigan
Faculty Mentor: Elissa Alzate

In 2023, Stanford University and the University of Michigan conducted a study on social media during the 2020 Presidential election. In this research, I will analyze the pre-2020 election portion to assess how social media influences public opinion. The specific platform I will focus on is Facebook. Throughout the 2020 election, many political opinions were shared across various social media platforms. Analyzing this dataset may reveal the statistical significance between information disseminated on social media and the political opinions of voters as they head to the polls.

## Socioeconomic Status and Political Opinion

Rebecca Harmon
Faculty Mentor: Elissa Alzate

This study examines the effects of socioeconomic status on one's political opinion. A survey will be voluntarily taken by Winona State Students. The survey will collect quantitative and qualitative data. I hypothesize that there will be a strong correlation between socioeconomic status and political opinion. This research will add to existing data proving a correlation.

## The Effects of Misinformation on Survey Recipients Satisfaction with Americas Political Atmosphere

Olivia Murray
Faculty Mentor: Elissa Alzate

If survey recipients are presented with negative misinformation, then they will be unsatisfied with the president elects time in office. If survey recipients are presented with positive misinformation, then they will be unsatisfied with the president elects time in office. This research takes the form of a survey which will be sent Winona State students to record their responses. I will test my hypothesis with one survey,

which will include several demographic questions. These questions will be paired with questions that present “fake news” or misinformation about president elect Donald Trump. The misinformation will present him in a negative light. The other set of questions that show misinformation will show president elect Donald Trump in a positive light. This set of questions will be randomized in each survey. The end of the survey will then ask a question about the recipient's satisfaction with presidents' term so far. The idea is that the fake news presented will affect the recipient's satisfaction with the president's term so far. If recipients are presented with positive fake news, they will be more satisfied with the president's term so far. If the recipients are presented with negative fake news they will be dissatisfied with the president's term so far. If the demographics in each survey are roughly 50% equal, then my hypothesis will be correct. I will get my data from the survey responses and analyze the answers to either support my hypothesis or disprove my hypothesis.

# Psychology

## Bystander Intervention and Cyberbullying

Corrie Born
Faculty Mentor: Carrie Fried

With technology usage becoming a normal part of everyday life, cyberbullying incidents have increased and become a noticeable issue in today's society. Previous studies on this topic have used the bystander intervention model to examine the bystander effect with social media usage. The current study manipulates the severity of a cyberbullying incident and the number of witnesses to the incident, while also measuring participants perceived severity of the incident, their feelings of responsibility/intention to intervene, and their self-reported empathy level. It is theorized that severity of the incident will positively influence participants feelings of responsibility and intention to help the victim. Higher number of witnesses will lead to participants being less likely to feel responsible to help the victim and their intention to help the victim. The current study found that the number of witnesses did not affect how severe participants perceived the incident. This finding showed that participants who were in the severe condition where more likely to help and feel more responsible to help. The current study also found that participants who reported past exposure to a cyberbullying incident were more likely to help the victims, no. matter the severity, than those who had no previous exposure to cyberbullying.

## Family and Children's Center Internship Experience

Audrey Kennedy
Faculty Mentor: Robert Casselman

This poster presentation will highlight my experience at Winona's Family and Children's Center. As a day-treatment intern, I worked with children ages 4-8. I learned how to help kids build skills and healthy coping methods. This internship allowed me to gain valuable hands-on experience, provided the opportunity to apply what I have learned in the classroom, and gave me insights on future career plans.

## Internship Experience at Hiawatha Valley Mental Health Clinic

Mason Pretzer
Faculty Mentor: Robert Casselman

This will be a poster board presentation on my internship experience at the Hiawatha Valley Mental Health Clinic. It will feature some things I've learned over the semester, like being assertive, facilitating group sessions, and redirecting within group sessions. I will also showcase how a psychological theory or principle applies to my internship experience.

## Internship With the Winona School District and Project Compass

Jasmine Odegard
Faculty Mentor: Robert Casselman

There are two parts to my current internship; I work with the enrichment events coordinator at the Winona School District, and I also help with project compass events. Both are very fulfilling in different ways. With the school district side of my internship I am constantly working with children or planning events for the children, and project compass works directly with adults that have various disabilities. The bulk of my internship is with the school district, and particularly the elementary school, so we will start from there. As I stated above, I am interning for the school district and for the bulk of my internship I am working under the enrichment events coordinator Casey Moger. In this position I help events, clubs, and after school activities run smoothly, as well as plan for bigger events in the future. Casey runs a lego club for about four weeks at each elementary school that I help out at, as well as a book club. Other than that, we have fundraisers such as a craft fair, we hold cooking camps, a summer kickoff event, and more. I have always loved working with kids, so this side of my internship has been extremely fulfilling. The other side of my internship is doing work for project compass. Project compass provides multiple fun services for people with disabilities mostly over the age of 18 and into their elderly years. Each week we have bowling and book club. On top of that there is a dance, bingo, a canvas painting class, and a cooking class once each month. We have many clients working with project compass with various types of disabilities and various levels of functionality. I had never worked with people with disabilities before, but it has been an amazing experience. The clients have such amazing personalities and they're such happy, gracious people. This internship has provided a new career path option that had never been explored in the past and provided a new outlook on life. I'm extremely grateful for both of these opportunities and can't wait to share my experience.

## IPAR Internship

Steven Goodnow
Faculty Mentors: Robert Casselman, Ben Nagel, and Brent Diekmann

One focus of this poster presentation will be focused on how I used Power BI to visualize institutional data from here at WSU. Another focus point will be how we used data of other institutions from IPEDS to find similar schools to WSU.  This internship is a part of my 120 credits toward graduating.

## My Time at Hiawatha Valley Mental Health Center: Client Based Mental Health Services and How They Relate to the Stages of Change

Natalie Berg
Faculty Mentor: Robert Casselman

I spent 300 hours of the Spring 2025 semester as an intern at Hiawatha Valley Mental Health Center. While providing services with two Adult Rehabilitative Mental Health Services workers and a Children's Mental Health Case Manager, I made connections with people I never would have interacted with otherwise, and I learned a lot about community-based, client-led services. Client-led services are based on a number of psychological concepts, one of which being the Stages of Change Model. Integrating this concept with my experience at Hiawatha Valley draws a larger connection between my time as a student and my real-world experience working with those suffering from severe and persistent mental health problems.

## Perceptions of Psychological Distress by Target Gender and Disorder Type: Preliminary Findings

Isabelle Anderson, Alanna Hartman, and Amelie Pflamminger
Student Coauthors: Molly Marston and Gabriella Becker
Faculty Mentor: Elizabeth Russell

Previous studies demonstrate that mental health issues are often under-recognized in males, and there are barriers to seeking help that may prevent men from getting necessary mental health treatment. Therefore, this study aims to examine how people perceive psychological distress in those with different genders and mental health disorders. Our sample consisted of around 250 participants who are attending Winona State University at the undergraduate level. In our survey, participants were presented with multiple vignettes of individuals showing symptoms of different mental health disorders, e.g. substance use disorder or social anxiety, for which the character gender was randomized. Following this, participants were then asked to complete a series of questionnaires. The chosen scales looked at stigma, levels of social distance, as well as severity. We are currently analyzing our data to examine whether these different depending on target gender and disorder. This presentation is a look at preliminary data.

Through this study, we hope to gain a better insight into mental health stigmatization by focusing closely on not only disorder type, but also gender. This can help us bring awareness to implicit biases surrounding mental health, especially regarding stigmatization of men. Through our findings, we hope to furthermore identity barriers to help-seeking.

## PSY 404 Internship Presentation

Charlotte Oudekerk
Faculty Mentor: Robert Casselman

Presentation about internship experience at Von Wald youth shelter.

## Sign Tracking Behavior in Long Evans and Sprague-Dawley Rats

Ryan Sleypen and Liam Kubitschek,

Faculty Mentor: John Holden

The purpose of the study was to evaluate differences in sign tracking behavior between Sprague Dawley and Long Evans lab rats. Sign tracking ultimately reflects the degree of impulsivity often modeled in addiction related research. Data collection for sign tracking included three types of data, total number of signtracking behaviors observed, latency scores for sign tracking behaviors, and sign tracking probability scores. Sign tracking latency times and probability scores displayed statistically significant results when comparing the two strains. However, the data regarding the total number of sign tracking interactions with the conditioned stimulus did not come back as statistically significant. The contrast between strains may have different applications in sign tracking research situations.

## Socioeconomic Status During Upbringing and Academic Performance as a College Student

Erin Farina
Faculty Mentor: Trisha Karr

The purpose of this study is to see if childhood socioeconomic status (SES) can be used as a predictor for both objective and subjective academic performance in college. Recruited from the psychology pool of a Midwestern university, participants (N=296) completed an anonymous Qualtrics Survey consisting of researcher-developed questionnaires and adapted standardized measures. Participants answered questions about their access to resources growing up, provided information about their grades and study habits, and rated themselves on a scale regarding performance and effort put into schoolwork. Data were examined using linear regression analyses and independent t-tests to evaluate the relationship between childhood SES and college-aged academic performance. This study found that childhood SES is a predictor of academic performance in college. The implications of this study suggest that students from lower SES backgrounds may require additional support services in order to succeed at the rate in that their higher SES classmates do.

## The Power of Authority: Can White Individuals Detect Racial Microaggressions from High Authority Figures?

Vivian Cavallin
Faculty Mentor: Amanda Brouwer

A microaggression is a subtle, brief remark that communicates a hostile or derogatory impression towards a specific group, often associated with race. Microaggressions are often overlooked by those who do not experience their effects firsthand, which may lead to desensitization to racism. However, some external aspects may cause microaggressions to be noticed more or less by White individuals, such as the authority level of the person saying the microaggression. Because individuals often feel prone to obeying authority, the power or status that an authority figure holds may cause an individual to ignore or disregard racial microaggressions said by authority figures. This study explored whether racial microaggressions are noticed or identified less by White individuals when the microaggressions are said by a person with a high level of authority. Participants were randomly assigned to one of two groups. In the control group, participants were asked to watch a talk on the topic of job opportunities given by a speaker introduced with a low level of authority. Four racial microaggressions were incorporated into the talk. In the experimental group, participants were asked to watch the same talk, except the speaker was introduced as having a high level of authority. Both groups of participants were then asked to fill out a survey with open-ended and scale questions assessing their perception of the a) effectiveness, b)

bias, and c) appropriateness of the talk, as well as their d) identification of microaggressions within the talk. We are currently in the process of collecting data for this study. The data will be analyzed using an independent samples t-test. We expect those in the experimental group to rate the talk as a) more effective, b) less biased, and c) more appropriate than those in the control group, and we expect the individuals in the experimental group to d) identify fewer racial microaggressions, indicating that White individuals are less likely to notice or identify racial microaggressions when they are said by people in high positions of authority. This study highlights the value of assessing how individuals with lower levels of authority respond to authority figures, specifically when the authority figure's behavior is deemed objectionable. The results will suggest ways to hold authority figures accountable for harmful words and actions regardless of their level of power, especially in settings like classrooms or workplaces, where they have direct status over individuals with lower authority.

## The Role of Self-as-Doer Identity in the Relationship between Intentions and Healthy Eating

Hannah Casselman, Megan Ekern, Ava Krolnik, Madeline Bersch, Esther Gauerke.
Faculty Mentor: Amanda Brouwer

**Introduction:** Proper nutrition is critical for a healthy lifestyle. Inadequate nutrition and sedentary lifestyles contribute to high obesity and health concerns, including cardiovascular diseases, hypertension, type 2 diabetes, cancer, and osteoporosis. Two-thirds of U.S. adults and one-third of children are overweight or obese. Reducing disease rates and improving health can be achieved through a nutritious diet, including consuming more fruits and vegetables. The theory of planned behavior (TPB) suggests that individuals are more likely to engage in behaviors, like healthy eating, when they have strong intentions, positive attitudes, subjective norms, and perceived behavioral control. Research suggests perceived behavioral control and supportive attitudes are crucial in predicting healthy eating habits. Furthermore, longitudinal data suggests that the TPB can predict healthy eating up to six years later. As an individual's intention stability intensifies, so does their intention and perceived past behavior, resulting in long term engagement with healthy eating behaviors.

Self-as-doer identity may be another way to promote healthy eating behavior. Self-as-doer identity is a way to describe identity as a person who performs a particular behavior, a doer of a task. Research demonstrates that self-as-doer identity interventions can increase healthy eating behaviors and explain the relationship between self-efficacy and healthy eating behaviors in people with diabetes. There is, however, a lack of research exploring whether doer identity explains the relationship between TPB components like intentions and healthy eating behaviors. Therefore, the current study aimed to explore whether seeing oneself as a healthy eater explains why intentions predict fruit and vegetable consumption in a non-clinical population.

**Methods:** Participants (N = 383, ages 17-74), completed a survey with questions about self-as-doer identity, intentions to eat healthy and healthy eating behaviors. Data were analyzed using a mediation model.
**Results:** There was a significant indirect effect of intentions on fruit consumption through self as doer identity, b = 0.32, 95% BCa CI [0.17, 0.49]. There was also a significant indirect effect of intentions on vegetable consumption through self-as-doer identity, b = 0.15, 95% BCa CI [0.07, 0.23].

**Discussion:** Doer identity is a significant mediator for intentions and fruit and vegetable consumption, suggesting that as intentions increase, so does seeing oneself as a doer of healthy eating, and therefore eating more fruits and vegetables. This can help promote a healthy lifestyle and possibly decrease obesity and other health concerns. The doer identity could also be implemented into dietary plans and clinical settings for healthier eating. Study design was correlational, so we cannot infer causality or directionality. Likewise, the population was generally homogeneous (i.e., mostly young, white women), and data was self-report. Future researchers should use an experimental design using real-time food consumption data collection in a more diverse population. Researchers could also determine if this relationship holds cross-culturally and whether interventions to boost doer identities might cause more fruit and vegetable consumption.

### Project Compass: An Internship for the Able-Adults

Thaddeus Kuehn
Faculty Mentor: Robert Casselman

I will be discussing my time and activities with the organization named Project Compass and its associated activities. I plan on having a poster board, fliers and even past and future schedules that shows what project compass is about, their mission statement, and the activities clients and members of the organization can take part in. Aside from the physical board and fliers, I'm preparing to write a short speech or script that will be addressed to those interested, not only explaining the organization but also the benefits of being an intern there. As well as the many fun, and various activities the members and the intern will be able to partake in.
My research itself has been largely observation based, I have plans to acquire a few quotes from some of our clients and ratings also by the same clients behind the events that I've gotten the opportunity to take part in. thereby placing them on our pasteboard as a means of spreading awareness and giving validity to Project Compass as a future intern site for willing and curious students.
Lastly, in addition to the quotes, pictures, I plan to give my impressions and opinions on the experiences for the events I've gotten to take part in with Project Compass. Though I do not plan on quoting myself on my poster board, I do plan to elaborate on top of everything above by giving reassurance and personal confidence that this is an effective and fun site for future interns.

## Recreation, Tourism, & Therapeutic Recreation

### Harnessing AI for Small Business Feasibility: A Paddleboard Guiding Venture in Winona, Minnesota

Grace Baden, Clay Craker, Isabella Howe, Andrew Regner, and Patrick Wright
Faculty Mentor: Phileshia Dombroski

This project explores the integration of artificial intelligence in constructing a feasibility study for a proposed paddleboard guiding business in Winona, Minnesota. Conducted as a six-week applied learning experience within the Commercial Recreation course, students systematically employed AI tools to develop a feasibility analyses, covering business concept development, market research, financial forecasting, and operational planning.

A core focus of this project was AI prompt engineering—students iteratively designed, tested, and refined AI-generated responses to improve the accuracy, clarity, and applicability of feasibility study components. The project also examined AI's efficiency in generating data-driven insights, its limitations in niche market research, and the need for human critical thinking to verify and enhance AI-assisted content.

This presentation highlights the evolving role of AI in entrepreneurial planning, demonstrating how emerging technologies can be harnessed to enhance efficiency yet maintain rigor in feasibility assessments for new ventures. The project offers insights for both educators and future entrepreneurs navigating AI-integrated decision-making in experience-based enterprises, and beyond.

## Moo-Moo Care Program

Shelby Knoble
Faculty Mentor: Phileshia Dombroski

Set on a family farm, the Moo-Moo Care Program is a hands-on, multi-day recreational program designed to teach youth about dairy cattle care. As part of my RTTR 203 final project, I created a daily schedule, goals and objectives, a Gantt chart for task organization, marketing materials, and an evaluation form.

Within this program, participants will engage in at least six hours of structured farm activities each day. Through interactive lessons and hands-on demonstrations, participants will learn key aspects of dairy cattle care, including feeding, milking, and how to maintain a clean environment. Participants will practice proper calf grooming skills - such as leaving 1.5 inches of hair on top - and demonstrate correct show techniques in the ring with a calf. Safety is also a priority, so participants will complete farm safety training throughout the week.

This Moo-Moo Care Program provides a structured, engaging, and educational experience by incorporating real-life farming routines and responsibilities. This project required planning to develop a balanced schedule, ensure participant safety, and create an immersive learning environment.

## Relaxed or Energized: The Impact of Virtual Tourism on Emotions

Natalia Miller, Grace Baden, Samantha Dischinger
Faculty Mentor: Hyunseo (Violet) Yoon

With the growing accessibility of virtual reality (VR) and digital tourism, understanding its impact on emotional well-being is essential. This study explores the psychological effects of virtual tourism by examining whether participants feel more relaxed or energized after experiencing a virtual tour. The research involves participants engaging in a guided virtual tour of a destination, either with a VR headset or a tablet PC, followed by self-reported assessments measuring their emotions. There will also be a follow-up survey with open-ended questions asking participants to explain their responses to the previous survey. Data collection has been ongoing since March 2025. Any adult who can watch 360-degree videos without health issues is eligible to participate in this study. The quantitative data will be analyzed statistically, and the qualitative data will be analyzed using content analysis. This research is expected to contribute to understanding the positive effects of virtual tourism on human well-being.

### The Impacts of Virtual Tourism on Tourist Destinations

Samantha Dischinger, Grace Baden, and Natalia Miller
Faculty Mentor: Hyunseo (Violet) Yoon

New technologies, including virtual reality (VR), offer exciting new opportunities for tourism, especially in the wake of the COVID-19 pandemic. While these technologies provide tourism experiences for those who are not comfortable with or able to physically travel, they may have adverse effects on tourist destinations by reducing the number of physical visitors. To assess this, the study will include questions to analyze whether VR experiences increase or decrease the incentive to physically travel to a given destination. This question will be answered through a laboratory experiment involving exposure to a virtual tour, either with a VR headset or a tablet PC, followed by a survey about participants' willingness and likelihood of traveling to the destination. There will also be a follow-up survey with open-ended questions asking participants to explain their responses to the previous survey. Data collection has been ongoing since March 2025. Any adult who can watch 360-degree videos without health issues is eligible to participate in this study. The quantitative data will be analyzed statistically, and the qualitative data will be analyzed using content analysis. The outcome of this study is expected to expand our knowledge of the effects of virtual tourism on destinations and how these technologies can be used to influence travel intentions.

# Special Education

### Changemakers for Students with Severe Disabilities

Kelsey Lamountain
Faculty Mentor: Amy Andersen

Students with severe disabilities continue to face multiple barriers in accessing their education compared to their non-disabled peers. Specifically, they can be segregated from their peers without disabilities, general education teachers, and the general education curriculum. Despite these barriers, special education teachers can work within their role to disrupt ableism and stop harmful practices. In addition to being case managers and teachers, special education teachers can take on the role as advocate as they work towards persisting past the above barriers. Research has documented the importance of teacher educators preparing special education teachers as change agents (Olson & Roberts 2017; Olson & Roberts, 2020). Specifically, a change agent needs to be ready and willing to recognize and disrupt practices that continue to marginalize students with severe disabilities. The purpose of this study is to understand positive changes that special education teachers have made around how students with severe disabilities access the general curriculum. Additionally, we queried why they made these changes and barriers and supports in doing so. We also sought to understand if special education teachers' teacher preparation programs prepared them to engage in making these changes. Data was collected using a structured interview process. Qualitative data was analyzed using the software program Dedoose. Preliminary themes will be presented in this presentation. Critically, recommendations for how special education teachers can engage in this work will be provided. Moreover, we will outline ways that teacher preparation programs can prepare special education teachers to engage in this work.

# Faculty Presentations

## AI in Business Classes

Professors Pat Paulson and Larry Schrenk

Artificial Intelligence (AI) is rapidly reshaping educational landscapes, offering opportunities to enrich teaching methodologies across diverse academic disciplines. In this session, two experienced faculty members from the College of Business share insights and practical experiences on integrating chatbots into their Finance and Management Information Systems (MIS) classes. Through practical examples from finance courses, such as investments and the Student Managed Investment Fund, and from MIS classes covering programming, databases, networking, and introductory MIS concepts, the presenters demonstrate how AI chatbots can effectively support student learning, enhance classroom engagement, and foster deeper conceptual understanding. This presentation will explore key successes, potential challenges, student feedback, and ethical considerations associated with using AI-powered tools in higher education. Attendees, including faculty and students from various disciplines, will gain actionable strategies and best practices for leveraging AI to elevate their own teaching and learning experiences.

## Analysis of phytosterols in two species of morel mushrooms: *Morchella tomentosa* and *Morchella americana*

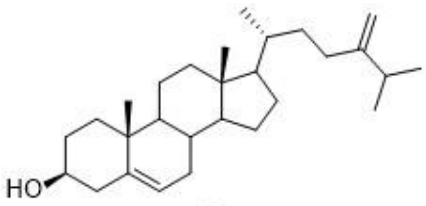
Professor Thomas Nalli
Student Coauthors : Alix M. Overgard, Sumar Quint, Natalie Walker, Chun Wa Chu

Morel mushrooms (*Morchella*) are found worldwide and greatly prized for their deliciousness. Like all mushrooms, morels contain phytosterols including ergosterol, the principal sterol used for fungal cell membranes. These phytosterols have several nutritional benefits including lowering of serum cholesterol levels, providing dietary vitamin D, and acting as antioxidants. Morels, in particular, have attracted attention as potential high-value functional food sources.

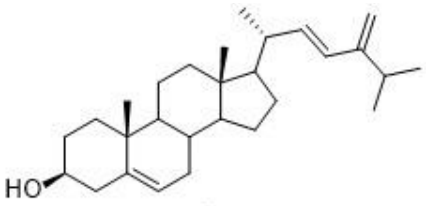
Our research determining the detailed phytosterol content of commercially procured dehydrated morel mushrooms led us to examine two North American species, *Morchella tomentosa* and *Morchella americana*. as respective examples of forest-fire associated species, aka "burns", and non-burns.

We used gas-chromatography/mass spectrometry (GC/MS) to analyze five samples of each species, which were extracted with petroleum ether, saponified, and treated with trimethylsilylimidazole prior to the GC-MS analysis. The respective relative concentrations of the well-known morel sterols, ergosterol 1 (27.5% vs 18.8%), brassicasterol 2 (46.5% vs 59.5%), campesterol 3 (4.4 vs 7.7%), and dihydroergosterol 4 (6.6% vs 0.9%) all showed statistically significant ($p < 0.05$) differences. More strikingly, the two species contain widely disparate proportions of the rarer sterols, 24-methylenecholesterol 5 (2.7% vs 10.0%, $p = 0.029$) and ergosta-5,22,24(28)-trienol 6 (9.2% vs 0.3%, $p = 0.00011$). Sterol 6 is an extremely rare compound that has only been reported in mushrooms (truffles) once in previous literature and might be useful as a phenotypic marker for M. tomentosa.

We thank the Spring 2024 Organic Chemistry II class at Winona State University for carrying out these analyses as part of their CURE laboratory experience.




5
Ergosta-5,24(28)-dienol
24-Methylenecholesterol




6
Ergosta-5,22,24(28)-trienol

## Encouraging Self-care for Nurse Practitioner Students to Decrease Stress and Prevent Burnout

Professor Sandra Paddock, DNP, APRN, FNP-BC, PMHNP-BC

**Background**: Burnout among health care workers (HCWs) is a documented problem that threatens the healthcare infrastructure in the United States. Nurses comprise the largest sector of HCWs. More than 50% of nurses report they manifest signs of burnout. Attending to self-care may protect nurses from burnout. Unfortunately, nurses often fail to attain adequate self-care and risk developing burnout. Similarly, more than one-third of students in a health-related program have symptoms of depression and anxiety. If burnout among nurses is a significant problem, then strategies to decrease stressors and increase self-care among nursing students in formal education programs are needed.

**Methods**: Nurse practitioner (NP) students were provided reminders on the importance of self-care through the university learning management system. Free online images, quotes, and resources to nurture the mind, body, and spirit were posted biweekly over two academic semesters. Images included nature scenes and yoga poses, while messages curated included topics of self-care, self-acceptance, practicing gratitude, and celebrating success. Access to free online yoga sessions was furnished. Creating unique identification codes for participants ensured anonymity of responses. The Perceived Stress Scale (PSS) measured students' stress before and after the intervention. Approval for conduct of the project was obtained from the university Institutional Review Board.

**Results:** Forty-four students were invited to participate. Five were matched on pre and post surveys. There was no difference in the average PSS scores between the two time points. Students reported devoting > 50 hours a week to work and study. One student initiated the practice of yoga. Four of five students increased the frequency of their yoga practice. All participants indicated intent to continue to practice yoga following graduation.

**Conclusion:** The findings support the benefit of faculty providing reminders and access to resources to increase self-care among NP students. This strategy could be viewed as an opportunity to secure a strong nursing workforce for the future. The investment of faculty time was worthwhile and revealed that concentrated efforts can impact the health behaviors of nurse practitioner students. Due to the small sample size (n = 5) and potential extraneous variables impacting stress levels, generalization of

findings to other NP students is limited. More research should be directed at NP students' stress levels to determine self-care modalities that demonstrate a reduction in stress levels.

## CURE by Community: Course-based undergraduate research experiences capitalizing on involvement from departmental colleagues

Professor Joseph K. West

For the past two spring semesters CHEM 213, Principles of Chemistry II, has been offered with a course-based undergraduate research experience (CURE) with the participation of multiple faculty in the Chemistry Department. This aspect harnesses the different backgrounds and strengths that others have to offer and has been very well received by students. By design, these CURE projects begin with chemical synthesis and then diverge into multiple pathways that have included computational modeling, spectroscopy, more in-depth properties analysis, catalytic testing, and bioactivity assessments.

## Minnesota Nice: qualitative research and things we love

Aurora Jacobsen, Library

This presentation explores the complex landscape of user interactions with digital library materials, specifically focusing on eAudiobook and eBook borrowing and purchasing interfaces. Building upon a comprehensive literature review examining global public perceptions of digital library availability, this research addresses the need for deeper contextual understanding of user experiences. Through qualitative data gathered from interviews with library patrons and staff across five locations in four states, this study investigates user behaviors, motivations, and challenges associated with accessing and acquiring digital books. The findings, derived from the perspectives of both users and library staff, offer valuable insights into designing interfaces for an evolving digital information environment.