Participant Abstracts
EMU Academic and Creative Excellence Festival 2025

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

Sleep deprivation among college students

Abenezer Abebe with Yishake Abate, Adelyn Soriano

Faculty Mentor: Joohyun Lee

Sleep deprivation is widespread among college students, dramatically affecting their academic performance, cognitive function, and overall health. Although they know that sleep matters, students prefer to put academic stress, social activities, and personal habits—such as caffeine consumption and screen time—before a consistent sleep schedule. Evidence indicates that chronic sleep deprivation impacts memory storage, reduces the span of concentration, and increases stress levels, ultimately hindering student success (Hershner & Chervin, 2014). This study aims to establish the most important causes of sleep deprivation among college students and analyze feasible solutions to encouraging healthier sleeping habits. Data will be collected through questionnaires completed by undergraduate students, and survey questionnaires will be used to determine an increased understanding of individual sleeping habits and problems. This study will identify the most common barriers to quality sleep by analyzing responses and providing evidence-based recommendations to help students improve their sleeping hygiene. Findings will guide a richer understanding of how lifestyle behaviors, academic pressure, and environmental surroundings influence sleep routines, with significant implications for university policy and student well-being strategies.

References

Hershner, S., & Chervin, R. (2014). Causes and consequences of sleepiness among college students. Nature and Science of Sleep, 6, 73–84. https://doi.org/10.2147/NSS.S62907

The effect of Zingerone on Bactrocera jarvisi (Diptera: Tephritidae)

Ruth Abera

Faculty Mentor: Jim Yoder

Bactrocera jarvisi is a fruit fly native to Australia and a major pest of crops like papaw, mango, banana, peach, and guava. Males of this species are strongly attracted to zingerone, a compound found in ginger, which suggests it may affect their behavior.This study examined how zingerone influences B. jarvisi through three main assays: (1) Mating Assays to see if zingerone affects male mating success, (2) Survival Assays to check if it impacts their lifespan, and (3) Chemical Footprint Analysis using Gas Chromatography-Mass Spectrometry (GC-MS) to detect changes in the chemicals on their bodies and in their waste. Adult flies were divided into three groups: control males, zingerone-fed males, and females.The results of this study provide valuable insights into how zingerone affects the behavior and physiology of B. jarvisi. These findings could

help develop better pest management strategies for controlling fruit fly populations in agriculture.

Integrating genomic and Bioinformatics approaches to identify gene-drug interactions in pancreatic cancer

Ruth Abera with Bethel Abiy, Elaine Miranda Perez

Faculty Mentor: Stephen Cessna

Pancreatic cancer is highly aggressive and difficult to treat. This study uses data from The Cancer Genome Atlas (TCGA) to explore how specific genes interact with drugs used in pancreatic cancer treatment. We analyzed BRCA1, BRCA2, CDKN2A, and TP53, which play key roles in DNA repair, cell cycle regulation, and tumor suppression. Using Cytoscape for network analysis and SwissTargetPrediction for drug target identification, we examined how these genes interact with gemcitabine and erlotinib, two common pancreatic cancer drugs. Our findings highlight important gene-drug relationships that could help improve targeted therapies. This study demonstrates how integrating genomic data with bioinformatics tools can provide new insights for more effective pancreatic cancer treatments.

Understanding the perception of spaces among commuter students

Furtuna Abraha with Claire Koontz, Anisa Sharhabeel

Faculty Mentor: Joohyun Lee

Commuter students at EMU have a harder time finding a space for just themselves and other commuters to come and go as they please. Our study is to gain insight into how they perceive and utilize these spaces is essential for improving their academic performance and overall university experience. Understanding the perception of spaces among commuter students at EMU is the basis of this study and the goal is to find a solution to this problem. We want to help find the specific challenges commuters face when it comes to finding a space for themselves and find a solution to this problem. Through a survey and convenience approach, we hope to contact students both commuter and live on-campus students to take this short survey and share their thoughts about the lack of space they have and how EMU can make a difference in these commuters' academic lives. To achieve these objectives, a mixed-methods approach will be used, incorporating surveys and interviews with at least 50 students from diverse academic backgrounds. Participants will be recruited through campus email lists, and student organizations, using a convenience sampling method. Insights from Campus Engagement Tip: Create a Commuter Orientation by Ashley Mowreader highlights effective strategies implemented at the University of Minnesota, such as modifying orientation programs, offering specialized commuter programming, and providing commuter assistants as mentors. This article is a fantastic way to help commuters on campus but doesn't solve their problem of finding a space for them. This research will analyze how similar initiatives could be applied at EMU to enhance commuter students' experiences and help to understand how to find better ways to create a space for our EMU commuters.

Mowreader, A. (2022, July 22). Building commuter connections during college orientation. Inside Higher Ed | Higher Education News, Events and Jobs. https://www.insidehighered.com/news/student-success/college-experience/2024/07/22/building-commuter-connections-during-college

Bridging communities: Constructing a suspended footbridge in Eswatini

Mariana Acosta with Levi Stutzman
Faculty Mentor: Daniel King

This project highlights the design, construction, and cross-cultural experiences involved in building a pedestrian suspended bridge in Sithobela, Eswatini. As part of a student-led collaboration with Engineers in Action, our team—comprising students from the University of Southern Indiana, the University of Iowa, and Eastern Mennonite University—worked alongside local community members to construct a 108-meter-long bridge over the Mhlathuzane River. The bridge now provides safe passage for approximately 3,000 people, connecting homesteads to essential resources such as a primary school and markets when the river floods. This presentation will detail the engineering design of the bridge, construction challenges, and the meaningful cross-cultural connections formed throughout the eight-week project.

Reactive oxygen species (ROS) production in white blood cells (WBCs)

Mina Adu-Newman with Cora Cozia
Faculty Mentor: Kristopher Schmidt

White Blood Cells (WBCs) generate Reactive Oxygen Species (ROS) as part of their immune defense through a process called the respiratory burst. During this process, WBCs rapidly produce ROS to combat pathogens. The production of ROS during respiratory burst is a key mechanism in immune defense, but bacteria can also generate ROS and possess mechanisms to resist oxidative stress. This experiment investigates the impact of different reagents on ROS production in WBCs and bacteria. We isolate WBCs from heparinized blood samples, wash them with saline, and use Nitro-blue tetrazolium (NBT) staining to assess ROS production. The experimental conditions include exposure to water (control), E. coli, and lipopolysaccharide (LPS). Since NBT is a colorimetric assay, increased ROS production will be indicated by a color change rather than fluorescence. We hypothesize that E. coli exposure will enhance ROS production in WBCs, leading to increased NBT reduction and a darker formazan precipitate, while minimal color change could indicate a weakened oxidative burst and potential immune dysfunction. Additionally, we will assess ROS production in bacteria alone to determine their contribution to oxidative stress.

Is extra strength liquid gel Advil as good as advertised?

Rin Akinotcho with Donovan Glymph
Faculty Mentor: Laurie Yoder

This experiment aims to determine the dissolution difference between gel coated tablets and extra strength solid tablets. The concentration of medicine helps determine how quickly it dissolves when ingested and how quickly it spreads throughout the body. The experiment will be two dissolution stations being simultaneously set up with constant conditions, and will determine how long the tablet takes to dissolve to simulate what happens within the body, and if the extra strength has qualities that make it more diverse compared to regular extra strength tablets. The water concentration will be measured with a spectrometer every 10 minutes, with

samples being taken from the dissolution solutions, with the water volume being replaced to be constant throughout the experiment.

How does the pH of a beverage affect ibuprofen dissolution?

Ephrata Amare with Melissa Miller

Faculty Mentor: Laurie Yoder

The aim of our experiment is to determine if the pH of the beverage used to take medication will affect the dissolution time. For this experiment we will use ibuprofen liquid capsules and soak them in common beverages of various pH's and evaluate the dissolution time using spectrophotometry. This is important because many people take medications with beverages other than water and it could impact the breakdown of the coating.

Bicycle power generator

Zander Armstrong with Nick Arnold, Renae Benner, Carter Cashin, Benjamin Huyard

Faculty Mentor: Daniel King

The purpose of this project is to repair and optimize an old bicycle generator from a previous project. The mechanical power that the rider produces will be fed into the grid as electrical power and power a tablet that is mounted on the bicycle.The generator will have multiple gearing options for difficulty options. The tablet will track the amount of power that the riders produce. Finally the tablet will display a leader board showing who has produced the most power.

Exploring the particle in a box model with cyanine dyes

William Bartel

Faculty Mentor: Stephen Cessna

This project will be looking at the particle in a box model to explain absorption of light in conjugated carbon chains. Cyanine dyes contain this conjugated chain between two nitrogen ends, but the dyes used in this project have benzene rings as well, making the size of the box more difficult to estimate. I will look at using 1 dimension, 2 dimensions, and 3 dimensions in order to find the most accurate representation of these 2 molecules.

Mindfulness and goal setting on stress among STEM students

Amiah Carter with Isabelle Fraher, Jayla Gray

Faculty Mentor: Allison Wilck

This study explores the impact of mindfulness and goal-setting practices on stress levels among STEM (Science, Technology, Engineering, and Mathematics) students. Due to the high academic pressures and the demanding nature of STEM programs, students in these fields often experience elevated stress, which can negatively affect their academic performance and overall well-being. Mindfulness, a practice of paying focused attention to the present moment, and goal-setting, setting specific and measurable goals, using these in hopes to be able to reduce stress. The research investigates whether the mindfulness practices and goal setting interventions can significantly reduce stress level in STEM students. The results suggest that mindfulness practices and goal setting interventions will decrease the stress level of STEM students.

Antioxidants in different Arizona drinks

Sebastian Clemente with Ricardo Fernández

Faculty Mentor: Laurie Yoder

Antioxidants are essential products to our health, with this experiment we will be seeing the amount of antioxidants in different flavors of Arizona drinks to see how healthy or unhealthy they are. We will be doing FRAP assay on three drink flavors: green tea, half and half lemonade and ice tea and mucho mango. Using the absorbances to determine their antioxidants. This experiment is essential for the understanding of the health benéfits of commonly consumed beverages and help the consumer know the health valúes of the drink.

How do parenting styles influence academic motivation?

Gracie Conner with Hayden Winston

Faculty Mentor: Allison Wilck

The following study explores the influence of parenting styles on academic motivation in college students. The study looks into the types of parenting styles that college students have been raised with, as well as their current academic motivation to succeed in college. Previous research has been conducted; however, research focuses on the effects of parenting styles on children, opposed to young adults. High academic motivation is most associated with authoritative parenting styles in children. The current study's hypothesis is that high academic motivation will also be associated with authoritative parenting styles in young adults. The study was conducted using a modified version of the Parental Styles and Dimensions questionnaire and the Academic Motivation Scale - College Version. The results of this study are important to research because it allows for students to understand why they are motivated to further their education, as well as contribute to future research on how to increase academic motivation in young adults.

Effects of temperature, caffeine, and Escitalopram Oxalate on gastrocnemius muscle contraction of a Lithobates Pipiens

Logan Darrow with Andrew Arledge, Maggie Groetsch

Faculty Mentor: Kristopher Schmidt

Muscle contraction is an important part of the physiology of movement. The mechanism of the muscle contraction uses many different molecules and receptors to signal and perform the contraction. Temperature has been seen to affect muscle contraction speed and force output. Caffeine and Escitalopram Oxalate can affect the signaling and muscle contraction. Our experiment aims to understand how these drugs and temperature interact and affect the speed and strength of muscle contractions. We are particularly interested in the effects of these drugs on athletes and these are prevalent in the world of athletics.

To perform this experiment, we will use Lithobates Pipiens (Northern Leopard Frogs) and dissect the gastrocnemius. Then we will use a force transducer and stimulators to measure the muscle contraction strength and speed. We will introduce warm, cold, and room temperatures, caffeine (warm, cold, room temp), and escitalopram (cold, warm, and room temp). We will measure the tetanus muscle contractions because they are the most prominent in athletes. We expect to learn that cold temperatures will lessen speed and force. We expect to see warm temperatures increase speed and force of muscle contraction. We expect the combination of

caffeine and cold to cancel each other's effects. We expect the caffeine at high temperatures to give us a significant increase in muscle force and speed. We expect cold temperatures and Escitalopram to cancel each other's effect. We expect warm temperatures and Escitalopram to increase muscle contraction. We expect escitalopram to prolong tetanus when compared to the caffeine conditions. When combining caffeine and escitalopram it will increase the peak of tetanus and prolong tetanus.

This experiment should give us a better understanding of muscle contraction when involved with different temperatures and drugs.

Comparing the antioxidant capacity of store-bought vs farmer's market fruits

Bennett de Tenley with Emily Donovan
Faculty Mentor: Laurie Yoder

Recently people have become more health conscious with their foods, so we decided to test whether fresh fruits from a farmers market had more antioxidants than store bought fruits. We will do this by extracting juice from strawberries then diluting and use FRAP assay to determine the antioxidant levels in each of the fruits. We expect to get different antioxidant levels in our fresh fruits and store bought.

The impact of athletic competition on stress and anxiety levels

Libbie Derstine with Natalye Graham, Morgan Leslie, Alex Palizzi
Faculty Mentor: Allison Wilck

In previous studies, researchers have examined both the physiological and psychological effects of stress on student-athletes. However, there are still gaps in understanding the differences for non-athlete students. This study aims to further examine the impacts of watching athletic competitions on stress and anxiety to fill in some of the gaps in the literature. We hypothesize that when participants are presented with a video clip of a high-intensity moment in an athletic event, that will lead to higher self-reporting anxiety scores and higher heart rate variability. In the current study, participants will watch one of three researcher-created clips of athletic competition while having a heart rate monitor on their finger. In addition to watching the assigned video, participants will complete the State-Trait Anxiety Inventory (STAI) two times. The sample consists of students currently enrolled at Eastern Mennonite University, varying in athletic background from no experience to current collegiate athletes. From this study, we anticipate that the information gained will lead to a further understanding of athlete mental health, specifically self-reporting anxiety. Understanding and paying attention to the psychological and physiological impacts of athletics on student-athletes could help lead our society to more efficient and effective mental health interventions.

Keywords: stress, anxiety, heart rate variability, athletic competition

Mystery sensor box

Odesa Elezi
Faculty Mentor: Holly Herr Stravers

The Mystery Sensory Box was created for 18-month-old toddlers to enhance their fine motor, gross motor, social, and cognitive skills using simple, household materials.

At 18 months, children refine their fine motor skills by grasping, pinching, and manipulating objects, while their gross motor abilities improve as they reach, pull, and explore their surroundings. Socially, toddlers begin to engage in interactive play, learning through communication and shared activities with caregivers. Cognitively, they develop problem-solving skills, explore cause and effect, and start categorizing objects based on sensory input.
The Mystery Sensory Box stimulates these areas by encouraging toddlers to reach into the box, feel hidden objects, and guess their textures and shapes. This action strengthens fine motor coordination and problem-solving abilities while fostering curiosity and engagement. Social interaction is promoted as caregivers guide the child through exploration, asking questions like "Is it soft or hard?" or "What do you feel?"

Safety was a primary concern in the toy's design. The box features smooth edges, securely attached fabric, and non-toxic, age-appropriate objects that are large enough to prevent choking hazards. The materials used ensure durability while maintaining a safe, interactive, and educational experience. The Mystery Sensory Box successfully combines play and learning, making it an ideal developmental tool for toddlers.

Physical activity and effects on student well-being

Damien Fisher with Pierce Donnelly, Tyler Thompson

Faculty Mentor: Joohyun Lee

Physical activity is a key factor in promoting overall well-being, yet many college students face challenges in maintaining a consistent exercise routine due to academic pressures and social obligations. Despite the availability of gym facilities on college campuses, the impact of gym participation on students' mental health, academic performance, and physical health remains unclear. This study aims to explore the relationship between gym usage and its effects on students' well-being, specifically focusing on its influence on stress levels, academic success, and physical health. Additionally, the research seeks to identify strategies to increase gym participation among college students. The study will utilize surveys to gather quantitative data on gym usage, stress levels, and academic performance. Convenience sampling will be used to select a sample of students who are easily accessible to the researcher, ensuring a practical and efficient approach to data collection. The findings of this research will provide valuable insights into the role of physical fitness in college students' lives and inform strategies for promoting healthier lifestyles on campuses. By identifying effective interventions, this study aims to encourage greater gym participation and enhance student well-being.

FRAP analysis of O2 oxidation in CyanthOx antioxidant solution

Dante Flowe with M. Lashway

Faculty Mentor: Laurie Yoder

Antioxidants are reducing agents that protect the body from oxidative stress. Molecular oxygen has a tendency to form free radicals such as superoxide (O2). This is one form and will be introduced to a solution of containing antioxidants over a set period of time. By utilizing FRAP assay we will determine the effects of oxidation and we expect to find lower FRAP values with extended exposure to O2. This experiment will show the rate at which the antioxidants will deteriorate thus determining the importance of timing in consumption of antioxidants.

Toy project for 9-month-old

Abigail Foltz
Faculty Mentor: Holly Herr Stravers

This toy project I made supports important developmental milestones in fine motor, gross motor, social, and cognitive skills for a 9-month-old baby. Given that babies at this age are naturally curious and want to investigate their surroundings, the project includes two toss boxes and sensory balls. This toy encourages development in a variety of domains while fostering engagement through active play. To gain a better understanding of this age group, 9-month-old infants practice their fine motor skills by manipulating objects, transferring objects between hands, and developing the pincer grasp. As they crawl, sit unsupported, and reach for objects, their gross motor skills improve. Infants socialize by interacting back and forth, identifying familiar faces, and starting to express toy preferences. Understanding object permanence and fundamental problem solving techniques help develop cognitive abilities. For this reason, I made the toss boxes and sensory balls target these developmental domains. Grasping and manipulating the balls helps to improve fine motor skills. Infants' ability to reach, crawl, and toss the balls support their gross motor skills. Playing interactively with caregivers help children develop social skills by encouraging turn-taking and communication. Cause and effect learning and sensory exploration promotes cognitive development which I why I added the animals and mirrors. The most important factor I considered is safety. The sensory balls are big enough to keep infants from swallowing the. Each toss box should be inspected before play time to ensure everything is securely attached. In order to guarantee safety and promote constructive interaction, they toy should be supervised. This toy offers a fun, safe, and developmentally appropriate play experience that encourages development in several important areas.

Knockdown of Cox6b (Complex IV) and ATPsynβL (Complex V) of the electron transport chain in Glutamate Neurons increases sleep and lifespan of Drosophila

Abigail Forrest with Maria Longenecker, Elaine Miranda Perez, Marciella Shallomita
Faculty Mentor: Jeffrey Copeland

RNAi targeting the electron transport chain (ETC) has been proven to prolong life span in many different species, including within Drosophila melanogaster. In previous studies, when RNAi was activated against genes of Complex I and V in glutamate neurons, life span was extended and sleep increased regardless of using the D42- or VGlut-GAL4 driver lines. Sleep and locomotor activity patterns were observed in glutamate-specific ETC RNAi in male flies aged 5 days and 30 days to determine the correlation between activity and aging. The results of this study contribute to the growing understanding of biological mechanisms influencing aging, specifically the role that Complexes IV, and V have on lifespan extension.

Tylenol liquid-gel versus regular strength dissolution rates

Ryan Gimbel with Cole Jordan
Faculty Mentor: Laurie Yoder

Drug dissolutions testing is used for comparing different drug substances and evaluating drug release to ensure bioequivalence. In this experiment, our goal is to determine whether liquid-gel tablets are more or less effective than solid tablets in releasing medicines. To do this, we will use a standard dissolution method. This method uses a magnetic stirrer that acts similarly to the

human stomach to dissolve different substances. In this experiment, We will compare the dissolution rates between types of pill. Using this data, we can make a data-driven hypothesis on how either one could be better for a quicker dose of pain relief.

The difference in dissolution between a newly formulated drug and one past its expiration date.

Holand Girmay with Maryam Jaf

Faculty Mentor: Laurie Yoder

Drug dissolution is a critical process in which a solid drug substance dissolves in a liquid to form a solution. This process is essential for optimal drug absorbance and bioavailability.This experiment's goal is to determine whether there is a difference in the dissolution rates between a newly formulated Tylenol and one that is expired. In effort to test this process we will assemble the dissolution apparatus, prepare six Tylenol sample tablets and perform the kinetic measurements then finish off by measuring the absorbance of the solution as a wavelength of 330 nm. We will analyze our data to determine whether there is a difference in the new Tylenols active ingredients compared to the experiment. This technique can help consumers save money and improve their knowledge on the effectiveness of the drug.

Pancake printer

Isaac Greenleaf with Dylan Diener, Micah Mast, Noah Sanderson

Faculty Mentor: Daniel King

The Pancake Printer takes user input to print a pancake. The printer moves an extrusion tube which pushes out pancake batter onto the hot plate. This is achieved by two stepper motors moving the tube along different axes. The user moves a joystick to move the tube to the desired position and pushes a button that tells the pump when to extrude pancake batter. This project enhances a previous student pancake printer project, with goals of improving speed and consistency of the batter flow. Axial movement speed is improved by switching from a screw to belts and switching from an Arduino logic controller to a Raspberry Pi, which allowed for multiple motors to run at the same time. Flow consistency is improved by switching to a pump-based extrusion system. The Pancake printer was revamped by Dylan Diener, Isaac Greenleaf, Micah Mast, and Noah Sanderson.

Bravo Cleaning Services: finalized strategic blueprint

Emanuel Habte

Faculty Mentor: Lindy Backues

This project plays a significant role in my capstone course, Strategic Leadership in Organizations. By focusing on drawing knowledge from various courses such as management, economics, finance, and marketing, my capstone course aims to form a comprehensive strategic plan for an organization. By using content from previously mentioned courses and more, my project aims to equip Bravo Cleaning Services, a cleaning company based in Harrisonburg, Virginia, with a finalized strategic planning document. The project follows six structured milestones, with each contributing to the creation of the strategic plan.

The process begins with a PESTLE analysis, evaluating external political, economic, social, technological, legal, and environmental factors that influence the business environment, and

identifying the factors affecting Bravo Cleaning Services. Next, a mission statement is crafted to define Bravo Cleaning Services' core purpose, values, and long-term vision beyond making profit. Building on this foundation, organizational goals are established, providing broad guidance. These goals are then translated into specific, measurable strategies that align with the company's mission and operational objectives. The plan further explores marketing and promotional strategies, identifying the most effective ways to expand market reach and customer engagement. Finally, a break-even analysis is conducted to assess financial feasibility, ensuring that Bravo Cleaning Services' growth strategies are backed by sound financial planning.

Stress and sugar: How cortisol affects Hhypoglycemia and glucose recovery in Danio rerio.

Gracianne Hall with Sierra McVey

Faculty Mentor: Kristopher Schmidt

Glucose homeostasis is tightly regulated by hormonal interactions, with cortisol playing a critical role in the physiological response to metabolic stress. This study investigates the effects of exogenous cortisol exposure on insulin-induced hypoglycemia and glucose recovery in zebrafish (Danio rerio). Adult zebrafish will be divided into four groups: a control group, an insulin-treated hypoglycemia group, a cortisol pre-treated group followed by insulin exposure, and a cortisol pre-treated group subjected to insulin-induced hypoglycemia with subsequent glucose rescue. Hypoglycemia will be induced via immersion in insulin, and glucose recovery will be facilitated by transferring fish to a glucose solution. Cortisol pre-treatment will be administered via water immersion for 24 hours prior to insulin exposure. Behavioral responses, including swimming activity and erratic behavior will be measured. This study will provide insight into the interaction between stress hormones and metabolic regulation, contributing to a broader understanding of endocrine control of glucose homeostasis.

Using transcriptomics to understand chronic infections in the Nematode Caenorhabditis elegans

Belen Hernandez Rosario with Angelica Escano, Jennifer Perera

Faculty Mentor: Kristopher Schmidt

Caenorhabditis elegans is a small free-living nematode, approximately 1 mm in length, that possesses the ability to respond to infections by altering gene expression. RNA profiling and exon usage analysis provide insight on how C. elegans responds to the chronic infections at a transcriptome level. We will identify how gene expression changes in a chronic infection model. RNA was extracted from C. elegans following a chronic exposure of 24 hours with Pseudomonas aeruginosa (Nakad, 2016) with a high-throughput sequencing being performed and the amount of final RNA expression was studied. We hypothesize that chronic exposure will induce significant changes in RNA expression, including upregulation of immune response genes, stress response pathways, and downregulation of genes associated with growth and reproduction, compared to uninfected controls. Gene Ontology (GO) analysis combined with RNA expression profiling helped identify how C. elegans adapt to chronic infection, ensuring survival through immune regulation, stress response, and immune system balancing. KEGG (Kyoto Encyclopedia of Genes and Genomes) pathway analysis will provide information about signaling pathways involved in immune response while exon differences between conditions, like acute vs chronic, reveal how gene expression is refined by RNA processing. We test at least one gene candidate

using the model invertebrate C. elegans to determine if it is protective against Pseudomonas aeruginosa.

Capsaicin spice consumption on metabolic function: Cardiovascular and urinary measures
Luz Hernandez Rosario with Dulce Shenk Zeager
Faculty Mentor: Kristopher Schmidt

Capsaicin is the chemical in spicy products that human receptors can sense as heat. Our study aims to better understand the relationship between capsaicin and its effect on the human metabolic processes. Previous findings suggest capsaicin accelerated metabolic functions leading to activation of thermogenic responses. We will assess changes to the cardiovascular and urinary systems following capsaicin consumption treatment. A stimulated metabolic rate will result in our cardiovascular measures to also be increased leading to uptake in the urinary system. Metabolic function will be assessed by measuring body temperature, and characteristics of urinary samples such as specific gravity, pH, and protein concentrations. Cardiovascular health will be monitored through blood pressure measurements and heart rate throughout the experiment. After all data is collected, analyzing the values will determine if capsaicin spice consumption stimulated or decreased the metabolic response and influencing cardiovascular and urinary measures.

The effects of regular exercise on cardiovascular health and cortisol levels in young adults
Christina Hilaire with Taylor Daniel, Angelica Escano
Faculty Mentor: Kristopher Schmidt

Cardiovascular diseases (CVDs) continue to be a major source of morbidity and mortality, and their prevalence has been increasing worldwide. However, research indicates that regular exercise is essential for reducing a number of cardiovascular disease risk factors, including high blood pressure (BP) and an excessive resting heart rate (HR). the physiological processes behind this preventive effect are nor well known, particularly in young adults (18-30 years old), who might benefit from early therapies even when they do not yet show clinical signs of cardiovascular disease. The body's reaction to stress is mostly controlled by cortisol levels, a stress hormone that affects cardiovascular and metabolic health in addition to blood pressure and heart rate. Increased blood pressure and other cardiovascular risk factors are linked to long-term increases in cortisol. Frequent exercise has been demonstrated to control cortisol levels, which may help to enhance cardiovascular health. The purpose of this study is to look into how regular exercise affects young, otherwise healthy adults' blood pressure, heart rate, and cortisol levels. We will contrast non-athletes who lead sedentary or low activity lifestyle with athletes who participate in moderate to high-intensity physical activity. The objective is to determine whether exercise can be utilized as a preventive measure for cardiac disease and stress-related diseases, as well as how different exercise parameters (frequency, intensity, and duration) affect these physiological markers.

Can the human podocyte be regenerated?
Adesola Johnson with Catherina Krabill
Faculty Mentor: Stephen Cessna

The podocyte cells make up the main filtration unit of the kidney glomerulus. Several kidney diseases have been related to podocyte injury/loss, making it important for us to study podocyte function. The podocyte is made up of epithelial cells that can regenerate, creating the question: Can the human podocyte successfully regenerate? This research aims to study the mechanisms that govern podocyte development and possibly regeneration in human adults.

Race to relief: Which tablet dissolves faster-gel or firm tablet?

Apekshya Karki with Isaac Miller

Faculty Mentor: Laurie Yoder

When we take medicine for pain, we want it to work as fast as possible. This study looks at whether Advil gel tablets or firm tablets dissolve faster in simulated body fluid. The way we will test this is by using the dissolution-apparatus. For 90 minutes we will take tests in increments of 5 minutes and test the absorbance in the spectrometer. The data that we get will help us understand the drug release over time.

The effects of energy drinks on physical activity

Ben Knutsson with Ariam Addisu, Chris Polymeropoulos

Faculty Mentor: Joohyun Lee

Energy drinks are popular among athletes and fitness enthusiasts due to their potential to improve performance, endurance, and focus. However, their effects on weightlifting are controversial, with concerns about dehydration, increased heart rate, and energy crashes (National Library of Medicine). Some studies suggest caffeine can boost strength, while others warn of long-term health risks and tolerance buildup (Healthline). This study aims to explore the short-term benefits and potential drawbacks of energy drinks on weightlifting performance. We decided to conduct this research to determine the effect of energy drinks on strength and power output in weightlifting, examine whether energy drinks improve endurance and reduce fatigue during weightlifting, and assess the potential negative side effects of energy drink consumption. We are going to do an in-person survey of athletes in the weight room after their workout is complete. We are going to ask them how caffeine effected their workout, both positively and negatively.

https://www.healthline.com/nutrition/caffeine-and-exercise

https://pmc.ncbi.nlm.nih.gov/articles/PMC8401129/

Effects of D. stramonium on C. elagans behavior and motility

M Lashway with Ben Perkin

Faculty Mentor: Kristopher Schmidt

The nightshade D. stramonium contains certain alkaloids, such as atropine, scopolamine, and hyoscyamine, that function like acetylcholinesterase (AChE). To analyze the effects of these alkaloids on neuronal transmission, we will create ethanol extracts of varying concentrations of D. stramonium in addition to certain standard solutions and introduce them to C. elegans. From there, we will analyze the movement of these C. elegans with ImageJ (NIH) software to observe the alkaloids' impact on neuronal transmission. Because these alkaloids depress neuronal transmission, we expect the experimental groups of C. elegans to move less than they normally would. Once we understand the effects of these alkaloids on C. elegans, we will be able to

make assumptions about how D. stramonium could be used as an ACh inhibitor in human beings.

Improved methods of eDNA detection of salamanders using probe-based qPCR analysis

Aja Laun with Kai Peachy-Stoner, Ella Richer
Faculty Mentor: Doug Graber Neufeld

Environmental DNA (eDNA) comprises segments of DNA shed by various organisms in the environment. Collecting water samples and isolating the DNA in the sample makes it possible to determine whether a species resides in the sample location, especially through the use of more precise techniques like probing.

When searching for Hellbenders (Cryptobranchus alleganiensis) this past fall, DNA detection was possible down to 200 copies of eDNA in a sample, while Tiger Salamander (Ambystoma tigrinum) detection reached 2 copies of eDNA in a sample. Detecting DNA in such a low concentration means that very small amounts of eDNA that were left behind could be detected in the water. Due to contamination in the Hellbender sampling bottles, detecting their traces of DNA was more ambiguous. In contrast, the triplicate analysis showed no detection of Tiger salamanders, demonstrating the precision of our updated contamination control and reducing the likelihood of false positives. This year sampling sets up reliable methods that will aid future research in yielding more positive results in future semesters and improve detection.

White blood cell count, subtypes, and resting heart rate: A comparison of athletes and non-athletes

Tiffany Lear with Hothiafa Abusamra
Faculty Mentor: Kristopher Schmidt

White blood cell (WBC) count and resting heart rate are key physiological markers influenced by various factors, including physical activity. While exercise is known to impact cardiovascular and immune function, the extent to which athletic status correlates with differences in WBC count and heart rate remains an area of interest. This study aims to investigate the relationship between athletic status and variations in WBC count and resting heart rate by comparing individuals who regularly engage in athletic activities with those who do not. A total of 10 participants (5 athletes and 5 non-athletes) were recruited for this observational study. Resting heart rate was measured after a 5-minute seated rest, and venous blood samples were collected for WBC analysis using a microscope The study included negative controls (healthy non-athletes with no recent infections) and positive controls (individuals with known acute infections) to ensure the accuracy of WBC measurements. Data were statistically analyzed to determine correlations between athletic status, WBC count, and resting heart rate. It is hypothesized that athletes will exhibit lower resting heart rates due to enhanced cardiovascular efficiency and may display either increased or decreased WBC counts depending on the immunomodulatory effects of chronic exercise. This study seeks to provide insight into how regular physical activity influences immune and cardiovascular markers. The findings may have implications for understanding the role of exercise in immune regulation and overall health. Further research with larger sample sizes and additional physiological markers is recommended.

Physiological response to pain: Male and female pain tolerance under cold stress

Maria Longenecker with Alex Belisle, Kate Stutzman
Faculty Mentor: Kristopher Schmidt

The brain-body connection is undeniable, and outside stimuli clearly illustrate this. This connection is particularly noticeable when looking at pain tolerance. Historically, women have been excluded from pain studies due to theories about hormonal impacts. More recently, however, this notion has been challenged, and there is significant debate about the difference in pain tolerance between sexes. This study investigates and compares physiological and cognitive responses to pain in male and female populations. To test the human pain response, college-age participants' hands were placed in ice water baths while their pain threshold, cardiac function, and brain function were measured. These parameters were measured to observe the differences in male and female participants' response to pain. Cardiac output was measured using electrocardiogram (EKG) and pulse oximeter technology, while electroencephalogram (EEG) technology was used to look at alpha, beta, and gamma waves. In comparing these activity levels, alongside the pain and temporal threshold observed while participants withstood the pain itself, conclusions may be drawn about such differences in pain tolerance between male and female participants.

Melatonin dissolution showdown

Maggie Mayhew with Abigail Fitzgerald
Faculty Mentor: Laurie Yoder

This study investigates the dissolution rates of melatonin gummies and tablets to determine which form dissolves more efficiently and how this may impact absorption and effectiveness. To achieve this, a controlled dissolution experiment will be conducted using a magnetic stir bar to simulate digestion. Gummies and tablets will be placed in a buffered solution (pH 6.7), and their breakdown will be measured at specific time intervals to analyze dissolution kinetics. It is expected that gummies will dissolve more quickly due to their gelatinous composition, while tablets may take longer but provide a more sustained release. Understanding these differences can help consumers make informed decisions based on their needs, whether for faster absorption or prolonged effects. Additionally, this research contributes to broader pharmaceutical studies that could further knowledge of medicine breakdown, specifically melatonin, including methods of consumption that are better fit for the body.

Anticipation vs. ambush: Investigating stress responses to expected and unexpected tasks

Arianna McDonald with Priscilla Asiedu, Kaitlynn Hammond
Faculty Mentor: Kristopher Schmidt

Stress reveals our body's response patterns to adversity, offering insights into our physical and mental thresholds. When exposed to stress excessively, the way in which our body responds can have potential detrimental effects. Long-term consequences lead to chronic activation of these stress responses, leading to significant health implications. Risks include cardiovascular disease, digestion issues, and depression in the immune system. In this study, we aim to investigate how stress triggers physiological responses such as jaw clenching, increased heart rate, and elevated blood pressure. By measuring these responses, we seek to simulate a stressful environment and observe its negative effects on the body.

To carry out this experiment, we will obtain a group of 10-15 participants. These participants will be divided into two groups. The first group will be informed about the tasks that they will be participating in while the second group will not be informed. To begin the experiment, the participants in both groups will take a survey about their perceived stress. We will obtain measurements of heart rate, blood pressure, and jaw clenching through an EMG. Once the equipment is placed on the participants, they will be given meditation time to relax before the task begins. Afterwards, baseline measurements will be obtained. These tasks will consist of timed math questions and a critical thinking passage. The second group will be given the task unexpectedly. Measurements will be collected while the task is being completed. We expect to find an increase in heart rate, blood pressure, and jaw clenching. We predict that participants who receive advance information about the upcoming task will demonstrate a more pronounced stress response. This enhanced reaction is expected to occur through a feedforward mechanism, where anticipatory knowledge triggers physiological stress responses before the actual stressor is encountered.

Analysis of homemade kombucha.

Elaine Miranda Perez with Seungmin Cha, Whitney Showalter

Faculty Mentor: Stephen Cessna

Kombucha, also known as “fermented tea,” is widely consumed across the world for its health benefits and usually made in domestic environments. Home brewers rarely have a qualitative picture of what their kombucha contains. We will be using a variety of analytical chemistry techniques to evaluate different components of kombucha. We plan to measure the pH, alcohol level, and caffeine content of locally made, non-commercial kombucha. We will compare methods such as infrared spectroscopy, UV-VIS and HPLC and evaluate their efficacy for this use.

Dissolving rates in chewable vs. effervescent Vitamin C tablets

Farrah Mohammed with Sarkawt Hamad

Faculty Mentor: Laurie Yoder

Vitamin C is a vital component of the body's needs for many functions, making it a popular supplement. The supplement comes in the form of two main tablets that are chewable or effervescent which have very different dissolving rates. A dissolution apparatus will be set up to test the rate of dissolution in both different tablets then later tested with a FRAP solution to test concentration in two minute intervals. With further research, this experiment can be used to increase the dissolution rate of other vitamins.

Strategic plan for Weaver's Floor Covering

Levi Myers with Isaac North-Sandel, Aidan Weaver

Faculty Mentor: Lindy Backues

This project outlines a strategic business plan put together specifically for Weaver’s Flooring America. The company operates in Harrisonburg, Virginia, and specializes in sales and installation of flooring products. Specific steps were taken to analyze the environment Weaver’s operates in, identify a mission and clear goals for the organization, provide a strategy to measurably reach these goals, determine sectors for marketing, and perform a break-even analysis. This process relied on direct communication with leadership of Weaver’s Flooring America throughout the

project. The findings of this project were given to Weaver's Flooring America in the hopes of deepening understanding of the Weaver's market position and opportunities and threats.

Using applied genomics to understand lymphocyte function

Ethan Neufeld

Faculty Mentor: Stephen Cessna

In recent decades, the study of cell biology has become more computationally intense and focused proteomics; the study of protein structure, synthesis, and function. Recently, single-cell RNA sequencing has provided unique advantages in characterizing the genomic changes that occur in cells in response to environmental stimuli, deepening our understanding of cellular signaling and gene expression. The goal of this experiment is to obtain open-source RNA seq data to better understand lymphocyte interactions with their environment. Data analysis with Galaxy and Cytoscape (online bioinformatics software), and R will be used to draw conclusions from RNA sequencing data.

Effects of storage temperatures on dissolution rates of Advil tablets

Sophia Nguyen with Dulce Shenk Zeager

Faculty Mentor: Laurie Yoder

Advil is often stored in many places, with various temperatures. Some storage temperatures could impact the dissolution rate of Advil tablets. Our study aims to better understand the relationship between storage temperature and the rate of dissolution of the tablet. To determine this relationship, we used 200mg Advil tablets placed in various controlled temperatures, and the dissolution rate was determined. Concentration measurements were taken every five minutes using a UV-visible Spectrophotometer to identify the dissolution rates.

Strategic plan for Richter Total office

Garrett Nyce with Grant Leichty, Chris Polymeropoulos

Faculty Mentor: Lindy Backues

This poster will describe the process of creating a strategic plan for a small business and recommendations we have made to help them plan for the future. It will show how recommendations can help structure strategy, operations, and relationships within the organization.

Reimagining the EMU Core

Eli Ours with Jean Betancourt, Isaac North-Sandel

Faculty Mentor: Joohyun Lee

The EMU Core, our undergraduate general education curriculum, hopes to provide students with a foundation of the EMU values while supporting social and professional development. EMU is currently working on adding a "Major" credential on to students' transcripts when they graduate. This major is based in the current Core curriculum, but offers several specific pathways that allow students more choice and focus, and with that, more in-depth engagement with the EMU Core values. The objective of our research is to determine how EMU Core can be more engaging to students while facilitating increased interaction with EMU values and fostering social and professional development. Student feedback will be collected through a questionnaire that

is offered to EMU students. Our results will ultimately be used to help further the development and decision making of the EMU Value Major Project Team as they make changes moving forward. When speaking with Heike Peckruhn and Jim Yoder, co-chairs of the Value Major Project, they said the goal is to not only create value to the Core classes, but also to provide students more choice and a way to put labels on their general education.

Using applied genomics to better understand innate immunity in C. elegans

Vian Ozic with Karim Frazier, Aneisha Moore

Faculty Mentor: Kristopher Schmidt

Worm's have innate immunity which mimics humans innate immunity. Thus, a worms' simplified immune system serves as a great model for studying innate human responses to pathogens. This study specifically used C.elegans (Caenorhabditis elegant) which share important aspects of innate immunity with humans, making it important in our investigation of immune-related gene expression. This study aims to analyze RNA-seq data from C.elegans exposed to pathogens, specifically E. Coli and Pseudomonas aeruginosa, at 12-hour and 24-hour time points. We focused primarily on the 12 hour exposure while our research group counterparts were focused on the 24 hour exposure group. We will sequence mRNA data to generate a comprehensive list of expressed genes. This will allow us to measure RNA abundance and identify mRNA transcripts produced in response to infection. We will examine Gene Ontology (GO) terms to determine gene functions and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathways to understand associated signaling networks. Our analysis will focus on two main objectives: (1) identifying which mRNAs are transcribed during infection and (2) investigating differences in exon usage between gene isoforms. If certain exons appear more frequently in our dataset, it may indicate alternative splicing events that influence immune responses. Any promising candidate genes identified will undergo further testing to assess their function in C. elegans immune response.

Emotional regulation, bullying, and mental health: Exploring the interplay and outcomes in college students

Sarah Peak with Iris Anderson, Daisy Hamshe

Faculty Mentor: Allison Wilck

Bullying is a worldwide phenomenon that can impact anyone regardless of race, gender, ethnicity, orientation, or any other social group. In the United States, it is estimated that one in every five students will be bullied during time in school (U.S Department of Education, 2024). This study examines the relationship of bullying in adolescence and how this impacts anxiety and emotional regulation in adulthood. The study also looks into the relationship between anxiety and emotional regulation. For the research project, participants consist of college students who are at least 18 years old. The participants complete an online survey consisting of demographics, the State Trait Anxiety Inventory, the Difficulties in Emotional Regulation Scale, and the Revised Peer Experience Questionnaire. We anticipate that if someone has low emotional regulation and high levels of bullying (a negative correlation) and low emotional regulation and high levels of anxiety (a negative correlation), then we would be able to predict someone's emotional

regulation based on their anxiety levels and bullying experiences (which are positively correlated). We will use a regression analysis. This study aims to understand how having experienced bullying in adolescence relates to emotional regulation skills and the mental health of current college aged students. This can further the discussion and open up more avenues in research that look at the interaction between bullying, anxiety, and emotional regulation. Additionally, further research can be done to find interventions that can help those who have experienced bullying.

Transgression is in the eye of the voter: Understanding voter response to political candidate transgression

Sarah Peak with Ella Brubaker, Dante Flowe, Joe Hatton, Alaiyis Jasper
Faculty Mentor: Kathryn Howard

Mixed-methods were used (N = 120) to understand how people reason and make decisions about political candidates who have morally or politically transgressed. Participants were randomly presented with recent, real-life transgressive behaviors either committed by ingroup or outgroup politicians. Along with surveys, participants completed structured, in-person interviews in which they provided in-the-moment responses regarding several features of each candidate transgression, such as perceived harm of the behavior and intentionality of the politician. AI language tools (ChatGPT) will be used to transcribe and assess content, reasoning patterns, tone, and the degree of motivated reasoning (i.e., compensatory qualities, attributions of harm and blame, etc.) in responses. We predict that strong partisans (compared to weak) will engage in greater ingroup-biased motivating reasoning, will be less restrictive in verbal outgroup criticism, and will be more likely to vote for ingroup candidates. Strong partisans will attribute greater harm and intentionality to behaviors committed by outgroup candidates compared to the same behaviors committed by ingroup candidates.

Social Media's double edge sword on EMU athletes.

Dimas Portillo with Anne Cornelius, Tre Uzzle
Faculty Mentor: Joohyun Lee

Social media has become a dominant influence in the lives of college athletes, impacting their mental health, personal branding, and engagement with the public. While social media offers significant opportunities for visibility and engagement, it also presents challenges such as increased pressure, potential for negative exposure, and distractions from athletic and academic responsibilities. A recent article suggested that caregivers should help athletes develop healthy usage patterns by utilizing social media effectively (Infrontadmin, 2024). Despite the widespread use of social media, there remains a lack of focused research on how it specifically affects college athletes across these dimensions. Our study aims to investigate whether social media usage interferes with the academic and athletic responsibilities of athletes, with a focus on aspects such as time management and academic engagement. We will be collecting data from Eastern Mennonite University using a convenience sampling method and expect to receive responses from at least 50 participants for data analysis.

References

Infrontadmin. (2024, November). 6 Ways Social Media Impacts Athlete Identity | TrueSport. TrueSport. https://truesport.org/mental-wellness/social-media-impacts-athlete/

Comparing the antioxidant levels of energy drinks

Claire Reichenbach with Kai Peachey-Stoner
Faculty Mentor: Laurie Yoder

In the past decade, the popularity of energy drinks has risen among college students. Following this growing trend, we wanted to determine the antioxidant level in these drinks that many use to compare which energy drinks have the highest antioxidant concentrations. We will do a FRAP assay analysis using a spectrophotometer to measure the difference in antioxidant concentrations. We hope to determine which energy drinks have the highest levels of antioxidants.

Determining the usage patterns of AI among EMU students.

Josh Rudd with Dalton Rocke, Erik Wilkinson
Faculty Mentor: Joohyun Lee

Artificial Intelligence (AI) technologies are increasingly being used by college students, aiding their academic research and coursework. However, its impact on academic integrity and learning is unclear. With these tools becoming used more day by day, it's important to understand the usage patterns and how it impacts academic performance, while thinking about the ethics behind using AI (Wang et al., 2024). Understanding the usage patterns of AI among college students is essential for educators, administrators and the institutions as a whole to help find the policies needed to promote ethics while using AI. This study aims to analyze the usage patterns of AI technologies among the students, also the frequency and reasoning of use. Additionally, it will examine students' perceptions of AI's effectiveness in their studies. We will collect data from students at Eastern Mennonite University using a convenience sampling method. An online survey questionnaire will be developed, and students will be asked to participate at Common Grounds. We expect to collect data from at least 50 students for analysis.

Wang, S., Wang, F., Zhu, Z., Wang, J., Tran, T., & Du, Z. (2024). Artificial intelligence in education: A systematic literature review. Expert Systems with Applications, 252, 124167. https://www.sciencedirect.com/science/article/pii/S0957417424010339

Nursing 325 toy project

Gabriella Seal
Faculty Mentor: Holly Herr Stravers

Purpose and Background:

The goal of this project was to create a toy, using household items that was developmentally appropriate with elements of cognitive skills, fine motor skills, gross motor skills, and emotional skills. Additionally, the toy had to include advanced features that exceeded the child's age. For my project, I was assigned the age of three! I made a busy board, inspired by my son, Benjamin. To use the board, a parent will set the board against a wall, with the side that the child wants to use facing outward! The child can then engage in independent play while challenging and growing their development.

Elements on the board:

For cognitive development, the board includes ABC ordering, a number game (on the back of the board), a lock and key, matching a battery light to the light switch (If the light is on, the switch is in the on position), and writing letters on the blue dry erase section! For the ABC section, you'd start with the letters off the board and have the child place them correctly. For the number game, the adult will tell the child to throw or roll the ball to a number! Both are advanced skills beyond the three year old milestones, pushing the child's development. For development of fine motor skills, the board has a lock/key element with the latch and the slide lock. Social skill development elements are the mirror and mustaches, known as the imagination station. Three year old social skills focus on their vivid imagination, which is reflected in the child's ability to pick one of the mustaches in the clear pocket and hold them up to their face in the mirror. The elements which encourage gross motor development include pressing the battery light on and off and throwing the ball in the number game on the back of the board.

Loss of the Drosophila serotonin transporter (sert) increases total sleep, disrupts daytime sleep, and provides starvation resistance

Marciella Shallomita with Abigail Forrest, Elaine Miranda Perez

Faculty Mentor: Jeffrey 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. To understand the full activity of the transporter, we created a sert knockout allele (sertΔ3.9) in Drosophila melanogaster that removes 3.88 kb of the gene's coding region. A multiple sequence alignment between Drosophila melanogaster, Danio rerio, Homo sapiens, Mus musculus, and Gallus gallus shows that the deletion covers the most conserved protein sequence across these species. sert mRNA and protein are undetectable by qPCR and Western blot. Compared to the control Canton-S flies, sertΔ3.9 mutant flies exhibit a 128.7% significant increase in sleep during both light and dark phases of a 12:12 LD cycle. Interestingly, long sleep (>25 minutes) is more fragmented by 28% compared to control flies. sertΔ3.9 flies are significantly less active flies, with a 91.0% decrease in activity compared to the control. These flies also show increased starvation resistance, together with a decrease in feeding but no change in mass. The observed decrease in feeding with no change in weight suggests an adaptation that allows the flies to withstand periods of food scarcity better. The sertΔ3.9 allele represents a true knockout of the sert gene and can be used to fully understand the gene's function in sleep, feeding behavior, and starvation.

Does mindfulness meditation improve the cognitive function of memory?

Samantha Simek with Furtuna Abraha, Rebecca Nordseth

Faculty Mentor: Allison Wilck

Memory impairments can significantly hinder daily functioning and academic performance, making it crucial to find effective, non-pharmacological interventions. Mindfulness meditation has shown promise in strengthening cognitive functions, particularly memory. This study investigates whether short mindfulness meditation sessions, specifically self-guided and audio-guided practices, can improve short-term and working memory. College students from Eastern Mennonite University will be randomly assigned to one of three conditions: self-guided

mindfulness, audio-guided mindfulness, or a neutral control group. Memory performance will be assessed using short-term memory tasks (e.g., letter recall) and working memory tasks (e.g., digit span). The findings of this study could provide valuable insights into the effectiveness of brief mindfulness meditation sessions and contribute to the growing body of evidence supporting mindfulness meditation as an accessible, non-drug-based intervention for improving cognitive health.

Green tea antioxidants levels among popular tea brands

Shayleigh Sims with Jade Davis

Faculty Mentor: Laurie Yoder

Antioxidant levels are prevalent in our daily diets and are beneficial to long term health. Antioxidant-rich beverages are a popular way to profit from the supplements. The goal of this experiment is to compare the levels of antioxidants within green tea across four brands. To accomplish this comparison, using the FRAP assay will give insight to the absorbance of antioxidants between the brands. It is expected to see a great variety amongst the teas once the absorbances are compared in the spectrophotometer.

Transforming STEM education with universal design for learning

Shayleigh Sims

Faculty Mentor: Kathy Evans

As a NOYCE scholar pursuing a degree in Biology education, it is imperative to constantly research ways to meet the needs of all students. Universal Design for Learning (UDL) supports inclusive learning environments for students in K-12 schools. The guidelines of UDL create options “to improve and optimize teaching and learning for all people based on scientific insights into how humans learn” (CAST, 2011). UDL includes strategies for how the educator provides for students while breaking the barriers of diverse learning needs.

In this poster presentation, I will share multiple ways of designing instruction to include multiple means of engagement, means of representation, and means of action and expression in STEM education. Encouraging students' participation in “innovative, hands-on, and discourse-focused curriculums” (Roth & Calabrese Barton, 2004) will ensure successful use of UDL in the classroom.

Education should not discriminate against students in special education or those with disabilities. As a pre-service educator, I am learning to support and adapt to the needs of every learner. Abolitionist teaching fights for “...an education system where all students are thriving, not simply surviving” (Love, 2019). Every student deserves a quality education that is crucial to their own individual needs and success.

Busy board pediatric toy project

Elijah Spicher

Faculty Mentor: Holly Herr Stravers

Students taking Nursing Care of Children were asked to engage in creative thinking by creating a toy that would appropriately challenge a child of a specified age group according to developmental stage. After being assigned the age group of 18 months, the “Busy Board” was created. The board includes a variety of activities. The mirror on the board was meant to challenge the child cognitively by encouraging the use of different facial expressions and self-recognition. Example photos of the child’s family are included on the board with felt flaps to cover these images, challenging the child socially and cognitively by promoting recognition of family members while also reinforcing object permanence. A “felt tug” activity is included on the board to challenge the child’s fine motor skills. Cartoon characters can be found under wipe container lids on the board. This activity allows the child to reinforce cognitive skills by promoting recognition and the idea of object permanence. Knobs and a button are found on the board to challenge the child to perform fine motor skills. A shape matching activity was included on the board to promote the development of cognitive matching skills. The foam block dropping activity promotes the development of gross motor skills by allowing the child to throw the foam cubes. The button sorting activity promotes cognitive development by allowing the child to sort buttons into printed circles. Safety considerations implemented during the creation of the “Busy Board” include avoiding sharp objects and edges, using a strong adhesive when pasting objects, and avoiding small objects that could be aspirated.

Acoustic Tweezers: levitation through sound

Adam Stoltzfus

Faculty Mentor: Daniel King

Acoustic tweezers utilize high-frequency ultrasonic waves to create pressure differentials capable of levitating small particles. This project repurposes transducers from low-cost ultrasonic distance sensors to construct an acoustic tweezer system. The apparatus consists of three pairs of opposing transducers, arranged to generate a stable trapping zone. Several parameters must be precisely controlled to achieve effective particle manipulation. The system’s frequency and phase angle are regulated using a function generator, while the transducer spacing is calibrated to maximize constructive interference. This project explores what it takes to create an acoustic tweezer system.

Eastern Mennonite University planetarium projector renovation and improvements

Adam Stoltzfus with Laura Benner, Hellena Gebremedhin, Micaiah Landis, Canyon Penner, Lleyton Stutzman, Rebecca Tezazu

Faculty Mentor: Stefano Colafranceschi

Eastern Mennonite University’s Planetarium has been unused since 2007, due to high maintenance costs and lack of faculty to run the Spitz A-4 projector. The projector, built in 1968 relies on an array of analog circuits all operated by a large control panel. Our Senior Capstone project aims to restore and modernize the projector’s functionality to make it more accessible and user-friendly while still having the ability to perform the shows it once did.

To Achieve this goal, new motors and calibration systems are installed alongside a new graphical user interface which simplifies operation requiring little knowledge of how the projector itself

works. Additionally, we are fabricating a new mobile base to support the weight of the projector and allow for some storage. Finally due to the addition of windows in the space, curtains are required to stop light from entering. These will be custom, sewn from blackout fabric.
An important aspect of our project is that future students will be able to use and upgrade the projector. To facilitate this, we are creating thorough documentation to ensure that students will have a clear understanding of the inner workings of the projector. This project poses unique challenges, balancing upgrades and modernization with preservation and restoration. By addressing the aforementioned issues we hope to revitalize the planetarium projector and provide an educational resource for many.

Low-cost small scale vertical axis wind turbine

Levi Stutzman with Ivan Betancourt, Myles Dixson, Ben Friesen Guhr, Sean Swartley

Faculty Mentor: Shravan Akula

This report details the design, development, and testing of a small-scale vertical axis wind turbine (VAWT) aimed at producing 1 kW of power within a $375 budget. The study addresses four critical components: alternator selection and adaptation, blade design optimization, wind data analysis, and site location considerations. To maximize efficiency within budgetary constraints, the team conducted extensive research on cost-effective, high-efficiency alternators suitable for small wind turbines, focusing on converting rotational motion to electrical power effectively at low wind speeds. Blade design emphasized simplicity and functionality, balancing aerodynamic performance with material costs. Simulated and real-world wind data for the intended location informed design decisions and predicted performance, guiding the selection of a suitable installation site. The completed VAWT demonstrates the feasibility of low-cost wind power generation, offering insights into sustainable energy solutions for small-scale applications.

Design and control of a low-cost inverted pendulum system

Lleyton Stutzman with Micaiah Landis, Adam Stoltzfus

Faculty Mentor: Daniel King

The inverted pendulum is a classic dynamics and control systems problem, consisting of a rotating pendulum arm affixed to a moving sled. A motor is programmed using control system logic to pull the sled back and forth, causing the pendulum arm to stay in an inverted equilibrium position, while rejecting disturbances such as an external force applied to the pendulum arm by a hand. The goal of this project was to replicate the inverted pendulum system as a one and two arm variant. This was accomplished by creating a Computer Aided Design (CAD) model of the system, fabricating all mechanical components, wiring the electrical system, and programming and tuning the control loop.

Relationship of temperature and drugs effect on frog cardiac physiology

Trinity Washington with Andre Mills

Faculty Mentor: Kristopher Schmidt

This study will examine how a combination of two drugs affect the Lithobates Pipens frog heart rate in different temperature conditions. One milligram of CBD and half a milligram of Escitalopram an antidepressant will be dropped on the frogs heart. Throughout two trials heart rate readings were taken at three different temperatures room temperature, warm, and cold in

that order. The reason for this experiment is to see if these two drugs mixed together have a bad side affect on the frogs heart. In humans doctors do not recommend mixing the two drugs for that reason of the antidepressant not working correctly. The goal of this experiment is to find repeating trends in metabolic activity and figuring out if heart rate increases, decreases, or stays the same in connection with temperature variations.

Comparing acetaminophen dissolution in soda-simulated and water solutions

Trinity Washington with Skylar Stevens
Faculty Mentor: Laurie Yoder

The solubility and absorption rates of medications may be impacted by the preference of people who take them with soda instead of water. This experiment compares the pace at which acetaminophen dissolves in a pH buffer that matches Coke's pH to that of water. To determine the rate of dissolution, identical dissolution apparatus were used the monitor the absorptions of the tablets. The absorption of the Coke-simulated solution and water were then compared to evaluate the impact of pH on the drug's dissolution rate.