Apr 15th, 9:00 AM - 6:00 PM

2021 URS Abstract Booklet

Undergraduate Research Center
Minnesota State University, Mankato

MINNESOTA STATE UNIVERSITY MANKATO

2021 UNDERGRADUATE RESEARCH SYMPOSIUM

APRIL 15TH 2021

BIG IDEAS CONTINUE!

URC

UNDERGRADUATE RESEARCH CENTER
MINNESOTA STATE UNIVERSITY, MANKATO

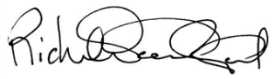
Greetings from the President

It is my distinct honor to welcome you to the 23rd Annual Undergraduate Research Symposium at Minnesota State University, Mankato. Talented scholars have been assembled for your intellectual and personal enjoyment. What an exciting, but challenging, year of productivity for our students and faculty. Earlier this month, students made 21 virtual presentations at the National Conference of Undergraduate Research. Later this month, five teams of our students will present at the MN State Scholars Conference.

This year's symposium is a celebration of intellectual exploration, creativity, hours of labor and collaboration across students, faculty, and staff. Enjoy your time as you listen to oral presentations, engage in meaningful discussions with students at posters, and view presentations of visual and performing arts. It is, in part, because of these sorts of scholarly showcases that Minnesota State Mankato has come to be known for its Big Ideas and Real-World Thinking.

I want to express my appreciation for the efforts of the Undergraduate Research Center staff, the Undergraduate Research Council, and the many volunteers who have made this event possible. I also want to recognize the many contributions of our faculty and staff in promoting research, scholarly, and creative activities for our students. Your contributions to the intellectual development of these young scholars and their pursuit of excellence will last a lifetime.

Once again enjoy your day as you are exposed to big ideas and real-world thinking in action.



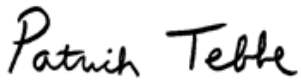
Richard Davenport
President
Minnesota State University, Mankato

A Message from the Undergraduate Research Center

Welcome to the 23rd Annual Undergraduate Research Symposium at Minnesota State University, Mankato. This event features research, scholarly, and creative works from undergraduate students representing majors across campus. The symposium allows undergraduates the opportunity to engage in the process of conducting and presenting research in an academic setting. This opportunity fosters collaboration between student presenters and an audience of faculty, administrators, peers, and family. This year we are also welcoming a small number of graduate student presenters to the event.

Student presenters will discuss their research or creative works through poster presentations, oral presentations, and creative exhibits. Students gain experience as they are challenged to communicate their findings.

We congratulate these student presenters for their accomplishments and hard work throughout this very challenging year. We wish them the best of luck on their future academic and professional journeys.



Patrick A. Tebbe, Ph.D., P.E.
Director of the Undergraduate Research Center
Professor, Mechanical & Civil Engineering

Mission Statement of the Undergraduate Research Center

The Undergraduate Research Center (URC) nurtures and supports mentored research, scholarly, or creative activities for all undergraduate students. The URC promotes research as an opportunity to engage in a community of scholars to enhance students' academic experience and readiness to succeed in the future.

Visit the Undergraduate Research Center's website for more information on our programs:

https://research.mnsu.edu/undergraduate-research-center/

A Special Thank You to the 2020-2021 Undergraduate Research Council

Rachel Cohen

Shawna Petersen-Brown

Kristen Abbott-Anderson

Heather McIntosh

Wade Davis

Hsinhuei Sheen Chiou

Bobby Bothmann

Jessica Albers

Corey Selland

Jeffery Dennis

Mohammad Yamin

Areca Roe

Samantha Katner

Leah White

Kristel Seth

Kristen Cvancara

Congratulations to the 2020-2021

Minnesota State University, Mankato Foundation Grant Recipients

Lankesha Sudasinghe
Rachel VanKeulen
Yaman Pandey
Ethan Hayes
Abbigal Osgood
Stevan Colakovic
Ramsey Pankratz
Mohamed Zakariya
Joseph Newman
Deven Paulsen
Lelti Asgedom
German Orrego Duque
Mohannad Rayani
Gabriel Villalpando
Jack Zimmerman
Kaylee Engle
Jamie Rogers
Emily Faust
Chouakou Vang
Brian Swancutt
Kade Patterson
Kaela Goodman
Muna Awel
Casey Plender
Tyra Klarenbeek
Roman Parpart
Samantha Kozelek
Kushan Sameera Sbeywickrema
Taiylor Hoeft
Molly Hill
Mykenzie Cole
Liberty Hombe
Emma Knutson

Undergraduate Research Center Grant Recipients

Val Urman
Makenzie Reed
Benie Bebela
Meaghan Keohane
Arjun Veerwal
Lauren Krieg
Amyah Ockenga
Tsion Sherbeza
Lyric Lopez-Kohler
Ireland Manning
Kianna Fladland
Jamal Saeed
Samuel Squires
Almaz Totayev
Justin Storm
Jessica Wimp
Jane Sakowicz
Maureen Nghambi
Nishant Salaria
Quinlan Brogdon
Riley Lehmer
Simale Kadir

National Conference on Undergraduate Research Presenters

Benie Bebela
Hope Benike
Dhaval Bhakta
Emily Bollendorf
Shannon Bruce
Bryn Caron
Michael Ciriacy
Steven Colakovic
Colton Corcoran
Abdelrahman Elkhatib
Douglas Folk
Taiylor Hoeft
Rishab Humagai
Teana Krolak
McKayla Kurtz
Merwan Mohammed
David Petersen
Alexander Prom
Mohannad Rayani
Jamie Rogers
Austin Seibert
Aayush Shahi-Thakuri
Jackson Smith
Russell Tesmer
Elizabeth Tiegs
Micah Tietz
Annalisa Tostenson
Peyton Wolf
Mohamed Zakariya
Eryn Zuiker
Khalil Mualin
Lindzy Nelson

Minnesota State Scholars Conference Presenters

David Petersen
Tayler Yankovec
Abdulaziz Alyousef
Scott Austin
Kline Barke
Zachary Bye
Colin Cahil
Kyle DuFrene
Samuel Stemper
Lamees Hamed
Kylee Johnson
Colton Corcoran
Jake Hendel
Mary Kloos
Jordan Niemeyer
Adam Rocamora
Asmaa Salama

CORNERSTONE

MINNESOTA STATE UNIVERSITY MANKATO

A Collection of Scholarly and Creative Works

Calling all Undergraduate Research Symposium Participants!

Congratulations on presenting at the 23rd annual Undergraduate Research Symposium at Minnesota State University, Mankato.

Now that you have finished all your hard work and your poster, creative work or paper is ready for the Undergraduate Research Symposium, did you know that you can also submit a copy of your work to Cornerstone?

Cornerstone highlights the intellectual productivity and creativity of Minnesota State University, Mankato's faculty, staff, and students by preserving their works in this online repository and presenting them to the world to view.

After the 2021 Undergraduate Research Symposium ends, Library Services will be adding the abstract booklet and proceedings to the repository as well. You can view the online collection at https://cornerstone.lib.mnsu.edu/urs/.

The proceedings include your name and the abstract of what you presented, but there is no full or complete text of your presentation, no view of your poster, or no images of your creative work. If you want, you can submit a full-text version of your work to Cornerstone which will be added to the proceeding record. Each item submitted to Cornerstone receives a permanent URL, which you can add to your resume to provide evidence of your hard work to prospective employers or graduate schools. Items are due by May 31, 2021.

Did your project result in a research paper? Consider submitting it to the *Journal of Undergraduate Research*, which is also archived in Cornerstone at: https://cornerstone.lib.mnsu.edu/jur/. Submission information will be coming out soon, so check the site for more information.

When you submit a full-text work to Cornerstone, you will be able to see statistics on the number of times people have downloaded or viewed your work. For example, a presentation by Stephanie Bennett titled *The Benefits of Exposure to Animals for Persons with Dementia: A Literature Review* from the 2014 Undergraduate Research Symposium has been downloaded 813 times since it was added to Cornerstone in November 2014 and has been viewed by people from over 50 different countries.

If you are interested, we encourage you to talk to your faculty mentor or contact Heidi Southworth, Digital Initiatives Librarian at heidi.southworth@mnsu.edu with questions.

Undergraduate Research Symposium Inclusion Statement

We consider the Undergraduate Research Symposium to be a place where you will be treated with respect, and we welcome individuals of all ages, backgrounds, beliefs, ethnicities, genders, gender identities, gender expressions, national origins, religious affiliations, sexual orientations, ability – and other visible and nonvisible differences. All presenters and attendees are expected to contribute to a respectful, welcoming, and inclusive environment for every other participant.

Accessing the URS

The URS is being hosted digitally on the Symposium by ForagerOne system. The URS Welcome page can be accessed through the following link (starting on Wednesday, April 14th):

https://symposium.foragerone.com/2021-mnsu-undergraduate-research-symposium

Viewing and Commenting on Student Presentations

Please take note of the two links in the upper right-hand corner of your Symposium screen: Presentations and Live Sessions.

The **Presentations Tab** is home to the students' abstracts, posters, presentation materials, exhibits, and performances. You may filter by subject area or search by presenters' names or titles. Anyone can view this material, but you will be asked to create a ForagerOne Symposium account to comment on submissions and interact with other virtual attendees. Click on the **Sign Up** option in the upper right to create a free account. Through the comments feature, please congratulate the students and feel free to engage them in networking and cross-disciplinary conversations.

Note that while all Oral Presentations also have entries here, it was left up to the presenter what information to upload. Full information on these projects will be shared during their live presentations.

Visit the **Live Sessions Tab** for links to the Question-and-Answer sessions, Oral Presentations, and Keynote presentations. You can join the Live Sessions when the occur, by clicking on the link provided. Note, we are using the Zoom platform for all live sessions. Please make yourself aware of polite Zoom etiquette when participating or attending:

- Mute your microphone upon entry to the session.
- To help keep background noise to a minimum, make sure you mute your microphone when you are not speaking.

Thank you for joining this spring's celebration of Minnesota State University, Mankato's undergraduate research community.

SCHEDULE OF EVENTS THURSDAY, APRIL 15TH, 2021

9:00 AM – 9:30 AM	**Welcome and Opening Remarks** "Dancing Alone Together: Anger and Sadness in COVID Quarantine" Daniel Stark, Professor Department of Dance and Theatre
9:30 AM – 10:30 AM	**Undergraduate Poster Sessions 1, 2, 3, 4** **Undergraduate Oral Presentation Sessions 1, 2**
11:00 AM – 12:00 PM	**Undergraduate Poster Sessions 5, 6** **Undergraduate Oral Presentation Session 3** **Creative Exposition Q&A** **Graduate Oral Presentation Session 1**
1:00 PM – 2:00 PM	**Keynote Presentation and Panel** "Research to Practice: Connecting Evidence, Proof, and Trust" Dr. Jessica Albers Question and Answer Panel Dr. Jessica Albers & Daniel Stark
2:00 PM – 3:00 PM	**Undergraduate Poster Sessions 7, 8** **Undergraduate Oral Presentation Sessions 4, 5** **Graduate Poster Session**
3:30 PM – 4:30 PM	**Undergraduate Poster Sessions 9, 10, 11** **Undergraduate Oral Presentation Session 6** **Graduate Oral Presentation Session 2**
5:00 PM – 5:45 PM	**Keynote Presentation** "Research Experiences Throughout My Career in the Space Industry" Tom Leimkuehler, PhD (NASA Johnson Space Center)
5:45 PM – 6:00 PM	**Awards Ceremonies and Closing Remarks**

College of Allied Health & Nursing

COVID-19 Impacting Care Partners Assisting Socialization for Dementia Friendly Chorus

Anna Peterson & Tatyana Soloviyov

Hsinhuei Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

Physical Therapy Use among Collegiate Dancers

Vanessa Kotek & Kacey Wachholz

Jessica Albers, Faculty Mentor (Department of Human Performance)

Recess and Play Before and During COVID-19 Pandemic: A Pilot Study

Mackenzie Glaser, Jakob Erickson-Thoemke & Edinatu Thoronka

Heather Von Bank, Faculty Mentor (Department of Family Consumer Science)

Family Coping In the Time of COVID-19

Ivy Packard, Kiara Brown, Cassandra Flaata & Emma Vogel

Daniel Moen, Faculty Mentor (Department Family Consumer Science)

Exploring COVID-19 Impact on Social Inclusion in a Dementia Friendly Chorus

Cassidy Hall, Jordan Enevold, Britta Anderson & Khadija Kamara

Hsinhuei Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

End-of-Life Care Conversations: Family Care Partners Share Their Experiences about Their Loved One Living with Dementia at End-of-Life

Chandler Johnson & Abigail Larson

Kristen Abbott-Anderson, Faculty Mentor (Department of Aging Studies)

College of Science, Engineering & Technology

The Potential Mechanism of Leptin on Lipolysis in Brown Adipose Tissue
Lyric Lopez-Kohler
Charles Krois, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Disease Mutations and Oxidative Effects on Calmodulin Structure and Function
Ethan Hayes
Rebecca Moen, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Effect of Adrenergic Signaling On All-Trans-Retinoic Acid Synthesis In Brown Adipose Tissue.
Tsion Sherbeza
Charles Krois, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

APOBEC3A Mediated Genome Targeting of the Thyroid Hormone Response Element
Abbigail Osgood
Allison Land, Faculty Mentor (Department of Biological Sciences)

Soil Health Characterization under Different Land Uses in Southern Minnesota
Mohammed Abdurahman
Mriganka De, Faculty Mentor (Department of Biological Sciences)

College of Science, Engineering & Technology

An Assistive Mobile Communication Application for Individuals Who Are Mute or Have Speech Impairments

Sashwot Koirala

Guarionex Salivia, Faculty Mentor (Department of Computer Information Science)

Bringing the High Redshift Universe to Instagram

Wen Sun

Michael Rutkowski, Faculty Mentor (Department of Physics and Astronomy)

Studying the Effect of Laser Power on Carbonaceous Meteorites by Raman Spectroscopy

Mohamed Zakariya

Analía Dall'Asén, Faculty Mentor (Department of Physics and Astronomy)

Simple Cosmic Ray Detector

Jamal Saeed

Michael Rutkowski, Faculty Mentor (Department of Physics and Astronomy)

College of Science, Engineering & Technology

Bridge Deck Thermography: Revisiting 'Bridges Freeze before Roadway' From a Safe Salt Perspective

Emily Bollendorf
Stephen J. Druschel, Faculty Mentor (Department of Mechanical and Civil Engineering)

Automatic Cutting Expert (ACE)

Cesar Esquivel, Jeremy Patricelli, Caroline Moore, Daniel Armstrong & Rachael Johnson
Jacob Swanson, Faculty Mentor (Department of Integrated Engineering)

IoT-based Solution to Gather Foot Plantar Pressure for Daily Life Activities

Abdelrahman Elkhatib
Puteri S. Megat Hamari. Faculty Mentor (Department of Electrical and Computer Engineering & Technology)

Collecting the Right Data? Condition Assessment for City of Richfield Water Main Pipes

Ian Moran & Chancellor McDonald
Basak Bektas, Faculty Mentor (Department of Mechanical and Civil Engineering)

College of Allied Health & Nursing
College of Social & Behavioral Sciences

An Interdisciplinary Approach in Arts Education a Unit Plan
Aditi Bheda
Gina Wenger, Faculty Mentor (Department of Art Education)
9:30 am – 9:45 AM

Rhetorically Speaking Danica Patrick and the Wide World of Marketing in Sports
Jonathan Fjeld
Emily Sauter, Faculty Mentor (Department of Communication Studies)
9:45 AM – 10:00 AM

Skinwalkers and Gender Roles
Marius Vold
Rhonda Dass, Faculty Mentor (Department of Anthropology)
10:00 AM – 10:15 AM

College of Science, Engineering, & Technology

Impact of Tire Temperature on Grip in a Racecar
Val Urman
Sam Ertl, Faculty Mentor (Department of Automotive Engineering Technology)
9:00 AM – 9:15 AM

Impact of Intake Air Charge Cooling from Upstream Auxiliary Fuel Nozzle
Gabe Villalpando
Matthew Simones, Faculty Mentor (Department of Automotive Engineering Technology)
9:15 AM – 9:30 AM

Coil Suppression
Samuel Squires
Matthew Simones, Faculty Mentor (Department of Automotive Engineering Technology)
9:30 AM – 9:45 AM

RPM Limiting System
Arjun Veerwal
Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)
9:45 AM – 10:00 AM

College of Science, Engineering & Technology

Understanding the Relationship Between Serum Thyroid Hormone Levels and Thyroid Hormone Action in Tissues
Lauren Krieg & Jessica Wimp
David Sharlin, Faculty Mentor (Department of Biological Sciences)

PER1 Expression in the Breeding and Non-Breeding Season of Anole Lizards
Alexus Bunnam & Taylor Grossen
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Effects of Gonadotropin Releasing Hormone on Reproductive Behavior and Testis Morphology in A Seasonally Breeding Lizard
Jada Harley
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Evolution of Terrestrial Behaviors in Aquatic and Amphibious Fishes
Andrew Ruiz
Michael Minicozzi, Faculty Mentor (Department of Biological Sciences)

Isolation and Identification of Cellulolytic Bacteria from Forest Soil
Andre Bluth
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

College of Science, Engineering & Technology

Investigation of Pulsed Eddy Current Effect for Multi-Target Non-Destructive Testing

Yaman Pandey

Min Li, Faculty Mentor (Department of Mechanical and Civil Engineering)

The Effects of an Inlet Restrictor on the Performance of a Turbocharger

Deven Paulsen

Matthew Simones, Faculty Mentor (Department of Automotive and Manufacturing Engineering Technology)

Design and Control of Multiple Degree of Freedom Spherical Motor

Jack Zimmerman

Min Li, Faculty Mentor (Department of Mechanical and Civil Engineering)

Effects of Bisymmetrical and Bilateral Symmetrical Vertical Axis Wind Turbine Designs

Annalisa Tostenson & Peyton Wolf

Nazli Wodzinski, Faculty Mentor (Department of Mechanical and Civil Engineering)

College of Allied Health & Nursing
College of Social & Behavioral Sciences

Discerning Science Fact from Science Fiction: Effects of Science Fiction Media Consumption on Undergraduate Perceptions of Neurotechnology
Shannon Bruce, Russell Tesmer, McKayla Kurtz, Teana Krolak & Andrew McCarty
Adam Steiner, Faculty Mentor (Department of Psychology)
11:00 AM – 11:15 AM

The Relationship between Intramural, Club, and University Student-Athletes' Belongingness and Motivation during COVID-19
Osadolor Louis Ikponmwosa
Michelle McAlarnen, Faculty Mentor (Department of Human Performance)
11:15 AM – 11:30 AM

Predicting Effective Learning: What Traits Make College Students Receptive to Learning?
Teana Krolak, McKayla Kurtz, Lauren Eckert & Dalyon Waldner
Karla Lassonde, Faculty Mentor (Department of Psychology)
11:30 AM – 11:45 AM

College of Arts & Humanities

Resilience - A Dance on Film
Emily Schumacher
Daniel Stark, Faculty Mentor (Department of Theatre & Dance)
11:00 AM – 11:15 AM

Experimental Videos
Jack Linell, Autumn Erdmann, Harry Ritchie, Natalie Wagley, Ben Liebl, Trang Nguyen, Hafsa Islam & Andrew Peterson
Areca Roe, Faculty Mentor (Department of Art & Design)
11:00 AM – 12:00 PM

Expression of the Dancing Body Without the Face
Kaitlin Murray
Daniel Stark, Faculty Mentor (Department of Theatre & Dance)
11:00 AM – 12:00 PM

A Century of Racism in Minnesota
Nicole Jecha
Leah White, Faculty Mentor (Honors Program)
11:00 AM – 12:00 PM

Beyond the Field: Poetry Reading
Robyn Katona, Maivboon Vang & Anza Malik
Michael Torres, Faculty Mentor (Department of English)
11:00 AM – 12:00 PM

College of Arts & Humanities
College of Education
College of Science, Engineering, & Technology

Breaking Traditions in Medieval Literature: Finding Parallels in Reynard the Fox and Robin Hood
Brianna Rose DeValk
Justin Biel, Faculty Mentor (Department of History)
11:00 AM – 11:15 AM

Meriam's Momentary Metamorphosis: Progressive Education and The Indian New Deal
Abigail Fer
Angela Cooley, Faculty Mentor (Department of History)
11:15 AM – 11:30 AM

Classroom Equity Research
Shivani Gautam, Justin Moua & Mohammad Ilham Bhuiyan,
Brooke Burk, Faculty Mentor (Center for Excellence in Teaching and Learning)
11:30 AM – 11:45 AM

Ways by Which Extracurricular Activities My Impact English Language Learners (ELL)
Paul Selman
Nancy Drescher, Faculty Mentor (Department of English)
11:45 AM – 12:00 PM

GRADUATE ORAL PRESENTATION SESSION 1

11:00 AM – 12:00 PM

College of Allied Health & Nursing
College of Social & Behavioral Sciences

Prenatal Experiences Of Hmong Women in Minnesota
Prerana Khatri KC & Gao Ja Yang
Laurel Ostrow, Faculty Mentor (School of Nursing)

COVID-19's Impact on Motives, Barriers, And Amount of Physical Activity Among College Students
Beth Albrecht, Nicole Aadalen, Jonathan Murillo-Rodriguez & Gabrielle Matthieu
Jessica Albers, Faculty Mentor (Department of Human Performance)

Learning about Global Elder Care Practices through an International Virtual Collaboration
Sarah Gunderson, Hillary Erih, Megan Kurtz, Morgan Metcalfe, Oluwapelumi Solomon & Grace Willaby
Renee Kumpula, Faculty Mentor (School of Nursing)
Kelly Krumwiede Faculty Mentor (School of Nursing)

Physical Activity Levels and Coping Skills during the COVID-19 Transition to Online Learning in College Students
Alison Tokkesdal, Kaitlyn Vomhof, Zoe Stone & Anja Enervold
Jessica Albers, Faculty Mentor (Department of Human Performance)

The Relationship Between Critical Thinking and Emotional Intelligence Among College Students
Louisa Hall
Emily Stark, Faculty Mentor (Department of Psychology)

College of Science, Engineering & Technology

Understanding How Notum Promotes Glypican-3 Shedding In Hepatocellular Carcinoma

Meaghan Keohane
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Investigating Key Enzymes Involved In Glypican-3 Release from Hepatocellular Carcinoma

Stevan Colakovic
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Cellular Localization Determinants of the HIV-2 Vpx Protein

Ramsey Pankratz
Allison Land, Faculty Mentor (Department of Biological Sciences)

Function of the Glycoside Hydrolase Family 8 Endoglucanases in Cytophaga Hutchinsonii Cellulose Utilization

Chouakou Vang
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

An Analysis of Migration Ability and Effects of Carboplatin and Cisplatin on Glioblastoma Cells with Proteoglycan Knockouts

Rachel VanKeulen
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Due to confidentiality reasons, this Zoom session will only be accessible by the mnsu.edu domain

College of Science, Engineering, & Technology

Targeting Epigenetic Regulators of Lymphoma via PROTAC Molecules

Shelby Lund
Keenan Hartert, Faculty Mentor (Department of Biology)
2:00 PM – 2:15 PM

Development of Techniques for the Genetic Manipulation of the Fish Pathogen Flavobacterium Psychrophilum

Lankesha Sudasinghe
Yongtao Zhu, Faculty Mentor (Department of Biology)
2:15 PM – 2:30 PM

The Effects of a Broad-Spectrum Fungicide on Photosynthetic Yield at Different Developmental Stages of Corn in an Agronomic Setting

Ashley Frederickson
Christopher Ruhland, Faculty Mentor (Department of Biology)
2:30 PM – 2:45 PM

Reconstructing Earths Oxygen History from Iron-rich Rock Samples

Emily Faust
Chad Wittkop, Faculty Mentor (Department of Geology and Chemistry)
2:45 PM – 3:00 PM

College of Science, Engineering, & Technology
College of Social & Behavioral Sciences

Analyzing the Trend and Forecasting of Covid-19 Outbreak using Machine Learning Technique
Benie Bebela
Suboh Alkhushayni, Faculty Mentor (Department of Computer Information Science)
2:00 PM – 2:15 PM

Generating a GPC-1 Knockout in Glioblastoma Cells Using CRISPR
Jamie Rogers
Samantha Katner, Faculty Mentor (Department of Biochemistry)
2:15 PM – 2:30 PM

Functional investigation of the Type IX Secretion System Regulatory Pathways in Flavobacterium johnsoniae
Ireland Manning
Yongtao Zhu, Faculty Mentor (Department of Biology)
2:30 PM – 2:45 PM

Mental Health Literacy in College Students
Emily Schiltz
Emily Stark, Faculty Mentor (Department of Psychology)
2:45 PM – 3:00 PM

How Normative Beliefs Affect Procrastination Rates in College Students
Adam Recknagel
Kevin Filter, Faculty Mentor (Department of Psychology)
3:00 PM – 3:15 PM

Due to confidentiality reasons, this Zoom session will only be accessible by the mnsu.edu domain

College of Science, Engineering & Technology

Function of Ribonucleotide Reductase-Encoding Genes in Flavobacterium johnsoniae

Hunter Doheny

Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Pre-methylation of Foreign DNA Improves Conjugation Efficiency in the Fish Pathogen Flavobacterium Psychrophilum

Seada Sloboda

Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Investigating miRNA Regulation of the Human APOBEC3 Enzymes

William Dietrich

Allison Land, Faculty Mentor (Department of Biology)

Due to confidentiality reasons, this Zoom session will only be accessible by the mnsu.edu domain

GRADUATE POSTER SESSION 1

2:00 PM – 3:00 PM

College of Science, Engineering & Technology

Importance of Testosterone, Estradiol, and Dihydrotestosterone in Neurogenesis
Zachary Sandborgh & Brooke Miles
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

The Effects of a Fish's Fins in a Terrestrial Jump
Mackenzie Reed
Michael Minicozzi, Faculty Mentor (Department of Biological Sciences)

Contrasting Oak Responses to Water Stress - Osmolyte Profiling Across Species
Joseph Newman
Matthew Kaproth, Faculty Mentor (Department of Biological Sciences)

Effect of Thyroid Hormone Transporters in Adrenal Cortex Remodeling
Amayah Ockenga
David Sharlin, Faculty Mentor (Department of Biological Sciences)

DNA Repair Genes and Their Expressions in Breeding and Non-breeding Seasons of Green Anole Lizards
Alex Calli-Wehrman & Matt Bromann
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Myosin Oxidation and Effects on Magnesium and Actin Binding: Actomyosin
Muna Mifta Awel & Lelti Asegdom
Rebecca Moen, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

College of Social & Behavioral Sciences

Assessing Students' LASSI Performance
Claire McDavid & Kailing Aw
Karla Lassonde, Faculty Mentor (Department of Psychology)

Students' Perceptions of Professionalism
Christina Sanders, Skylar Williams, Samantha Giannelli & Teana Krolak
Kristie Campana , Faculty Mentor (Department of Psychology)

Examining the Impact of COVID-19 on the College Students' Experience
Kaylee Engle & Taiylor Hoeft
Carlos Panahon, Faculty Mentor (Department of Psychology)

Honors Program
College of Allied Health & Nursing
College of Social & Behavioral Sciences

University Health Services and Non-English Speaking Patients
Riley Lehmer, Kianna Fladland, Quinlan Brogdon, Maureen Nghambi & Simale Kadir
Leah White, Faculty Mentor (Honors Program)

Mask Usage Behaviors amongst the MNSU, Mankato Community
Molly Hill, Roman Parpart, Brian Swancutt & Liberty Hombe
Leah White, Faculty Mentor (Honors Program)

Impact of Supplemental Technology on Student Performance
Kade Patterson, Emma Knutson , Mykenzie Cole & Samantha Kozelek
Leah White, Faculty Mentor (Honors Program)

Exploring How Duration and Mode of Delivery Impacts Outcomes of Literacy Intervention
Rebecca Guss
Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

Strategies for Teaching History
Sage Grothe
Emily Stark, Faculty Mentor (Department of Psychology)
Jill Cooley, Faculty Mentor (Department of History)

UNDERGRADUATE POSTER SESSION 11

3:30 PM – 4:30 PM

College of Science, Engineering, & Technology

Sentimental Analysis of COVID-19 Vaccine Related Tweets

Mohannad Rayani
Suboh Alkhushayni, Faculty Mentor (Department of Computer Information Science)
3:30 PM – 3:45 PM

Detecting Online Review Fraud Using Sentiment Analysis

Bryn Caron
Rajeev Bukralia, Faculty Mentor (Department of Computer Information Science)
3:45 PM – 4:00 PM

A Method and Apparatus For Testing Cohesion Between 40 µm to 50 µm, SAC305 Solder Spheres

Cohen Rautenkranz, Vadim Kuleshov, Sreymom Men, Edward Sweeney, Napoleon Kwamesa

Jake Swanson, Faculty Mentor (Department of Integrated Engineering)
Ryder Febo, Faculty Mentor (Department of Integrated Engineering)
4:00 PM – 4:15 PM

The Importance of Measuring Air Velocity on a Race Car

German Orrego, Casey Plender & Kushan Sameera
Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)
4:15 PM – 4:30 PM

College of Allied Health & Nursing
College of Social & Behavioral Sciences

GRADUATE ORAL PRESENTATION SESSION 2

3:30 PM – 4:30 PM

Teletherapy and Camp Maverick: Literacy Students and Caregiver's Perspectives

Kelsey Anderson & Kristin Smith
Megan Mahowald, Faculty Mentor (Department of Communication Sciences and Disorders)
3:30 PM – 3:45 PM

The Effect of Resistance Training on Distance Running Performance: A Comprehensive Meta-Analysis

Nathan Goslin-Klemme
Corey Selland, Faculty Mentor (Department of Human Performance)
3:45 PM – 4:00 PM

What Do the Twitter Sentiments Say About the COVID-19 Vaccine?

Ilma Sheriff
Naseef Mansoor, Faculty Mentor (Department of Computer Information Science)
4:00 PM – 4:15 PM

Xtreme-NoC: Extreme Gradient Boosting Based Latency Model for Network-on-Chip Architectures

Ilma Sheriff
Naseef Mansoor, Faculty Mentor (Department of Computer Information Science)
4:15 PM – 4:30 PM

COVID-19 Impacting Care Partners Assisting Socialization for a Dementia Friendly Chorus.

Anna Peterson & Tatyana Soloviyov
Hsinhuei Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

Abstract

The purpose of the study was to examine the impact of the COVID-19 pandemic on a person living with dementia (PWD) in a dementia friendly virtual chorus group from perspectives of CP. The specific survey questions for CP addressed PWD's ability to participate in choral activities, social aspects of the chorus and perceived social isolation, and the impact of COVID-19 on their overall well-being. Qualitative and quantitative data were collected for data analysis. Some challenges are to be expected about the changes from in-person to virtual, but overall, the continued effect of music being able to lift moods of CP and PWD.

Physical Therapy Use among Collegiate Dancers

Vanessa Kotek & Kacey Wachholz
Jessica Albers, Faculty Mentor (Department of Human Performance)

Abstract

Dance is a popular and growing sport among female individuals in the United States. These athletes face unique injury prevention and rehabilitation challenges based on the sport and resources. Collegiate dancers often lack recognition as a sanctioned sport in universities and are considered clubs and not sports. Because of this, they may not receive the same access to strength training personnel or resources which are essential in the prevention and rehabilitation of injury. Additionally, collegiate dancers often do not have access to athletic training facilities or health care information as those in recognized sports. The purpose of this research is to examine the injury rates and physical therapy resources of collegiate dancers. This research will set up a project to increase therapy use by collegiate dancers to prevent sitting out from their sport. Using the databases ProQuest, Nexus Uni, EBSCOhost, PubMed, and SPORTDiscus from our university's library, the following

keywords were searched: Collegiate dance, Physical Therapy, Injuries, Prevention, and Access to Doctors. Sources were included in the literature review if they talked about reasons for injuries among collegiate dancers, nutrition and eating disorders affecting dancers' health, and the reasons one does not seek physical therapy. After the literature review, health behavior change theories were examined for relevance for physical therapy use among collegiate dancers. Data is being analyzed. Results and conclusions will be presented.

Recess and Play Before and During COVID-19 Pandemic: A Pilot Study

Mackenzie Glaser, Jakob Erickson-Thoemke & Edinatu Thoronka
Heather Von Bank, Faculty Mentor (Department of Family Consumer Science)

Abstract

The global pandemic affected many institutions, including schools. Children and their families were quarantined at home immediately impacting parents' roles; parents became co-teachers, recess coordinators, and IT specialists. Teachers were challenged with a diverse set of roles as they developed lessons on the fly, worked with little to few resources, and found creative ways to send resources home to their students.

In addition, children's play began to look very different. Children could no longer play with their friends, playgrounds and parks were closed, children's museums and recreation programs where cancelled, and extracurricular activities diminished. However, children now had more time to explore outdoors and spend time with family members.

Elementary school aged children have come to rely on recess as an opportunity to express themselves and do what they like during recess; whether that's sitting and talking with friends, playing football, or using the playground equipment to create gymnastics routines. Teachers have also noticed how changes to recess time affects classroom time. Studies have shown that when children have more time for recess to play, they were more prepared to learn in the classroom and had positive emotions on the playground (Clark & Rhea, 2017).

In the current we surveyed teachers and parents of elementary school age children. We asked participants about children's play during recess before and during the pandemic, their opinions of recess, and how recess has changed. The results will shed light on how our children's access to play has been affected by the global pandemic.

Family Coping in the Time of COVID-19

Ivy Packard, Kiara Brown, Cassandra Flaata & Emma Vogel
Daniel Moen, Faculty Mentor (Department Family Consumer Science)

Abstract

This exploratory study addresses the need to understand family coping in the time of COVID-19. Researchers utilized Hill's (1949) Family Stress Theory ABCX model to provide an explanation for the unique phenomena that has brought family coping abilities to light. Using a systematic review of recent peer-reviewed literature, the study identified the top three empirical themes for three different components; Family resources, family perception, and family crisis. Researchers then took these themes and compared them to data that was brought about in a survey sent out to the public in order to understand how families are coping during the times of COVID-19.

Exploring COVID-19 Impact on Social Inclusion in a Dementia Friendly Chorus

Cassidy Hall, Jordan Enevold, Britta Anderson & Khadija Kamara
Hsinhuei Sheen Chiou, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

Abstract

This study explored the impact COVID-19 has on the chorus members living with the disease and their social well-being during rehearsals. Two participants living with dementia were interviewed in the study. A short survey was provided to the participants at the beginning of the choir season. They answered questions on a five-point scale ranging from 0 to 4, in addition to several open-ended questions. Survey questions focused on how COVID-19 has affected the choir experience for the person living with the disease. Quantitative and qualitative data are being analyzed. The results demonstrated a decrease in social inclusion due to COVID-19 during a virtual choir season.

End of Life Care Conversations: Family Care Partners Share Their Experiences About Their Loved-one Living With Dementia at the End of Life

Chandler Johnson & Abigail Larson
Kristen Abbott-Anderson, Faculty Mentor (Department of Aging Studies)

Abstract

Background and Purpose:
In 2016, 47.8% of nursing home residents were diagnosed with Alzheimer's disease or related dementia (ADRD). End of life (EOL) conversations between the family care partners (family who care for ADRD loved ones) and the patient are needed to provide individualized care. As dementia progresses, patients may be unable to convey their needs to their caretakers, therefore EOL conversations should be initiated early. Yet, scant research describes guidelines for these conversations. This study will explore the experience of family care partners who had loved ones with dementia in a care facility and EOL care conversations.

Theoretical Framework:
The Peaceful End of Life Theory provides a holistic view of EOL that encompasses respect and dignity for care for patients, which along with literature review informed our hypothesis:

Family Care partners will report a more peaceful EOL for their loved one:
If advanced care directives were established and updated and/or
The family was provided education about EOL.
Proposed Methodology:

Data is currently being collected via an original online survey and phone interview. Survey questions were derived from EOL literature about ADRD care. Recruitment began in December, 2020 following International Review Board (IRB) approval and will continue through February, 2021. Challenges faced thus far include delayed IRB approval and recruitment through the holiday season.

Results and Conclusions:
To date, five individuals have completed the survey and one has completed the follow-up interview. Findings from this study may provide greater understanding about conversations of advanced directives and conduct of EOL conversations. Descriptive statistics, correlations, and content analysis will be utilized. The results may be used by healthcare workers regarding the timing and importance of EOL conversations.

Student Role:
Chandler Johnson and Abigail Larson, Undergraduate Students collaborated with Faculty Mentor Kristen Abbott-Anderson to identify the topic, conduct the literature review; develop hypotheses and develop the abstract for submission. The student researchers will take an active role in data analysis and development of the research poster for dissemination.

The Potential Mechanism of Leptin on Lipolysis in Brown Adipose Tissue

Lyric Lopez-Kohler
Charles Krois, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Using mainly fatty acids for energy, brown fat produces heat in order to maintain body temperature through thermogenesis. Lipolysis, the release of fatty acids from stored triglyceride, is mediated (in part) by the protein hormone sensitive lipase (HSL). Activation of HSL occurs when it is phosphorylated by protein kinase A (PKA), which is itself activated due to signaling via a G protein-coupled receptor (GPCR).

Leptin, a hormone, signals to cells by activating a cascade called the JAK-STAT pathway. In short, activation of Janus kinases (JAK) leads to phosphorylation and activation of STAT (signal transducers and activators of transcription) to alter the expression of specific target genes (1,5). In addition, leptin can also exhibit crosstalk affecting the GPCR pathway. Zhang and colleagues identified an example where leptin signaling inhibited PKA in endothelial cells (5,6). However, whether this crosstalk occurs in brown fat is unclear.

Disease Mutations and Oxidative Effects on Calmodulin Structure and Function

Ethan Hayes
Rebecca Moen, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Several mutations in the protein calmodulin, termed calmodulinopathies, have been reported as potential contributing factors to the cause of several heart conditions such as Long QT Syndrome, idiopathic ventricular fibrillation, and catecholaminergic polymorphic ventricular tachycardia. In essence, these diseases cause disorders of the heart's electrical activity, which can be extremely dangerous or even fatal. Calmodulin regulates calcium levels within the cell, and this interaction signals for many cellular processes to occur. Calmodulin has a multitude of binding partners, though this research focused specifically on the interaction between calmodulin and the cardiac ryanodine receptor (RyR2). RyR2 is responsible for the release of calcium from the sarcoplasmic reticulum in the heart muscle during excitation and contraction. When not functioning properly, this receptor can be a cause of irregular heartbeats characteristic of several heart diseases. Furthermore, calmodulin contains a high percentage of methionine (Met) amino acid residues that are crucial to its binding capabilities. However, these residues are susceptible to oxidation, which has been shown to adversely affect calmodulin binding. Our research explored structural and functional effects of two specific disease-causing calmodulin mutants; F90L and D129G. In addition, we have studied the oxidative susceptibility and the structural and functional changes in both wild type and mutated calmodulin. Finally, we investigated the compounding effects of both mutation and oxidation on calmodulin's binding properties to both calcium and the RyR2 receptor. These results could lead to advancements in possible future treatments for heart diseases such as Long QT Syndrome and our overall understanding of calmodulinopathies

Effect of Adrenergic Signaling On All-Trans-Retinoic Acid Synthesis In Brown Adipose Tissue.

Tsion Sherbeza
Charles Krois, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Thermogenesis is a process where our body maintains its temperature by producing heat. Nerves release norepinephrine to signal a thermogenic response in brown adipose tissue (BAT), which uses the activity of uncoupling proteins 1 (UCP1) to make heat. All-trans-retinoic acid (atRA), synthesized from dietary vitamin A, also affects an animal's ability to carry out thermogenesis. Both atRA and norepinephrine independently increase the amount of UCP1, however, their interrelationship is not well understood. This experiment is focused on how norepinephrine effects atRA production in BAT, by examining norepinephrine's effect on the mRNA levels of atRA synthesizing proteins. First, we determined the optimal dose of isoproterenol, a norepinephrine mimic, to elicit changes in UCP1 mRNA in cultured BAT tissue cells. Presently, we are determining whether treatment with a PKA inhibitor affects isoproterenol's effect the mRNAs of atRA synthesis enzymes.

APOBEC3A Mediated Genome Targeting of the Thyroid Hormone Response Element

Abbigail Osgood
Allison Land, Faculty Mentor (Department of Biological Sciences)

Abstract

APOBEC3A (A3A) is a hydrolase enzyme that deaminates cytosine in DNA sequences to produce uracil. A3A is specific for the nucleotide sequence of nnnTCA and is one of the most potent human DNA cytosine deaminases. My goal is to use A3A's specificity as a genome targeting tool, specifically targeting the thyroid hormone response element (TRE), which is a DNA sequence important for the thyroid hormone receptor transcription cascade. The DNA sequence of the TRE contains the A3A specific nucleotide sequence in two palindromic nnnTCAnnnnnnnTCA sites. I hypothesized that A3A would mutate this cytosine in the TRE sequence, obliterating the TRE and halting its transcriptional function. Thus far, I have shown that A3A, transfected into 293T cells, successfully mutates an oligonucleotide sequence with the target AGGTCA to AGGTUA. This was shown through subsequent uracil removal by Uracil DNA Glycosylase and cleavage by NaOH/heat treatment visualized on a 15% TBE-Urea electrophoresis gel. In order to observe deamination by A3A in vivo, both A3A and the TRE sequence must be present in live cells. For future in vitro experiments, a plasmid containing the TRE sequence will be transfected into two cell populations. One population (experimental) will also be transfected with an A3A expression plasmid. The second population (control) will be transfected with plasmid encoding a catalytically inactive version of the enzyme. Both cell groups will be observed and analyzed using genome sequencing. Successful A3A deamination will be shown by mutations of the cytosine in the TRE sequence when active A3A plasmid is present. The ability to perform genome targeting and editing of the TRE, using A3A, will allow for observation of metabolic changes produced in response to a lack of a functional TRE and greater understanding of the thyroid hormone receptor transcription cascade.

Soil Health Characterization Under Different Land Uses in Southern Minnesota.

Mohammed Abdurahman
Mriganka De, Faculty Mentor (Department of Biological Sciences)

Abstract

Rapid population growth in the Southern Minnesota leads to the conversion of natural ecosystem such as forest and grasslands into agricultural lands. This land-use changes have resulted in significant losses of soil organic matter (SOM) in the past century and have thereby negatively affected soil health by altering physio-chemical and biological properties of soils. Therefore, a comprehensive soil health assessment is necessary to formulate sustainable management planning of these three ecosystems. A study was thus conducted in Fall 2020 to evaluate soil health under three different land uses (agricultural, forest, and prairie) in the Southern Minnesota. Soils were collected from 0-15 cm depth of the identified land uses with nine field replications and measured for soil texture, maximum water holding capacity (MWHC), gravimetric moisture content (GMC), pH, and SOM following standard procedures. Results showed that the highest average MWHC at field capacity was found in forest soils (58±9%), followed by prairie (52±10%) and agricultural (18±10%) soils. This was probably due to the presence of 33-35% greater SOM content in forest soils as compared to the prairie and agricultural soils. Contrarily, agricultural soils had the highest average GMC (36.5±2.1%) because the average clay content in agricultural soils was significantly ($P < 0.05$) greater than the prairie and forest soils. Average soil pH of prairie (6.0±0.03) soils was significantly lower than that of forest (6.4±0.05) and agricultural (6.2±0.12) soils. Other soil health parameters such as microbial biomass, total organic carbon and nitrogen, and available nutrients will also be measured to identify the soil health indicators that are sensitive to these land uses. The results of this study will be beneficial in developing sustainable land use strategies within the region to reduce land degradation.

An Assistive Mobile Communication Application for Individuals Who Are Mute or Have Speech Impairments

Sashwot Koirala
Guarionex Salivia, Faculty Mentor (Department of Computer Information Science)

Abstract

People with speech disorder or with muteness experience difficulties communicating with their peers and with abled bodied individuals. They often rely on low-tech solutions such as writing what they want to say in a piece of paper. The purpose of this research is to develop an assistive mobile cross-platform communication application that uses Web Speech API (Application Programming Interfaces) that recognizes text input and outputs speech to aid people with muteness or speech disorders.

Bringing the High Redshift Universe to Instagram

Wen Sun
Michael Rutkowski, Faculty Mentor (Department of Physics and Astronomy)

Abstract

After completing the Hubble Space Telescope survey of more than 200,000 galaxies, the UVCANDELS team has generated thousands of color images of galaxies observed over the past 10 billion years of cosmic time. In this work, we wanted to provide these images to the public for their enjoyment and appreciation and devised an automated bot to regularly post these images to the popular app, Instagram. Through this bot, the public can get a taste of the diversity and beauty of these galaxies each day.

Studying Thermal Effects of Laser Excitation Power on Carbonaceous Meteorites by Raman Spectroscopy

Mohamed Zakariya
Analía Dall'Asén, Faculty Mentor (Department of Physics and Astronomy)

Abstract

Carbonaceous chondritic meteorites can provide valuable clues about planet formation since they are considered some of the most primitive surviving materials of our solar system 1 This information can be obtained through their physical properties which can be characterized using microscopy and spectroscopy techniques 2 6 In particular, Raman spectroscopy has been used extensively on meteoritic samples since it is a nondestructive tool that provides information about their structure and mineralogical composition However, the power of the laser excitation source used in this technique can alter the properties of the samples due to thermal effects 2 7 Hence, it is critical to analyze in detail what alterations could be produced in a meteoritic sample due to the laser power to obtain reliable information about its physical properties, and thus, provide the right evidence to understand the origin of these relics In this work, we study in detail the laser induced thermal effects produced on carbonaceous chondritic meteorites (in particular, NWA 6603 by analyzing the Raman spectra parameters of the minerals found in these samples as a function of the laser excitation power and correlating them with changes that can occur on the topography of the irradiated regions using optical microscopy.

Simple Cosmic Ray Detector

Jamal Saeed
Michael Rutkowski, Faculty Mentor (Department of Physics and Astronomy)

Abstract

The goal of this project is to build a working prototype of cosmic ray detector that will serve two purposes. First, it will provide the student in charge of this project an opportunity to perform a classic experiment in physics: measuring the masses of charged cosmic rays. Secondly, and the primary focus of this proposal, is to build and test a sustainable public outreach activity for use in public nights at the Andreas Observatory.

Bridge Deck Thermography: Revisiting 'Bridges Freeze Before Roadway' From a Safe Salt Perspective

Emily Bollendorf
Stephen J. Druschel, Faculty Mentor (Department of Mechanical and Civil Engineering)

Abstract

"Bridge Ices Before Road" is a road sign almost every driver has seen, however, the magnitude of that statement is not always known. Icy bridges pose a safety concern for drivers in winter weather conditions. Bridge decks freeze before surrounding roadways due to their exposure to wind and cold temperatures from all directions. Wind cools the bridge deck from the top, bottom and sides. Bridges also do not have insulation and warmth radiating from the ground that roadways do. These factors lead to the rapid formation of ice on bridge decks, which can cause drivers to lose control of the vehicle and crash. Plow drivers attempt to mitigate the problem by applying salt and other deicing mixtures, however, salt has a devastating impact on the ecosystems when it runs off into nearby bodies of water. Deicing performance is also sensitive because a fifteen-degree differential can cause up to an eight-fold difference in snow and ice melt. This greatly impacts deicing decisions, considering temperature differentials can occur within fifty feet of bridge deck length. Understanding how various construction and location factors impact the thermal response of bridges would help engineers design and maintain safer roadways for drivers.

This research project analyzes the thermal response of various bridge types in winter weather conditions. Using a Forward-Looking Infrared Camera (FLIR) and laboratory experiments it was concluded that bridge material, orientation, size, and landscape underneath the bridge impact the rate at which bridge decks freeze.

Automated Cutting Expert (ACE)

Cesar Esquivel, Jeremy Patricelli, Caroline Moore, Daniel Armstrong & Rachael Johnson
Jacob Swanson, Faculty Mentor (Department of Integrated Engineering)

Abstract

The team has been approached by Design Ready Controls (DRC) to design a feeding system for the Automated Cutting Expert (ACE) machine. The ACE will be capable of producing programmed cuts along the length for two specific materials (DIN rail and Wire Track). The team is building a belt-positioning system that will extrude material through manual cutting tools. The project will also include writing a software package for the ACE, consisting of a hardware control program and a user interface. The initial stage of this project involved researching existing machines with similar purposes and identifying applicable design aspects.

IoT-based Solution to Gather Foot Plantar Pressure for Daily Life Activities

Abdelrahman Elkhatib
Puteri S. Megat Hamari. Faculty Mentor (Department of Electrical and Computer Engineering & Technology)

Abstract

Our daily routine in life contains numerous activities throughout the day, and our feet play an essential role in every activity. Each activity has a unique foot plantar pressure profile depending upon the actions executed, and information about the applied pressure can be advantageous for revealing whether medical intervention is necessary. The purpose of this research-oriented project is to provide a wireless means of gathering data on foot plantar pressure in order to assess the locomotive activity performed by a particular person and determine the medical issue associated with the extracted profile. This will help in early identification of a disease and complement the medical decision-making process. The methodology centered around the design of an insole integrated system that would collect data on pressure and gait, after which it would wirelessly transmit this data to a remote server. Our results show that informative data can indeed be collected and transmitted using our insole integrated system. The significance of this research lies within its potential to be applied to the fields of athletic medicine, weight management, and podiatry.

An Interdisciplinary Approach in Arts Education a Unit Plan

Aditi Bheda,
Gina Wenger, Faculty Mentor (Department of Art Education)

Abstract

Despite the interconnectedness of the world, we tend to compartmentalize the way the arts are taught in schools. With this unit comprising ten sessions for Grade 9 students, the aim is for students to create a dance performance that takes inspiration from the works of visual artists Arthur Ganson and Mella Jaarsma. With this interdisciplinary approach, my hope is that students find connections between events in contemporary times and how their inner worlds fit within the political. More importantly, for them to be able to express their thoughts and ideas through their bodies in movement and through the visual work they create in collaboration with their peers. At the end of this unit (of approximately 10 sessions), each group of four to five students will create a group dance (using a prop) that is inspired by Gansons kinetic sculptures. The prop (a chair that is a recurring motif in Gansons work) is designed taking inspiration from Mella Jaarsmas work and constructed using recycled material. Additionally, each group will provide a write up for the work they create.

Rhetorically Speaking Danica Patrick and the Wide World of Marketing in Sports

Jonathan Fjeld
Emily Sauter, Faculty Mentor (Department of Communication Studies)

Abstract

This presentation goes over Danica Patrick's career and how it functions as a lesson for the current diversity-keen environment of marketing and the media that we are in today.

Skinwalkers and Gender Roles

Marius Vold,
Rhonda Dass, Faculty Mentor (Department of Anthropology)

Abstract

Legends of shapeshifters exist in different forms all over the world. The Skinwalker, or Yenaldlooshi is an evil shape-shifting sorcerer, traditionally most often associated with the Indigenous North American Navaho tribes. To fully understand the Skinwalker stories and what they communicate to their audience, it is imperative to understand the gender portrayal of this monster and how this portrayal shapes the Skinwalker stories. I have gone through a little over one hundred modern Skinwalker stories and selected three stories that I used to perform a comparative analysis of the Skinwalkers gender portrayals to traditional gender representations of villains in folklore within this paper. As the Skinwalker changes its gender portrayal, so does its behavior and function change within the story, often marking turning points in the progression of the story. We can see a clear distinction in the Skinwalker's behavior and function, emphasized and dependent upon the gender it is portraying, as they fall within expected gender-stereotypical behaviors. This becomes especially emphasized by the Skinwalker's androgyny, its ability to play on both different gender stereotypes as well as fears of sexual confusion, the undefinable, and the chaotic.

Impact of Tire Temperature on Grip in a Racecar

Val Urman
Sam Ertl, Faculty Mentor (Department of Automotive Engineering Technology)

Abstract

When designing a suspension system for a racecar, tires are the first considered, as they are the component connecting the vehicle to the ground. Throughout a race, a tire will heat and cool, depending on the track conditions, suspension geometry and setup, and driver inputs. Typically, tire temperatures are logged in small batches, after an entire run. This year, sensors constantly reading temperatures in sixteen places across the width of the tire throughout a run were purchased and their readings logged and evaluated. Capturing and logging these temperatures are extremely helpful in vehicle tuning and system designing. This data is used to make quantitative adjustments to the vehicle setup and to provide future teams with a strong base to begin their suspension designs using data from a similar vehicle. The sensors were placed on the vehicle in order to collect temperature readings across the tire, while being rules compliant. The readings showed that the suspensions initial setup was not correct. Using the tire temperatures read through corners the suspension was adjusted to ensure the tires were kept at the correct position through a corner and did not overheat. This led to a well handling car that required less trials to achieve.

Impact of Intake Air Charge Cooling from Upstream Auxiliary Fuel Nozzle

Gabe Villalpando,
Matthew Simones, Faculty Mentor (Department of Automotive Engineering Technology)

Abstract

The cooling effects of the intake air charge of a turbocharged engine based on upstream (secondary) low volume fuel injection were explored. The enthalpy of vaporization of the fuel causes energy in the form of heat to be absorbed from the air charge it is being injected into. Power output of an internal combustion engine is directly affected by the density of the air charge entering the combustion chamber on the intake stroke, and by cooling this charge its density is increased. Turbocharged engines generally produce much higher intake air temperatures due to the compression of the intake charge. Besides lower volumetric efficiency, this can also cause accelerated engine wear and/or catastrophic engine failure from abnormal combustion if left unchecked. By cooling the air charge, engine reliability, power, and efficiency can all be increased. However, over saturation of the intake air prior to flowing into the combustion chamber causes air (oxygen) to be displaced by liquid-phase fuel and can have a negative effect on engine power. Therefore, the focus of the research was to find the minimum amount of fuel required to maximize the cooling effect of upstream fuel injection. In this work, air charge temperature was measured before and after upstream injection while monitoring engine power output on a chassis dynamometer. After repeated power pulls on the dynamometer with varying amounts of upstream injection, the results were plotted against a baseline test without upstream injection. These results were then used to develop a secondary injection fuel map for the engine control unit in order to optimize the fuel injection required as a function of engine speed.

Coil Suppression

Sam Squires
Matthew Simones, Faculty Mentor (Department of Automotive Engineering Technology)

Abstract

Relay coil suppression aims to reduce/eliminate the back EMF or voltage spike induced upon the collapse of the magnetic field. This research in particular looks at the back EMF generated by a 12-volt relay that could be used in the Formula SAE Electric (EFSAE) design competition, where relays are often controlled by a low voltage battery management system and are susceptible to damage. Coil suppression in these tests utilizes diodes of different types and sizes. The EFSAE team utilizes off the shelf relays, which are available with or without internal coil suppression. Choices can be limited when looking for relays with coil suppression and are also more expensive. Designing an external coil suppression circuit could save $20 per relay for a total savings of $160 per year for the team, and a more complete understanding of the danger of a non-suppressed relay would be understood. To test the benefits of coil suppression a simple circuit was made where the test item was placed in parallel with the relay and cycled on and off using a toggle switch. Using an oscilloscope, the voltage with and without suppression was measured with readings of 13 volts and 280 volts, respectively. Test results show that diodes costing less than a dollar are effective in mitigating the transient response from the relay to within safe voltage levels. These results will guide the EFSAE team in the design and selection of an appropriate diode for external coil suppression and will allow the team to utilize relays that may not be offered with an internal coil suppression option.

RPM Limiting System

Arjun Veerwal,
Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)

Abstract

The Small Engine Team project was to research and make an RPM Limiting/Cut-off system to work with dynamometer for the ongoing Small Engine Round Robin Project. LabVIEW graphical programming software along with National Instruments were used to create a program that limits the RPM of the engine and engine shuts off when the defined threshold RPM value is reached. Some Dynamometers have inbuilt safety device which cuts power to engine if it over revs to prevent damage to engine and the dyno but on our dynamometer such system was not present, hence we came up with our own ignition cut-off system. An inductive pickup from FLUKE along with LabVIEW and NI modules were used after a lot of research for this project. After doing a lot of research and testing this system on our small engine we found that we had some problems with the program running a little slower than our anticipation and requirement. We had to use a different module which had a faster response time which helped our system work even better than expected. This system gave us the ability to test small engines without fear of any damage to engine as well as the dynamometer because of the elevated rpms which may exceed the mechanical limits of the engine.

Understanding the Relationship Between Serum Thyroid Hormone Levels and Thyroid Hormone Action in Tissues

Lauren Krieg, Jessica Wimp
David Sharlin, Faculty Mentor (Department of Biological Sciences)

Abstract

One essential component for normal nervous system development is thyroid hormone. Low thyroid hormone during development of the nervous system results in cognitive deficits including low IQ. A growing body of evidence suggests that the amount of circulating thyroid hormone in humans and rodents can be impacted by a number of environmental chemicals. Considering this, our group is investigating the degree to which circulating levels of thyroid hormone must be reduced to observe altered thyroid hormone action in tissues. To test this, we are administering five increasing doses of methimazole (MMI; drug used to block thyroid hormone) to 16-18 week old male mice to induce a step-wise reduction in circulating thyroid hormone. Mice were assigned one of five groups based on MMI dose; 0, 0.002, 0.004, 0.01, 0.05% (weight/volume). Following two weeks of treatment, mouse serum was collected as well as brain, liver, and heart tissues. Serum total T4 levels were determined by enzyme-linked immunosorbent assay (ELISA). We are currently purifying total RNA from liver tissue to assay the well-known thyroid hormone responsive genes in the liver spot14 mRNA levels by qRT-PCR. This work has two goals: (1) Obtain baseline information on the dosing needed to induce a stepwise decrease in serum thyroxine and (2) determine what is minimum decrease needed to observe an adverse outcome as indicated by a change in gene expression in liver, brain, and heart tissues. Our prediction is that a certain level of reduction in thyroid hormone must be reduced to observe significant change in gene expression, and likely mirror the decrease in serum thyroid hormone induced by MMI.

PER1 Expression in the Breeding and Non-Breeding Season of Anole Lizards

Alexus Bunnam & Taylor Grossen
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Abstract

Green anole lizards (Anolis carolinensis) go through changes in sexual behavior during the breeding season such as; enlargement of testes and ovaries, extension of the dewlap, head bobbing and territorial tendencies. However, these sexual behaviors are not seen in the non-breeding season. The gene PER1 is activated through environmental light cues. Anole lizards breeding season is within the summer months. The longer duration of light hours in the summer allows for PER1 to be signaled to more frequently. This leads to the hypothesis that PER1 is regulated differently in the breeding and non-breeding season but not differently between females and males. In preliminary experiments it has been shown that PER1 is upregulated more in the breeding than in the non-breeding season. PER1, a member of the period family, runs on a twenty-four-hour feedback loop that is associated with the internal biological clock in mammals. To test this a database was used to determine potential primers. Three primers were chosen and tested to determine the best amplifier for PER1. One primer set, with an amplicon size of 200, was the most suitable. To further strengthen the validity of the primers, a PCR cleanup was performed. It was sequenced in order to establish whether the primer amplified the proper gene. The PER1 gene had a 99.37% identity with our PCR product. Several qPCR were performed resulting in no variation in the expression of PER1 within the breeding and non-breeding season ($p= 0.635$) and within males and females ($p= 0.327$). We can predict that PER1 is an important gene that must be regulated equally through seasons and sexes in anole lizards.

Effects of gonadotropin releasing hormone on reproductive behavior and testes morphology in a seasonally breeding lizard.

Jada Harley
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Abstract

Many people in the world struggle with infertility, which is often caused by misregulation of the hormones that control reproduction. The hypothalamus pituitary gonadal (HPG) axis regulates reproduction through the release of gonadotropin releasing hormone (GnRH). Seasonally breeding animals offer a unique opportunity to study reproduction in the same animal when they are fertile (breeding season) and infertile (non-breeding season). The non-breeding season can be further broken down into refractory and post-refractory periods. During the refractory period, breeding-like environmental conditions do not stimulate breeding. During the post-refractory period, breeding-like environmental conditions can cause animals to begin to reproduce. To test the role of GnRH in these two non-breeding periods, male green anole lizards (Anolis carolinensis) were injected with GnRH or saline (control) during the refractory and post refractory periods. The results from our first experiment showed that there was an increase in testis weight, spermatogenesis, and reproductive behavior in the post-refractory period compared to the refractory period, with no effect of GnRH injections. The GnRH sequence in green anole lizards has not been characterized, and a second part of our study was to perform PCR testing to amplify the GnRH sequence in green anoles. We used the GnRH sequence from a similar lizard species to design primers that will hopefully amplify the green anole GnRH sequence. If successful, we will determine the GnRH sequence in green anole lizards, which will allow us to begin characterizing how GnRH influences normal seasonal regulation of reproduction in this species.

Evolution in Terrestrial Behaviors of Amphibious and Aquatic Fishes

Andrew Ruiz
Michael Minicozzi, Faculty Mentor (Department of Biological Sciences)

Abstract

Fishes are generally thought to be fully aquatic organisms, but many fishes have evolved mechanisms that facilitate terrestrial excursions. When stranded on land, fishes can respond with a variety of behaviors to bring them back to water. Because mostly aquatic fishes are not frequently observed on land, not much is known about their behaviors once stranded. This begs the question as to whether these fishes evolved mechanisms to facilitate adequate terrestrial locomotion when compared to amphibious fishes. Hypothesis: fishes that rarely leave the water will jump quickly and often as a means to return to the water quickly as they may not have evolved mechanisms to survive for long periods on land. For this experiment, a variety of teleost fishes with disparate terrestrial inclinations were used to investigate their response to being stranded. We used amphibious fishes (mummichog, mosquito fish, and guppies) that have all been observed to voluntarily leave the water and move on land and compared these to fishes considered to be fully aquatic (longfin and wildtype zebrafish) that are not known to voluntarily leave the water. Fishes were stranded in a plastic arena and their voluntary response to being stranded was recorded for 2 minutes. Using these videos, we measured how many times the fishes flopped and jumped, measured the distance of each jump, the total distance moved, and how quickly it took the fish to start moving. We found that longfin and wildtype zebrafish took less time to begin moving, moved more often, spent more time moving, and traveled a greater distance than the amphibious fishes. Interestingly, the amphibious fishes barely made any movements over the two-minute stranding period. These results indicate that fishes that rarely leave the water are still capable of producing effective and coordinated overland movements although, their frequent behaviors indicate that these fishes have not evolved mechanisms to remain out of water for extended periods and must quickly return to water if stranded.

Isolation and Identification of Cellulolytic Bacteria from Forest Soil

Andrew Bluth
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Abstract

The digestion of cellulose is difficult and not done by many organisms, but the breakdown of cellulose can be used in the production of biofuels. This project aims to isolate and identify multiple bacteria that are able to digest cellulose. A sample of forest soil was serially diluted and plated on carboxymethyl cellulose (CMC) and then replicate plated. The replicate plates were then stained with Congo red to determine CMC digestion. The organisms that could digest CMC were further isolated and then incubated on cellulose filter paper as the sole carbon and energy source. From the ones that could grow on cellulose, the 16S rRNA genes were amplified by PCR and then sequenced. Three organisms were able to digest CMC, but only two were able to grow on the cellulose filter paper. The bacterium named AB-1 is unidentified but is efficient in cellulose digestion and likely belongs to Actinomycetes. The life cycle of AB-1 was then observed over seven days under the microscope. This organism is Gram-positive and has large, black, and fuzzy colonies with hyphae that spread out over time as well as aerial spores that develop. The spores are relatively large in size and form branches into the air. The other organism named AB-2 was identified as Cellulomonas terrae, previously shown to be a Gram-positive, aerobic, and non-motile straight rod that can digest cellulose and xylan.

Investigation of Pulsed Eddy Current Effect for Multi-Target Non-Destructive Testing

Yaman Pandey
Min Li, Faculty Mentor (Department of Mechanical and Civil Engineering)

Abstract

The existence of multiple frequency components provides the potential to design a Pulsed Eddy Current (PEC) sensor, which is capable of measuring/detecting multiple parameters/properties simultaneously. However, most of the existing PEC sensors in the market only provide a single function, which doesn't fulfill the needs of intelligent manufacturing (real-time multi-target measurement and detection). The purpose of my research is to investigate the potential of the PEC techniques for the multi-target Non-Destructive Testing applied in the field of intelligent manufacturing.

The Effects of an Inlet Restrictor on the Performance of a Turbocharger

Deven Paulsen
Matthew Simones, Faculty Mentor (Department of Automotive and Manufacturing Engineering Technology)

Abstract

The effects of a restrictor on a turbocharger on a Formula SAE car will be the focus of this technical research project. Formula SAE race cars are high performance vehicles and the systems on these cars should be designed for this purpose. Design goals of the restricted turbocharger system are to maximize power produced by a restricted engine. The system must also be compliant with FSAE competition rules. Most turbocharger inlets are unrestricted and allow for the desired amount of airflow to enter the turbocharger. Per the FSAE competition rules a restrictor is to be placed before the inlet of the turbocharger, thus restricting airflow into the turbocharger. What will be found in this research is how the turbocharger will react once the restrictor reaches its maximum potential flow while the turbocharger demands a greater airflow. This technical research will also explore ways to maximize airflow through a restrictor while on a budget. Pressure transducers will be placed before and after the turbo compressor to monitor pressure changes. Calculations will be performed to determine the pressure, mass airflow, volumetric airflow, and speed of the air past each sensor. The test will be conducted using an unoptimized and optimized restrictor. The data measured and calculated in this study will be compared. It is expected that the speed of the compressor wheel of the turbocharger will continue increasing in speed, thus creating a vacuum between the restrictor and the turbocharger. It is expected that once the restrictor reaches its maximum flow, the boost pressure created by the turbocharger will remain constant even as compressor wheel speeds rise. The design considerations for Formula SAE cars are uncommon due to their unique set of rules.

Design and Control of Multiple Degree of Freedom Spherical Motor

Jack Zimmerman
Min Li, Faculty Mentor (Department of Mechanical and Civil Engineering)

Abstract

The need for multiple degree of freedom motion is required for many applications in industrial automation such as robotic assembly arms, motion control for work surfaces, and many more increasing applications in the general field of robotics. Traditionally, the use of multiple single degree of freedom actuators was used to achieve this, yet this leads to an expensive, bulky and mechanically complex system. Thus, the design of single actuators with multiple degrees of freedom is attracting more and more attention for these applications. One such actuator is a Permanent Magnet Spherical Motor, or PMSM which features a ball joint like structure with a rotor with permanent magnets (PMs) surrounding a stator with electromagnets (EMs). In this research, the design, assembly and control of a multiple degree of freedom PMSM is explored and carried out, and various problems with current designs are improved upon.

Effects of Bisymmetric and Bilaterally Symmetric Vertical Axis Wind Turbine Designs

Annalisa Tostenson & Peyton Wolf
Nazli Wodzinski, Faculty Mentor (Department of Mechanical and Civil Engineering)

Abstract

The hypothesized behavior of vertical axis wind turbines (VAWTs) can be tested using miniature models of the design placed in a wind tunnel, providing information on the flow field and power curves without constructing a full-size model. However, several models used for this testing have been found to lack bisymmetric properties due to a protrusion of a rod coupler attaching the VAWT to the testing setup. Several of these bilateral symmetric characteristics also appear in full-size vertical axis wind turbines as well, resulting from the placement of the hub and generator for H-Darrieus type models. This research investigates the effect of the inconsistencies in symmetry on the VAWT model and further understand how it will alter the data. This experiment will be conducted by recording and graphing the rotational velocity outputs of both bisymmetric and bilaterally symmetric VAWT models. The output rotational velocity of the vertical axis wind turbine models of varying symmetry will be compared. It is expected that the bisymmetrical model will have a higher power output than the bilaterally symmetrical model; this research will provide insight into the true effect of these design changes.

Discerning Science Fact from Science Fiction: Effects of Science Fiction Media Consumption on Undergraduate Perceptions of Neurotechnology

Shannon Bruce, Russell Tesmer, McKayla Kurtz, Teana Krolak & Andrew McCarty
Adam Steiner, Faculty Mentor (Department of Psychology)

Abstract

Media can undeniably influence how college students perceive scientific concepts. Advances in neurotechnology, such as electroencephalograms (EEG), are becoming more popular in the media. Neurotechnology is depicted both accurately and inaccurately in science-fiction media. Science literacy seems to positively affect how college students integrate this information into their real-life understanding of technologies such as EEGs. In contrast, lack of scientific knowledge may produce overconfidence in self-perceived knowledge of neurotechnology. This effect appears to be independent from the accuracy of students' understanding of EEGs. This implies that science literacy fosters skepticism. The overall goal of our study was to determine the relationship between science fiction media consumption, basic science literacy/demographic information, and students self-reported familiarity with neuroscience. A survey was used to gather information about college students beliefs about the accuracy of neurotechnology portrayals in science-fiction. In addition, participants gave a self-perceived rating of their knowledge of EEGs, as well as listed examples of science-fiction media associated with these technologies. We compared participant's science literacy scores to science fiction media consumption scores and their self reported EEG knowledge. To determine a Science-Fiction Media Literacy score, media titles were used as unique keywords (i.e. Black Mirror, the Maze Runner) and then compared using Google Trends to identify how frequently they were searched for in the United States. Comparisons were kept consistent through the use of a ground truth term used in all comparisons and defined as the most searched for term. Our goal is to identify the influence that science-fiction media has on the understanding of factual information. We hope to illuminate the relationship between science literacy, science-fiction media consumption, and familiarity of neurotechnologies (such as EEGs). These data will inform educators and parents who wish to counteract the misleading information the public receives from science-fiction media.

The Relationship between Intramural, Club, and University Student-Athletes Belongingness and Motivation during COVID-19

Osadolor Louis Ikponmwosa
Michelle McAlarnen, Faculty Mentor (Department of Human Performance)

Abstract

The Relationship between Intramural, Club, and University Student-Athletes' Belongingness and Motivation during COVID-19

Louis Ikponmwosa, Minnesota State University, Mankato

Michelle McAlarnen, Ph.D., CMPC, Minnesota State University, Mankato

The current study analyzed the effects of COVID-19 on intramural, club, and collegiate athletes' motivation and belonging during the Fall 2020 semester using a cross-sectional survey research design. Participants' motivation was assessed with the Sport Motivation Scale-Revised (SMS; Mallett et al., 2007) and belongingness was evaluated with the General Belonging Scale (GBS; Malone et al., 2012). Thirty-nine participants (female = 22, male = 16) ages 18 – 28 years old completed the study. Data analysis consisted of correlational analyses between each GBS subscale (Acceptance/Inclusion and Rejection/Exclusion) and each type of motivation (SMS). Results indicated a statistically significant indirect, moderate relationship between Acceptance/Inclusion and amotivation ($r = -.411$, $p < .001$). There was a statistically significant direct, weak correlation between Acceptance/Inclusion and identified regulation ($r = .367$, $p < .05$) and intrinsic motivation ($r = .362$, $p < .05$). There was a statistically significant indirect, moderate relationship between Rejection/Exclusion and amotivation ($r = -.412$, $p < .05$). Additionally, participants indicated their level of belonging and motivation in the Fall of 2020 compared to Fall 2019. The results indicated that participants' current level of belongingness was neutral to moderate ($M = 3.38$, $SD = 1.87$), and their level of belongingness was slightly to moderately lower than this time last year. Participants reported current motivation as neutral to moderate ($M = 3.51$, $SD = 1.2$). Participants considered their motivation to be about the same or much lower than last year. This study shows there is a correlation between the participants' sense of belonging and sense of motivation and demonstrates how participants perceive changes in their belonging and motivation during COVID-19. The results can help sport professionals understand student experiences and develop programming to meet their belonging and motivation needs.

Predicting Effective Learning: What traits make college students receptive to learning?

Teana Krolak, McKayla Kurtz, Lauren Eckert & Dalyon Waldner
Karla Lassonde, Faculty Mentor (Department of Psychology)

Abstract

Students who are academically successful may have traits that assist in the learning process. Intellectual humility may be a desirable trait for life-long learning. Intellectual humility is described as a method of thinking in which a person is open to being wrong and willing to change their mind (Resnick, 2019). In this study, approximately 100 students were asked questions from the following psychological scales: The Interpersonal Reactivity Index (1980), Need for Cognition Scale (1984), Intellectual Humility Scale (2017), and Actively Open-Minded Thinking Test (2013). Participants also responded to demographic questions (e.g., GPA, work experience, career preparation) and evaluated how their own learning processes compare to a series of behaviors related to learning in college. We will compare scale scores to one another to determine which traits, if any, are related to successful learning. These survey results will assist us in designing experiments that further assess learning and may reveal methods to help students learn.

Resilience - A Dance on Film

Emily Schumacher
Daniel Stark, Faculty Mentor (Department of Theatre & Dance)

Abstract

While COVID-19 created many challenges within the learning environment it also required students and faculty to get creative. Dance on film has become an opportunity to continue working on our craft while navigating these unprecedented times. In addition to COVID-19 before returning to school in the fall my hometown of Cedar Rapids was majorly affected by the devastating Derecho (inland hurricane) that swept across Iowa. A potential idea was born and with the opportunity to dance for the camera I was able to put my emotions to movement. My research explores vulnerability through a lens. How does that read to the viewer? Does it become more personal? How does it translate? All questions that sparked inspiration as well as confusion throughout the process. This research challenged my creative process which in return opened my eyes to more possibilities within my field. It taught adaptation, frustration, inspiration, collaboration, and resilience.

Experimental Video

Jack Linell, Autumn Erdmann, Harry Ritchie, Natalie Wagley, Ben Liebl, Trang Nguyen, Hafsa Islam & Andrew Peterson
Areca Roe, Faculty Mentor (Department of Art & Design)

Abstract

Experimental videos created by undergraduate students in the ART 378: Experimental Video course. The works display a variety of styles, including music videos, stop-motion videos, and short films.

Expression of the Dancing Body Without the Face

Kaitlin Murray
Daniel Stark, Faculty Mentor (Department of Theatre & Dance)

Abstract

This project Expression of the Dancing Body Without the Face is an exploration of movement and creative process. By using props, set decor, lighting, and costumes, I explored how to create a piece that did not show my face, yet still was able to be expressive. The goal was not to show my face to the camera and still be able to express something with other types of movement qualities or use of other body parts. My professors explore these concepts, however, I wanted to experience what it would look like through a camera and how others perceive it. At the time, I experimented with the camera in my living spaces and use of a prop seemed to guide me in my movement and thinking process. The piece itself changed from the beginning and overtime from concept to location. The result was the piece Winter Shadows and got into the Fall 2020 student dance concert. I left it open for interpretation because it is interesting for me to hear what people think about it or how they interpret it, whether experienced in dance vocabulary or not. The results seem to be a success in how expressive the rest of the body can be or needs to be in relation to one body part not being exposed.

A Century of Racism in Minnesota

Nicole Jecha
Leah White, Faculty Mentor (Honors Program)

Abstract

This research project contains depictions of racial violence and may be sensitive for some viewers. In 1920, Elias Clayton, Elmer Jackson, and Isaac McGhee were lynched in Duluth based on an accusation of assault. 100 years later, in 2020, George Floyd was murdered in Minneapolis by police based on an accusation of a fraudulent $20 bill. 2 events, a century a part, show that while years have passed, Minnesota's history of racial discrimination still repeats itself. As I looked at what happened in both situations, I ask myself how, if at all, has racism changed in Minnesota? And what is the cause? I researched racially motivated events in Minnesota from 1920 to 2020 to uncover hidden acts of discrimination. I analyzed how supremacy and white fragility play a role in the discrimination we see today.

Beyond the Field: Poetry

Robyn Katona, Maivboon Vang & Anza Malik
Michael Torres, Faculty Mentor (Department of English)

Abstract

For non-poets, one may wonder what contemporary poets write about these days. The truth? Our obsessions, people and places, passions, and more. But sometimes, poets run out of ideas. That's when we go beyond the field and research something we are unfamiliar with but desire to know more about. We learn the specific vernacular and inner mechanics of what the field is all about. After this full immersion we form what we learn into poetry. Watch three second-year MFA graduate students perform and discuss their experience going beyond their field.

Breaking Traditions in Medieval Literature: Finding Parallels in Reynard the Fox and Robin Hood

Brianna Rose DeValk
Justin Biel, Faculty Mentor (Department of History)

Abstract

In 1973, Walt Disney Productions released the animated film, Robin Hood. In this now-popular motion picture, the makers of the film portrayed the cast of the notorious fifteenth-century legend as anthropomorphic animals. The English outlaw, Robin, is specifically cast as a fox. This was not accidental. Scholars often acknowledge the influence in which the twelfth-century French tale, Reynard the Fox, had on the film's development. Academic scholars have also identified the presence of the Old French tale in England during the period in which the earliest Robin Hood ballads were produced. While scholars have acknowledged these historical connections, none have made an attempt to analyze the deeper connections between Reynard and Robin, because France and England are often discussed as having distinct literary histories. However, as the Robin Hood legend developed during the centuries of Reynard's presence in England, it becomes increasingly important to ask whether these tales share any similar elements, especially in relation to satire and government. This presentation answers this question through a literary analysis of the twelfth century's Renard the Fox, William Caxton's fifteenth-century English edition A History of Reynard the Fox, and the fifteenth century's A Gest of Robyn Hode. This presentation fundamentally argues that A Gest of Robyn Hode, an early ballad of Robin Hood from the fifteenth century, shares significant parallels with the tradition of Reynard the Fox in relation to crime, authority, punishment, and satire. These parallels help to build a case for why scholars should break away from exclusive literary traditions and conduct further investigations into the literature of Reynard and Robin.

Meriam's Momentary Metamorphosis: Progressive Education and The Indian New Deal

Abigail Fer
Angela Cooley, Faculty Mentor (Department of History)

Abstract

The Progressive Education movement of the 1930s was a great moment of possibility for both students and teachers involved with Native American Education and serves as a precursor to the contemporary Culturally Relevant Pedagogy movement with educators today. This paper traces the story of Native American Education starting with the Meriam Report's scathing critique of poor conditions and teaching pedagogy to the early 1940's where government funding was reallocated to America's involvement in World War II. The Progressive Education Movement saw great leaps in teaching quality and support for teachers and most importantly a shift to embracing students' respective cultures opposed to erasing them. It also considers the perspectives of indigenous critics of the movement and the gendered biases of the movement.

Classroom Equity Research

Shivani Gautam, Justin Moua, Mohammad Ilham Bhuiyan,
Brooke Burk, Faculty Mentor (Center for Excellence in Teaching and Learning)

Abstract

Over the years, it has been observed that student of color has been less satisfied and relatively express concerns towards discrimination, likely to be impacted by opportunities and success gaps (Morris, Oman, Williamson, n.d.). To understand this very closely, assessment of classroom culture and comfortability of students of color on campus, focus groups interviews were conducted with graduate and undergraduates, including both domestic as well as international students. This study examined the classroom experiences of students of color at Minnesota State University, Mankato as people of color tend to be less satisfied with campus climate (Minnesota State University, Mankato, 2017, paragraph 3). The specific qualitative data on campus is collected by the stories and unique experiences on topics related to academic, social, and financial structures shared by the students of color and analyzed through data analysis tools which includes the process of coding, and transcription for clarification and interpretation.

Prenatal Experiences of Hmong Women in Minnesota

Prerana Khatri KC & Gao Ja Yang
Laurel Ostrow, Faculty Mentor (School of Nursing)

Abstract

Improving prenatal care by increasing participation and enhancing health outcomes is the ultimate goal of this research, which will explore attitudes of Hmong women in Minnesota toward these crucial health care services. Design/Methodology: After IRB approval, the research was conducted using a Likert Scale within a Qualtrics confidential survey. Four questions were taken from an existing instrument known as the Quality of Prenatal Care Questionnaire. The remaining questions were created by researchers. Social media was used to recruit participants. Facebook was the primary platform, including the Minnesota State University, Mankato Hmong Student Association, and the researchers' Facebook pages. To protect participants' confidentiality, consents were required, and no identifying information was collected. All responses were recorded without names or identifying information. The data were analyzed using MS excel. Results may be used by stakeholders in society to increase the use of prenatal care by Hmong women, potentially affecting pregnancy and birth outcomes. These data will facilitate a deeper understanding in health care workers concerning how Hmong women feel and may reduce the barriers to the use of essential resources by post-partum Hmong women. Findings: The majority of the participants expressed that the reassurance of a healthy baby during their prenatal visit is important for them. About 96% of the participants agree that prenatal care is important. Some of the barriers that the participants experienced were a lack of medical insurance, having to make decisions that conflicted with their cultural beliefs, and having to take time off work to attend their appointment. Many suggestions were given to improve prenatal care. A participant wanted more information regarding prenatal vitamins. Limitation: The sample size was small and the sample population was from Minnesota so it cannot be generalized to populations from other states. Practical Implication: This information may inform culturally competent care for pregnant Hmong women and their babies among health care providers.

COVID-19's Impact on Motives, Barriers, and Amount of Physical Activity Among College Students

Beth Albrecht, Nicole Aadalen, Jonathan Murillo-Rodriguez & Gabrielle Matthieu
Jessica Albers, Faculty Mentor (Department of Human Performance)

Abstract

COVID-19 has impacted many aspects of everyday life including physical activity, which is essential to one's health and has been linked with reducing the risk of many illnesses. The college student population is at a complicated crossroads as the younger age makes them less vulnerable to the occurrence and severity of COVID-19, but with a longer wait time for vaccinations and resources. As the physical restrictions, information, and guidelines fluctuate, it is important to examine the perceptions on the availability and motives of physical activity among the college student population to effectively promote physical activity during and proceeding the pandemic.
Purpose: The purpose of this research is to determine the impact that COVID-19 has had on the motives, barriers, and amount of physical activity in college students.
Methods: Participants were college students recruited to take the online survey using SONA Systems. The survey included a demographic questionnaire and assessed motives using the 23 item Motives for Physical Activity Measure-Revised, barriers using the 24-item Perceived Barriers Scale, and physical activity using the Physical Activity as a Vital Sign measure. Using a priming statement, participants were asked to reflect on their pre-COVID-19 physical activity and then their current behaviors. Results and Conclusions: COVID-19 decreased the minutes of exercise per week and day. The majority of motives remained the same regardless of COVID-19 with the exception of a significant decrease in competence motives in Fall20. The total barriers and time barriers remained relatively constant from pre-COVID to Fall20.

Learning Global Elder Care Practices through an International Virtual Collaboration

Sarah Gunderson, Hillary Erih, Megan Kurtz, Morgan Metcalfe, Oluwapelumi Solomon & Grace Willaby,
Renee Kumpula, Faculty Mentor (School of Nursing)
Kelly Krumwiede Faculty Mentor (School of Nursing)

Abstract

Nursing students from Minnesota State University participated in a virtual international program on evidence-based dementia care and planning for elder care transitions. The week-long program featured international expert guest lecturers (from Austria, Scotland, and Singapore) with facilitated discussions and interactive activities. The purpose of this international learning experience was for students to analyze nursing care offered in various countries. Considering cultural, social, and economic factors, students explored how elder individuals with chronic morbidities can be supported in the home and community. Students from the United States, Austria, Chile, and the United Kingdom worked in small groups to explore elder care and public health models. Students developed a case scenario and presented a holistic nursing care plan at a virtual conference at the end of the program. Their plans were designed for an elderly patient diagnosed with chronic illnesses who was being discharged from the hospital to home. Students chose interventions involving analysis of healthcare services, interdisciplinary teams, reimbursement/ economic models, social supports, and community resources. This expanded student perspectives to compare and contrast elder care alternatives in Minnesota, from urban to outstate, with other countries. Students gained appreciation for different models of healthcare services and reimbursement on four continents. They established new relationships for collaboration and networking with peers around the globe. This opportunity afforded accessible learning without traveling abroad during a pandemic. Student evaluations and reflections indicated positive learning from experts and peers that will help students provide inclusive, relevant, and culturally sensitive care in future nursing practice.

Physical Activity Levels and Coping Skills during the COVID-19 Transition to Online Learning in College Students

Alison Tokkesdal, Kaitlyn Vomhof, Zoe Stone & Anja Enervold,
Jessica Albers, Faculty Mentor (Department of Human Performance)

Abstract

The COVID-19 pandemic is impacting college students' daily lives in many different aspects. With a worldwide shutdown, lack of accessibility to exercise facilities has made the ability to exercise challenging. Physical activity and exercise are common coping mechanisms for many individuals. The transition into online learning is an additional challenge for college students. his research is important as it examines the impact the COVID-19 pandemic has on physical activity levels, the stability of that activity, and coping skills, during the transition to collegiate online learning. Purpose: The purpose of this research is to examine the relationship between exercise frequency and coping skills used by college student's intensity during the COVID-19 pandemic.
Methods: Research participants are college students who have transitioned. Participants were asked to complete a survey that included questions on current physical activity levels (Physical Activity as a Vital Sign), current overall stress (Perceived Stress Scale), their use of coping skills (Brief COPE Scale), and emotional regulation (Differences in Emotional Regulation Scale). Results and
Conclusions: Data is being analyzed and results and will be presented.

The Relationship Between Critical Thinking and Emotional Intelligence Among College Students

Louisa Hall
Emily Stark, Faculty Mentor (Department of Psychology)

Abstract

As undergraduate college students prepare for the workforce, it is essential that they are equipped for the array of experiences that they may encounter in their future jobs. Two important aspects of academic and workplace success are demonstrated through the development of critical thinking (CT) and emotional intelligence (EI). CT is associated with problem solving and decision making, while EI reflects an individual's ability to understand and communicate emotions. Both CT and EI are noted to be important components of success among college students, but the relationship between CT and EI is less clear. The purpose of this study is to investigate college students' CT in relation to EI by evaluating the responses that college students provide in answer to the various workplace scenarios that outline a multitude of problems and dilemmas. Upon collection, the responses were scored to determine the CT skills of each participant and then analyzed in association to the Self-Rated Emotional Intelligence Scale. Data collection is ongoing with over 50 participants complete, and we intend to present the results with recommendations for future researchers interested in understanding critical thinking and emotional intelligence.

Understanding How Notum Promotes Glypican-3 Shedding In Hepatocellular Carcinoma

Meaghan Keohane
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Hepatocellular carcinoma (HCC), a solid tumor malignancy, causes approximately 1 million deaths annually, and therefore is considered one of the primary causes of cancer mortality in the world. HCC has proven to be exceedingly resistant to chemotherapy with little improvement in mortality rates in recent years. Like any cancer, to better diagnose, treat, and prevent HCC, we must gain a better understanding of the specific secreted factors that precisely relate to the disease. Recently, the proteoglycan family, proteins containing glycosaminoglycan (carbohydrate) chains, and the proteins that interact with them have been identified as possible therapeutic targets for a variety of cancer treatments. In HCC specifically, a secreted factor belonging to the proteoglycan family known as glypican-3 (GPC-3) is significantly overexpressed. GPC-3 has been shown to promote the growth of HCC cells through stimulation of the growth factor signaling pathway known as Wnt. We seek to understand to what enzymes and regulatory factors that facilitate the shedding (removal from cell's surface) of GPC-3. To quantify the relationship between such factors and GPC-3, we have used an ELISA analysis. Once this relationship is thoroughly understood, we will be able to use the newfound specificity to determine a more precise treatment to regulate GPC-3 shedding in HCC. In our ambitions to understand GPC-3 shedding, it may lead others to develop a novel therapeutic approach for targeting this shedding in HCC.

Investigating Key Enzymes Involved in Glypican-3 Release from Hepatocellular Carcinoma

Stevan Colakovic
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Hepatocellular carcinoma (HCC) is the fifth most common cancer in the world. This form of cancer has a high rate of metastasis and recurrence, with only 10-20% of primary tumors in patients are resectable at the time of diagnosis. Uniquely, HCC contains unusually high amounts of glypican-3 (GPC3). GPC3 is a member of the glypican family, which are a family of heparan sulfate proteoglycans (HSPGs) anchored to the cell surface by a glycosylphosphatidylinositol (GPI) linkage. In general, glypicans act as coreceptors and interact with growth factors to regulate cellular growth. GPC3 is known to heavily promote cancer progression and tumor angiogenesis in HCC patients. GPC3 shed from the cell membrane becomes soluble and can freely interact with other cells. Elevated levels of soluble GPC3 were frequently found in the extracellular microenvironment of HCC cells, and higher levels of soluble GPC3 are directly associated with poorer prognosis of HCC. In this project, enzyme-linked immunosorbent assays (ELISA) and western blots were used to determine and compare the amount of GPC3 shedding that occurred under different conditions. The purpose of this project is to identify key enzymes involved in GPC3 shedding from the HCC cell surface. Higher additions of specific enzymes to HCC cells induced higher concentrations of soluble GPC3 from the cell surface, demonstrating a direct correlation between additions and GPC3 shedding. This demonstrates HCC's dependence on enzymes for HCC tumor progression and angiogenesis, and can open the way to the creation of drugs that selectively target molecules HCC depends on with minimal adverse effects to the patient.

Cellular Localization Determinants of the HIV-2 ROD9 Vpx Protein

Ramsey Pankratz
Allison Land, Faculty Mentor (Department of Biological Sciences)

Abstract

Human immunodeficiency virus type 2 (HIV-2) is a lentivirus which is a type of retrovirus. Retroviruses insert their viral genome into the host genome by reverse transcription and can cause chronic or delayed disease. HIV-2 contains Viral protein x (Vpx), which is not encoded in human immunodeficiency virus type 1 (HIV-1). Vpx interacts with human sterile alpha motif and HD-domain-containing protein 1 (SAMHD1), which breaks down lone nucleotides, thereby decreasing viral replication. Vpx counteracts the function of SAMHD1, leading to more nucleotides available for viral replication. Prior, unpublished research in Dr. Allison Land's lab has noted a difference in the localization of Vpx from two different strains of HIV-2: HIV-2 ROD9 and HIV-2 7132a. After transfection into HeLa cells, HIV-2 7132a Vpx was mostly cytoplasmic, while HIV-2 ROD9 Vpx was present in the cytoplasm and the nucleus. Our research goal is to identify the cause of this difference in localization. **We hypothesize** that by mutating key amino acids in HIV-2 ROD9 Vpx to match HIV-2 7132a Vpx, HIV-2 ROD9 Vpx localization will shift from cell wide to primarily cytoplasmic (matching HIV-2 7132a Vpx localization). By comparing the amino acid sequence of Vpx from HIV-2 ROD9 and HIV-2 7132a, we identified sites of significant difference and mutated two of these sites causing the amino acids to change and match the other Vpx protein. Next, the mutated plasmids will be transfected into HeLa cells, and the expression of Vpx will be observed. By learning about the different regions in the Vpx sequence that affect localization, the infectious process of HIV-2 can be better understood which will allow for further research on how to treat this disease.

Function of the Glycoside Hydrolase Family 8 Endoglucanases in Cytophaga hutchinsonii Cellulose Utilization

Chouakou Vang
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Abstract

Cytophaga hutchinsonii, a member of the phylum Bacteroidetes, digests crystalline cellulose efficiently, but the mechanism by which it does this is unclear and is different from other well studied cellulolytic bacteria. The two well understood mechanisms involve secreting soluble extracellular cellulases or producing cell-associated cellulosomes. In both cases, endoglucanases (EGs) cleave the disordered amorphous regions and cellobiohydrolases (CBHs) attack the free ends generated by the EGs processively, releasing cellobiose. β-glucosidases (BGs) then digest cellobiose to glucose, finalizing the process of cellulose breakdown. C. hutchinsonii appears to employ a unique cellulose utilization mechanism. It does not produce cellulosomes, but its cellulolytic enzymes are primarily cell associated. Genomic analysis revealed predicted EGs belonging to the glycoside hydrolase families 5, 8, and 9 (GH5, GH8, and GH9). No CBHs, essential in digestion of crystalline regions of cellulose used by other bacteria, were predicted in the genome. C. hutchinsonii may utilize novel enzymes to cleave crystalline cellulose and transport fragments of cellulo-oligosaccharides across its outer membrane, then digesting these internally in the periplasm.

We employed a sacB-mediated deletion strategy to create mutants lacking cel8A, one of the GH8 encoding genes. Cells of the cel8A mutants were able to grow on cellulose as well as the wild type, indicating this gene is not essential for C. hutchinsonii cellulose utilization. We plan to delete all the other GH8 encoding genes including cel8B, cel8C, cel8D, and cel8E individually and in combinations. Growth of the mutants on various carbohydrate substrates, especially cellulose, will aid in the determination of GH8 gene function as it relates to cellulose utilization by C. hutchinsonii.

Key words: Cytophaga hutchinsonii, cellulose, cellulase

An Analysis of Migration Ability and Effects of Carboplatin and Cisplatin on Glioblastoma Cells with Proteoglycan Knockouts

Rachel VanKeulen
Samantha Katner, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Glioblastoma (GBM) is one of the most common forms of brain cancer, and it is the most aggressively malignant of all the brain tumors. This malignancy is due to the ability of these GBM cells to migrate into surrounding tissues. This invasiveness makes GBM quite difficult to treat with surgical resection, and thus requires concurrent treatment with chemotherapy and radiation. Carboplatin and cisplatin are both FDA-approved, platinum-based drugs that are commonly used in chemotherapy regiments for a variety of cancers. Cisplatin has been implemented in some GBM chemotherapy regiments. A major factor in the aggressiveness and migration ability of these GBM cells lies within presence of proteoglycans on the cell surface. These proteins have glycosaminoglycan (carbohydrate) chains – hence the name "proteo" and "glycan". Specifically, a family of heparin sulfate proteoglycans, HSPGs, are noteworthy in their effects on GBM. HSPGs are found in most healthy human tissues, but they are overexpressed in many cancers, including GBM. Previous experimentation by the Katner lab has generated CRISPR edited GBM cells with knockouts (removal of the gene encoding these proteins from the genome of the cell) of specific HSPGs linked to an aggressive phenotype. We have attempted to analyze the difference in migration ability using a wound healing assay, butinducing a complete closure of the wound proved difficult in these wild type GL261 cells, even after many alterations of protocol to enhance the migration ability of these cells. Because of this, we moved to analyze the knock-out cells in their response to the aforementioned platinum-basedcompounds using cell viability assays. We intend to continue this research by using the cisplatin and carboplatin results to compare against the results of novel compounds that have been produced by collaborators as a potential future treatment for GBM.

Targeting Epigenetic Regulators of Lymphoma via PROTAC Molecules

Shelby Lund
Keenan Hartert, Faculty Mentor (Department of Biology)

Abstract

Development of Techniques for Genetic Manipulation of the Fish Pathogen-*Flavobacterium psychrophilum*

Lankesha Sudasinghe
Yongtao Zhu, Faculty Mentor (Department of Biology)

Abstract

Flavobacterium psychrophilum, a member of the phylum Bacteroidetes, is the causative agent to infect salmonid fish with the bacterial cold-water disease (BCWD) resulting substantial economic losses in aquaculture. Infected fish with BCWD appeared to have tissue eruptions damaging their gills and fins. Efficient way to wipe out possible infections caused by F. psychrophilum was not still discovered. Current control of the outbreak relies on standard antibiotic administrations. The aim of this research is to advance current genetic manipulation techniques including DNA transfer in different F. psychrophilum strains. This will allow us to identify virulence genes, understand the pathogenicity of F. psychrophilum, and eventually develop live attenuated vaccines that can be used in aquaculture to effectively prevent diseases caused by this bacterium.

Twenty-seven of F. psychrophilum strains (#1 to #27) were obtained from the U.S. Department of Agriculture. Conjugation was used as a primary DNA transfer method to transfer pCP11 plasmid (Replicative Plasmid) from Escherichia coli S17-1 λ-pir to F. psychrophilum cells. pCP11 contains an erythromycin resistance gene as the selection marker, which allows us to evaluate conjugation efficiency. We have optimized conjugation and growth conditions over the course of the research for 11 strains (1-5,12,14,15,22,25,26). pCP11 was successfully transferred to strains #15 and #26 confirmed by Polymerase Chain Reactions using primers spanning the erythromycin resistance gene ermF. We are applying a sacB-mediated strategy by using repetitive counterselection and conjugation to isolate spontaneous mutants of THCO2-90 (#26) that are more efficient in conjugation. Two spontaneous mutants FP107, FP108 were isolated from #26 strain by using sacB -mediated strategy.

The Effects of a Broad-Spectrum Fungicide on Photosynthetic Yield at Different Developmental Stages of Corn in an Agronomic Setting.

Ashley Frederickson
Christopher Ruhland, Faculty Mentor (Department of Biology)

Abstract

Fungicides are widely used in agronomy to control crop pathogens such as northern corn leaf blight, anthracnose leaf blight, gray leaf spot and southern rust. These diseases can result in a 10-20% reduction in yield in midwestern states. Delaro is a recently introduced broad-spectrum fungicide that contains both strobilurin and triazoles that disrupt mitochondrial respiration and sterol biosynthesis in fungal mycelia. In this study we applied Delaro to different developmental stages of corn to assess any potential impacts on photosynthesis. We applied Delaro on Gold Country (106-96R2P) and Beck's (5699V2P) varieties at the vegetative 5-leaf (V5) and vegetative tassel (VT) stages using a boom sprayer and an aircraft, respectively, in an agricultural field in Lewisville, MN during the summer of 2020. Leaves were harvested 14-d after application and maximal quantum efficiency of photosystem II (Fv/Fm) was analyzed with a pulse-amplitude modulated chlorophyll fluorometer. There were no significant differences in Fv/Fm between treated and untreated corn leaves or between varieties at the V5 developmental stage. At the tassel stage (VT), leaves that were treated with Delaro had a slight reduction (≈4%) in Fv/Fm in the Gold Country variety. There were no differences in Fv/Fm between varieties that had been treated at both developmental stages. Previous studies have found that other types of fungicides can greatly reduce Fv/Fm, however our results generally agree with current studies that show both strobilurin and triazoles do not interfere with or can have slight positive effects on photosynthesis in healthy plants. These findings must be interpreted with caution, visual inspection of the crop did not reveal the presence of any disease pressures in our experimental plots and the presence of a fungal pathogen might alter results.

Reconstructing Earths Oxygen History from Iron-Rich Rock Samples

Emily Faust
Chad Wittkop, Faculty Mentor (Department of Geology and Chemistry)

Abstract

The Freedom Formation is a sedimentary rock unit that was deposited in the middle Proterozoic Eon between 1.7 and 1.5 billion years ago. This rock formation is difficult to study because it is located only in the subsurface of southern Wisconsin, resulting in little being known about the mineral and chemical composition of the unit. The Freedom Formation is unique in that it contains both iron and manganese minerals, and formed during a time when the history of Earth's atmospheric oxygen levels is not well known. The sensitivity of iron and manganese to changes in oxygen levels allow iron- and manganese-enriched rocks to serve as records for the past history of Earth's oxygenation. Data from X-ray fluorescence (XRF) analysis indicates the weight percent of various chemical compounds within the core samples. This data indicates that there are Freedom Formation intervals that are rich in both iron and manganese (greater than 20 weight percent). Using X-ray Diffraction (XRD) analysis the crystalline (mineral) phases within these samples are identified. Mineral phases that have been identified include the carbonates rhodochrosite, siderite, and ankerite, which indicates mineral substitution of iron and manganese within the samples. Additionally, XRD data shows the presence of iron oxide minerals including hematite and magnetite. Manganese appears to be concentrated in reduced-phase carbonate minerals, while iron occurs in both reduced and oxidized mineral forms. This assemblage of iron and manganese minerals suggest that the Freedom Formation formed in an environment that contained enough oxygen to oxidize iron, but not enough to fully oxidize manganese, consistent with an environment hosting lower levels of atmospheric oxygen relative to today. These chemical and mineralogical results are being compared with sample textures using microscopy to further constrain the relationships between mineral phases and sample chemistry.

Analyzing the trend and forecasting of Covid-19 outbreak using machine learning technique

Benie Bebela *Suboh Alkhushayni,*
Faculty Mentor (Department of Computer Information Science)

Abstract

This global pandemic has impacted the world and most particularly the healthcare system in an unprecedented way. Relying on old prevention methods is not an option. This project can revolutionize how prevention is made for the covid-19 by making accurate predictions. Its main goal is analyzing large set of data and through computerized ways making accurate predictions that will help advancing into mitigating the impact of the pandemic. Through Machine learning technique, intelligent systems will be able to identify the patterns in the evolution of the virus and help keep track of the numbers of active cases, deaths, and recoveries. It is not only limited to the US or states in this country but it will be able to analyze worldwide data and give real time accuracy in information and prediction by calculating such numbers as the mortality and recovery rates. This will help make predictions for a period of as long as 90 days and through patterns determines common factors that can make certain individuals more susceptible than others (Alimadadi et al.,2020). This can revolutionize the healthcare system in the providing a more efficient and preventative treatment.

Generating a GPC-1 Knockout in Glioblastoma Cells Using CRISPR

Jamie Rogers
Samantha Katner, Faculty Mentor (Department of Biochemistry)

Abstract

Glioblastoma (GBM) is a type of aggressive brain cancer that represents roughly 15% of all brain tumors and as of right now, is incurable. GBM is especially known for having abnormal quantities of extracellular matrix proteins called proteoglycans, which are the main protein substituents in brain tissue that serve in development, brain function, and more. A family of proteoglycans, called glypicans (GPCs), play an important role in tumor behavior, and Glypican-1 (GPC-1) has shown to be over produced in glioblastoma cancer cells. Over-expression of GPC-1 causes an increase in a specific growth factor which can overall contribute to tumor growth. Since GPC-1 is over-expressed in GBM cells, generating a knockout (removal) of this protein could then allow us to establish a relationship between GPC-1 and the growth of glioblastoma cancer seen in the clinic. This can be achieved using CRISPR and clonal expansion techniques. CRISPR is a type of gene-editing application that is paired with a Cas-9 endonuclease, which cuts genomic DNA at a specific location, guided by a single guide RNA. This CRISPR technology was introduced to the GL261 cells in order to remove the GPC-1 gene, a clonal expansion was performed to grow up the "pool" of cells transfected with the CRISPR components, and the cells' DNA was then sent out for sequencing. The GPC-1 gene was successfully knocked out and two true wild-type GBM populations were also obtained for use in further experimentation.

Functional investigation of the Type IX Secretion System Regulatory Pathways in *Flavobacterium johnsoniae*

Ireland Manning
Yongtao Zhu, Faculty Mentor (Department of Biology)

Abstract

The Type IX Secretion System (T9SS) is a protein secretion system unique to the phylum *Bacteroidetes*. The T9SS is a large complex composed of several different functional proteins that extend through the inner and outer membrane of the cell. This T9SS is responsible for secretion of polysaccharide digesting enzymes, motility adhesins, and virulence factors in members of the *Bacteroidetes*. The T9SS gene expression is known to be regulated by a two-component system (PorX and PorY) and a Sigma Factor protein (SigP) in the human oral pathogen *Porphyromonas gingivalis*, a non-motile member of the phylum *Bacteroidetes* that causes gum diseases. When PorY receives extracellular signals, a chain reaction of phosphorylation occurs, ending with SigP, which will directly interact with T9SS encoding genes and initiate their expression. The T9SS regulation mechanisms have not been studied in other *Bacteroidetes.*

In this research, we aim to investigate the functions of the PorXY two component system and *sigP* in *Flavobacterium johnsoniae*, a model organism from *Bacteroidetes* for gliding motility and the T9SS studies. *F. johnsoniae* has adhesins along its outer membrane, allowing for gliding motility across solid surfaces. This organism also produces chitinase, an enzyme that digests chitin. These adhesins, as well as the chitinase, are secreted by the *F. johnsoniae* T9SS. We have created mutants lacking *porY* and *sigP* in *F. johnsoniae* by using a *SacB* mediated deletion system. The mutants will be tested for ability to digest chitin and use their gliding motility. The mutants may exhibit defective chitin digestion and gliding motility if *porY* and *sigP* are involved in regulating the expression of *F. johnsoniae* T9SS.

This functional investigation provides more information about gene regulation of a relatively novel secretion system, as well investigating possibilities for drug therapies in pathogenic species of *Bacteroidetes.*

Key words: Type IX Secretion System, *F. johnsoniae*, gliding motility, chitinase, regulation

Mental Health Literacy in College Students

Emily Schiltz
Emily Stark, Faculty Mentor (Department of Psychology)

Abstract

Mental health is an increasingly important topic in today's society. Research shows that 1 in every 5 adults will be diagnosed with a mental health disorder during their lifetime. This number will only continue to increase unless we educate younger generations on what these illnesses look like and how to take care of ourselves. This project overviews the mental health literacy of 160 college students, where they have learned this information, how accurate it is, and how K-12 education discusses mental health in the classroom.

How Normative Beliefs Affect Procrastination Rates in College Students

Adam Recknagel
Kevin Filter, Faculty Mentor (Department of Psychology)

Abstract

In this study, I will measure the effect that the Intent to Procrastinate displayed by classmates has on an individual's Actual Procrastination. Upon signing up to be in the research project on Sona, participants will be given 1 of 2 introductions- one with a quiz that shows that their "class" (Which will just be data pre-entered by me) generally plans on procrastinating, and one that shows a more proactive attitude. Participants will then be divided into the groups that correspond to their given introductions, and will have a month to turn in their assignment to a virtual classroom where they can see who else has turned in their assignments. Again, no one else will really be turning in anything, it will simply be notifications managed by me. One group will have a steady rate of turn-ins, and the other will have them largely focused on the last 5 days. At the end of the month-long period, participants will be debriefed, and data will be analyzed.

Function of Ribonucleotide Reductase-Encoding Genes in Flavobacterium johnsoniae

Hunter Doheny
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Abstract

Ribonucleotide reductases (RNRs) are essential enzymes for all living organisms. These enzymes convert ribonucleotides to 2'-deoxyribonucleotides, molecules that are required for the synthesis of DNA. Bacterial RNRs have a variety of activation mechanisms that, in many pathogenic bacteria, differ from those used in human cells. This makes them an ideal target for antibiotic treatments. RNRs are divided into three distinct classes: Classes I, II, and III. Class I RNRs are divided into five subclasses (a-e). Many organisms have more than one class of RNR and new RNRs are still being discovered. Class Id, a novel RNR subclass, was shown to have an activation mechanism unlike previously studied class I RNRs. This enzyme has been shown in vitro to scavenge manganese and superoxide from the environment to become activated. To create an effective RNR targeting antibiotic, it needs to be understood how these enzymes function in vivo. The goal of this research is to investigate how RNRs function inside a bacterial cell. Flavobacterium johnsoniae was selected as the model organism for this study as it is the bacteria in which the class Id RNR was discovered, and in this organism targeted genes can be easily manipulated. Analysis of F. johnsoniae shows that it has genes for two Class I RNR enzymes: Ia and Id. We have generated 15 mutants lacking genes encoding the class I RNRs, manganese transporter, and two superoxide dismutases. The growth of these 15 strains is currently being analyzed under varying growth conditions in order to understand how they function. The growth results will reveal if endogenous changes of the manganese or superoxide levels can affect the activation of the Id RNR in vivo. This research could provide the basis for the development of future antibiotic drugs that target these essential enzymes in pathogenic bacteria.

Pre-methylation of foreign DNA improves conjugation efficiency in the fish pathogen Flavobacterium psychrophilum

Seada Sloboda
Yongtao Zhu, Faculty Mentor (Department of Biological Sciences)

Abstract

Flavobacterium psychrophilum is a known fish pathogen causing bacterial cold-water disease (BCWD) and rainbow trout fry syndrome (RTFS). The diseases cause tissue damage and tail rot in young and adult fish. The issue is prevalent in fisheries in the Pacific Northwest and the diseases generally affect salmonids. Genetic manipulations in F. psychrophilum CSF 259-93, the most problematic strain in rainbow trout fisheries in U.S., is scarce due to strain's ability to use restriction modification systems to destroy foreign DNA. Pre-methylation of foreign DNA has been shown to improve the efficiency of DNA transfer via transformation in other bacteria. The goal of this research project is to pre-methylate foreign DNA (plasmids) by insertion of three methyltransferase encoding genes to the plasmid pACYC184 individually and use of the constructed plasmids (pSS01, pSS02, and pSS03) to methylate the tested plasmid pCP11 in E. coli, followed by conjugation to transfer pCP11 to F. psychrophilum CSF 259-93. Our first conjugation trial showed that two of the constructed plasmids (pSS01 and pSS02) were able to protect pCP11, with 33 and 5 F. psychrophilum colonies containing pCP11 obtained, respectively. The success to improve the conjugation efficiency in F. psychrophilum CSF 259-93 would allow us to further construct deletion mutants with decreased virulence, which can be potentially used in creating live attenuated vaccines to prevent the BCWD and RTFS diseases, and thus reduce the economic losses in aquiculture.

Investigating miRNA Regulation of the Human APOBEC3 Enzymes

William Dietrich
Allison Land, Faculty Mentor (Department of Biology)

Abstract

Human cells have evolved numerous ways to defend themselves against viral invaders, one example is the human APOBEC3 (A3) class of enzymes. This family of proteins consist of seven enzymes, A3A, B, C, D, F, G and H; which function as cytosine deaminases. By mutating viral DNA, the enzymes can hinder or stop replication of viruses such as human papillomavirus, herpes simplex virus, and HIV 1. Several of the A3 enzymes have also been implicated in contributing to cancers such as head and neck and breast cancers by mutating cellular genomic DNA, making the ability to control A3 expression an attractive target for cancer therapy. The A3 enzymes are regulated by small fragments of RNA called miRNA. I am currently working on developing an assay to test A3 enzymes and the regulatory effects of their miRNAs in the human cell line HeLa. I hypothesize that the A3 family is regulated by miRNAs; each member by a different repertoire of miRNAs. To test this hypothesis A3 3' UTRs were inserted into psiCHECK-2 vectors that encode both firefly and sea pansy luciferase. Potential miRNAs were compared and sorted by their predicted efficiency of interacting with the A3 3' UTRs. Candidate miRNAs will be cloned into pcDNA 3.1 expression vectors. The miRNA and A3 3' UTR plasmids will be co-transfected into HeLa cells and the expression of the two luciferase proteins will be measured to quantify the miRNA regulation of the A3 3' UTRs. After testing the A3 3' UTR constructs and miRNAs I will mutate base pairs on the miRNA to confirm that the regulatory effect is from the miRNAs

Importance of Testosterone, Estradiol, and Dihydrotestosterone in Neurogenesis

Zachary Sandborgh & Brooke Miles
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Abstract

Neural plasticity, or changes to the brain over time, is an important area of study that may yield better treatment options for various neurodegenerative diseases. One aspect of neural plasticity is the addition of new neurons from neural progenitor cells, called neurogenesis. Brain regions such as the hippocampus, the olfactory bulb, and the amygdala are known to add new neurons in adults. It is also established that the structure and function of many brain areas depends on the levels of circulating hormones, such as testosterone, estradiol, and dihydrotestosterone. The present study aims to analyze the overall effects that these steroid hormones have on the birth of new neurons in the amygdala. We are studying the seasonally breeding green anole lizards (Anolis carolinensis) because they exhibit seasonally dimorphic steroid hormone levels. There are fewer amygdala neurons in breeding compared to non-breeding lizards and we hypothesize that lizards treated with steroid hormones will have a lower number of new neurons in the amygdala. To address this, breeding male lizards were treated with hormones and injected with bromodeoxyuridine (BrdU), a compound that labels dividing cells. The brain was collected, and an immunohistochemistry was performed on brain sections. The sections were double-labeled using antibodies for BrdU and NeuN (a neuronal maker), and DAPI as a cell nuclei marker. Currently, we are imaging tissue sections using a Zeiss LSM880 confocal microscope and examining images for double-labeled neurons in the amygdala. Examining how steroid hormones impact neurogenesis will help increase understanding of plasticity in the brain.

The Effects of a Fish's Fins in a Terrestrial Jump

Makenzie Reed
Michael Minicozzi, Faculty Mentor (Department of Biological Sciences)

Abstract

Fishes are generally considered to be fully aquatic but some voluntarily strand themselves on land when conditions are not ideal. On land, these fish move around using a tail-flip jump without any apparent morphological specialization for terrestrial locomotion. Zebrafish (Danio rerio) are an excellent model to investigate the anatomical factors that determine tail-flip jumping performance because many varieties exist in the pet trade and have the ability to move around on land with a tail-flip jump. In this experiment, I investigated if jumping ability was different in the wildtype zebrafish and the longfin zebrafish based on the caudal fin ray characteristics. I hypothesized that the longfin zebrafish will jump a shorter distance and take off from the ground at a higher angle than the wildtype zebrafish because the longer fin rays will hinder jumping performance. Individuals of each species were placed in a tabletop arena composed of a hard, rough surface and a wet substrate. Each fish was jumped in this arena and the best jump from each individual was used for kinematic analysis. Data from these jumps were acquired from a high-speed camera situated directly across the arena, to measure kinematics, and an overhead non-high-speed camera, to measure jump distance. Once the jump data was collected, each fish was euthanized, cleared and double stained for bone and cartilage to measure thickness, length, and distance between the fin rays of the caudal fin. Interestingly, despite differences in fins and fin ray anatomy, there were no differences in any of the jumping performance measures considered here. This implies that the differences in the anatomy of the two species are not great enough to alter the jumping performance from one another.

Contrasting Oak Responses to Water Stress - Osmolyte Profiling Across Species

Joseph Newman
Matthew Kaproth, Faculty Mentor (Department of Biological Sciences)

Abstract

This is an evolutionary biology project, using analytical chemistry, looking at oak species responses to water stress. Species must be able to adapt to their environment when water is limited. In plants, one mechanism to deal with water stress is to decrease its water potential by producing organic and inorganic solutes within cells. These organic and inorganic solutes can be classified as osmolytes. Non-structrual carbohydrates (NSCs) osmolytes were the focus point of this experiment. Two hypotheses were proposed; 1) The sister species will have adapted similar osmolyte responses to drought stress, distant relatives would have a different profile of osmolytes; or 2) Species sharing the same climatic niche will have adapted similar osmolyte responses to drought stress, species from different climate niche would have a different osmolyte profiles. Plants were grown in a common garden with two different water treatments to replicate drought and mesic conditions. Leaf tissue was then harvested and went through ethanol extractions to obtain NSCs. 5 NSCs were able to be profiled using high performance liquid chromatography. Oak species were grouped into red and white clades, as well as an outgroup group for unrelated species. Statistical differences were observed in NSC/total osmolyte content based on evolutionary relatedness.

Effects of Thyroid Hormone Transporters in Adrenal Cortex Remodeling

Amayah Ockenga
David Sharlin, Faculty Mentor (Department of Biological Sciences)

Abstract

Previous research reported that excess T3 during the peripubertal period alters adrenal gland development such that it results in the persistence of embryonic-like cells in adrenal gland of mice; suggesting T3 has role in the timing of adrenal gland development. Interestingly, it has been proposed that adrenocortical carcinoma may arises from the persistence of embryonic stem-like cells. Whether there is link between excess T3 during adrenal gland development and adrenal gland cancer later in life is unknown. A prerequisite for thyroid hormone signaling in the nucleus is the transport of T3 across the cell membrane by specific plasma membrane transporters. Two of these transporters, monocarboxylate transporter 8 (Mct8) and monocarboxylate transporter 10 (Mct10) are suggested to be expressed in the adrenal gland and thus may have functional role in adrenal gland development. Considering this, our project is testing the role transporters Mct8 and Mct10 in adrenal gland development with two main goals: (1) Document Mct8 and Mct10 expression in the development of the adrenal gland and (2) test whether thyroid hormone treatment alters this expression. To investigate our goals, we are visualizing Mct10 and Mct8 expression in control or T3 treated mice. In T3 treated animals, T3 is being provided through drinking water from postnatal (P) 21- P35. At P21 and P35 we are comparing the result of T3 exposure to untreated control mice. The Mct8 transporter is being visualized using a LacZ transporter gene that is knocked into the endogenous Mct8 gene. The Mct10 transporter is being visualized using immunofluorescence. Our initial results suggest that Mct8 is localized at the boundary between the adrenal medulla and cortex. Ongoing immune of luorescent studies are mapping Mct8 protein expression.

DNA Repair Genes and Their Expressions in Breeding and Non-Breeding Seasons of Green Anole Lizards seasons of Green Anole Lizards

Alex Calli-Wehrman & Matt Bromann
Rachel Cohen, Faculty Mentor (Department of Biological Sciences)

Abstract

Green anole lizards (Anolis carolinensis) have distinct breeding and non-breeding seasons. During these seasons, certain genes are either expressed or not. Our gene, DNA ligase 4, was detected as more active in the non-breeding season. We hypothesized that our gene would be much more active in the non-breeding season than the breeding season as it is a DNA repair gene. We determined which out of the three primer sets we designed to use through a polymerase chain reaction or PCR. We then moved on to RNA isolation using the green anole lizard hypothalamus. The hypothalamus is the control center of the brain and controls what genes are expressed during which season. Once the RNA samples were isolated, they were turned into cDNA through cDNA synthesis. The cDNA was then used in quantitative PCR, or qPCR for short. The qPCR tested how much of our desired gene was amplified in a sample. In the qPCR, we made a standard curve to compare to and ran through a total of 24 samples. Once we had our data, we normalized its RNA by Beta-actin, ran a T-test, removed outliers, and ran an ANOVA for lizard sex and season. There was no significant difference in LIG4 expression between sexes ($F_{1,19} = 0.149$, $p = 0.704$). There was no significant difference in LIG4 expression between seasons ($F_{1,19} = 0.431$, $p = 0.519$). Our data didn't support our hypothesis, and we plan on researching further into other DNA repair genes.

Myosin Oxidation and Effects on Magnesium and Actin Binding: Actomyosin

Muna Mifta Awel & Lelti Asegdom
Rebecca Moen, Faculty Mentor (Department of Biochemistry, Chemistry, and Geology)

Abstract

Muscles are responsible for producing force throughout the human body. Muscle tissue is divided into three general types: skeletal, cardiac and smooth muscle. Our muscles are prime targets of oxidative stress as they must respond effectively to influences such as exercise, hormonal changes, development and aging (1). Repetitive muscle contractions lead to a variety of physiological responses including an increase in reactive oxygen species (ROS) production. The unpaired electron on oxygen is extremely reactive. Oxygen intermediates like superoxide, peroxide and hydroxyl group are ROS and promote oxidation reactions of biomolecules such as proteins. ROS can affect all muscle types. For example, in cardiac muscle oxidative stress is linked to heart failure (2). The ROS induced malfunction in the muscle tissue is caused partially by defects in contractile proteins that cause muscle contraction, myosin and actin (1, 2).

Assessing Students' LASSI Performance

Claire McDavid & Kailing Aw
Karla Lassonde, Faculty Mentor (Department of Psychology)

Abstract

In college it is crucial for students to know how to learn effectively to succeed. According to The Learning and Study Strategies Inventory (LASSI), there are 3 major components of successful learning: Skill (Information Processing, Selecting Main Ideas, and Test Strategies), Will (Attitude, Motivation, and Anxiety), and Self-regulation (Concentration, Time Management, Self-testing, Using Academic Resources). The purpose of our study was to identify how MSU, Mankato students who were taking a college psychology class on science learning, would perform on the LASSI components. Students completed the LASSI inventory at two separate times during the semester; once at the beginning and then again at the end. During the rest of the semester, these students were taught strategies for effective learning and completed prescriptions, which were computer-based training sessions on the LASSI skills they wanted to improve upon. Analyses of pre and post assessment along with self-reporting about the course revealed that students needed, and personally desired, more training and awareness in the self-regulation component of learning. Most students, after learning more about their learning, reported that they wanted to work on their time management skills specifically. Overall students self-reported the value of skills gained from both the course and the LASSI inventory.

Students' Perception of Professionalism

Christina Sanders, Skylar Williams, Samantha Giannelli & Teana Krolak
Kristie Campana , Faculty Mentor (Department of Psychology)

Abstract

The observation of soft and hard skills plays an important role in employers' ability to assess how professional their employees are. A 2012 questionnaire survey of 49 executives showed that the top 10 soft skills they value are “integrity, communication, courtesy, responsibility, social skills, positive attitude, professionalism, flexibility, teamwork, and work ethic” (Robles). Our study assesses students’ perceptions of these 10 soft skills, in addition to a few basic hard skills. Furthermore, we also seek to investigate how traditional college students learn about professionalism, and what they believe is appropriate behavior at work. Generally, our results indicated that students most readily identified soft skills as most important for professionalism, with responsibility, work ethic, and courtesy earning the highest ratings. Meanwhile, hard skills such as computer skills, reading skills, and math skills were generally not identified as professional skills. Responses to the reading scenario indicated that communication skills were commonly demonstrated in students' responses with integrity being the most common reason to communicate. Currently, there is a gap between what skills employers' desire from graduates and the skills graduates have and think employers want. This study, and others like it, can help students and educators to understand where the gap is between what skills employers are looking for, and what skills students are gaining from the sources they attain their perception of desirable workplace skills.

Examining the Impact of Covid-19 on College Students' Experiences

Kaylee Engle & Taiylor Hoeft
Carlos Panahon, Faculty Mentor (Department of Psychology)

Abstract

The Covid-19 pandemic has altered higher education as universities began closing their campuses in late March 2020 and started shifting courses from traditional face-to-face lectures to online or hybrid learning experiences. Traditionally, students attend college to meet other students, learn new information through their courses, apply what they have learned in various settings, and experience the campus' social life. Covid-19 has forced the college students' experience to change for the last two semesters and for the near future. The new learning environment consists of a majority of courses moving online, while limiting face-to-face interaction to small groups for certain courses. In addition, students experienced changes to their social interactions as a result of social distancing guidelines.

The purpose of this study is to examine the impact Covid-19 has had on college students' experiences. An online survey was distributed to undergraduate and graduate students from Minnesota State University, Mankato. The survey consisted of five sections, including demographics, daily activities/routines, social life/interactions, work/life balance, and school/learning experiences. Each of the main sections focused on the effect that Covid-19 has had on a participant's life prior to the pandemic, at the beginning of the pandemic, and within the last two weeks of the pandemic. Results of our study indicate that the Covid-19 pandemic severely impacted the lives of college students. More specifically, significant findings were found when comparing participants' experiences prior to, at the beginning of, and during the last two weeks of the pandemic across the domains of daily routines, social life/interactions, work/life balance, and school/learning practices. Across these four areas, similar trends were found. Respondents' average scores dropped at the beginning of the pandemic when compared to their experiences prior to the pandemic. Then, when compared to the beginning of the pandemic, participants' average scores across the domains have increased when they rated their experience during the most recent two weeks of the pandemic. These results highlight the resiliency and flexibility that college students have exhibited throughout the past year. We hope that by learning more about challenges students are facing and strategies they are implementing to cope, colleges may be able to make changes that lead to improved student success.

University Health Services and Non-English Speaking Patients

Riley Lehmer, Kianna Fladland, Quinlan Brogdon, Maureen Nghambi & Simale Kadir
Leah White, Faculty Mentor (Honors Program)

Abstract

This research project studies the experiences of non-native English speakers with University Health Services. This is important because communication is a crucial part of healthcare. Previous literature had found that background and culture shape how individuals thank about healthcare overall, and that serious education is needed in order to create more culturally competent healthcare providers. The research project utilized surveys sent out to students in Minnesota State University, Mankato's (MNSU) International Student Association via email. Once all the data was gathered it was analyzed, and it was found that most students who have a first language other than English have had positive experiences with University Health Services.

Mask Usage Behaviors amongst the MNSU, Mankato Community

Molly Hill, Roman Parpart, Brian Swancutt & Liberty Hombe
Leah White, Faculty Mentor (Honors Program)

Abstract

In the context of COVID-19 cases globally, there is a lack of agreement on whether wearing a face mask is an effective physical interference against disease transmission. This study focuses on how the MNSU, Mankato community makes decisions about when to wear a mask and general campus attitudes surrounding the topic. We used a survey with multiple choice and open-ended questions to assess the campus's beliefs and decision-making regarding mask usage. Currently, there is insufficient understanding on the behavioral patterns of mask use in the general population for the prevention of COVID-19. Data acquired from this project will be an important step forward in understanding what factors the MNSU, Mankato community considers when deciding when to wear a mask. This may be applied to larger, similar population groups.

Impact of Supplemental Technology on Student Performance

Kade Patterson, Emma Knutson , Mykenzie Cole & Samantha Kozelek
Leah White, Faculty Mentor (Honors Program)

Abstract

The use of technology use in the classroom has become increasingly prevalent. In light of the COVID-19 pandemic it has become imperative to understand how the use of supplemental technology affects student performance in their course work. The purpose of our research project is to investigate just that. As a group we were interested in observing student thoughts and opinions about the supplemental technology that they have experienced in their own learning experience. In order to do this we sent out a 10 question multiple choice survey to select Registered Student Organization at Minnesota State University, Mankato. We collected data from 22 participants in the survey. We analyzed the responses and looked for themes and general attitudes towards supplemental technology used in the classroom. We had originally planned to conduct three focus groups as well, but due to a lack of interest in the focus groups we had to postpone them. As a group we are planning to conduct these focus groups in the fall and are looking forward to being able to compare our findings from our survey to our findings from the focus groups.

Exploring How Duration and Mode of Delivery Impacts Outcomes of Literacy Intervention

Rebecca Guss
Megan Mahowald, Faculty Mentor (Department of Speech, Hearing, and Rehabilitation Services)

Abstract

Along with many other programs, Camp Maverick at Minnesota State University, Mankato, was moved online in 2020 due to the COVID-19 pandemic. The purpose of this project is to explore how the number of weeks, as well as how online versus virtual delivery impacts the effectiveness of literacy intervention. Participants of Camp Maverick, aged between Kindergarten and fifth grade, were assessed using the Gray Oral Reading Test (GORT-5), before and after completing camp. The GORT-5 is used to measure oral reading ability of individuals aged 6 to 24 years old. The fluency and comprehension scaled scores are added together and converted to an Oral Reading Index (ORI) score. After comparing the pre- and post- data, it was found that 2018 saw the most improvement, with four weeks of in-person sessions. An implication from this project is that improvement is most likely to occur in a literacy intervention program that lasts at least four weeks. In the future, having more participants in an online format would improve the research findings

Strategies for Teaching History

Sage Grothe
Emily Stark, Faculty Mentor (Department of Psychology)
Jill Cooley, Faculty Mentor (Department of History)

Abstract

Over the past few decades the use of re-enactments and simulation learning has become an increasingly popular teaching method for helping students understand history. This learning style asks students to research a particular event in history, while looking through the eyes of someone that lived during that time. Recent research by Thomas Hagood and Watson Edward, along with Dawn McCormack and Karren K. Peterson, has shown that there are many positive aspects to this teaching method. Studies have shown the simulations help establish better public speaking, research, and social skills in students, as well as learning how to analyze historical topics and develop different perspectives to use during the research process. This current study, conducted at Minnesota State University, Mankato, compared and contrasted two types of history class teaching methods, "Reacting to the Past simulations" and a regular history survey classes. 50 participants completed a survey that asked a series of questions related to their experience with the teaching methods being studied. The purpose of this study was to measure the effectiveness of both teaching methods from the students' viewpoint. This study targeted getting a better understanding of where improvements can be made and evaluating skills students built on while participating in these two teaching methods.

Sentimental Analysis of COVID-19 Vaccine Related Tweets

Mohannad Rayani
Suboh Alkhushayni, Faculty Mentor (Department of Computer Information Science)

Abstract

The year 2020 will be remembered in history for the widespread destruction caused by the COVID-19 pandemic. Pharmaceutical companies around the world have started working on the vaccine with many of them being in their final trial stage. However, vaccines take many years before they are available to the general public. In the current scenario, it is expected that it will be available by the end of 2020. Twitter is an online platform where people share their thoughts in the form of tweets. These tweets carry sentiments regarding specific topics organized by hashtags. This study's main motive is to construct a domain-specific approach that will analyze the sentiments within tweets related to the COVID-19 vaccine. This can be done by gathering COVID-19 vaccine-specific tweets from the Twitter API. The tweets are then processed into a dataset that is suitable for the sentiment classifier algorithms. The dataset is then fed into the sentiment classifier algorithms with customized settings and features. The algorithms are used in both an individual and a hybrid model with n-gram features to compare the accuracy of the two models. Our study shows how a n-gram feature set affects the accuracy of the hybrid and individual sentiment classifier models.

Detecting Online Review Fraud Using Sentiment Analysis

Bryn Caron
Rajeev Bukralia, Faculty Mentor (Department of Computer Information Science)

Abstract

With the exponential increase of e-commerce markets, reviews on products have become a substantial advocate for a shop and product's reputation. Consequently, fake reviews have become a way to ploy customers into trusting the credibility of a product. On account of this, fake reviews have been a topic of research for as long as e-commerce stores have had review sections. Nevertheless, there still has not been an efficient solution found to detecting these fake reviews. With this research we hope to gain insights to continue the development of detection techniques. To do this we have explored the accuracy of sentiment analysis on book review data through quantitative research. To complete this analysis, we have found the polarity score of each of the reviews and correlated it to the star rating of the review. Results from this research have found that the polarity score of the review is not an effective value to use when detecting fake reviews. This is due to the disconnect of the language used in the review to the rating given. This disconnect could be a cause of several factors, such as the limitations in ontology used in sentiment analysis and the review language not reflecting the overall sentiment of the rating given.

A Method and Apparatus For Testing Cohesion Between 40 µm to 50 µm, SAC305 Solder Spheres

Cohen Rautenkranz, Vadim Kuleshov, Sreymom Men, Edward Sweeney, Napoleon Kwamesa
Jake Swanson, Faculty Mentor (Department of Integrated Engineering)
Ryder Febo, Faculty Mentor (Department of Integrated Engineering)

Abstract

Team S-cubed was tasked by Aaron Collins, Staff Process Engineer - Advanced Assembly Development Engineering on behalf of Seagate Technology PLC, to design and build a test apparatus to observe and measure the behavior 40 µm to 50 µm, SAC305 solder spheres. During manufacturing the spheres have been observed (intermittently) self-assembling into a bridge structure within a hopper. This prevents movement of the spheres and halts production. Seagate directed the team to identify a method and design an apparatus capable of observing and resolving the sphere to sphere cohesion, or "stickiness," between different lots, vials, or specimens of 40µm to 50µm, SAC305 solder spheres. The company intends to (later) correlate the results from the test apparatus with observational data from the manufacturing line to form the basis for further investigations of the mechanism causing this behavior. The goal of this project is to devise a test and apparatus able to observe and resolve differences in behavior, but not the precise mechanism at play or a precise value of the force of cohesion between individual spheres.

The Importance of Measuring Air Velocity on a Race Car

German Orrego, Casey Plender & Kushan Sameera
Gary Mead, Faculty Mentor (Department of Automotive Engineering Technology)

Abstract

This study was conducted by three students studying Automotive Engineering at the Minnesota State University, Mankato and the focus is to understand the airflow around the aerodynamic package of the formula SAE car. Throughout this project it was possible to study the aerodynamic forces that act on the aero devices on the racing car that the Formula SAE team built during this last year, 2020-2021. The biggest obstacle preventing the investigation was the lack of resources to acquire state-of-the-art sensors. Students were able to purchase 2 sensors for the tests that were executed. Thanks to the URC this project could be successfully carried out. It was first received, and it needed to be mounted on the car, and that was done by creating different 3d printed mounts that were attached with adhesive tape or Velcro, so the airflow could be tested in various positions. At first, five location points were assigned to measure the different pressures, mainly in the front and rear wing. The information was collected with the sensors, sent, and stored in the computer that the car has on board. The data were then transferred to the students' computers to be analyze. The racing car was subjected to different tests such as coast down, skid-pad, acceleration, among others. It is important to mention that factors such as air density, ambient temperature and wind speed were measured and included in the records for each test. During testing, the data was carefully analyzed to validate the Aero targets set by the team at the start of the year. If the racecar's aerodynamics did not meet the objectives, the wings would be adjusted to meet the goals. The team discovered that they were nearly there, but that certain wings needed to be adjusted to create more downforce without increasing drag excessively.

Teletherapy and Camp Maverick: Literacy Students and Caregiver's Perspectives

Kelsey Anderson & Kristin Smith
Megan Mahowald, Faculty Mentor (Department of Communication Sciences and Disorders)

Abstract

Camp Maverick is a day camp that includes recreational and literacy activities to help improve a child's literacy skills. Given circumstances, Camp Maverick was provided via teletherapy sessions. The aim of our research was to gather information on the child/caregiver's perception of effectiveness for literacy sessions via teletherapy compared to face-to-face. An anonymous survey was provided to both the child and caregiver, although optional, was highly encouraged. Participants were asked to rate their experience on an ordinal scale, describe their experience, and whether they preferred face-to-face therapy or teletherapy for sessions. Results indicated that children and caregivers liked teletherapy for its convenience, however, preferred face-to-face-therapy for building a connection between the child and therapist. Limitations that could have affected the outcome of the research included children misunderstanding questions and the lack of survey responses. The significance of this study provides insight as to the effectiveness of teletherapy versus face-to-face therapy for Camp Maverick participants.

Effect of Resistance Training on Running Performance, Meta-Analysis of Current Research

Nathan Goslin-Klemme
Corey Selland, Faculty Mentor (Department of Human Performance)

Abstract

Background Resistance Training (RT) has long been studied as a method of improving aerobic running performance. Three of the variables most looked at as a measure of improved performance are Vo2max, which is defined as the maximal amount of oxygen (O2) being utilized towards the working muscle during steady state exercise. Running Economy (RE) defined as the amount of energy and O2 used at submaximal intensities, and Time Trial Performance (TT). Which involve various practical applications typically measured in competition format ranging from 2.4-10-kilometer race distances. RT while providing a benefit to these variables has not yet been found to have a standout mode or dose response in the literature. This may be attributed to high inter-individual variability.

Objective Originally this research was designed to determine whether timing of a RT session either pre or post aerobic run is more beneficial to RE, Vo2max or TT variables. However, due to the Corona Virus (COVID19) global pandemic and the restrictions imposed upon in person research a meta-analysis of the current literature was performed. This meta-analysis is meant to further review and explain the need to understand the importance of RT session timing and further the evidence of RT promoting aerobic running gains.

Methods Extensive search of the literature to find studies related to the review topic was conducted. Results were analyzed via a comprehensive meta-analysis software. Results for effect size and 95% confidence interval were obtained. Studies were subject to inclusion/exclusion criteria.

Results Studies involved in RT and its effect on RE found a combined p-value of <0.05 (0.004) along with a standard mean difference of 0.345 suggesting a low to moderate level of effect. Results of RT effect on Vo2max. P-value of <0.05 (0.000) was determined along with and standard difference in means of 0.464 suggesting a moderate effect. TT results were found to have a p-value of <0.05 (0.000) of 8 studies analyzed a positive effect of 0.732 standard mean difference was found suggesting a high effect.

Conclusion Based upon the results found via the comprehensive meta-analysis software. RT influences multiple running performance outcomes. This suggests a continued need to implement RT for peak performance and a need for further research to determine the timing of RT bout for peak performance.

What Do the Twitter Sentiments Say About the COVID-19 Vaccine?

Ilma Sheriff
Naseef Mansoor, Faculty Mentor (Department of Computer Information Science)

Abstract

The coronavirus disease (COVID-19) pandemic led to substantial public discussion. Understanding these discussions can help institutions and individuals navigate through this pandemic. In this paper, we analyze and investigate the twitter sentiments toward COVID-19 vaccine. Starting from a publicly available twitter dataset on COVID-19 vaccine from Kaggle, we create a unified dataset containing data about public sentiments, sentiment scores, and COVID-19 cases for various U.S. states. To generate a sentiment scores from the tweets, we have applied a Valence Aware Dictionary and sEntiment Reasoner (VADER) sentiment analyzer. These scores were then classified to positive, negative, and neutral sentiment classes using a simple threshold-based classifier. From our analysis, we observe that in our dataset around 41.93% of the tweets are positive, 17.64% tweets are negative, and 40.42% tweets are neutral. We also analyzed the data based on geographic locations of the tweets to answer the following questions - 1) Is there any relationship between the number of tweets and the number of COVID-19 cases? 2) Is there any shift in the public sentiment after the approval of the vaccine? Our analysis shows high correlation between the number of tweets and the number of COVID-19 cases as well as a decrease in negative sentiment after the approval of the vaccine.

Xtreme-NoC: Extreme Gradient Boosting Based Latency Model for Network-on-Chip Architectures

Ilma Sheriff
Naseef Mansoor, Faculty Mentor (Department of Computer Information Science)

Abstract

Due to the heterogeneous integration of the cores, execution of diverse applications on a many processor chip, application mapping strategies, and the design of Network-on-Chip (NoC) plays a crucial role to ensuring optimum performance of these systems. Design of an optimal NoC architecture poses a performance optimization problem with constraints on power, and area. Determination of these optimal network configurations is carried out by guided (genetic algorithm) or unguided (grid search) algorithms to explore the NoC design space (DSE). Each step of this DSE, a network configuration is simulated for performance, area and power for a wide range of applications. To perform these simulations, system level modeling is required to accurately capture the network's timing behavior, energy profile, and area requirements. Accuracy of the model, network configuration, and application running on the system, these simulations can be extremely slow. Alternative to such simulation is to use analytical network models utilizing queuing theory and treat each input channel in the NoC router as an M/M/1, M/G/1/N, or G/G/1 queue. These models provide a good estimate of network performance as latency only under certain assumptions, i.e.: a Poisson process for network traffic with exponential packet service time, and an exponential distribution for packet length. These assumptions are not guaranteed for real application-based traffic patterns, and the accuracy of the analytical models are disputable. As a result, to improve the slow DSE process of NoC architectures, an accurate NoC performance model with accelerated runtime is required. In this work, we propose Xtreme-NoC, an extreme gradient boosting based NoC latency model that can predict the accuracy of NoC architectures with 98.1% accuracy. To show the efficacy of the proposed model, we compare it to other regression models and prove that ours is more accurate at predicting latency.