Participant Abstracts
EMU Academic and Creative Excellence Festival 2024

Listings are in alphabetical order by the last name of the presenter. In the case of group projects, the entry is alphabetized under the name of the student who submitted the entry.

Poster Presentations

Comparing Copper Absorption In Beets and Spinach
Bethel Abiy with Lemi Bekele
Faculty mentor: Laurie Yoder

> Phytoremediation is a plant based environmentally friendly technique used to treat soil contamination. The aim of this project is to test whether plants of the same botanic family (beets and spinach) have similar or different copper absorption by using BCA solutions and Atomic Absorbance Spectroscopy.

The effects of agonistic drugs on the physiological aspects of Lithobates catesbeianus
Andrea Acevedo with Chidubem Ekoh, Angel Hines, Evan Kauffman
Faculty mentor: Hongtao Li

> An essential component of comprehending the operation of the cardiovascular system is knowledge of heart physiology. The pithed frog model is a popular tool for studying how different medications affect the heart. Our goal in this experiment is to examine how three medications affect pithed frogs' heart rates and electrocardiograms (ECGs): acetylcholine, adrenaline, and pilocarpine. We will also study Frank-Starling's Law, which indicates that a rise in preload causes a rise in cardiac output. To carry out this project, we will obtain two Lithobates Catesbeianus (American bullfrog) to be ethically pithed and perform experimentation on. The first frog will receive the three drugs and the heart rate and ECG of the frogs in response to each drug will be measured. The second frog will act as a control frog with no manipulation to it. In addition, we will change the volume of fluid in the heart and measure the corresponding cardiac output while adjusting the preload of the heart following pharmacological treatments. Knowing the prior effects of each drug, we hypothesize that acetylcholine will decrease the heart rate and have no effect on ECG, while epinephrine will increase the heart rate and have a positive effect on ECG. It is anticipated that pilocarpine will not significantly affect heart rate and ECG. In addition, we anticipate that Frank-Starling's Law will cause an increase in cardiac output and preload. This project will demonstrate how Frank-Starling's Law is applied in cardiovascular physiology and aid in our understanding of the physiological effects of these medications on the heart.

The Effect of Mindfulness Meditation on Heart Rate Variability During Exercise
Rachelle Batichon with Grace Ayole, Patricia Hizon, Desmone Logan
Faculty mentor: Hongtao Li

Mindfulness meditation has been shown to have a plethora of physiological benefits, such as chronic disorders, cardiovascular disease, hypertension, and diabetes. The ultimate goal of mindful meditation is to reduce stress and negative emotions while improving one's emotional, psychological, and physical health. There is an increase in parasympathetic activity with a reduction in stress hormones, inflammatory markers, and sympathetic vascular tone (Priya 2018). These holistic factors play a vital role in one's heart rate variability. The regulation of one's sympathetic and parasympathetic nervous system determines whether one's heart variability is higher or lower (Tiwari 2021). Researchers aim to investigate the specific impact of mindfulness meditation on heart rate variability during exercise.

The researchers plan to recruit a group of healthy adult participants with varying fitness levels. The participants would be given a consent form and instructions on what they will do during the experiment. The participants' baseline heart rate variability would be measured using a heart rate monitor. The participants will then be divided into two groups: one group will practice mindfulness meditation for 10-15 minutes before exercising, while the other group will have no intervention (Tiwari 2021). All participants would be asked to perform a standardized moderate-intensity exercise session for 30 minutes while being monitored on a heart rate monitor. Immediately after completing this exercise session, their heart rate variability will be measured. Then, their heart rate variability will be measured 15 minutes after completing the exercise session (Tiwari 2021). Using statistical analysis, the researchers will compare the heart rate variability parameters between the mindfulness mediation group and the control group during exercise and recovery.

Exploring the impact of mindfulness meditation on heart rate variability during exercise will offer valuable insight into the potential benefits of integrating mindfulness practice into physical activity routines for improved cardiovascular health.

References

Priya, G., & Kalra, S. (2018). Mind-Body Interactions and Mindfulness Meditation in Diabetes. European endocrinology, 14(1), 35–41. https://doi.org/10.17925/EE.2018.14.1.35

Tiwari, R., Kumar, R., Malik, S., Raj, T., & Kumar, P. (2021). Analysis of Heart Rate Variability and Implication of Different Factors on Heart Rate Variability. Current cardiology reviews, 17(5), e160721189770. https://doi.org/10.2174/1573403X16999201231203854

Forsythia's Ability to Phytoremediate at Varied Copper Concentrations

Renae Benner with Alex Belisle
Faculty mentor: Laurie Yoder

In this study, cuttings of forsythia plants were placed in Erlenmeyer flasks of water with varying concentrations of dissolved copper. The change in copper concentration in each flask was measured a few weeks later, using atomic absorbance spectroscopy (AAS). The goal of the study was to determine the ideal concentration of copper for forsythia phytoremediation. Phytoremediation is a process that uses plants to remove toxins from the environment. Understanding forsythia's ability to phytoremediate could be useful in preventing environmental damage and protecting aquatic ecosystems threatened by pollutants.

The Impact of Road Salting on Bean Crops
Amber Bonds

Faculty mentor: Stephen Cessna

> Beans are known to withstand a lot of salt. However, the salt table provides the majority of that salt. This experiment was designed to find out how road salt affected bean crops. Utilizing an optisci chlorophyll fluorometer to evaluate the health of the plant's roots, stems, and leaves.

Comparing Copper Levels in Tomato Roots, Stems, and Leaves.
Amber Bonds with Maya Tutton

Faculty mentor: Laurie Yoder

> Tomatoes are known to be resistant to some contaminants like copper. The process by which plants eliminate contaminants from soil is known as phytoremediation. The goal of our experiment was to test tomatoes' effectiveness on a variety of concentrations of copper by comparing the amount of copper found in the roots, stems, and leaves using atomic absorption spectrometry.

Water Temperature and Coral Health
Noah Buckwalter

Faculty mentor: Doug Graber Neufeld

> Coral reefs are in danger across the globe. In this project I will use ArcGIS Pro to correlate changes in water temperature with coral death/bleaching.

Stream Water Quality
Noah Buckwalter with Bellamy Immanuel

Faculty mentor: Stephen Cessna

> In this project we will test different water parameters of streams and compare them to each other to correlate differences based on location. We will use lab equipment to conduct our analysis.

Copper Phytoremediation in Sunflower Plants Affected by pH Change
Tara Cahill with Jade Davis

Faculty mentor: Laurie Yoder

> Plants use phytoremediation to remove toxins from the surrounding environment. In an effort to test this process, copper was added to the soil of sunflower plants. The aim of the experiment is to observe the effect of varying pH levels on copper phytoremediation in sunflower plants. The plants were separated into three different groups based on the pH they were watered with, such as acidic, basic, and neutral. After adequate growth, the copper concentration was measured using atomic absorbance spectroscopy.

Student Experience: A Study into Housing, Satisfaction, Student Life, and Academic Success at Eastern Mennonite University
Caleb Chupp with Grant Leichty, Garrett Nyce
Faculty mentor: Joohyun Lee

>This study addresses the connection between the quality of housing and student life, overall well-being, and academic success of students at Eastern Mennonite University. Recognizing the role these factors play in the student experience, this study aims to measure the levels of satisfaction of students at EMU with their current housing situations, identify the relationship between housing and student life and academic success, and explore potential correlations between housing satisfaction and the likelihood of student transfers or dropouts. Using online surveys and questionnaires administered via multiple different outlets, we hypothesize that higher reported satisfaction with housing and student life corresponds to increased academic output, while lower satisfaction levels may increase the likelihood of student transfers or dropouts, as well as diminish the feeling of community and belonging.
>By addressing these objectives and hypotheses, we aspire to provide valuable insights which can influence improvements in campus facilities, services, and community at EMU. Ultimately, enhancing student satisfaction and fostering a positive environment may contribute to a more fulfilling overall student experience and contribute to the university's efforts to retain maximum student enrollment and community connections.

Evaluating the No Net Loss Policy of Wetland Coverage in Virginia
Laura Craft
Faculty mentor: Doug Graber Neufeld

>This project aims to investigate the changes in wetland coverage in Virginia over time, specifically as a result of development and infrastructure. The goal is to determine if the No Net Loss policy for wetland habitats is followed and to assess the health of the habitat. Evaluations will include the number of wetland delineations in Virginia watersheds and the overall acreage of wetland habitats over time using ArcGIS Pro. Wetland coverage is paramount for maintaining biodiversity and water purity, and the loss of wetland habitats is damaging to the environment. This chronological assessment allows for the estimation of the No Net Loss policy's effectiveness in Virginia.

Deciphering semaglutide's weight loss mechanism: Insights from RNA sequencing and BI 456906 dual agonist study
Betty Debebe
Faculty mentor: Jeff Copeland

>As obesity continues to challenge global health, semaglutide, a GLP-1 receptor agonist, emerges as a significant tool offering notable weight loss benefits through mechanisms that are not entirely understood. This research seeks to deepen our understanding of semaglutide's molecular action by leveraging RNA sequencing data derived from studies on BI 456906, an innovative dual agonist that targets both the glucagon and GLP-1 receptors, demonstrating efficacy in reducing body weight. By conducting a comprehensive analysis of gene expression

changes associated with the administration of semaglutide, and comparing these with the effects observed with BI 456906 in Mus musculus models, this study aims to identify critical pathways and alterations that underpin the weight loss facilitated by semaglutide. Furthermore, the significance of this research is heightened by the fact that humans and mice share a very similar genetic background, with areas of conserved synteny amounting to almost 90% of their genomes. This high degree of genetic similarity makes the study on the mouse model not only relevant but highly indicative of how semaglutide similarly works in humans, providing insights and a valuable framework for translating preclinical findings into clinical interventions.

Quantifying NAV1 Isoforms in Adults with Congenital Heart Disease
Sarah Deputy with Josiah King, Meredith Lehman, Kaden Schrock
Faculty mentor: Hongtao Li

> The purpose of this project is to quantify isoforms of a selected gene in people with hypertrophic cardiomyopathy (HCM) and aortic stenosis, by using data from people with healthy hearts. This will be accomplished by using RNA-Seq data from NCBI, and establishing a bioinformatics workflow in Cyverse. The workflow will be established by utilizing current literature on transcriptome analysis and will include five main steps: processing raw data, read alignments, transcriptome reconstruction, expression quantification, and differential expression analysis (Yang & Kim, 2015).

ChatGPT usage among college students
Mesa Dula with Ben Alderfer, Jansen Miller
Faculty mentor: Joohyun Lee

> ChatGPT, an online artificial intelligence chatbot, has become increasingly prevalent over the last few years. This service offers users answers to specific questions, content creation, and many other features. Previous research has indicated that ChatGPT plays a significant role in supporting students pursuit of higher education (Marquis, 2023), making course materials more accessible and potentially enhancing course content. These improvements suggest that ChatGPT could increase student satisfaction. Our study has two objectives. Firstly, we aim to examine the usage of ChatGPT in a college setting, assessing how frequently college students use ChatGPT. Secondly, we seek to explore the relationship between ChatGPT usage and student satisfaction. Data will be collected through online questionnaires, distributed to students using a convenience sampling method. Through this research, we aim to gain insights into ChatGPT's usage in higher education and explore the potential future impact of this artificial intelligence on education.
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> References

Marquis, J. W. (2023, August 1). AI in Higher Education. Retrieved from https://www.gonzaga.edu/news-events/stories/2023/8/1/ai-in-higher-education

Worldwide Greenhouse Gas Emissions: Examining conformity with the Paris Climate Accord Targets
Grace Eye
Faculty mentor: Doug Graber Neufeld

> This study presents each country's greenhouse gas goals and budget as outlined by the Paris Climate Accord, looking at their ability to reach these target goals and whether their emissions have remained equal to or below their given limits. It will contain maps with greenhouse gas emissions of individual countries over the most recent 20 years. This will be explored using a collection of data that contains different GHG levels from Climate Watch, United Nations Framework Convention on Climate Change (UNFCCC), Global Carbon Project (GCP). Data containing goals and greenhouse gas budgets per country is taken from the United Nation and then all the data is compiled into maps using ArcGISPro. This project will help assess climate data and act as a helpful tool for informed policy-making regarding climate remediation for GHG target goals.

Accessing Water Health and Contaminants in Park Woods and the Shenandoah Valley
Grace Eye with Laura Craft, Vanessa Gardiner
Faculty mentor: Stephen Cessna

> This project aims to obtain water quality measurements in Park Woods to determine which contaminants need to be monitored and treated. The measurements collected in Park Woods will be compared to water quality measurements from local waterways to evaluate the differences between contaminants. As a response, water quality purification and monitoring plans will be drafted for implementation in Park Woods, thus contributing to the health of Blacks Run and the watershed as a whole.

Comparative Analysis of Pre and Post-Exercise Heart Rate Recovery in Non-Runners, Sprinters, and Long-Distance Runners
Abigail Forrest with Jaylen Flesher, Aneisha Moore, RayRay Taylor
Faculty mentor: Hongtao Li

> The purpose of this study is to examine the cardiovascular recovery rates of non runners (NR), long-distance runners (LD), and sprinters (SP). According to a study performed at the University of Tennessee, heart rate was recorded at minute 18 during a dynamic exercise and showed that the cardiac index of LD was higher than that of the SP (1995). Stanford Medicine reports that the ventricle and atria both increased in size and that muscle thickness increased in athletes (2024). It is hypothesized first that SP will have the lowest resting heart rate (RHR), LD will have the second lowest RHR, and NR will have the highest RHR. Second, it is hypothesized that SP will have the fastest recovery rate, LD will have intermittent recovery rate, and non runners will have the slowest recovery rate.

> Nine female participants aged 18 to 23 were selected based on being NR, LD, or SP (three participants per variable). The resting heart rates of each of the participants was recorded using an ECG machine and HRM band. The participants performed a ten minute HIIT workout. Heart rates were recorded immediately after completing the workout at minutes 0, 2, 4, 6, 10, and 15 using an ECG and HRM band. The results were compared using a t-test with a p-value of 0.05.

The effects of exercise on heart rate
Karim Frazier with Ashley Bykowski, Sadie Oesch, Vian Ozic
Faculty mentor: Hongtao Li

> Understanding how the human heart responds to varying durations and intensities of exercise is crucial for optimizing physical training programs and enhancing cardiovascular health. This study investigates the differential effects of short bursts of intense exercise and long stretches of steady exercise on heart rate dynamics. Using a heart rate monitor and exercise protocols, we examined heart rate of participants over different types of exercise. We hypothesized that when participating in long steady exercise participants will have a lower max heart rate than when they participate in short intense exercise. Our study elucidates the acute recovery kinetics of heart rate following intense exercise bouts, highlighting the efficiency of the cardiovascular system in restoring homeostasis. These insights contribute to a deeper understanding of the complex interplay between exercise intensity, duration, and cardiovascular adaptations, with implications for optimizing exercise prescription and promoting cardiovascular health.

The Path of Trash: Do Plastic Trash Densities Correlate with Shipping Routes and Ocean Currents?
Vanessa Gardiner
Faculty mentor: Doug Graber Neufeld

> This project is analyzing what factors affect where plastic gathers and moves throughout the ocean. Known plastic densities will be mapped against potential factors such as international shipping routes and ocean currents to determine any correlation between them. Plastics are used extensively in various goods, such as food packaging, electronics, toys, cosmetics, and disposable medical equipment, making them an everyday element of daily life. However, littering and ineffective waste management of plastics has led to oceans becoming sinks for plastic and negatively impacting marine habitats and animals. It's estimated that 1.15 to 2.41 million tonnes of plastic are entering our oceans each year from rivers. Currently in the Pacific Ocean the Great Pacific Garbage Patch is the largest of the five offshore plastic accumulation zones in the world's oceans, containing approximately 100,000 tonnes.

Embracing Diversity: Understanding International Students' Sense of Belonging at Eastern Mennonite University
Emanuel Habte with Elphas Adam, Nick Ondrus
Faculty mentor: Joohyun Lee

> With the U.S. drastically increasing in population diversity, efforts are being made to help international clusters of individuals throughout the United States feel welcome. Feeling welcome, from a foreigner's perspective, is one of the most important parts of being integrated into a new society. However, it is also one of the hardest things to attain. "Literature suggests that international students may be vulnerable to acculturative stress, which refers to the physical, social, and psychological impact of adaptation to a new culture." (Berry et al., 1987).

The purpose of this research specifically targets the importance of international students' sense of belonging and feeling of being welcomed at universities, specifically Eastern Mennonite University. Me and my fellow researchers attempt to grasp the feelings of international students as they step foot into EMU and how their sense of belonging gradually shifts, whether it is for better or worse. Furthermore, we will attempt to correlate international students' success in their academic and social lives, while also including retention rates, with their sense of belonging to EMU. Due to the availability status and busy schedule of international students, we will be gathering information through interviews and online surveys.

Exploring the Interplay Between Quality of Life Indicators, Border Crossings, and Population Dynamics in Texas
Emanuel Habte
Faculty mentor: Doug Graber Neufeld

By gathering data about the border crossings into the United States (specifically Texas), from Mexico, I believe I can create an interesting poster that shows the effect of border crossings on quality of life indicators such as healthcare access, education level, job opportunities, and crime rates. I plan on asking the question, "How do variations in quality of life indicators (such as healthcare access, education level, crime rate, etc.) across different regions of Texas correlate with patterns of border crossings and population change?"

Abstract: This study delves into the nuanced relationship between border crossings and quality of life indicators, focusing on the unique context of Texas. Utilizing comprehensive datasets encompassing healthcare access, education level, crime rates, and other socio-economic factors, I will employ spatial analysis techniques to assess how border crossings influence key aspects of quality of life across different regions of the state.

Residential Students vs. Commuter Students and their Engagement with On-Campus Activities at EMU
Mya Hamlet with Zazkia De la Vega, Jacob Nichols
Faculty mentor: Joohyun Lee

The growing number of commuter student population in the United States has brought to light the existence of inequality in engagement opportunities, depending on students' housing choice. It has been demonstrated that there is a correlation between being a commuter/residential student and the frequency a student participates in school organized events, sports teams, and clubs/organizations. Previous studies have mainly used questionnaires to obtain critical information from various students, however these studies have not focused solely on the student involvement-giving a general interpretation of the results. Our research focuses on understanding student involvement dynamics through surveys, exploring factors that influence engagement. Going beyond the commuter-residential divide, we aim to identify specific motives affecting participation, including commuting distance, time constraints, and a perceived lack of community. As previously research concluded, residential students have a higher level of involvement in their university's activities than commuter students; the study will provide

practical insights for universities to improve inclusivity and opportunities for engagement, irrespective of students' housing preferences.

The Effects of Mining and Fracking on Community Wellbeing in West Virginia
Madelynn Hamm
Faculty mentor: Doug Graber Neufeld

This project aims to map hellbender (Cryptobranchus alleganiensis) habitat locations across the eastern United States alongside land use data around the same area. By correlating these datasets, we can address the ecological concern of habitat degradation and its impact on sensitive amphibian species. Land use, such as agriculture and habitat fragmentation, can subject water systems to runoff of toxic substances, creating uninhabitable aquatic ecosystems. Salamander's thin permeable skin makes them vulnerable to such changes in acidity or turbidity. The decline of hellbender populations, indicative of ecosystem health, reflects broader environmental issues such as water pollution and loss of wetland and forest habitats. This project would offer insights into the relationship between habitat suitability and land use, aiding conservation efforts and informing land management strategies to mitigate threats to biodiversity.

Caffeine and Its Impact on Working Memory and Metacognition
Samantha Hensley with Hayley Collins, Sarah Moore
Faculty mentor: Allison Wilck

Caffeine is a renown mental and physical enhancement drug that is used by the world's population on a daily basis to promote the efficiency of task completions in individuals. The majority of United States populations, including college students, also perceive caffeine as a positive stimulant for cognitive processing, including working memory. Caffeine's mental and physical catalyzing effects are seen by many individuals as positive reinforcers to have when completing daily tasks. Previous research has shown that many memory task performances were enhanced after consuming caffeine, but the specific amount that has an impact is still an ongoing investigation. The goal of this research is to collect data on how people perceive the impact of caffeine, versus its actual impact on memory. This particular research focuses on the stimulating effects of caffeine on visual/auditory recall in working memory, metacognitive judgment, and heart rate. A Mixed ANOVA and multiple t-tests will be conducted for data analysis. The anticipated results are that caffeine will increase heart rate, caffeine will decrease metacognitive judgment, and increase auditory and visual memory recall. Using the manipulation of caffeine on a group of volunteer participants from Eastern Mennonite University will give us insight into how caffeine affects both an individual's cognitive and physiological responses.

Using Django as a Graphical User Interface
Jacob Hess
Faculty mentor: Charles Cooley

Instead of using somewhat rigid libraries to create a User Experience, we can use Django and it's HTML front end to create a UX that looks good and is fully customizable while having a back end that can help sort data.

Emotional Support Animals' Impact on Human Connection
Elizabeth Horn
Faculty mentor: Allison Wilck

Animals provide many benefits to humans, but emotional support animals (ESAs) provide a different benefit to their owners. ESAs are animals that provide emotional support or comfort to their owners. People who own emotional support animals suffer from mental health conditions. These owners receive special approval from a qualified healthcare professional to own the animals because of laws that are put into place. The need for a healthcare professional's approval is important in obtaining an ESA, but there has been some controversy surrounding the process. ESAs tend to provide support for their owners in such areas as physiological, social, and psychological. The purpose of this research is to explore the impact of emotional support animals on human connection. The study included 40 people who own emotional support animals and those who do not. The participants were asked to complete a survey based on how their ownership status aided their ability to make human connections. There is much research on the support that service dogs give to their owners, but there is little on the effectiveness of emotional support animals.

Investigating the Relationship between Socioeconomic Status and Green Space Access and Canopy Cover in Harrisonburg, Virginia
Isaac Huyard
Faculty mentor: Doug Graber Neufeld

The goal of this research is to explore the interplay between socioeconomic status and access to green areas, including tree canopy cover, in the urban landscape of Harrisonburg, Virginia. By integrating maps that show the distribution of socioeconomic statuses in Harrisonburg with green space metrics, this research offers insights into potential disparities in environmental equity and informs strategies for fostering inclusive urban green infrastructure development.

Impact of Wildfires on Ozone Levels
Bellamy Immanuel
Faculty mentor: Doug Graber Neufeld

his GIS project aims to look at the impact of wildfires on ozone levels by use of satellite imagery data. Examining variations in ozone concentrations across different seasons, the study will provide data on how wildfires influence the ozone and air quality over time. Through spatial analysis techniques, this research will contribute to a better understanding of the dynamic relationship between wildfires and ozone, which will facilitate more effective management strategies for the environment conservation and public health.

Navigating the Navs: Applying RNA-seq Tools to Understand Differential Isoform Expression of UNC-53 in C. elegans.

John Jantzen with Meredith Lehman

Faculty mentor: Kristopher Schmidt

> The development of higher organisms requires that cells and cellular processes navigate complex environments to reach their final destinations. The Neuron Navigator (Nav) family of genes encode conserved intracellular signaling protein NAVs (NAV-1,2,3) that function to integrate extracellular guidance cues to changes in the cytoskeleton. The C. elegans homolog of NAV2, UNC-53 (uncoordinated-53), is encoded by the unc-53 gene. Like the Navs more generally, the unc-53 genetic locus is complex, encoding several short and long isoforms, subject to alternative splicing, and driven by at least three promoters. The precise spatiotemporal pattern and relative importance of the various isoforms of unc-53 and the Navs is not well understood. This project employs a custom bioinformatics approach to identify and compare the various unc-53 isoforms from FACS sorted neurons derived from L1 and L4 staged animals (Sun & Hobert 2022) and from adult tissues: neurons, muscle, intestine and hypodermis (Kaletsky et. al 2018). In each case, RNA-Seq data from publicly available databases was obtained and processed via a dual-output bioinformatics workflow in Cyverse. The workflow included five main steps: processing raw data, read alignments, transcriptome reconstruction, expression quantification, and differential expression analysis. For qualitative analysis, RNA-Seq data was visualized after alignment with HISAT2 using the UCSC genome browser. We are currently employing more quantitative approaches using EdgeR4.0 in addition to STAR and RSEM to determine isoform prevalence.

Movements of Male & Female Colony-reared Bactrocera jarvisi Tracked Using Harmonic Radar in Northern Queensland Papaya Fields

Adesola Johnson with Meredith Lehman, Allysen Welty-Peachy

Faculty mentor: Jim Yoder

> Tephritid fruit flies, such as Bactrocera jarsivi, are major horticultural pests worldwide and pose invasion risks due primarily to international trade. Determining movement parameters for fruit flies is critical to developing agent-based models that aim to increase the effectiveness of surveillance and control strategies. This study was conducted in Queensland, Australia, where B.jarvisi are commonly found in agricultural areas. In this study, harmonic radar (HR) was used to track the movements of both male and female lab-reared B. jarvisi in papaya fields. Movement path distances (7-12 steps) for females ranged in length from 19.1 to 102.4 m with a mean step distance of 3.2 ± 0.5 m. Movement path distances (6-11 steps) for males ranged in length from 15.7 to 74.8 m with a mean step distance of 3.8 ± 0.6 m. Most tagged B. jarvisi showed strong flight directional biases similar to other HR tracking results with Zeugodacus cucurbitae, and B. tryoni. Wind data was recorded during every tracking experiment to find correlations between wind direction and the flight bias of the flies. Flight directions were also found to be correlated with the wind direction. Data on flight directionality and step-distances determined in this study provide parameters for models that may help enhance current surveillance, control, and eradication methods, such as optimizing trap placements and pesticide

applications, determining release sites for parasitoids, and setting quarantine boundaries after incursions.

Contact Lenses In The Lab - Permeability and Solubility testing

Doran Kennedy

Faculty mentor: Laurie Yoder

It is currently a rule in EMU labs that contact lenses are not to be worn, and this rule is reflected by several other protocols from labs nation-wide. The main reasons for this are harmful vapors that can get trapped behind the lens and pressed up against the eye, in addition to limited solubility in certain organic solvents. This makes them dangerous to have on when in a lab setting. However, due to the very stable structure of most polymers, they need long-term exposure to show any kind of degradation and the documentation on vapor permeability for solvents other than water is very limited. This project aims to provide the groundwork for a guide on what is safe to use with contacts in. I have tested solubility in various solvents as well as permeability of the contact lens, and have gravimetric data for both. I measured the contact lenses before and after solubility tests and found how much was dissolved, as well as took measurements for a container of solvent every so often when the opening was blocked by a lens or a larger film of the same material.

COVID and Social Anxiety

Chris Kibler with Seth Strong

Faculty mentor: Allison Wilck

A study has not been done before on the relationships between eye contact and social anxiety before and after a global pandemic. We looked at a study on what happens in the brain when eye contact is made (Lapolla et al., 2023), and how the personality characteristics of a person affect their ability to hold eye contact (Libby & Yaklevich, 1973) to understand its role as a social mechanism. Studies on the negative effects of the COVID-19 pandemic in the workplace (Waight et al, 2022), school (Peimani & Kamalipour, 2021), and mental health (Cui & Han, 2022) note the connection between COVID-19, eye contact, and social anxiety. Furthermore, it has been suggested that eye contact after the pandemic (Rashid, 2022) may not be consistent with pre-pandemic experiences. Our study seeks to determine if there are correlations between eye contact and social anxiety before and after the COVID-19 pandemic. We are anticipating an increase in average social anxiety among college students, as well as a decrease in eye contact after the pandemic as compared to before. Findings can be used to better understand how the pandemic affected our social life and intertwining that with depression/anxiety.

Assessing vegetation growth as a result of sand dams

Joel Kornhaus

Faculty mentor: Doug Graber Neufeld

We analyze the extent to which sand dams in Kenya lead to an increase in vegetation. Using ArcGIS Pro and Google Earth Engine, we employ raster analysis tools to assess whether sand

dam sites exhibit significant vegetation growth over time. Additionally, we explore means of more efficiently applying workflows that have been developed up to this point to assess sand dam efficacy.

River's Cardboard Cruiser

Rizel LaBossiere

Faculty mentor: Holly Herr Stravers

The creation of this cardboard toy car was explicitly designed for 18-month-old toddlers. This art project explores the imaginary world of childhood development. The idea for this project began with my son's toddler play preferences, which was my inspiration when I created the toy with the hope that it could relate to the curiosity and interests of young kids.

The list of developmental milestones for an 18-month-old includes cognitive development, developing social abilities, gross motor skills, and fine motor skills. This toy I created purposefully addresses these areas of development and produces a comprehensive play environment. The cardboard car's tactile and engaging design helps toddlers hold and manipulate items as they develop their fine motor abilities. Pushing or dragging the toy simultaneously improves mobility and gross motor abilities while fostering a sense of freedom. Regarding cognition, the toy functions as an exploration canvas, using colorful, kid-safe paint that can hold the child's interest and stimulate their curiosity. The cardboard car's simple but captivating form encourages exploring causes and effects, promoting cognitive development. Playing together fosters the development of social skills since the toy serves as a center for interaction between kids and adults.

During the making process, safety was the priority. The toy is safe from risks since only child-friendly materials, such as non-toxic paint and carefully chosen cardboard, were used. The child's safety is the priority at every stage, from structural planning to final details, reducing hazards, and offering a safe play space.

In conclusion, this toy project explores the relationship between a child's growth and development with the use of their imagination through this cardboard box toy car. This creativity seeks to celebrate play and promote holistic development in toddlers by carefully weighing the developmental demands of an 18-month-old while keeping a close eye on safety.

Tracking Gaps in Gene Expression Between Birds and Reptiles That Could Belong to Their Common Ancestor

Aja Laun

Faculty mentor: Jeff Copeland

Birds and crocodiles have been linked through many phylogenetic trees because they are thought to have shared a common Archosaur ancestor. Through genome sequencing, it is possible to find gaps in the genomic sequences of birds that are present in reptiles like Alligators to give a better understanding of what the birds' and reptiles common ancestor was like. This study uses comparative genomics to find regions of DNA that are present in reptiles that aren't present in birds. Once these chromosomal regions are found, finding out what they code for will help trace traits back to reptiles and birds' common ancestor. The genomes being used are the

fully sequenced American Alligator, Painted Turtle, Golden Eagle, and Brown Kiwi provided by UCSC genome browser.

Investigating Sunflower Species Efficiency of Absorbing Copper

Aja Laun with Roumany Sefin

Faculty mentor: Laurie Yoder

> Chemical runoff from roadways can be toxic to the surrounding environment. Some plants work as phytoremediators to prevent toxins like those from getting further into the environment. Sunflowers are frequently found in medians and on the sides of highways, putting them in the prime position to work as phytoremediators. This study aims to determine the effectiveness of different sunflower species as phytoremediators. Two different species of sunflower were grown in three different pots, and a standardized amount of copper was mixed into the soil of each one. After several weeks of more growth, each flower's roots and pot soil had their copper concentrations measured through Atomic Absorption Spectrum or BCA. This study can determine the sunflower species' effectiveness at phytoremediation which can be used to protect their surrounding environments.

Emmetropia or Myopia, does it affect Pupillary Light Reflex?

Lynette Layman with Roxana Coriano-Navarro, Wendy Ilboudo, Jocelyn Portillo-Romero

Faculty mentor: Hongtao Li

> The purpose of our experiment is to develop a deeper understanding of the pupillary light reflex and the conditions that affect this important mechanism in vision. The question that we hope to answer by conducting this research is: does myopia affect the time it takes for the pupil to respond to a light stimulus? We hypothesize that myopia will cause an increased reaction time in the pupillary light reflex (PLR) in comparison to a subject that has perfect or near-perfect vision known as emmetropia.
>
> In order to test our hypothesis, we will be conducting an experiment on eight self-identified eye condition individuals; four of whom have myopia and four who have emmetropia. Each test subject will be asked the following information before the test begins (age, gender, eye condition, and approximate screen time usage) Each subject will be asked to sit in a room that has an equal low light source. A video camera will be set up with a bilateral view of the subject's pupils. With both eyes uncovered we will shine a light and record the response time, then we will ask the participant to cover their left eye and record the response time in the right eye, lastly, we will ask the participant to cover the right eye and record the response time in the left eye. Each of these trials will be repeated three times.
>
> After the experiment is finished, using the recording we will calculate the response times for each of the 9 trials, and for each trial (both eyes uncovered, right eye covered, left eye covered) we will average the response times. This process will be repeated for each test subject.

Comparison of copper phytoremediation potential among different radish species.
Tiffany Lear with Kristen Andersen
Faculty mentor: Laurie Yoder

> Phytoremediation is an environmental restoration technique that uses plants to reduce the concentrations of toxins present in the environment. For this experiment, we used two species of radishes to test their ability to phytoremediate. After the plants grew the copper was added to the soil and the plants were allowed to phytoremediate. After some time, samples were taken of the soil and studied to get the Copper concentrations. The copper concentration was calculated using the BCA spectrometry technique. This method, if repeated, could be used as a means of toxin management in the environment.

Photosynthesis and chlorophyll concentrations of arugula (Eruca sativa) in response to excess water and drought stress
Christina Louk
Faculty mentor: Stephen Cessna

> This study aims to investigate the impact of two of the significant plant stresses caused by global warming on the Arugula plant (Eruca vesicaria) through photosynthesis and chloroplast detection. By subjecting Arugula plants to varying water conditions—excess water and drought, the analysis of chlorophyll concentration and the photosynthesis process are recorded using the Optisci chlorophyll fluorometer and the LiCor photosynthesis gas exchange analyzer. Insights into the plant's adaptive mechanisms will be shown in response to these conditions. This research not only enhances our understanding of Arugula's resilience to climate change but also offers valuable insights into broader implications for the effects of the two stressors on plants. Ultimately, by discovering the effects excess water and no water can have on the Arugula plant, this study contributes to the broader discourse on climate resilience and sustainable agricultural practices.

Copper Phytoremediation In The Roots and Leaves of Roma VF Tomatoes
Christina Louk with Wendy □Iboudo
Faculty mentor: Laurie Yoder

> A phytoremediation technique is done using plants as an alternative method to chemical techniques for the removal of metals, such as Copper. The phytoremediation technique is used to improve the soil and water decontamination process. The objective of the project is to compare the different copper concentrations on Roma VF tomato plants that could be used for phytoremediation and its impact on the roots and leaves. The approach of this study is to expose the Roma VF tomatoes to high and low concentrations of copper to measure its effect on their roots and leaves. The study consisted of the dehydration of the roots and leaves, with the use of BCA solution, and the measurement of absorbances using the spectrometric meter.

How do EMU students feel about the EMU fitness center?
Ashley Maldonado with Elizabeth Longacre, Sean Mays

Faculty mentor: Joohyun Lee

This study aims to explore factors that influence satisfaction among EMU students regarding the fitness center, specifically focusing on qualities including atmosphere, cleanliness, staff friendliness, and equipment quality. This will allow for a greater understanding of students' needs and expectations of the fitness center as well as identify potential improvement areas. Because research shows that satisfaction with facilities has a positive impact on young athletes' motivation (Aznar-Ballesta, A., et al., 2022), it is important to exceed students' expectations and improve what they are unsatisfied with.

Data will be collected through online questionnaires emailed to students and posted in the fitness center. This will allow for these quantitative surveys to be distributed among a diverse sample of the population in order to gather different perspectives. Once those surveys are completed, we will gain a deeper understanding of students' satisfaction levels, preferences, and suggestions for improvements. Wanting to provide a comprehensive understanding of these factors to shape the satisfaction with the college fitness facilities and offer recommendations to improve the students' experiences.

Effects of riparian buffer installation on stream health in Lancaster County.
Esme Martin
Faculty mentor: Doug Graber Neufeld

This poster highlights the effects of riparian buffer installation on stream health in Lancaster County, PA. Specifically, it seeks to understand whether riparian buffers (woody vegetation planted along river and stream banks) help to improve the health of local waterways, by comparing locations of known riparian buffers with concurrent changes in the quantity of nitrogen, phosphorus, and sediments in streams.

Spatial Analysis of Nesting Sites in Different Turtle Species
Sierra McVey
Faculty mentor: Doug Graber Neufeld

This project will explore the nesting behavior of different turtle species. The comparison of each species and their geographical location will be observed. Nesting behavior will be examined with each species and how those correlate with their protected nesting sites. The goal of this study is to explore how nesting behavior differences in each species and why it is important to understand.

Prevalence of Microplastics in Market Fish
Sierra McVey with Maddison Stockner
Faculty mentor: Stephen Cessna

We will be detecting microplastic particles within fish from the marketplace. We will be comparing different species of fish to determine if one digested more substances with plastic. Our goal is to determine how much plastic is present in the fish we eat.

BRCA1 Gene Loss Impact on Breast Cancer Cell Gene Expression.

Elaine Miranda Perez

Faculty mentor: Jeff Copeland

> Breast cancer remains a major global health problem, affecting millions of people each year. Understanding the molecular mechanisms underlying breast cancer progression is crucial to improving patient outcomes. Loss of BRCA1 correlates with aggressive tumor characteristics, such as high tumor grade and negative hormone receptors. Previous research has shown that the reduction in expression or loss of BRCA1 leads to decreased protein levels, which affects the cell's ability to repair DNA damage efficiently and results in greater genomic instability, causing cells to be more susceptible to the accumulation of mutations. In this study, we investigated the impact of BRCA1 loss on gene expression in breast cancer cells, by exploring the functional implications of altered BRCA1 expression on other genes expression, increase in genomic instability, and effects on cell proliferation and DNA repair pathways. We will delve into these questions using bioinformatics tools for data collection, preprocessing, and quality control by processing raw sequencing data, read alignment, and assessing data quality and normalizing data expression levels. This project bridges bioinformatics and cancer research, highlighting the intricate interplay between gene expression and cancer progression.

Exploring factors that affect grizzly bear populations in British Columbia

Samuel Myers

Faculty mentor: Doug Graber Neufeld

> Using data about grizzly bear populations in British Columbia this project will explore the effects of abiotic and biotic factors. Grizzly bears are of special concern in this area making knowledge about how to protect their habitat vital for the flourishing of them as a species. The human population of BC has increased by approximately 1.5 million since 2003 endangering the habitat of grizzly bears.

The Effects of Mining and Fracking on Community Wellbeing in West Virginia

Levi Myers

Faculty mentor: Doug Graber Neufeld

> This project will attempt to find correlation between indicators of community harm and mining and fracking activity. Data will measure the effects of mineral operations by observing toxin levels in waterways and the air, poverty levels, and life expectancy of the communities that surround mining and fracking sites. These specific measures are important because high toxin levels in the air and water could lead to increased cases of sickness in populations, and increased poverty levels and lower life expectancy points to a struggling populace. The results of this study will potentially allow us to locate and protect the communities that are most vulnerable to the effects of mining and fracking.

Characterizing the transcriptome of a novel T-cell lymphoma subtype

Ethan Neufeld

Faculty mentor: Jeff Copeland

> T-cell lymphomas are a diverse group of cancers with over 40 subtypes (Song et al., 2023), and their pathogenesis is not entirely understood. The purpose of this study is to compare RNA sequencing data from a novel T-cell lymphoma subtype isolated by Song et al. (2023) to the annotated transcriptomes of other T-cell lymphoma subtypes. T-cell lymphomas are a rare subtype of non-Hodgkins lymphomas and are more difficult to treat than many other non-Hodgkins lymphomas. Because T-cell lymphomas are so heterogeneous, occurring in both precursor T cell and mature T cell populations, understanding each subtype's specific physiology is of immense clinical relevance. This project seeks to expand on this goal for the novel subtype discovered by Song et al. (2023). RNA seq data will be collected from the publicly available data sets on the NCBI projects page and compared to other transcriptomes using Galaxy software. Comparing the transcriptomes of different lymphoma subtypes with the new subtype characterized by Song et al. may elucidate mutations or gene translocations that led to a novel gene expression pattern in this case study. Beyond genetic factors, RNA seq data can show potentially carcinogenic transcriptional control or alternative splicing that is associated with this subtype.

> Song, W., Wang, G., Wang, C., Liu, L., Zhang, L., Zhang, R., Zhang, H., & Shi, K. (2023). Case report: An unclassified T cell lymphoma subtype with co-expression of TCR αβ and γ chains revealed by Single Cell Sequencing. Frontiers in Immunology, 14. https://doi.org/10.3389/fimmu.2023.1184383

The Relationship Between Childhood Home Environment and Adult Personality

Tyler Oaks with Asmait Embaye

Faculty mentor: Allison Wilck

> Bronfenbrenner's Ecological System Theory suggests that a child is influenced by the microsystem, mesosystem, exosystem, marcosystem, and chronosystem. Bronfenbrenner's theory says that our parents have a big impact on how we develop, since our parents are the primary direct with whom we interact on a daily basis. Our research will explore childhood home environments that affect adult resilience, with a focus on the importance of parental attentiveness. Analysis of the four parenting styles authoritarian, authoritative, permissive, and neglectful focuses on the significance of responsiveness. Our hypothesis, there is a direct link between enhanced adult resilience and having attentive parents as a child. Using a mixed-methods approach, we collect data on resilience and parenting styles through interviews and questionnaires. The expected results we seem to aim for is a positive correlation between high parental responsiveness and high resilience. The reason for our study is that we believe that resilience is an important trait to have; and we want to have a better understanding on how parents have an influence on that since they are our first direct interaction and have an impact in most of our life.

Serotonin transporter (dSert) mutation in Drosophila melanogaster increases food consumption and starvation resistance

Sadie Oesch with Abigail Forrest, Elaine Miranda Perez

Faculty mentor: Jeff Copeland

> The monoamine serotonin is known to impact human behaviors such as sleep cycles, eating, anxiety, and depression. The reabsorption of serotonin back into the presynaptic neuron is mediated by the serotonin transporter (SERT), the target of citalopram, a selective serotonin reuptake inhibitor (SSRI) used to treat anxiety and depression. We turned to the model organism Drosophila melanogaster to better understand the mechanisms by which serotonin and SSRIs influence behavior. We created a 3.9 kb deletion within the Drosophila SERT (dSert61) gene and tested its effect on larval and adult behaviors. dSert61 larvae consumed 64.4% (p=0.0044) more food than controls, a result also noticed in the dSert16 deletion allele (74.7%, p=0.0004) and the dSert61/dSert61 trans-heterozygote (87.9%, p=0.0003). Adult dSert flies show a dramatic resistance to starvation, a trait possibly linked to increased food consumption. When 10-day-old female adults were starved on 1% agar, dSert61 flies survived 51.1% longer (p<0.0001) and dSert16 flies survived 8.9% longer (p=0.001). dSert61/dSert16 hybrids lived 66% (p<0.0001) longer when compared to Canton-S controls. The effects of citalopram on starvation resistance and adult feeding are ongoing. The results in feeding and starvation give us the opportunity to study the role of serotonin in these behaviors.

Water System Health of Local Streams

Jenna Oostland with William Bartel, Madelynn Hamm

Faculty mentor: Stephen Cessnam

> This project seeks to analyze the health of Blacks Run, a local Harrisonburg stream. We will take multiple samples at different points along the stream as it flows through the city to highlight areas of concern. Our assessment will include pH values, dissolved oxygen (DO), calcium content, electrical conductivity, as well as E. coli (Escherichia coli) concentration. The DO value is important to understand how habitable the water is, as low DO levels can decrease aquatic life's survival rates. Previous issues with E. coli in Harrisonburg's waterways, stemming from agricultural runoff, motivate us to monitor this parameter closely. The pH of these samples will also be able to indicate areas of concern, as acidity poses significant risks to aquatic ecosystem health. These measurements can provide an understanding of the health of one of our local water systems and potentially identify areas of concern for further action.

Copper levels of arugula grown in contaminated soils

Levi Peachey-Stoner with Isaac Miller

Faculty mentor: Laurie Yoder

> This study aims to find the maximum copper level in soil which yields arugula with healthy copper levels for human consumption. Arugula was grown in soils with varying copper levels; representative plants grown in each environment were tested using a BCA assay to determine the level of copper present. The results are compared to healthy dietary guidelines. This is

relevant because gardens with extremely high levels of copper may still support arugula, but may result in foods with high copper levels.

The importance of social media presence and how it leads to growth and brand awareness in business.
Drew Petitt with Alec Riles, Colin Troilo
Faculty mentor: Joohyun Lee

"Social media is a platform that everyone across the globe uses. Social media marketing enables you to attract customers from different parts of the world, helping your business expand globally with less set-up cost, thus proving to be a cost-effective digital marketing technique" (Chugh, 2022). Our study investigates the significance of social media and its impact on brand awareness. To be more specific, this study finds out how colleges can use social media as a tool, using it to their advantage. This can look like branding, engagement, and as a way to share information quickly from anywhere. For this study, we will be using a survey questionnaire with a convenience sampling method. The sample that the data will be collected on is from Eastern Mennonite University (EMU). The goal of our study is to assess how effectively EMU uses their social media platforms for brand awareness not only for existing students but also for alumni and prospective students.

Effect of facility quality on student satisfaction
Chris Santisteban with Bryce Graf, Colby Massengill, Aidan Miller
Faculty mentor: Joohyun Lee

Students come and go from Universities every year.There are many factors that come into consideration when prompted to make a move like that. Campus and facility quality is an essential factor in a student's satisfaction and that is what this study looks to investigate. As campuses grow and change, funds are often invested in facilities and it is important to understand the relationship between these facilities, new and old, to determine the role they play in student satisfaction. These student's satisfaction is recognized as an indicator of the quality of student's learning and teaching experience (Oliver & DeSarbo, 1989 apud Elliott & Shin). It has also been shown that students expectations can influence how they respond to their academic environment which in turn has an impact on their decision as to whether or not they graduate (Bosch, Hester, MacEntee, MacKenzie, Morey & Nichols, 2008; Kuh, Gonyea & Williams, 2005; Pike, 2006).

In order to gain this additional understanding of student satisfaction, we will conduct an online survey across the campus of Eastern Mennonite to determine the satisfaction of campus facilities. Educational institutions, private or public, should investigate campus and facility quality to help determine where resources are best utilized to optimize student satisfaction

Pediatric Toy Project: "Billy the Ball Box"
Jada Schutt
Faculty mentor: Holly Herr Stravers

For our pediatric nursing class, we were given the assignment of making a small toy out of things found around our homes for the age groups that we were assigned. We were told that the toy had to meet all the developmental milestones of the age we were assigned as well as the safety requirements set by "Bright Futures". The age group I was assigned was 9-month-olds. The toy I created was called "Billy the Ball Box", this toy was meant to meet the fine motor milestones of the pincer grasp where the child uses their thumb and two other fingers to pick the balls up out of the box or put them in. I also incorporated verbal development and social play by making the balls colored for the parent or guardian to help them practice sounding out the colors. Lastly, I used gross motor skills because this toy can be played sitting up or working on the child's ability to stand and balance. The child is also able to take the balls out of the box and crawl to it to put the balls back in which also works with gross motor skills. The materials I used to make this toy were an empty tissue box, colorful puff balls, holographic duct tape, and googly eyes to attract the 9-month-old to want to play with it or crawl to it.

Loss-of-Function In The Drosophila Serotonin Transporter (dSert) Gene Changes Sleep and Activity and Decreases Life Span

Marciella Shallomita with Abigail Forrest, Elaine Miranda Perez, Sadie Oesch
Faculty mentor: Jeff Copeland

The monoamine serotonin is known to impact human behaviors such as sleep cycles, eating, anxiety, and depression. The reabsorption of serotonin back into the presynaptic neuron is mediated by the serotonin transporter (SERT), the target of selective serotonin reuptake inhibitors (SSRIs) used to treat depression. We turned to the model organism Drosophila melanogaster to better understand the mechanisms by which serotonin and SSRIs influence behavior. We created a gene knockout of the Drosophila SERT (dSert61) that removes the coding sequence and eliminates mRNA transcription. dSert61 flies show an increase of 144.5% (p<0.0001) in total sleep and 86.5% (p<0.0001) in average activity. dSert16, a 1.1 kb deletion in the promoter region, shows similar in responses in sleep and activity. dSert61/dSert16 hybrids phenocopy the individual dSert61 flies, verifying these two fly strains both these two alleles affect the same gene. Compared to Canton-S control flies, dSert61 and dSert16 have 15.1% (p<0.0001) and 4.2% (p=0.008) shorter life spans, respectively. The fly dSert ortholog will be used further to explore the mechanics of serotonin uptake and its connection to other complex behaviors.

Bioinformatic analysis of cardiac tissue functionality: Implications for the process of bioengineering hearts

Marciella Shallomita
Faculty mentor: Jeff Copeland

Understanding the molecular components that underlie cardiac tissue functionality of Homo sapiens and species which have been utilized in organ transplantation such as Sus domesticus is crucial for advancing bioengineering strategies in heart transplantation. In this study, we utilize bioinformatics tools, including RNA sequencing, gene annotation, and multiple sequence alignment (MSA), to analyze the specific components of cardiac tissue essential for proper

function. Samples are sourced from NCBI BioProject, and analysis is conducted using programs such as Galaxy, UCSC Genome Browser, and Clustal Omega MSA. Our findings have implications in optimizing the repopulation process essential for bioengineering a functional heart. By understanding the molecular makeup of cardiac tissue and its functional significance, this study contributes to the research of organ bioengineering.

Analyzing How Tree Composition Has Changed in Parkwood's Over 24 Years

Evelyn Shenk

Faculty mentor: Doug Graber Neufeld

Parkwoods has been a centralized place on EMUs campus since before it was founded. Over the years this wooded area has shifted and been shaped to what it is now, a 10-11 acre well used natural space on campus. As EMU looks to the future of Parkwoods it is helpful to have an understanding of the ecological shifts that have occurred for the past 20-25 years. This project uses GIS data to observe differences in tree species distribution and composition in Parkwoods from 1999 and 2023. This project focuses on data collected in the eastern section of Parkwoods to provide an analysis of tree species diversity, diameter at breast height and species abundance for both years.

Assessment of Water Quality at Cooks Creek

Evelyn Shenk with Andrew Arledge, Elaine Miranda Perez

Faculty mentor: Stephen Cessna

Water quality is a critical aspect of environmental health. In this study, we investigate the impact of a poultry processing plant on water quality in Cooks Creek. We collected three water samples: one directly adjacent to the plant, and the others approximately 1 mile upstream and downstream. Our objectives are to conduct a turbidity assessment as well as analyzing other contaminants such as heavy metals, nutrients, and organic pollutants that might be present in our samples. After conducting the measurements, we will interpret our findings within the context of environmental chemistry principles by considering sources, sinks, and potential impacts on water quality. Our study will shed light on the poultry plant's influence on Cook Creek water quality. By understanding the contaminants present and their distribution, we can make informed decisions regarding environmental management and protection.

Fencing along agricultural land and its effect on water quality in Augusta County

Chloe Shepard

Faculty mentor: Doug Graber Neufeld

Studies show that agricultural runoff is among the largest contributors to water quality decline along the Shenandoah Valley's streams and rivers, areas contributing to agricultural runoff are those that do not keep cattle out of streams and rivers. This project analyzes the relationship between phosphorus and nitrogen levels in areas with and without fencing along agricultural land.

Effects of copper lever on sunflower growth
Skylar Stevens with Rogelio Cruz
Faculty mentor: Laurie Yoder

> Phytoremediation is the process in which plants remove toxins from the soil. To test the effects of copper on the growth of sunflowers, we added copper to the soil and then planted sunflowers and watched their growth over a period of time. Furthermore, we tested the known copper concentrations, using BCA, in the soil after 6 weeks and found the amount of copper left in the soil from the original concentration. We then took the plant and measured its growth by height and mass.

Analyzing Endemic Clam Species within Southwest Virginia
Madison Stockner
Faculty mentor: Doug Graber Neufeld

> I will be looking at the prevalence and decline of endemic clam species within Southwest Virginia. Water quality is a major influence of clam prevalence in rivers and water systems so by analyzing the water quality of multiple areas in Southwest Virginia will allow me to gain information on the increase or decrease of endemic clam species over recent years.

Building an Affordable Turbidity Sensor
Levi Stutzman with Ivan Betancourt, Myles Dixson, Ben Friesen Guhr, Jonathan Kronimus, Sean Swartley
Faculty mentor: Daniel King

> In collaboration with individuals from EMU Biology, we aim to reconstruct and iterate upon a low cost, open source, turbidity sensor with the ultimate goal of creating a fleet of low cost sensors able to be placed in water networks of interest in and around Harrisonburg. Turbidity is an important measurement of fine sediment transportation in a river, used for measuring the amount of nutrient flow, water quality, and pollution levels. Currently, there are not affordable solutions to create a network of long term monitoring sensors as typical sensors cost several thousand dollars. We aim to create a sensor that can be manufactured for less than $200 dollars. The sensor body will be constructed using cost effective 3D printing technology which allows for easy adaptation of the model during iteration. Currently, the sensor this design is based upon is not created for long term monitoring projects, as this design aims to be. A necessary iteration is the addition of a sensor wiping mechanism that wipes the sensor lens periodically, ensuring consistent measurements. The sensor detects the amount of sediment present in the water using an infrared LED and two infrared sensors. The change in amount of light received is interpreted as the amount of sediment present in the sample, and using known standard water samples, is correlated with NTU measurements. Without the wiper, algae grows on the sensor lens and prevents light from passing through the lens, causing a reading of higher turbidity than reality. The primary objectives of this project are to effectively recreate the existing solution, add a wiper to increase long term usability, and ensure a watertight seal to prevent water leakage from destroying electrical components.

The Impact of Athletic Facilities on Student Satisfaction and Recruitment.

Cooper Thomas with Cole Wallace, Will Waller
Faculty mentor: Joohyun Lee

The purpose of our study is to examine the different impacts that athletic facilities have on student satisfaction and recruitment. Athletic facilities play a large role in the satisfaction of student athletes, as well as any others who utilize the area. Our research method is going to consist of sending out a survey to the students of EMU and asking them to participate in it if they have a few minutes. We plan on utilizing the Likert scale for the questionnaire, as well as multiple choice and a text box for the students to use to voice any remaining opinions. We wish to draw sampling method ideas from a study done by Steven Hirsch. In this study, he sent out a mass email to students of the university containing a survey. Using the results of his findings, he proceeded to examine what should be improved to increase both student satisfaction and recruitment rate. We are going to study the data so that we can determine what students feel should be changed in the facilities.

Crochet stacking bowls and balls

Jenna Weaver
Faculty mentor: Holly Herr Stravers

For this project, I was assigned 12-month-olds. At 12 months old, socially they are working on looking for hidden objects and imitating new gestures. They also verbally use "dada" or "mama" specifically and can say one word other than names. Cognitively, 12 month olds are beginning to follow simple gestures, and also start to understand the concept of object permanence, thus the looking for hidden objects. A 12 month old's gross motor skills will look like taking their first independent steps and standing without support, and with fine motor 12-month-olds are working on dropping objects into cups, picking up small objects with a 2-finger pincer grasp, and picking up food to eat.

I crocheted rainbow colored stacking bowls that fit into each other but can also be stacked on top of each other, and then crocheted matching colored balls to each bowl. The goal of this toy is to especially address the fine motor and social skills categories, but can be used in the others as well. 12-month-olds can drop the balls into the bowls, and can work on picking up the balls with the 2-finger pincer grasp. They can also look for the balls underneath the bowls, using their new cognitive skill of object permanence. Additionally, they can interact with an older child or adult asking them to bring something to them, and can follow those directions while standing and taking a couple steps. I chose yarn and non-allergenic polyfill stuffing for the safety aspects - they can be washed, the balls are big enough that they will not be a choke hazard. In addition, this project can grow with the child as later in their development they can begin to stack the bowls, name the colors, and match the balls to the bowls.

Spinach plants' ability to use phytoremediation with copper

Yuji Wenger with Rosa Martin Fonseca

Faculty mentor: Laurie Yoder

      Phytoremediation is the use of plants to clean up pollution by absorbing contaminants in soil and water. To test this we monitored spinach plants with added copper and without added copper in the soil. We then tested the concentration of copper in the leaf, stem and root of the plants. We analyzed the copper concentration using atomic absorption spectroscopy to determine where the copper accumulated in the plant.

Toddler Train

Rachel Wheeler

Faculty mentor: Holly Herr Stravers

      This project was to create a toy that was developmentally stimulating for an 18-month-old. A 18-month-old is developing and perfecting their gross motor skills, as well as their fine motor skills. They are also learning so many new things so a toy that is mentally stimulating is appropriate to support their development.

      Gross motor skills that an 18-month-old is developing include walking, running and pulling a toy behind them. Fine motor skills this toy develops include placing shapes into the holes and opening the lid of the tub. Social skills that this toy helps develop include imitating other people's actions. For example, putting the shapes into the holes or imitating the caregiver pulling the toy behind them. This toy helps significantly with cognitive development for this age. The child is starting to build their vocabulary and learning their shapes and colors, as well as matching colors and shapes together. Some safety considerations for this toy include choking, strangulation and poisoning. This toy does not have any small pieces so there is not a choking hazard. There are no batteries and the paint is non-toxic so there are no sources of poison from this toy. There is a risk for strangulation with the pull string therefore adult supervision is recommended with this toy.

      For this project I used my nephew's old toy with wheels for the base. I used an ice cream bucket and cardboard from my recycling and some non-toxic paint for the interactive, shapes and colors element. I also attached a string to the front of it to allow for the child to pull it along with them. I picked these materials because they are what I had on hand that would work best for building a developmentally stimulating toy for this age group.

Is it safe to eat copper-contaminated radishes?

Shardae Williams with Andre Mills

Faculty mentor: Laurie Yoder

      Copper (Cu^{2+}) is not harmful in small doses to humans but a large amount can cause sudden (acute) copper poisoning. Adults can consume up to 10mg of copper a day. The purpose of this study is to determine the safety of eating radishes grown in copper-contaminated soil. In this experiment, radishes were grown in different amounts of copper-containing soil and then the copper was extracted from the radishes and measured using an atomic absorption spectroscopy machine. The amount of copper was measured in the radishes and was compared to the safe consumption of copper.

Student Satisfaction of Renovated Fitness Facility

Mara Woolford with Laney Cline, Bryson Hunter

Faculty mentor: Joohyun Lee

> Students' mental health and wellbeing are affected by their physical activity levels. Having a comfortable and easily accessible location to be physically active increases students to be active more often and for a longer period of time (Reed & Phillips, 2005). It has also been shown that a high level of fitness has a positive effect on male and female academic performance (Hou, Mei, Xu, 2020). Some students have different needs when it comes to physical activity which makes them more satisfied with the available resources in the fitness rooms. Undergraduate students need an easily accessible, comfortable environment, and to be satisfied with the machinery provided to be physically active and increase their overall wellbeing and academic performance. Our goal is to determine student satisfaction of fitness areas based on qualities of new renovations and the effects of their wellbeing. We will collect data by sending emails to students, messages in Royal Radar, and QR codes around campus with incentives to increase participation levels.

Anxiety in College Athletes

Sam Yoder with Kate Landis

Faculty mentor: Allison Wilck

> Research indicates anxiety has increased in prevalence in college athletes (Xiao et al., 2017). Male college athletes report feelings of anxiety at a rate of 31%. Female student athletes reported feelings of anxiety at a rate of 48% (Davoren and Hwang, 2014). Multiple factors play a role in athlete anxiety, specifically, exposure to sunshine (Howarth & Hoffman, 1984), pressures on the athlete from teammates and coaches (Gonzáles-Garcia et al., 2022), and course load and grades (James, 2010). This study investigates factors that may have a relationship to athlete anxiety in which there is a gap in the literature; including differences between particular sports, athletes who are in-season versus out-of-season, and if the athlete has a competition that day or not. The design of this study is survey based, utilizing the State Trait Anxiety Inventory and the Sport Anxiety Scale. The sample for this study consists of college athletes at Eastern Mennonite University. Predicted results include higher levels of anxiety on competition days as well as for athletes that are in season. Sports that demonstrate higher levels of aggression and physical contact will likely have heightened anxiety levels.