



URSA

Undergraduate, Research,
Scholarship and Arts.
Benedictine University

2020 Program

April 21–May 1, 2020 ❖ projects online at D2L

Art

- ◆ **“Official Logo Design and Brand Identity: ‘Luxe Interiors’”**

Abby Ang

A logo is a signature design that a company uses to promote its brand so the public can easily identify its products. My logo design was inspired by high-end brands. The purpose of my design was to create a logo that looked classy and luxurious but still clean and simple. Being given different shapes to work with, I chose a chair along with a pattern of lines. I combined the two shapes to add a meaning and increase visual intensity. I created an interior design company called Luxe Interiors. The company is for both women and men who are looking for an interior designer.

Faculty sponsor: Hairi Han

Biology

- ◆ **“Activity and Effects of Small Molecule M-0446 and Its Analogs on *Streptococcus pyogenes* QS Expression”**

Zainab Ahmed, Hajar Mchabcheb

The Gram-positive human pathogen *Streptococcus pyogenes* is known to cause infections such as “strep throat” and in more severe cases necrotizing fasciitis. Many studies have argued that *S. pyogenes* uses bacterial quorum sensing (QS) to communicate and respond to the environment. We are focused on a specific QS system that uses a transcriptional regulator known as Rgg and small molecules or peptides to mediate gene expression. Not all Rgg QS system have known peptides. Thus, small molecule libraries are used to find modulators of QS sensing pathways. Our study made use of a small molecule M-0446 found to induce the RopB (Rgg) QS system in *S. pyogenes*. Eleven analogs of M-0446 were generated at Benedictine University to determine molecule structural activity. We observed that changes in specific structural components lead to increased activity in the QS system. This activity was dependent on RopB. However, some analogs also affected bacterial growth in the test media. We hypothesize that a signal importer, specifically the oligopeptide importer (*opp*), could be affected by specific molecule structures in the RopB QS system. We are currently testing a wild type strain and an *opp* deletion in the presence of M-0446, its analogs, and different media to determine changes in bacterial growth.

Faculty sponsor: Tiara Pérez Morales

◆ **“Advanced Agar Templates for STEAM Outreach Generated Using Soil Microorganisms”**

Nuha Alkhwaja, Elzahraa Hussein

Biology is a visual subject that gives rise to artists who can work alongside scientists and transform complex information into drawings that are relatable to the public. Art can also be used in the context of research, such as by helping compare the anatomy and function of different species. Our goal was to create a STEAM (Science, Technology, Engineering, Arts, Mathematics) project that would engage students from other disciplines at Benedictine University. We repurposed soil bacterial samples acquired through our microbiology Tiny Earth antibiotic discovery project and created a live palette to be used for art templates. These soil bacteria did not produce antibiotics during the project but possessed unique colors and morphologies that made them perfect for our work. Once the template is made, they are grown for a week at room temperature and trimmed to create the desired final painting look. During the process, we found that media and colony combinations can change the colors presented by each microorganism. Our project will describe two advanced templates, include additional post bacterial growth styling, and how to best make a live painting fluoresce. The Tiny Earth project impressed upon us the importance of soil microorganisms and through it we were able to expand this project to include and teach science to a more diverse audience.

Faculty sponsor: Tiara Pérez Morales

◆ **“Alternate Splicing of the BRCA2 Tumor Suppressor Gene”**

Karen Long, Patrick Salazar

In eukaryotic cells, primary transcripts undergo splicing to remove intronic RNA sequences and join exons into mature messenger RNAs. On occasion, the splicing process chooses alternate splicing sites generating alternate splicing products. This project explores the possibility that the methylation status of genomic DNA can affect splicing fidelity differently in cancer cells (MCF7) and non-cancer cells (MCF 10A). Cells were treated with the DNA demethylating drug 5AzaC or left untreated as controls. Relative levels of full-length BRCA2 and an alternate splicing isoform lacking exons 17 and 18 are being compared using isoform-specific reverse-transcriptase polymerase chain reactions and agarose gel analysis.

Faculty sponsors: James Fackenthal, Mark Poch

◆ **“Arbor Assays Corticosterone Enzyme Immunoassay Kit Can Be Adapted for Freshwater Turtles”**

Elena Garza

Reptile populations are experiencing worldwide declines linked to anthropogenic factors and climate change. Though many of these factors cause direct mortality in reptile populations, other factors indirectly affect the survivorship of a population by initiating a chronic stress response. Chronic stress affects the life functions of an individual such as reproduction, growth, and immunity, which can decrease population-level fitness. Corticosterone (CORT) can be measured in reptiles as an indicator of physiological stress. Although radioimmunoassays (RIAs) have been traditionally used to quantify CORT in reptiles, enzyme immunoassays (EIAs) have recently become a popular, safer, and cheaper alternative. The main objective of this study was to determine whether a commercially-available, species-independent CORT EIA kit could be used to measure CORT in freshwater turtle serum. Blood was collected from three turtle species and processed for analysis. The kit was optimized to reduce variability and determine the dilution factor. Using a 1:10 dilution factor, turtle CORT concentrations ranged from 9.61-15.8 ng/ml with relatively low variability (<17.4% CV).

Faculty sponsors: Leigh Anne Harden, Mark Poch

◆ **“Characterization of Antibiotic-Producing Soil Bacteria Obtained from Lake St. Benedict”**

Rachel Koshy, Kori Taylor

Tiny Earth is a national initiative that focuses on the discovery of new antibiotics, since the rise of antibiotic resistance has become a worldwide health threat. Its mission is to increase student interest in science careers by engaging them in laboratory course-based research. For our project, we collected soil from Lake St. Benedict, which faces the university’s parking garage. We hypothesized that the various ecosystems contained in and near the lake

would give rise to bacteria more likely to have antibiotic properties. We diluted and grew our samples in different media that promote bacterial growth while selecting against contaminants. We selected 8 colonies and created a bacterial grid to test against other microorganisms for antibiotic production. Secretion of an antimicrobial would be observed as a clear zone around a soil colony that extends up to where the competing microorganism can grow. Two colonies, RK5 and RK8, showed zones of inhibition when tested against *Acinetobacter baylyi* and *Enterobacter aerogenes*. We characterized these colonies and identified them as Gram-positive rod-shaped microorganisms. We are using our bacteria's genomic DNA to identify genus and species. This information will help us determine if this soil bacteria has known antibiotic molecules described in literature or if there is an opportunity to characterize a new molecule in the future.

Faculty sponsor: Tiara Pérez Morales

♦ **“A Collaborative Effort to Assess the Hematological Health of Augmented Blanding’s Turtle (*Emydoidea blandingii*) Populations”**

Rebecca Weber

Blanding’s turtles (*Emydoidea blandingii*) are an IUCN-listed species that have experienced population declines in the greater Chicago area. Captive-rearing programs have been implemented to augment wild Blanding’s populations, however; program effectiveness is largely unknown. We assessed the hematological health of captive-reared and released juvenile Blanding’s via leukocyte profiles (e.g. heterophil/lymphocyte [H:L] ratios), which can provide a measure of immune health and stress. Our aim was three-fold: to compare leukocyte profiles of juveniles pre- and post-release from captivity, to compare leukocyte profiles of recently-released to formerly-released juveniles, and to explore seasonal trends in leukocyte profiles. Preliminarily, H:L ratios did not differ significantly between pre- and post-release juveniles or between recently- and formerly-released juveniles. However; H:L ratios for recently-released juveniles varied across the active season. We plan to develop a Summarized Health Index using blood and body condition data to predict juvenile survivorship. Our results can provide a basis for fine-tuning augmentation programs to mitigate stress and increase survivorship.

Faculty sponsor: Leigh Anne Harden

♦ **“Design of an Integrated Solid Waste Management Facility for Nuquí, Colombia, South America”**

Olivia DeBenedictis, Aisha Diab, Zarish Hafeez, Kaitlyn Lipps

The current waste disposal method in Nuquí, Colombia, involves the collection of only 43% of the population’s waste which is then dumped on the beach to be burned at regular intervals. This method is not conducive to public health or that of the highly biodiverse ecosystem of the area. As a result of these practices, waste that is not burned is swept into the ocean and the other 57% of the population discards their waste in undesignated locations, negatively impacting the environment. Diseases such as malaria and dengue fever are prevalent throughout the area and pose a risk of spreading to other areas since Nuquí is a popular tourist destination. By assessing the parameters of this issue, a waste management initiative was developed to address the problem. Combining the use of Air Curtain Destructor (ACD) incineration, a recycling line, a regular pick up schedule, and the ability to scale the facility for changing population sizes, a proposed solution was created to be implemented in Nuquí.

Faculty sponsor: William Schubert

♦ **“Did Body Size Play a Role in the Extinction of Late Ordovician Trilobites?”**

Moeen Khan, Joshua Moua

Numerous extinctions have occurred throughout Earth’s history. Many living organisms have died off due to many different circumstances. This includes the numerous amounts of trilobites that have existed throughout Earth’s history. This study aims to explain the mass extinction event in the late Ordovician period that shows a significant disappearance and reappearance of trilobites due to glaciation and sea level fluctuations. We decided to explore whether body size was a factor in determining whether a species went extinct or was able to survive the extinction. Our data would show that body size did not play a role in whether a trilobite species went extinct, but other outside factors could have caused some trilobites to go extinct that were not measured in this experiment.

Faculty sponsor: Phil Novack-Gottshall

◆ **“Do Religious and Cultural Beliefs Affect Podiatric Diseases and Treatments?”**

Calvin Kavalackal

The goal of this project is to discover how different cultures affect foot-related diseases. I propose an observational study on attitudes towards feet among the different cultures of Africa, the Middle East, and Asia. This study will interview Middle Eastern, Asian, and African immigrants to the U.S. on podiatric health, religious practices, and attitudes towards podiatric treatment. I expect to see a correlation between religious and spiritual beliefs of the people being tested and disease prevalence. This study will use a cross-sectional design among 10 podiatric practices to measure hammertoes, heel pain, diabetic ulcers, arthritis, and other foot diseases. Interview questions will examine spiritual and religious beliefs and practices among people in each culture to see if there is an effect on the rate of disease and the efficacy of treatments. This research may help with behavior change interventions.

Faculty sponsor: Jean-Marie Kauth

◆ **“Effects of Cadmium Exposure on LDH Activity in Human Embryonic Kidney Cells”**

Nicholas Calhoun, Yusra Ghafoor, Tom Kolbusz

Cadmium is a heavy metal that can have deleterious effects on the human body. Cadmium is known to cause kidney damage, is a carcinogen, and increases reactive oxygen species (ROS) production. The goal of our research was to determine if exogenous antioxidants can prevent cytotoxicity induced by cadmium exposure. We studied the effects of different concentrations of cadmium and its effect on human embryonic kidney (HEK) cells to study the ROS pathway. In our experiment, we tested cadmium concentrations of 0.1, 1.0, 5.0, and 10.0 micromolar (μM). After incubating the cells with cadmium for 24 hours, cell viability was determined by a lactate dehydrogenase assay (LDH). In concurrence with previous studies, HEK cells increase in LDH leakage at 5.0 μM of cadmium and cell viability significantly decreases at 10.0 μM . Our next step is to test the effectiveness of three antioxidants: curcumin, resveratrol, and melatonin, on the ROS pathway. Studies show that curcumin, resveratrol, and melatonin effectively protect against cadmium-induced lipid peroxidation.

Faculty sponsor: Allison Wilson

◆ **“Effects of DNA-Modifying Reagents on Splicing Regulation of the BRCA2 Tumor Suppressor Gene”**

Ziyad Abdelrahim, Zaain Ahmad, Talia Ishfaq, Milica Janosevic

BRCA1 and BRCA2 are tumor suppressor genes that are represented by multiple alternate splicing isoforms. As literature has suggested that DNA damage and altered genomic DNA methylation affect splicing fidelity, we sought to compare the effects of common therapeutic DNA damaging and demethylating agents on BRCA2 splicing in a cancer cell line (MCF7) and a non-cancer cell line (MCF10A). In MCF7, the DNA damaging agent doxorubicin increased the level of alternate BRCA2 splicing, while bleomycin decreased it. Demethylating drugs reduced levels of alternate splicing in MCF7 but not MCF 10A. Thus, therapies could compromise tumor suppressor function.

Faculty sponsor: James Fackenthal

◆ **“Estimating the Developmental Age of the Sterkfontein Type 3 Endocast”**

Maggie Sera

The Type 3 partial endocast from Sterkfontein, South Africa has been estimated to have one of the smallest brain sizes of any *Australopithecus* specimen. For this study, we reevaluated Type 3's cranial capacity and developmental age by comparing its endocast reconstruction to x-rays and scaled photographs of orangutans, gorillas, chimpanzees, modern humans, and other fossil specimens. Type 3's proportional measurements match those of older juvenile hominoids but are larger than those of infants and younger juveniles, suggesting that 286 cubic centimeters may be an overestimate for this specimen. A previous study suggested that Type 3 was three years old based on its size relative to the adult Sterkfontein mean, but new brain growth evidence for African apes, humans, and *Australopithecus* suggests that this estimate is likely too high. Asymptotic growth curves based on cranial capacity for known-age chimpanzees, mountain gorillas, and modern humans predict that Type 3 was more likely between - 0.53 and 1.12 years of age, suggesting that australopiths did not possess a fully modern human pattern of growth.

Faculty sponsor: Robert McCarthy

- ◆ **“From Undergraduate Soil Bacteria Research to Science Outreach: A Tale of a Fluorescent Microbe”**

Anna Dudziak, Christian McCusker

Tiny Earth is a network that focuses on “student sourcing antibiotic discovery from soil” by researching a diverse array of bacteria found in different environments. A second goal of this project is to inspire students to pursue and communicate science to the public. Our soil sample was collected near the Krasa Student Center. We hypothesized that heavy traffic near this area would provide diverse antibiotic-producing bacteria. Different microbiological assays led to the conclusion that we had not identified antibiotic-producing microorganisms. However, we isolated a fluorescent bacterium, *Pseudomonas fluorescens*, which we used to create an agar art template to use for K-12 science outreach. The template (the mythical hammer Mjolnir) and characterization of this soil bacteria is the focus of our work. We hope to promote interactive science in the classroom to schools in our area.

Faculty sponsor: Tiara Pérez Morales

- ◆ **“A New Method for Estimating Adult Brain Size for Hominin Juvenile Fossils”**

Syed Mohammed Qadri

Brain growth in primates is essentially complete around the age of 3. Previous researchers have extrapolated juvenile cranial capacities, but their calculation overestimated known adult brain sizes for those species because it was thought that hominin brain growth continued much after the age of 3. We estimated adult brain sizes for 18 juvenile hominin specimens using known brain growth data for *Gorilla beringei*, *Pan troglodytes*, and *Homo sapiens*. Non-linear asymptotic regression was run in R-Studio as it seemed to be the most fitting for visualizing and estimating growth of these specimens. The growth curves predict a much earlier than expected accomplishment of the maximum possible brain size based on the samples that were sorted by dental stage. These curves predicted much smaller adult brain sizes. Since the extrapolations are based on growth data for known-age samples of gorillas, chimpanzees and humans, these extrapolations are likely to be more accurate than the ones previously done by other researchers.

Faculty sponsor: Robert McCarthy

- ◆ **“Problems with Existing Methods for Converting Endocranial Volume to Brain Mass”**

Sanampreet Bhullar

Encephalization indices (like EQ) are calculated for fossil specimens using endocranial volume (ECV), which is sometimes converted to brain mass. Recent studies claim that the isometric relationship between ECV (in cubic centimeters) and brain mass (in grams) makes it possible to convert one to the other by adjusting for the brain’s specific gravity without needing to account for more complex spatial relationships. To assess this we compared three different methods for converting ECV to brain mass (multiplying by the brain’s specific gravity, multiplying by the proportional relationship between brain mass and ECV, and predicting brain mass from ECV using regression) in four fossil specimens (CGM 85785 *Aegyptopithecus zeuxis*, ARA-VP 6/500 *Ardipithecus ramidus*, Sangiran 17 *Homo erectus*, Amud 1 *Homo neanderthalensis*). We found that adjusting by either specific gravity or the proportional relationship between brain mass and ECV produces unrealistic estimates in smaller-brained primates and larger-brained hominins, whereas regression predictions using existing equations are unrealistic for non-human primates and smaller-brained hominins. Thus, it is difficult (if not impossible) to apply one equation across a wide range of sizes.

Faculty sponsor: Robert McCarthy

- ◆ **“So You Like Your Coffee Strong, but Can Your Body Handle It?”**

Tysen Noble, Claudia Reyes

Using a laboratory exercise that detects variants in caffeine metabolism (Zephyr and Walsh [2015], Genetics Society of America PREP, 2015.001), we compare an individual’s perception of caffeine tolerance to their genetic makeup. Cytochrome p450 1A2 (CYP1A2) is a liver enzyme that metabolizes caffeine by demethylation. A single nucleotide polymorphism (SNP) found in the intron of the CYP1A2 gene (rs762551) presents an allele with either a C or A base change. The presence of the C allele, which is considered dominant, indicates a slow metabolizer of caffeine, while

the A allele indicates a fast metabolizer of caffeine. DNA samples are obtained from volunteers along with a statement of their perception of caffeine tolerance. A portion spanning the region of the SNP is Polymerase chain reaction (PCR) amplified. It is then subjected to restriction fragment length polymorphism (RFLP) used to detect whether they have A, C or both alleles. Although caffeine metabolism works systematically with other enzymes, we hypothesize that those who perceive themselves to have a higher caffeine tolerance will have the A allele at this loci.
Faculty sponsor: Mark Poch

◆ **“Systematic Review of Ectopic Teeth in the Maxillary Sinus”**

Jinkle Modi

Teeth sometimes erupt ectopically in non-dental regions such as the orbit, nasal cavity, and maxillary sinus. Previous studies claim that teeth rarely erupt into the maxillary sinus. A recent systematic review identified 51 such cases, but perusal of the literature suggests that many more cases exist. We conducted a systematic review of cases of ectopically-erupted teeth in the maxillary sinus and collected standard information (patient’s age, sex, tooth type, location in maxillary sinus, etiology/pathological associations) for each published instance. We were able to identify >300 reported cases of ectopic teeth in the maxillary sinus through 2018. Ectopic teeth are more prevalent on the right side, in males, and in late adolescents and young adults. Over 70% of cases involved a molar tooth (usually M3), and the most common association was with a dentigerous cyst, although odontogenic keratocysts and other tumors types were represented. We considered potential sources of publication bias qualitatively and using summary statistics. This expanded dataset of ectopic teeth in the maxillary sinus should prove a useful resource for dentists, clinicians, and researchers, including anthropologists.

Faculty sponsor: Robert McCarthy

◆ **“Using Tiny Earth to Create a STEAM Environment in the Classroom”**

Maryam Salik, Sophia Sami

Antibiotics play a crucial role in the containment of infectious diseases. However, antibiotic resistance in widespread pathogens is of greater concern worldwide. The Tiny Earth initiative in microbiology laboratory courses uses soil samples to identify new antibiotic-producing bacteria. From one soil sample, there is a diverse array of bacterial species that range in structure, pigment, among other characteristics. For this project, we collected soil from a fertile garden and a pond. We hypothesized these locations would be ideal for antibiotic-producing bacteria because of the diversity in these systems. 86 colonies were grown in Luria-Bertani agar and 85 were grown in Emerson agar. A grid was created to test against different microorganisms for antibiotic production. Although no new antibiotic-producing bacteria were found, strains were added to an art collection to showcase the diversity of soil microorganisms. Through agar art, we can explain laboratory concepts that would otherwise be difficult to visualize. Two agar art templates (waves and constellations) were created. The templates can be used for undergraduate STEAM (Science, Technology, Engineering, Arts, Mathematics) outreach.

Faculty sponsor: Tiara Pérez Morales

◆ **“Validation of a CRISPR Knockout of a Transferrin Receptor in Cancerous Lung A549 Epithelial Cells”**

Nicholas Gill

Research has shown that artemisinin derivatives can be effective in inducing cellular apoptosis in A549 cancerous lung epithelial cell lines. Theoretically, the higher iron concentration in cancerous lung epithelial cells provides a reactive intermediate that triggers apoptosis not found in non-cancerous cells. It is proposed that a CRISPR knockout of transferrin receptor gene (TFRC) in the cancerous cells would limit ferric endocytosis potentially reducing the drug’s effectiveness due to the decreased TfR1. If the assumption is validated, this will support the role of iron in artemisinin’s induction of apoptosis in cancer cells. The expression levels of TfR1 in A549 TfR1 KO cells compared to control A549 cells will be quantified using qPCR by quantitation of TFRC by real time PCR (ABI QuantStudio 3) compared to GAPDH controls to be further confirmed on agarose gels. Determining the expression of TfR1 in A549 TFRC-1 KO cell lines would provide an essential validation before the modified cells can be tested in comparison with non-modified A549 cells for the effectiveness of artemisinin derivatives for the drugs mechanism of action.

Faculty sponsor: Mark Poch

Business

- ◆ **“The Crashing of One of the Most Popular Hedge Funds in History: Long Term Capital Management”**

Jacob Goodson, Matilda Ly, Hafsa Rahman, Yasmeen Shahbain

The demise of one of the most astoundingly successful hedge funds in the history of the world is due to lack of risk management and the incentive of maximizing returns. Long Term Capital Management is a great example of a genius trading strategy going south at an alarming speed due to unsuspected changes in market conditions. No strategy is bullet proof, but LTCM sure thought they were, and it is hard to blame them due to their low risk high reward strategies that they implemented. However, all good things do eventually come to an end, and the end can sometimes result in one of the biggest collapses in a funds value that anyone could have ever suspected, and it took a massive bailout to avoid a severe financial crisis.

Faculty sponsor: Larissa Adamiec

- ◆ **“Gas Price Variance Over the Last Five Years by Region”**

Mihai Folea, Dorota Mniszak, Hannah Morris, Matthew Rosko

In this project, we compare the average monthly gas prices in the Midwest and on the West Coast. We used the Map tool on Microsoft Excel to create a map of the United States and highlighted those two regions by using the radiation color tool to show us which cities in those regions have the lowest and highest prices. This information allows us to make a conclusion about why those gas prices are that high or that low. Another interpretation that can be made with this information includes grouping into the four seasons to see which seasons result in the highest or lowest gas prices and researching why that is the result. At the end of our project, we will be able to show how ArcGIS is a good tool for taking large amounts of data and accurately define it in order to communicate effective results to a specific audience.

Faculty sponsor: Deborah Cernauskas

- ◆ **“How to Improve Efficiency in an Urgent Care Clinic”**

Samia Douedari, Claudiu Folea, Ryan Hassoun, Matthew Rosko

Chicago area urgent care clinics and hospitals are constantly looking for ways to improve their emergency room (ER) patient experience. The pursuit of better patient experience remains consistent for most hospitals in today's environment. Therefore, we developed a simulation that will portray a more systematic technique for patient experience. Using a data process modeling simulator, ExtendSim allows us to properly develop a visual representation of business models. This simulation will help us determine the key factors to making an emergency room run more efficiently with the information gathered from Chicago area hospitals. ExtendSim gives us the opportunity to experiment with various data in order to gain an understanding of what works best.

Faculty sponsor: Deborah Cernauskas

- ◆ **“PRIMA Risk Management Challenge: Executive Summary of the Fall of Long Term Capital Management”**

Samual Cummings, Adam Kowal, Jakob Rabianski, Luke Schendl

For this project, our team analyzed Long Term Capital Management (LTCM), a hedge fund started in 1993 by former vice-chairman and head of bond trading at Solomon Brothers, John W. Meriwether. The LTCM team consisted of several Nobel-Prize winning economists and highly experienced bond traders from Wall Street. LTCM promised its investors high returns from an arbitrage strategy that took advantage of temporary changes in the market, with the possibility of theoretically reducing the risk level to zero. LTCM would eventually become the biggest startup in history after amassing more than \$1 billion in investor capital. To analyze the firm we relied on information provided in the book *When Genius Failed: The Rise and Fall of Long-Term Capital Management*. Our methods included looking at what caused the firm's demise, what trading strategies they used, how they leveraged risk, and how their models failed to account for real world events. We conclude that it is likely a similar fund failure can happen in the future, and that LTCM didn't adequately leverage risk.

Faculty sponsor: Larissa Adamiec

Chemistry

- ◆ **“Addition of Pyrrolidine and a Methyl Group to Produce a Novel Lidocaine Derivative”**

Megan Fast, Madelyn Sullivan

Lidocaine is used as a local anesthetic because of its capabilities to inhibit the nerve impulses that create pain in the body. A derivative of lidocaine was synthesized in order to add pyrrolidine and a methyl group. To do this, our first reaction included using 2,6-dimethylaniline and 2-bromopropionyl bromide in order to produce an intermediate of 2-bromo-N-(2,6-dimethylphenyl) propanamide at a percent yield of 95.72%. This product was combined with pyrrolidine and it successfully produced N-(2,6-dimethylphenyl)-2-(pyrrolidin-1-yl)propanamide at a percent yield of 29.58%. The lidocaine derivative structure was confirmed using 1H-NMR spectroscopy and then it was synthesized in an overall yield of 28.3%.

Faculty sponsor: David Rubush

- ◆ **“Fluorimetric Analysis of 4-Methylumbelliferone in Acidic Conditions”**

Uzair Mohammed, Thomas Riedl

Hymecromone (7-Hydroxy-4-methyl-coumarin, 4MU) is a synthetic coumarin and aromatic chemical compound in the benzopyrone chemical class. Studying fluorescent properties and fluorimetric quantification of 4MU has become pertinent due to its possession of a range of diverse pharmacological properties. Both natural and synthetic coumarins are extensively used as medication and analytical reagents. Hymecromone can be taken orally and is found in many plant-derived pharmaceuticals. When taken as an oral substance the molecule will initially be exposed to low acidic pH levels of 1-4 in an individual's stomach. Hymecromone has been noted to be an excellent fluorophore with high quantum yields. Two forms of 4MU, the ionic and neutral species, are considered to be the main structures at which it fluoresces with maximum emission wavelengths ranging from 380-445 nm. Fluorimetry is one of the most sensitive analytical methods in addition to being safe, selective, fast, and relatively inexpensive. An FP 6500 JASCO Fluorescence Spectrophotometer was used with 1 cm quartz cell to measure limit of detection, quantum yields, and room temperature emission intensities of 4MU under varying pH conditions in aqueous solutions. From the data collected, it appears that the emission intensity of 4MU under increasingly acidic conditions results in a decrease in emission intensity and a shift to a different emission wavelength.

Faculty sponsor: Niina Ronkainen

- ◆ **“Lidocaine Derivative Synthesis Using 3-Chloropropionyl Chloride and Dipropyl Amine”**

Nicole Faille, Karolina Zeglen

Lidocaine is a local anesthetic that is used to numb specific areas of tissue. This is done by indirectly inhibiting glycine transporter 1 by metabolizing MEGX, which is a primary metabolite of lidocaine. As a result of this, the sodium channels are blocked which ultimately causes numbness. Over the course of time, scientists have tried to make derivatives of lidocaine to see if they can be useful as local anesthetics or may be implemented in a different way. Here, a lidocaine derivative known as N-(2,6-dimethylphenyl)-3-(dipropylamino)propanamide, was successfully synthesized in two steps. For step one, 2,6-dimethylaniline and 3-chloropropionyl chloride were used to form 3-chloro-N-(2,6-dimethylphenyl) propanamide with a 98.02% yield. For step two, the product made in step one was reacted with dipropylamine to form the lidocaine derivative with a 16.28% yield. The product was then purified, and the structure was confirmed with 1H-NMR and IR spectroscopy. The results show that a lidocaine derivative was successfully synthesized with an overall yield of 15.96%. Further experiments will be done with the derivative to test its ability to block sodium channels.

Faculty sponsor: David Rubush

- ◆ **“Synthesis of a 3,5-Bis(trifluoromethyl) Lidocaine Derivative”**

Diana Jaber, Uzma Jafry

Lidocaine is a local anesthetic and antiarrhythmic drug used in a clinical setting. Addition of trifluoromethyl groups with other R groups on the aniline have shown to exhibit antispasmodic activity in the human body. A lidocaine

derivative was synthesized by removing the methyl groups from the ortho positions and replacing them with trifluoromethyl groups at the meta positions. However, the role of two trifluoromethyl groups on lidocaine has yet to be determined. The synthesis of the lidocaine derivative occurred in two steps. First the 3,5-bis(trifluoromethyl)aniline was reacted with 2-chloroacetyl chloride to produce an amide. This product was reacted with diethylamine using toluene as a solvent. An acid workup was performed on the final product which was isolated in 20.4% as a white solid. ¹H-NMR spectroscopy was used to confirm the structure of the product.

Faculty sponsor: David Rubush

◆ **“Synthesis and Activity of Polar Derivatives of Lidocaine”**

Ansareen Hassan, Lauren O'Connor

As modern medicine evolves, there is an increased focus on the use of local anesthetics, which allow for painless, simple procedures. Lidocaine, a type of anesthetic, functions by binding to sodium channels and preventing signals from passing through the ion channels. As scientists work to improve anesthetics, derivatives of lidocaine are being synthesized. However, there is still research being conducted on how the binding and degradation processes can be improved by altering the molecule. This study focused on synthesizing two separate derivatives of lidocaine, with the addition of a carboxyl (Project One) and hydroxyl group (Project Two). The addition of these functional groups increases the polarity of the molecule, which has the potential to strengthen the binding of the derivative to the ion channel, which could prolong the effect of the drug. Project One attempted to synthesize N-(2-((2,6-dimethylphenyl)amino)-2-oxoethyl)-N-ethylglycine which would increase the polarity of the molecule, however, more research and time is needed for a successful synthesis. Project Two consisted of the successful synthesis of N-(2,6-dimethylphenyl)-2-(ethyl(2-hydroxyethyl)amino)acetamide which had a 2.5% yield. By synthesizing these molecules, scientists can study the effects of the derivatives as more efficient nerve blockers to potentially improve anesthetic drugs that are locally used in health care.

Faculty sponsor: David Rubush

◆ **“Synthesis of an Amino Ester Lidocaine Derivative: 2,6-Dimethylphenyl Diethylglycinate”**

Sanampreet Bhullar, Christine Nato

Lidocaine, an amino amide local anesthetic, works by blocking nerve signals by halting impulse initiation and transmission processes that occur at the axon. An amino ester derivative, known as 2,6-dimethylphenyl diethylglycinate was synthesized in two steps. In the first step, 2-chloroacetyl chloride was combined with 2,6-dimethylphenol at 0°C to produce 2,6-dimethylphenyl 2-chloroacetate in 24.03% yield, which was purified using column chromatography. Proton NMR spectroscopy confirmed the correct structure. Step two involved combining the product from step one with diethylamine to produce 2,6-dimethylphenyl diethylglycinate in 46.92% yield. This product was purified through acid-base work-up. The overall yield of the two-step synthesis was 11.28%. H-NMR analysis of the final purified product confirmed that 2,6-dimethylphenyl diethylglycinate was synthesized. Further research on 2,6-dimethylphenyl diethylglycinate can be done on its physiological effectiveness as a local anesthetic.

Faculty sponsor: David Rubush

◆ **“Synthesis of Bis-trioxane and N-H Dioxazinane, Potential Anticancer Drugs”**

Alexandra Kiszluk

Extracted from the Chinese herb *Artemisia annua*, artemisinin is a compound utilized as an antimalarial drug. Artemisinin's cytotoxic effects are due in part to activation by iron and subsequent release of radical oxygen species. Because of the elevated levels of transferrin expression in cancer cells, this endoperoxide has also shown potential as an anticancer agent. However, due to pharmacological limitations of the molecule, such as short half-life and poor solubility, researchers have taken to synthesizing derivatives of artemisinin and investigating their potential in treating cancer. In this study, N-H dioxazinane and bis-trioxane, two novel artemisinin analogs, were synthesized in yields of 7% and 68%, respectively. ¹H-NMR confirmed successful isolation of the products. In the future, these drugs will be tested against cancerous and healthy cell lines to measure their ability to induce apoptosis.

Faculty sponsor: David Rubush

- ◆ **“Synthesis of a Lidocaine Derivative: Increasing Sterics and Decreasing Polarity by Addition of a Benzene Group”**

Rajin Bains, William Corrigan

Lidocaine is a local anesthetic, specifically an antiarrhythmic medication, that is widely used in the medical and specifically dental community. Lidocaine works by binding to and blocking sodium channels of local neurons and effectively blocking pain signals from communicating with the brain. The physiological process of the lidocaine blocking the sodium channels was one part of the two-fold target application of our derivative. By adding a second benzene ring to the opposite side of the lidocaine molecule, the molecule was significantly bulkier with the nonpolar addition, which we hypothesized would further stick out of the sodium channels and more effectively block the channels. The second reasoning and possible benefit we hypothesized was that adding an additional benzene ring would make the molecule more hydrophobic which in turn would allow for easier/faster diffusion through membranes and possible faster effect time of the anesthetic. The proposed synthesis consisted of two steps.

Faculty sponsor: David Rubush

- ◆ **“Synthesis of Lidocaine Derivative Using 1-Naphthylamine”**

Jason Peart, Patrick Salazar

Lidocaine is primarily used as a local anesthetic. Its function is to block sodium channels which interrupts signaling between neurons. It is currently named in the World Health Organization Model List of Essential Medicines. There is a lot of research into lidocaine derivatives as they could potentially be more potent anesthetics than the standard lidocaine used. In this experiment, a lidocaine derivative was designed then a two step synthesis was carried out to create it. First, 1-naphthylamine was reacted with chloroacetyl chloride to form an amide. Next, the amide was converted into the proposed lidocaine derivative via SN2 reaction with diethylamine. The product was confirmed to be the proposed lidocaine derivative using TLC, NMR and IR. The percent yield for the first step was 97.343% and 36.269% for the second step, resulting in an overall percent yield of 35.305%.

Faculty sponsor: David Rubush

- ◆ **“The Use of Piperidine to Synthesize a New Lidocaine Derivative”**

Inshal Haque, Dalya Kanani

Lidocaine is used as a local anesthetic and many studies suggest that it has more clinical uses. Lidocaine blocks voltage gated sodium channels which prevents the formation of action potentials, decreasing the sensitivity of a stimulus. A derivative of lidocaine was created with a few adjustments. Piperidine was used in place of dimethylamine, and 3-chloropropanoyl chloride was used in place of 2-chloroacetyl chloride. Research has shown that piperidine has potent suppressing activity against malignant cell lines. Our TLC plates showed two molecules were present in our final product which could be due to the nature of amines forming multiple resonance structures. Our H-NMR matched our predicted H-NMR, as well as the C-NMR. This synthesis took a total of two reactions with an additional purification step. The yield of the second step was 26%, with an overall yield of 26%.

Faculty sponsor: David Rubush

Jurica-Suchy Nature Museum

- ◆ **“Digitization of the Specimens of the Jurica-Suchy Nature Museum”**

Jack Purcell, Tanya Rasha, Stephanie Slagle

The Jurica-Suchy Nature Museum contains thousands of specimens collected through the work of Frs. Hilary and Edmund Jurica, O.S.B., and Fr. Theodore Suchy, O.S.B., from sites worldwide. The museum identified the need for greater accessibility. The research collection of fossils and egg specimens would benefit from digital and physical improvements in the name of long-term sample health and preservation. The museum was awarded the Inspire! grant from the Institute of Museum and Library Services to fulfill the Saving Our Specimens Preservation Project. As part of this grant project, the specimens will be photographed in a controlled setting, creating a top-down photograph of the sample, from the front and back. Photographs and associated metadata will be organized through

Adobe LightRoom. Finished photos will be organized into an Arctos database and paired with an Excel file to organize and catalog all data and metadata, specifically the photographs of the sample, the time period it existed, the date and location of its finding, and the logistical information of those entering the sample as a file. Samples will then be freely available for observation and study for scholars worldwide.

Faculty sponsors: Karly Tumminello, Colleen Filipek

◆ **“Herbarium Digitization at the Jurica-Suchy Nature Museum”**

Enas Alnass, Rachel Carlson, Sarah Jablonski, Nida Sultana

The goal of this research endeavor is to assemble and compose information on the preserved plant specimens at the Jurica-Suchy Nature Museum Herbarium. This herbarium consists of plants from all over the world, some dating back more than a century. This project has been in progress for over 2 years. This year we made a lot of progress, putting our total number of completed entries at over 600. In our research group, each of us contributes to the specimen cataloging process. The four positions are data input, accessioning, barcoding, and data verification. The principal objective is to have the material be available to the public. Our next stage will be to upload our herbarium information to a database portal.

Faculty sponsor: Karly Tumminello

Mathematics

◆ **“Connections Between Ceva’s Theorem and High School Geometry Content”**

Katelyn Beamish

Ceva’s Theorem provides a general solution to a particular concurrence problem for certain lines in a triangle. In particular Ceva’s theorem establishes the necessary and sufficient conditions for the three Cevian lines in a triangle, each of which, is a line that passes through a vertex of a triangle and the opposite side line. We will discuss the proof of the general theorem and show connections applicable to a high school geometry course.

Faculty sponsor: Tim Comar

Nutrition & Health Services

◆ **“Learning Strategies and Processes for Nutrition Majors”**

Agne Siksnaitė

Self-efficacy can be defined as an individual’s belief in their perceived ability to attain certain performance achievements. We are seeking to identify if a role exists in a student’s academic achievements using data collected through the Metacognitive Awareness Inventory (MAI) and Motivated Strategies for Learning Questionnaire (MSLQ). Our analytical survey design investigated responses by nutrition majors (n= 35) attending Benedictine University using Spearman correlations and Mann Whitney statistical tests. Correlations were examined between self-efficacy in learning and performance (MSLQ), knowledge of cognition (MAI), and regulation of cognition (MAI). An investigation was also conducted to identify a difference in self-efficacy for learning and performance (MSLQ) by GPA categories. Our results showed no significant difference between self-efficacy and the categories of age and gender. A significant difference existed between self-efficacy and GPA category means <3.5, >3.5 (U=54.5,p=.009) and GPA <3.25, >3.25 (U=60.5,p=.02). Those who earned a higher GPA (category) reported significantly higher self-efficacy. A significant moderate correlation existed between self-efficacy for learning and performance and knowledge of cognition ($\rho=-0.429,p=.010$) and regulation of cognition ($\rho=-0.377,p=.026$). As self-efficacy in learning and performance increase, scores for knowledge of cognition and regulation of cognition also increase.

Faculty sponsors: Paula Sochacki, Catherine Arnold

- ◆ **“Use of eHealth to Facilitate Diet and Exercise Discussions between Cancer Survivors and Clinicians”**

Leslie Tello

Objectives: Despite the importance of healthy diets and regular exercise for cancer survivors, health-promoting habits are rarely discussed due to limited resources. eHealth [electronic medical records (EMR)] could facilitate communication but little is known about survivors' eHealth habits and whether their engagement differs from those without cancer history. Methods: Data from 6751 adults from NCI HINTS 5 were analyzed; 1097 adults were cancer survivors, the remainder served as comparisons. Adjusted polytomous logistic regression models were performed to estimate associations between cancer history and eHealth use, with a significance threshold of $p < 0.05$. Results: Roughly one-third of survivors used eHealth to track health goals. Less than half shared eHealth data with clinicians (20%) and accessed EMR ≥ 1 time in the past year (43%). Survivors were more likely to access EMR ≥ 10 times in the past year than comparisons, after adjusting for sociodemographics and BMI [OR=1.93 (95%CI 1.12, 3.34), $p=0.02$]. Conclusion: Results show survivors are beginning to engage in eHealth to manage health and communicate with clinicians. eHealth seems to be underused, yet is a promising tool for the future.

Faculty sponsor: Annie W. Lin (Northwestern University)

Physics

- ◆ **“Developing a Catalog of All Known Strong Gravitational Lenses”**

Ahmad Hamed

Gravitational lensing is the deflection of light by gravity due to the chance alignment of celestial objects. Massive objects can create a gravitational field strong enough to visibly bend the light of another object. For the lensing to be visible the source, lens, and observer must be aligned correctly. When the deflection of light by a massive object is easily visible it is known as strong gravitational lensing. For this poster we will compile all known cases of strong gravitational lensing to look for patterns in spatial density on the celestial sphere. A number of researchers have attempted to create such a catalog, but none have been completed. Once finished, this catalog will be the first of its kind. Currently, our list stands at 1899 strong lenses. We believe our list is almost complete and are in the final stages of data collection. Aside from spatial density, we plan on analyzing other properties of the lenses such as redshift distribution, Einstein radius, and mass.

Faculty sponsor: Matthew Wiesner

- ◆ **“Lithium-Ion Batteries Within Biomedical Applications”**

Michael Paunove

Biomedical applications constantly undergo innovations to make them as efficient and abundant as possible. To confirm the dependability of these devices and ensure that they are safe to implement in human activity, it is crucial to first know that the mechanism that powers them is safe, which for most of them, is the lithium-ion battery. In this study, the properties of Li-ion batteries, such as discharging and battery capacity, were studied under various conditions. The battery capacity analyses were brought into correlation with physiological features in the human body, providing insight into how lithium-ion batteries operate within implanted devices such as implantable cardiac pacemakers which are used to monitor and control heart arrhythmias. We have investigated the temperature effect on battery performance and found that as the temperature increased, the battery capacity increased as well. Another discovery was that humid conditions, such as those within the human body, had no effects on battery performance. Both results show that the lithium-ion battery's performance was not significantly altered after being subjected to conditions that replicate those in the human body cavity.

Faculty sponsor: Stefan Stefanoski

- ◆ **“Properties of Li-Ion Batteries for Electric Vehicle Application”**

Alaina Thompson

Lithium-ion (Li-ion) batteries are one of the top emerging technology with applications ranging from consumer

electronics to large-scale energy storage. In this study, a characteristic review of Li-Ion battery button cell 2450 was performed, with focus on properties under various abuse conditions, such as mechanical and thermal stresses. Data was collected using a potentiostat/galvanostat instruments to perform cycling, Electrochemical Impedance Spectroscopy (EIS), and to measure voltage and capacity. These test results compared with the cell structure of the Li-ion battery are used in correspondence with one another to discuss the results of the EIS performed. Equivalent circuit models were reviewed and used with the EIS graphs for an understanding of the cell on such abuse conditions. The results of this study show the poor performance of Li-ion batteries at low temperatures as well as the other various influences temperature and mechanical stress have on a Li-ion battery conduct. The best fitting equivalent circuit model for these batteries is in testing and its implications are still in progress.

Faculty sponsor: Stefan Stefanoski

◆ **“Simulations of Gravitational Lensing of Galaxies for Use in Cosmological Catalogs”**

Stephen Tomsy

In this poster I will describe a project creating simulations of gravitationally lensed galaxies in collaboration with the Legacy Survey of Space and Time Dark Energy Science Collaboration (LSST-DESC). A gravitational lens creates a distorted image of a distant object as light is bent around a nearer massive body. This distortion appears as a ring, arc or multiple images around the image of the lensing body. The simulations are being generated for Data Challenge 2 (DC2) of the LSST-DESC. DC2 involves the production, validation and analysis of a 5000 square degree mock catalog and a 300 square degree end-to-end simulation of mock images and image processing. This project produced several thousand simulated images of strongly lensed galaxies using the Flexible Image Transport System (FITS) file type used in astronomical data storage. Using the Photon Simulator (PhoSim), the generated FITS stamps will be put into large-scale cosmological simulations. My work was in testing and running the code that generates the FITS stamps and creating full-system images using PhoSim for quality checks. As part of this project the images are displayed on a website hosted by Github.

Faculty sponsor: Matthew Wiesner

Political Science

◆ **“Religiosity and Influence on Voter Choice in Presidential Elections”**

Jacob O'Donnell

The topic of my research is the relationship between religiosity and voter choice in presidential elections. I study how one's level of participation in their religious life can impact the important and crucial decision of who to vote for. Just as one uses their political party identification to dictate who they will or will not vote for, I question: How is a college student's presidential vote choice influenced by his or her level of religious participation? My prediction and hypothesis is: The higher one's level of religious participation, the more likely it is that he or she will vote for a candidate that is conservative in their political beliefs. The null hypothesis, consequently, is that there is no relationship between religious participation and one's candidate preference. Through my research I intend to disprove the null hypothesis.

Faculty sponsor: Phil Hardy

Psychology & Sociology

◆ **“The ‘Dumb Jock’ Stereotype Threat and Its Effect on Collegiate Student-Athletes”**

Tyler Bernat

The purpose of this study was to find whether or not the "dumb jock" stereotype threat exists in smaller universities where scholarships aren't given to student-athletes for their participation in sports. A survey and questionnaire was conducted using participants from the student body at Benedictine University. The results of the survey and

questionnaire showed that student-athletes perform worse academically than non-student-athletes, and that female student-athletes perform better than male-student athletes. Based on the results and difficulties of reaching a high participation rates, the data was unable to be considered significant or insignificant when looking to find whether or not the dumb jock stereotype exists, or the strength of its impact on student-athletes at smaller universities.

Faculty sponsor: James Davis

◆ **“The Impact of the Recent Rise in Single-Mother-Headed Households in the United States”**

Morgan Weber

In the United States today, there are about 15 million children being raised by a single mother. The recent rise in single-mother-headed households has become a topic of concern as many argue that this development is a sign of the failing American family. As a child of a single mother, I contend that this movement is more accurately an indication of the progressing American feminist. That is, the traditional American family is not being destroyed, but rather is changing in form to grant single mothers the power to be the leaders of their families. As a result, single mothers have been able to alter the traditional gender roles in the American family as they assume the position of head matriarchs. To add credibility to my claim that the recent rise in single mothers has led to the emergence of a matriarchal family structure in the United States, I completed extensive research with citations from three credible websites, two articles published by acclaimed research organizations, one government-managed blog, and one book. My findings justify the larger impact of the recent rise in single-mother-headed households on the American feminist movement as millions of children are growing up with the example of a female figure in a position of power.

Faculty sponsor: Wilson Chen

◆ **“Perceived Criminality Based on Personal Demographics and Characteristics”**

Angela Gallinati

Based on prior research done on racial prejudice and stereotypes in our criminal justice system, the consequences of these disparities, and the detrimental costs of incarceration, there is undeniable bias in our society’s beliefs about criminality. This information led me to the prediction that personal demographics, location, and exposure changes societal beliefs on criminality. I predict that students who have taken the Inside-Out Transformative Justice class or who have been exposed to the criminal justice system will have increased positive perceptions of criminals and recognize our system’s prejudice towards and dehumanization of incarcerated persons. I also anticipate that students who have not taken the Inside-Out class, who come from higher socioeconomic statuses, or who have never known an incarcerated individual, will have more stereotypical and preconceived notions about criminality.

Faculty sponsor: James Davis

◆ **“The Psychological Promotion of Body Ideals Through Vanity Sizing”**

Emily Vaskys

Vanity sizing, the practice of intentionally labeling clothing smaller than the actual fit, is a new phenomenon created by clothing industries. Women are the main target for this practice because of the body ideals set by society. In order to understand the main motivation for vanity sizing, I analyzed several studies involving vanity sizing and its role in economics, psychology, and sociology. Wan-Ju Iris Franz, the author of “Economics of Vanity Sizing,” conducted research studying how companies base their clothing sizes on income. As income rises, there is less time for families to cook meals and the substitution effect arises. Often, clothing companies size their clothing up, in order to keep up with the growing weight of wealthier individuals. Designer brands, targeting women in the highest brackets of income, size their clothing down, diminishing the substitution effect and replacing it with the income effect. While vanity sizing may seem like a harmless practice, it is in fact masking the truth of weight gain and the fragile body image of women.

Faculty sponsor: Gregory Ott

Arthur J. Schmitt Future Leaders Projects

- ◆ **“Alive Inside: A Music Therapy Program at Villa St. Benedict”**

Brittany Chally

This leadership project focuses on two of my biggest passions: music and Alzheimer’s advocacy. The Alive Inside Outreach is based on the 2014 documentary of the same name. The premise of the project is that students meet with residents with dementia in an Assisted Living facility, on two separate occasions for one hour each, getting to know a little bit about them. Then, they compile a music playlist of 10-20 songs based on the memories and preferences of their senior. The music is uploaded to official Alive Inside headphones. For this project, the headphones were donated. During the third visit, students bring the playlist back for residents and listen to the music with them. Finally, they follow up with the residents a week later to see how they like the music. My project consisted of five residents from Villa St. Benedict and five pairs of students from Benedictine University. This project took place every Saturday for 4 weeks from February until March. Residents and students expressed a sense of impact, each in their unique ways. The overall goal of this project was to connect elders with youth through conversation and music. See also <https://www.aliveinside.org/film>.

Faculty sponsor: Sandra Gill

- ◆ **“Analyzing How Healthy Benedictine Students and Faculty Are Through Basic Vital Tests”**

Hana Asfar

As a college student, I have noticed that my peers do not take care of their health as much as they should, often due to the mindset that school is more important than anything else. This means sacrificing sleep, eating fast food, using unhealthy stress coping methods, and putting off health appointments. For this reason, I hosted a free health mini expo on campus for students and faculty. The following hypothesis was tested to analyze the healthiness of subjects: if subjects engage in healthier life habits, then they will exhibit healthier results. The hypothesis was tested by taking a wide range of vitals, including body composition, blood glucose, blood pressure, hearing, oxygen saturation, and pulse rate. Each subject filled out a confidential questionnaire and result sheet as they went through each vital test. Once each vital test was completed, subjects had the opportunity to be educated on their test results to further understand the current state of their health. Overall, the results from 51 subjects indicated that the hypothesis was supported, with the exception of some blood pressure vitals that were above the normal range.

Faculty sponsors: Sandra Gill, Regina Schurman, Leigh Ann Harden, Jayashree Sarathy

- ◆ **“BenU eSports: Videogames On Campus at Benedictine University”**

Tyler Bernat

Because Benedictine is a commuter school with high participation levels in sports, students who aren’t athletes may struggle to find a community that best suits their interests and helps them build relationships with peers. The goal of the BenU eSports Club was to create a recreational and competitive community welcome to all students. Preliminary event data showed a strong interest in eSports within the Benedictine student population. Twenty-two students, in 11 teams of 2, competed in our first Thrilling Thursday eSports Tournament, hosted at the NIU Naperville campus on November 7, 2019. The live stream of the event engaged 351 viewers, of which at least 129 were students. On-campus space and equipment, along with a proposed code of conduct, club rules and regulations, and 5-year budget, have been developed for future implementation. With eSports steadily growing on university campuses, BenU eSports is aiming to be the first all-inclusive club on campus that will build community with all students who enjoy playing videogames.

Faculty sponsor: Sandra Gill

- ◆ **“Love for Those Overseas: Putting Passion to Action”**

Marie Boulos, Marina Ibrahim, Jennifer Pfeiffer

Active duty military men and women overseas receive only generic personal care items. Our leadership project had two goals: to provide these women and men with specialized care items and to inspire others through active

participation with us. Each major event exceeded our goals. Two fundraising efforts generated \$881 for the purchase of specialized personal care items. Fifty handwritten letters were completed by 50 students and staff members. In-kind donations of resulted in 105 additional personal care items; and our funds will purchase hundreds more. Around 20 care packages, helping 200 active duty military personnel, will be shipped in April 2020 in cooperation with our partner, Operation Support Our Troops. Finally, we provide recommendations for increasing student engagement, thus further aligning our project with the university's mission and Benedictine heritage.

Faculty sponsor: Sandra Gill

- ◆ **“Meeting the Demand for STEM Careers in an Ever-Evolving Technological Society”**

Giselle Campos

In our society, there is an increasing need for STEM-oriented professionals and America is falling behind. To help meet the demand for professionals in these fields, two initiatives were undertaken. These projects consisted of the collaborative planning of a High School STEM Day hosted by the Benedictine University College of Science and the reactivation of the American Chemical Society/Society of Physics Students Chapter (ACS/SPS) at Benedictine University. The aim of the STEM day was to increase and/or foster interest in STEM careers amongst high school students in surrounding communities. As an on-campus club, the ACS/SPS club aims to support current students pursuing STEM careers through community building and science exploration. From data collected at both events, a positive correlation between interest and involvement was detected. Thus, it was concluded that both initiatives meaningfully contributed to the purpose of this project.

Faculty sponsor: Sandra Gill

Sport & Exercise Science

- ◆ **“Evaluating the Dynamic Between Exercise and Anxiety/Depression in College-Aged Populations”**

Thomas Arriaga, Leanne Siewert, Catie Wolford

Mental disorders are usually treated using pharmaceutical methods. Exercise is an area of study where physical effects have been shown to be positive, but mental health benefits questioned. However, research is beginning to show a positive correlation to disorders like anxiety and depression. The aim of this research was to examine the relationship between exercise participation and symptoms of depression and anxiety. The researchers reviewed 15 articles located using EBSCOhost via the Benedictine University Library. Data was collected from both experiments and sample groups for questionnaires in regard to physical and mental data. Specifically, depression rating scales were used for mental disorder scoring. Both statistical analysis and cross-referencing were used to determine the margins in both baseline and post-trial data. Different intensities and modalities of physical activities play a role in how they affect symptoms of mental and emotional disorders. With the majority of research showing improvement in anxiety/depression following exercise protocols, the goal is to educate others on this modality as treatment.

Faculty sponsor: Annmarie Chizewski

- ◆ **“The Interrelationship Between Exercise and Cognitive Function”**

Hannah Bray, Xadriana Herrejon, Ryan Skiera

Numerous studies show that there is a direct relationship between exercise and cognitive function (CF). CF refers to the ability of humans to process information or how the brain performs a variety of mental activities. The purpose of this project is to present the information gathered from 15 articles pertaining to the interrelationship between exercises and CF. The objective was to examine what role exercise and Physical Activity (PA) had on the CF of people from varying stages in their lives. Studies focused on participants from 6 to 50+ years old. The populations varied from healthy individuals with no physical and or mental limitations to adolescents with Cerebral Palsy to older adults who were at risk to Alzheimers and/or dementia. To meet our research criteria, articles needed to discuss the relationship exercises had on CF; studies varied in PA from kayaking with elderly populations, shuttle runs, and self-reported PA. The results that were found were all consistent in saying exercise or PA does in fact have a direct and

positive impact on CF. It has been concluded that exercise is a positive mechanism for improving CF or buffering against the decline of CF in all populations.

Faculty sponsor: Annmarie Chizewski

♦ **“The Relationship Between Exercise and Affective Response”**

Mariama Banks, Eduardo Candelas, Brandon Knox, Joseph Lock

Exercise has long been associated with enjoyment, with many believing that people are in better moods following both acute and chronic exercise. Purpose: To review the literature on affective response in relation to exercise. Methods: Fifteen different articles pertaining to exercise and affective response were reviewed. Participants in these studies were all healthy individuals ranging in ages from adolescents to middle aged adults. Most studies used outcome measures such as Feeling Scales (FS), Activation deactivation checklist (AD ACL), physical activity enjoyment scale (PACES), and rate of perceived exertion (RPE). Several studies lasted weeks with multiple sessions varying. Studies looked at resistance training (RT), high intensity interval training (HIIT), moderate conditioning training (MCT), and affective response. Results: Most participants had an increased positive affect immediately following acute exercise. People also experience a decreased negative affect after chronic exercise sessions. Conclusion: Results indicated participants having positive affective responses both during and post-exercise, demonstrating psychological benefits to individuals.

Faculty sponsor: Annmarie Chizewski