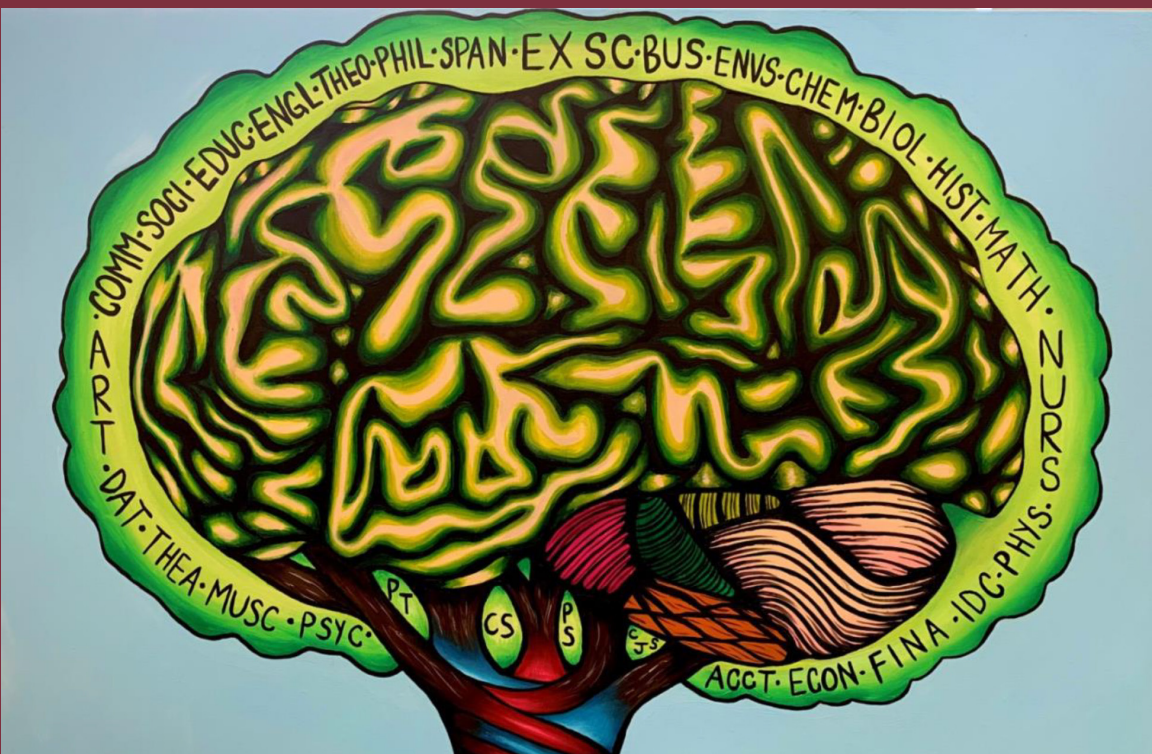
BELLARMINE UNIVERSITY
IN VERITATIS AMORE

2020 CELEBRATION OF STUDENT RESEARCH + CREATIVITY



About the BecVar Artist in Residence Program

The Artist in Residence program was established in the Lansing School of Nursing and Health Sciences 2002-2003 academic year. This program examines the art and science of Nursing and Health Sciences Health Professions through the eyes of an undergraduate student working in the fine and creative art mediums. Endowed by Mrs. Arthur N. BecVar in 2006 in honor of her husband, this program exemplifies the diverse and many creative and artistic talents of the BecVar family. Having earlier established an endowed nursing scholarship fund during Art's lifetime, with this endowment Jayne BecVar further connects her desire to support and provide to our community caring, ethical graduates. It is our mutual desire that the students' experiences in this program, as viewed through the arts, will give them new ways of thinking to inform their clinical practice, the health care profession, and patient contact and care.

Kayla Bailey

Kayla Bailey's Artist Statement

I have always been captivated by the Arts and Sciences because it is a unique union. This is the driving inspiration behind me being what I am at Bellarmine: a double major in Art and Psychology. Through my artistic lens, I have always loved creating art of any kind. My love for creating has only grown bigger each year since I first started taking art classes in the fourth grade. In the near future, I wish to help people understand themselves in their environment by being an Art therapist to people with disabilities. I adore assisting those who learn differently to express themselves through the outlet of art. They desire to share themselves, they're relatable and vulnerable, and I am beyond ecstatic to portray that to others through art, who might not otherwise have known it. This year, I intend on using knowledge of the Arts and the Health Sciences to further push the theme of connectedness and equal opportunity that I so often see within our Bellarmine community.

Image on title page by Kayla Bailey

Kenzi Gooley

Kenzi Gooley's Artist Statement

In the last year that I have spent working on my Artist in Residency project, I have learned more than I ever envisioned. Working on this project has prepared me as a writer and has taught me to manage long term projects. Interviewing Alzheimer's patients has given me an entirely new perspective on disease, illness, and death. I hope this story will preserve some essence of the resident's life history, and that the narrative choices in the creative piece as a whole can ignite empathy in my readers.

Unnameable
by Kenzi Gooley

All she knew was that respiratory failure was wet and loud. They say it's in your lungs, but it rumbles up from your belly. Rocks through your body. Bends you over in half, like a hearty laugh, and rolls up your lungs, off your tongue, taking what is inside with it. She hated that she was forgetting. Even worse, she hated remembering that she was forgetting, but worst of all, she hated that every memory she had of Gary was now attached to that wretched sound.

He used to sing. She knew it. It was a fact she could recite, and likely would be able to recite until her very end stages, the last memory to be wiped away, but she couldn't remember what it sounded like. Why couldn't she remember what it sounded like? She loved what it sounded like. God, that was all she knew. What she would give to hear it again—

"Hi Gary," she said. Her voice held a tightness of tone that came in most hospital rooms. But there was something in it, her voice, and the way she looked down first down then up. The way she tucked her hair behind her left ear. The way she smiled. There was something in it, unnameable, but something, that sang into existence the fifty-one years of marriage they shared.

2020 CELEBRATION OF STUDENT RESEARCH + CREATIVITY POSTER SESSION

UNDERGRADUATE STUDENTS

GRADUATE STUDENTS

ACTUARIAL SCIENCE

POSTER 1

Discovering the Optimal Portfolio Using Monte Carlo Simulations

Brennan Bauer / bbauer@bellarmine.edu / Faculty Advisor: Anne Raymond

The primary goal of using Monte Carlo simulations to construct a portfolio is to take advantage of computing power and generate as many portfolios as needed to find the optimum portfolio, specifically the portfolio with the highest return for the lowest risk. The metric used to determine this portfolio and the relationship between return and risk is the Sharpe ratio. The five steps that are followed to find the optimal portfolio using Monte Carlo simulations are extracting stock prices for the companies chosen, calculating daily returns, utilizing Monte-Carlo simulations to generate ten-thousand or more portfolios, calculating the risk and return of each of those portfolios, and plotting the risk and return of the portfolios. For this analysis, the companies chosen are Google, United Health Care, Black Rock, Disney, Tesla, Cummins, Proctor & Gamble, Chevron, American Electric Power, Duke Reality, and Ecolab. One company from each sector of the S&P 500 was chosen to mimic the diversification of an actual investment fund. The end goals or key results are displaying allocations of the best portfolios from the simulations. The portfolios that are displayed include the portfolio with the maximum Sharpe ratio, the portfolio with the minimum risk, and the portfolio where the investment in each company is allocated equally.

POSTER 2

The Application of Mathematics in the National Football League via Data Analytics

Jerod Hopson / jhopson@bellarmine.edu / Faculty Advisor: Anne Raymond

Recently in professional sports, specifically professional football, data analytics has helped coaches and their front office personnel lead their teams to success. This research looks at the different ways probability and statistical mathematics are used throughout different aspects of coaching and front office management in the National Football League. These aspects include the in-game scenarios, player development, which includes health and exercise, and coaching, which includes contract negotiations and draft choices. To better exemplify how mathematics is used, an emphasis is put on the in-game scenarios. Using historical play calling data and results, as well as current in-game aspects such as score, position on the field, and yards until a first down or touchdown is achieved, the expected return on an individual play are calculated.

POSTER 3

Applying Game Theory to the Analysis of Investing Strategies

Jordan Reinhart / jreinhart@bellarmine.edu / Faculty Advisor: Anne Raymond

Volatility, variability, and uncertainty are the driving factors behind the ebbs and flows in the stock market. As such, these factors are what make investing and attempting to profit from doing so such a difficult a task. This is evidenced in recent weeks

amid the stock market correction in response to the growing Covid-19 concerns. The question then is what are the best investment strategies that one should employ so as to maximize his profit or minimize his risk. That is the very question that this research intends to answer. This research conflates game theory with investment theory, proposing investment strategies in line with both that are garnered from analyzing Nash Equilibria and the means of finding such equilibria given a myriad of economic conditions. By representing the market as a nature-like component whose actions are not dependent upon the expected actions of those investing in the stock market, but instead dependent upon the probabilities that the market will boom, bust, or behave normally, it is possible to model stock exchange in a number of ways, or "games," that lend themselves to be being analyzed through a Game Theory lens. This research, then, identifies how likely one's investments/portfolio are to perform given the strategies he employs and, thus, elucidates the optimal investing strategies one should employ to achieve his goal.

POSTER 4

The Opioid Epidemic: An Analysis at the State Level

Jamey Van Dyke / jvandyke@bellarmine.edu / Faculty Advisor: Michael Ackerman

Over the last two decades, there has been a significant increase in opioid prescriptions and addiction. The potential for addiction is related to factors that include genetics, prescriber behavior, user behavior and characteristics, in addition to environmental and systemic determinants. One measure for the gravity of the crisis is overdoses. In 2017, drug overdoses killed over seventy thousand Americans and overdose deaths are projected to increase in the future under current policies. Despite the risk of addiction and overdose, opioids are commonly prescribed to combat pain. This research uses mathematical modeling and cross-sectional time-series state level data to examine the socioeconomic, demographic, and community level factors that are important in explaining synthetic opioid overdose deaths.

BIOCHEMISTRY AND MOLECULAR BIOLOGY

POSTER 5

Antimicrobial Activity of Extracts from the Leaves of Marrubium Vulgare

Ashley Cravens / acravens@bellarmine.edu / Faculty Advisor: Amanda Krzysiak

Natural products have served as powerful therapeutics against pathogenic bacteria since the golden age of antibiotics of the mid-20th century. In the United States, antibiotics are a key component of modern medicine and are one of the top written prescriptions every year. However, overuse and misuse of antibiotics has led to an increasing frequency of antibiotic-resistant infections. These infections are difficult and expensive to treat, often resulting in increased length of illness, hospital stays, and mortality rates. This clearly demonstrates that new antibiotics are critical for modern medicine. Murrubium vulgare (White Horehound) is a shrub found in the Appalachia region that has been used in herbal medicine to treat many pulmonary aliments as an expectorant, tonic, and emmenagogue. Previous studies of this plant and its commercial products have indicated that it may contain antioxidant and antibacterial properties. The aim of this study is to determine if whole leaf extracts of

M. vulgare contain antimicrobial properties. Five different plants were sampled for this project. The leaves were dried and then underwent extract in 95% ethanol in a 1:10 (m/v) ratio. The solvent was removed using a rotavapor at 60°C and hot plate evaporation. The crude product was left in a desiccator until constant weight was achieved. The crude samples were analyzed to characterize the different classes of natural products present. The crude extracts were dissolved in 5% DMSO at different ratios. The disk diffusion method was applied to determine the antimicrobial activity.

POSTER 6

Combating a Global Pandemic: Screening Chalcone Derivatives for Antimicrobial Properties via Kirby Bauer Disk Diffusion

Breena Frazier / bfrazier@bellarmine.edu / Faculty Advisor: Amanda Krzysiak

As antibiotic resistance emerges stronger than ever, novel antimicrobial compounds are necessary to continue the fight against disease and prevent a global pandemic. One natural source of antimicrobial activity is the chalcone. Abundant in our food, chalcones are versatile compounds that are easily synthesized and have demonstrated many pharmacological effects. In my research, I screened a number of chalcone derivatives for antimicrobial properties. Through analysis of this data, I hope to determine what type of substituents contribute to this type of biological activity. My goal in this research is to contribute to the growing knowledge on how these molecules can be used therapeutically in the future.

POSTER 7

A Biochemical Study of Eriodictyon californicum, A "Holy Herb," for its Bioactive Components and Healing Abilities Against Oxidative Stress

Allie Richards / arichards@bellarmine.edu / Faculty Advisor: Savita Chaurasia

Oxidative stress (OS) is a crucial factor in development of chronic and degenerative diseases such as stroke, cancer, diabetes, rheumatoid arthritis, Alzheimer's disease, and Parkinson's disease etc. The main cause of OS is free radicals, which are continuously generated in our body during normal physiological process. Antioxidants help combat OS by neutralizing free radicals. Plants are an important source of antioxidants. Therefore, this research is focused on finding novel antioxidants in E. californicum, commonly known as yerba santa or "holy herb." Yerba santa originates in California and Oregon and is a species within the Hydrophyllaceae family. Yerba santa was traditionally used by early settlers and Native Americans to help reduce coughs and colds. In the present study, the ethanolic leaf extract of E. californicum was studied for the phytochemical constituents, antioxidant potential and free radical scavenging activity. Phytochemical analysis unveiled the presence of flavonoids, saponins, phenols, tannins, terpenoids, and steroids. Antioxidant potential was assessed by total phenolic content, flavonoid content, and reducing power assay. Phenol content was 78.57630.016Qg GAE/mg and flavonoid content was 6.76430.0003Qg QE/mg. The extract showed significant reducing power in a concentration dependent manner. The free radical scavenging activity of the extract was assessed against DPPH, superoxide and hydroxyl radicals. Plant extract showed a dose dependent radical scavenging activity against all the three radicals. At a concentration of 1.0 mg/ml 90.39% inhibition of DPPH radical, 57.36% inhibition of superoxide radicals and 80.89% inhibition of hydroxyl radicals was observed. Herein, we report for the first time that E. californicum is a potential source of bioactive components with strong radical

scavenging activity. This holy herb could serve as a healing agent against oxidative stress. Further studies in this direction are in process.

Recipients of the Student Government Association Research Grant Award

POSTER 8

Analyzing the role of Src, MEK and EGFR in Cadmium-Induced Activation of ERK1/2 in Ovarian Cancer Cell Lines

Kira Steinke / ksteinke@bellarmine.edu / Faculty Advisor: Mary Huff

Cadmium, a naturally occurring heavy metal, is a toxic industrial and environmental pollutant commonly found in both ground and industrial wastewater. Studies have shown that cadmium is also a metalloestrogen that can bind to the human estrogen receptor (ER), stimulate DNA synthesis, and increases cellular proliferation in ovarian cancer cell lines. Furthermore, it has been shown to stimulate ERK1/2 activity in an ER-dependent manner. To determine if cadmium stimulates proliferation in two human epithelial ovarian cancer cell lines, OVCAR3 and SKOV3 cells were treated with varying concentrations of cadmium, and growth was measured using a cell proliferation assay. The results support that cadmium induces cellular proliferation at environmentally relevant concentrations (0.001-1.0 uM) within 24 hours of treatment. It was also observed that treatment with 1 nM of cadmium for 5 and 10 minutes activates ERK1/2 phosphorylation in OVCAR3 and SKOV3 cell lines, respectively. Inhibitor studies to determine if Src, MEK, and EGFR are required for cadmium-induced phosphorylation of ERK1/2 have been initiated. Preliminary results suggest that Src and EGFR are required for ERK1/2 phosphorylation induced by cadmium in SKOV3 cells while MEK plays less of a role. In contrast, MEK does appear to be required for cadmium induce ERK1/2 phosphorylation in OVCAR3 cells.

Accepted for presentation at Experimental Biology Conference, San Diego, CA, April 4, 2020

BIOLOGY

POSTER 9

Isolation of an Herbicide Resistant Gene from Giant Ragweed (Ambrosia trifida) Plants

Austin Buettner / abuettner@bellarmine.edu / Faculty Advisor: David Robinson

The development of herbicide resistance in weedy plants is an expanding problem throughout the U.S. One of the most common examples of this is tolerance in weeds to the herbicide glyphosate (Roundup®). The 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) gene in plants is associated with glyphosate resistance, meaning that herbicides containing glyphosate will not kill the plant. The exact cellular mechanism for the rise in glyphosate resistance is currently unknown, but one theory is a bypass in the shikimate pathway. Giant Ragweed samples were collected from a field in Ullin, Illinois. Samples collected were from a plant that showed damage from herbicides but continued to grow. The herbicide used was a Tomahawk™-Cobra® mixture of glyphosate solutions. The goal of this study is to isolate and sequence the EPSPS gene of resistant Giant Ragweed and compare it to the non-resistant Giant Ragweed sequence. Genomic DNA (gDNA) was extracted from four different Ragweed plants and PCR primers were designed in order to isolate the EPSPS gene from each. PCR

conditions were optimized using a gradient of annealing temperatures, template concentrations and primer combinations. An annealing temperature of 58.1°C or higher, and a Ragweed gDNA concentration of 25ng/uL appeared to work best. We can now see a single band of PCR product after gel electrophoresis. PCR products from two different plants are now being prepared for DNA sequencing and bioinformatic analysis. This research will hopefully allow for a better understanding of glyphosate resistance in Giant Ragweed, a major weed in the U.S. Hopefully, this research will contribute to our knowledge of the genetic, biochemical, and physiological mechanisms behind herbicide resistance in Giant Ragweed, so that farmers can better resolve this agricultural and environmental problem.

POSTER 10

The effect of E-liquid from JUUL pods on human epithelial lung cells

Lindsay Dyer / ldyer02@bellarmine.edu / Faculty Advisor: Mary Huff

The use of electronic cigarettes and vaping has grown in popularity in the United States over the last 12 years as a safe alternative to cigarettes. While e-cigarette use continues to rise, a recent outbreak of lung injuries and deaths associated with vaping, particularly among young people, has raised public concern regarding the safety of their use. Studies have shown that vaping damages cells that line airways and maintain surfactant levels, but the chemical(s) in the E-liquid responsible for this damage is unclear. In this study, we first wanted to determine if the different concentration of nicotine in the E-liquid in JUUL pods had a differential effect on the proliferation of human lung cancer cells. Using the human epithelial lung cell line, A549, cells were treated with varying concentrations of menthol-flavored JUUL E-liquid containing either 3% or 5% nicotine for 24 and 48 hours, and growth was measured using a cell proliferation assay. Our results show that cells treated with higher nicotine concentrations were less likely to proliferate, suggesting that the concentration of nicotine may have an impact on cell growth. Ongoing studies are being conducted to determine if other added components in the E-liquid may affect cell proliferation. These studies will address the chemical components that are found in the different flavors of E-liquid including Menthol, Classic Tobacco and Blue Raspberry.

POSTER 11

Discovering the Antioxidant Potential in Lomatium Root

Annabel Moore / amoore3@bellarmine.edu / Faculty Advisor: Savita Chaurasia

Natural products have been used for medicinal purposes for many centuries and have been of great interest in the pharmaceutical industry. Several plants have been known to reduce oxidative stress or detoxify the body of reactive intermediates that can cause severe damage. Oxidative stress is a condition linked to over 300 degenerative diseases. Antioxidants are present in many medicinal plants and help to limit the number of harmful chain reactions that occur due to oxidative stress. This research aimed to find the antioxidant potential in Lomatium dissectum, a species in the carrot family (Apiaceae). Lomantium root has been used historically by Native Americans, mostly as a treatment for respiratory illness, bacterial and viral infections. This study was completed to find out phytochemical composition, to determine total phenolic and flavonoid content, reducing potential and antioxidant activity in ethanolic extract of Lomatium root. Qualitative phytochemical screening revealed the presence of phenols, flavonoids, saponins, terpenoids, and steroids. Total phenolic and flavonoid contents were found to be 20.80 3 5.76mg GAE/g and 65.5 3 15.8

mg QE/g dry weight respectively. Plant extract showed high reducing potential in a dose-dependent fashion, which indicated the ability of the plant to donate electrons to neutralize free radicals. Antioxidant activity was determined using DPPH, superoxide and hydroxyl free radical scavenging assays. Lomatium extract displayed a concentration dependent radical scavenging activity. At a concentration of 0.5 mg/ml, plant extract scavenged DPPH, superoxide and hydroxyl radicals by 67.2%, 25.15% and 60.36%, respectively. These results show that Lomatium possess free radical scavenging activity and reducing effect and is rich in phenols and flavonoids. This is the first attempt at researching the antioxidant potential in Lomatium root, and the results instill confidence that this plant possesses the ability to act as an antioxidant against oxidative stress borne diseases.

Recipient of the Student Government Association Research Grant Award.

POSTER 12

Can Anatomical Structures on a Bisected Cadaver Donor Head Indicate a History of OSA?

Emily Porta / eporta@bellarmine.edu / Faculty Advisor: David Porta

According to the SleepFoundation.org, more than 18 million adults have obstructive sleep apnea (OSA), a disorder that can result in daytime fatigue, hypoxia, hypertension, arrhythmias, et al. Previous studies in live patients have suggested a correlation between OSA and uvular length (>15mm) and width (>10mm). We describe a possible correlation that can be seen in the gross lab setting. Causes of death are often provided for donors in a gross lab setting. Recently, comorbidities have been included which enhances the potential for clinical correlations. In this case, 2 Caucasian female cadaver donors, ages 87 and 88, had documented OSA. For comparison, 2 Caucasian females, ages 87 and 90, of similar anthropometry were also studied. OSA is most problematic when the patient is supine. The donors in our lab, like in most labs, were embalmed in the supine position. In an effort to document anthropometry, we measured donor height and specimens ranged from 151.1 to 162.6 centimeters. Because obesity has been implicated in OSA, we measured the distance from the dissection table to the anterior surface of the abdomen and specimens ranged from 193.7 to 304.8 millimeters. The heads and necks were then bisected in order to measure the distance between the epiglottis and uvula, width of the uvula, distance between the tongue and pharynx, and the distance from the nose to the inion. In our small study, we describe gross observations on 2 OSA versus 2 non-OSA donor cadavers. The most striking difference was the distance between the epiglottis and the uvula. In the OSA donors, the distance was 7.8 and 10.3 millimeters. In the non-OSA patients, the distance was considerably greater at 21.7 and 20.1 millimeters. When instructing on a bisected head, a short space between the uvula and epiglottis may be indicative of OSA.

Accepted for presentation at American Association of Clinical Anatomists Conference at Cornell University, New York City, June 15-18, 2020

POSTER 13

Pain, Sensory and ABI Tolerance to Aquilo Bilateral Leg Cryo-compression in Aged Individuals

Savannah Trussell / strussell@bellarmine.edu / Faculty Advisor: Sonja Bareiss

Cold-compression (CC) therapy has been shown to reduce pain and inflammation after

exercise in young, healthy adults. This therapy also has the potential to relieve pain and inflammation from older adults, especially those suffering from chronic conditions. However, to determine if CC is a safe modality for older adults, both older (65 +) and young (18-30) adults were recruited for a 15-minute bilateral lower extremity therapy session. Based on our study, CC was well tolerated in the older adults and displayed similar changes in outcome measures as in young adults to the therapy session.

CHEMISTRY

POSTER 14

Bismuth Chalcone Complex as Potential Active Ingredient in Cancer Drugs

Antonio Angelov / aangelov@bellarmine.edu / Faculty Advisor: Anna Christianson

Chalcones are small organic molecules that have been investigated as potential anticancer drugs; however, there is much room for improvement of their function. Bismuth was complexed with a chalcone in order to improve the function of said chalcone, following other reports of bismuth-based therapeutic agents. Bis (4-carboxychalcone) phenylbismuth (III) was successfully synthesizes and sent out for cellular assay with promising preliminary results against cancer and bacteria cells compared to non-complexed chalcone. Future research may involve changing the non-chalcone ligand in the bismuth complex, improving the synthetic procedure, and optimizing the solvents used. In the future there may be more metal complex-based therapeutic agents in the fight against cancer and bacteria.

ECONOMICS

POSTER 15

Exchange Rate Regimes, Income Classifications, and Economic Growth

Amandarae Matthew / amatthew@bellarmine.edu / Faculty Advisor: Hongwei Song

This paper will explore the relationship between economic growth and exchange rate regimes among countries of lower income, lower middle income, upper middle income, and high-income countries. Since the factors that a country typically uses to choose its exchange rate regime vary over time, countries must make careful consideration when choosing an exchange rate regime. A cross section pooled time series data will be used for a sample of 42 countries over the period of 2000-2018. Multiple models will examine the various relationships between exchange rate regimes, income classifications, and economic growth. The components of the models being tested include political stability, change in terms of trade, population growth, income classification, investment/GDP, and exchange rate regime classification because they are all determinants of the robustness of a country's economic growth. The findings from this paper will further the literature regarding exchange rates and growth.

POSTER 16

A Study of Addiction: The Opioid Epidemic, An Analysis at the State and County Level

Jamey Van Dyke / jvandyke@bellarmine.edu / Faculty Advisor: Myra McCrickard

Addictive diseases such as those stemming from the use of alcohol, cocaine and opioids lead to serious negative consequences at both the individual and societal level. Over the last two decades, there has been a significant increase in opioid prescriptions and addiction. The potential for addiction is related to factors that include genetics, prescriber behavior, user behavior and characteristics, in addition to environmental and systemic determinants. One measure of the seriousness of the opioid epidemic is the number of overdose deaths. In 2017, drug overdoses killed over seventy thousand Americans and overdose deaths are projected to increase in the future. Despite the risk of addiction and overdose, opioids are commonly prescribed to combat pain. This paper uses cross-sectional county and state level data to examine the socioeconomic, demographic, and community level factors that are important in explaining opioid overdose deaths.

ENVIRONMENTAL SCIENCE

POSTER 17

Stressors to urban wetlands

Jess Glaser / jglaser@bellarmine.edu / Faculty Advisor: Martha Carlson Mazur

Urban wetlands have a major importance, providing various wildlife in an urban environment. They are also very important for increasing biodiversity, take carbon out of the air and stabilize the air temperatures around them. However, urban stressors, such as road salt, micro-plastics and issues with urban heat island effect and invasive species also pose a threat. The purpose of this study was to investigate the effects of pollution from urban sources on urban wetlands. I found that the pollution from the urban sources affects the water quality and dramatically affects the wetlands water chemistry and the organism inhabitants. The wetlands studied were recently restored and are located on the property of the Passionist Earth & Spirit Center in Louisville Kentucky. Methods for the study were to collect water quality data, specifically specific conductance and alkalinity, from the wetlands every other week looking at the issues with drought and Macro invertebrate biodiversity and abundance were sampled on both wetlands. The findings show that, even though the wetlands are in the same area, what is affecting the wetlands is different even when they are in the same area. Wetland one has issues with experienced more drastic water level changes and it has-showed less diversity of macro invertebrates than wetland two, while the water level in wetland two 's water level was more stable and has higher diversity in macro invertebrates it has higher alkalinity due to a geological effect. This information shows show urban wetlands have a lot going on and a lot impacting them researching them will have a great impact on how we can use them to help in urban environments. If we make the wetlands better prepared our environment will be to sustain human pollutants and help fight climate.

Recipient of the Student Government Association Research Grant Award

POSTER 18

Groundwater Geochemical Research for Wetlands

Maria Holmes / mholmes2@bellarmine.edu / Faculty Advisor: Martha Carlson Mazur

In urban areas, there has been an increased use in road salts and fertilizers. These materials can pollute water sources, like wetlands. As road salts break down and enter these water sources, they can be detrimental to fish and amphibians if the concentration is too high. Fertilizers can cause algal blooms, which can reduce the oxygen in the water and harm the ecosystem in that area. These contaminants can be delivered by different hydrologic flow paths: overland flow and groundwater flow. Knowing these pathways to two restored wetlands, in particular, at the Passionist Earth and Spirit Center is important because different levels of pollution get delivered through different pathways and affect the wetlands. To this end, stable water isotopes were measured in eight different water sources. Water samples from three groundwater sources, the two wetlands, a vernal pool, rainwater, and an unknown stream were collected and sent to the Colorado Plateau Stable Isotope Laboratory for isotope analysis.

The stable water isotopes showed how various contaminants can flow in through different hydrologic pathways. Wetland 2 showed a different type of algal growth than Wetland 1, and this seems to be because of the different flow paths and what is brought in by those flow paths with Wetland 2 receiving more fertilizer dissolved in groundwater. Wetland 1 had less groundwater and more water from sources like rain. If this is the cause, then that means some contaminants could be flowing in through the groundwater and impacting Wetland 2, while other contaminants are delivered by overland flow to Wetland 1.

Recipient of the Student Government Association Research Grant Award

POSTER 19

Anthropogenic Effects on Wetland Macroinvertebrates

Michael Kotarski / mkotarski@bellarmine.edu / Faculty Advisor: Martha Carlson Mazur

Wetlands are areas that are important both for the organisms that inhabit them and for humans. Wetlands provide habitats for plants and animals, serve as protection against flooding, offer recreational opportunities and are a source of research for educational purposes. As compared to rural wetlands, urban environments are highly affected by human activity. Anthropogenic effects on urban wetlands include air and water pollution through poor waste disposal methods and the release of harmful toxins into the air and water. I hypothesized that the aquatic macroinvertebrates inhabiting restored urban wetlands are affected by the anthropogenic effects from upslope. My study included two recently restored wetlands at the Passionist Earth & Spirit Center in Louisville, KY. To test for pollutants that might be present in the wetlands, I measured pH, turbidity (FNU), temperature (ºC), nitrate (mg/L), and specific conductance (uS/cm) using a YSI Pro-DSS. I used a Hach kit to test orthophosphate and alkalinity (mg/L CaCO3) and a Vernier instrument to test dissolved oxygen levels in each wetland. Macroinvertebrate sampling was performed in spring and fall by collecting organisms using a D-frame net and identifying them to family level in the field. Macroinvertebrates were more abundant in the spring in Wetland 1 and in the fall in Wetland 2. Water chemistry results indicated that the aquatic macroinvertebrates are affected by anthropogenic effects posed by humans. High nitrate levels found in each wetland in the fall likely are caused by fertilizers that are put on gardens and lawns above the wetland. The fertilizer infiltrates the groundwater that feeds into the

wetlands and cause algal blooms and the subsequent removal of oxygen that macroinvertebrates need. These results are important for guiding restoration efforts and understanding the impacts that humans have on these important urban ecosystems.

EXERCISE SCIENCE

POSTER 20

The Effect of Acute Beta-Alanine Supplementation on Muscular Strength

Morgan Seppenfield, Beth DiChiara, Bayley Wade, and Amela Alic / mseppenfield@bellarmine.edu / Faculty Advisor: Sara Mahoney

Beta-Alanine is a precursor to muscle carnosine which works as a physiological buffer within the muscle. Muscle carnosine is important to the muscle because it reduces the feeling of fatigue, allowing the athlete to continue high performance exercise longer. The purpose of this study was to investigate the effect of acute beta-alanine supplementation on muscular strength. Methods: 11 undergraduate students (7 male) were recruited to participate in this double-blind, randomized, controlled trial. Participants completed an initial 1-rep max bench press to measure strength and were then randomized to either receive 3.2 grams of beta-alanine or placebo as a first condition. The participants returned to the lab within 48 hours to complete a post-test. Then, following a 7-day wash-out, participants completed the second condition. Results: 1-RM strength was significantly higher following the beta-alanine treatment (1583102.8105053) as compared to placebo (130383.0060239). Conclusion: Overall we found that acute beta-alanine supplementation increased 1-RM bench press in college students.

HEALTH AND AGING SERVICES LEADERSHIP

POSTER 21

Analyzing the Use of a Long-Term Care Administration Simulation Tool in the Classroom and its Effect on Student Performance

Patrick Dalton and Taylor Funk / pdalton2@bellarmine.edu / Faculty Advisor: David Wolf

Problem: The turnover rate of newly emerging long-term care administrators has reached as high as 300% within the first two years of employment. Several long-term care administration programs at universities have not yet used an industry-specialized simulation program that is implemented to aid students in better understanding the relationship of theory to practice within long-term care and health services administration.

Hypothesis: The Building Excellence with a Simulation Training (BEST) program is a new virtual simulation tool where students can engage and make decisions related to the operational, financial, political, technological, and regulatory aspects of long-term care administration. Using a simulation tool to apply classroom knowledge in

such a situation will better prepare students for careers as leaders upon graduation.

Methodology: As part of a pilot research project, students enrolled in a leadership and management capstone course utilize the BEST tool on a weekly basis during a 15-week semester. Students will apply content learned in lecture to simulated scenarios in a nursing home. The results of their data inputs (e.g., time spent on census development, staff to hire or fire) will be recorded and analyzed to determine if industry comprehension and understanding of decision-making effects increase from the start of the semester to the end.

Results: Anticipated results will show students' improvement from pre- to post-simulation scores over the course of a semester. In addition, students will share their experiences and feedback as study participants. This is an ongoing study that will be completed before Convocation.

Conclusions: The effects of using a simulation tool in a classroom, as part of this research, will be shared with attendees, including the quantitative results and qualitative feedback. Future plans for using the BEST simulation tool in academic settings will also be discussed

Accepted for presentation at American College of Healthcare Administrators Conference, New Orleans, LA, May 3-6, 2020

POSTER 22

Stay Interviews vs Exit Interviews: Strategies for Nursing Homes to Improve Staff Retention

Ken Gumira / kgumira@bellarmine.edu / Faculty Advisor: Kevin Hansen

Direct care staff shortages are a persistent problem in post-acute care. With respect to nurses and CNAs staffed within a facility, the reality is that many will resign at some point. To address high turnover, many employers turn to exit interviews to assess why staff members leave, and ultimately ways in which the facility can retain staff. Exit interviews are useful; however, the majority of these interviews take place with an employee's foot already out the door (Prasanth & Suresh Babu, 2014).

To address this, some employers have turned to stay interviews, which is "a proactive approach that's been shown to be very successful in retaining staff across multiple disciplines" (Robeano, 2017). Questions such as "Why are you leaving?" turn to "Why do you stay?", to get results that help employers connect with staff by finding out how to better engage and lead them.

To understand how effective such questions can be, a sample of nurses from a facility will be asked a series of open-ended stay interview questions. Responses will be recorded and used with previously collected data (e.g., relationships, compensation, recognition, work-life balance). The data recorded is qualitative, describing what keeps employees satisfied and wishing to stay in their position, while also recording employee retention over time.

Qualitative results from stay interviews will be shared, as well as identified recruitment, onboarding, continuing education, and retention strategies employed by the care community, based on feedback.

Stay interviews are vital because they can contribute to lower turnover and, ultimately,

more satisfied residents. These interviews aid leadership on how to be supportive with staff and retain talented caregivers. With stay interviews, employees are included as members in leadership decisions, and this could help in keeping top performers as part of a strategy to address staff shortages that affect many organizations.

Accepted for presentation at American College of Healthcare Administrators Conference, New Orleans, LA, May 3-6, 2020

POSTER 23

The Story of the Building Excellence with a Simulation Tool (BEST)

Holly Cox / hcox@bellarmine.edu / Faculty Advisor: David Wolf

The field of long-term care administration has not had an interactive and robust education simulation available to train leaders in the field, unlike many long-established academic disciplines. Responding to the rapidly changing dynamics in the post-acute care and senior housing leadership field, a diverse group has begun work on developing a 'state of the art' simulation program. The goal of BEST is to provide a honing of critical thinking and decision-making skills for both existing administrators and emerging leaders. A steering committee has reviewed past efforts, worked on the conceptual development and identified the overall and refined learning objectives to share with the field. Further conversations have validated these concepts and gathered additional real-life cases and scenarios to use within the experience. We have developed the system and training materials and unveiled this educational product with a beta test at the ACHCA Convocation in Louisville this past March of 2019 and did a second beta test with the UWE-Eau Claire HCAD practicum students. Based on the feedback, we are working to advance another version of the model in partnership with PrimeCare Technologies. The development history of the new model and platform will be shared with attendees, along with the projected uses of the product moving forward.

Accepted for presentation at American College of Healthcare Administrators Conference, New Orleans, LA, May 3-6, 2020

MATHEMATICS

POSTER 24

Mathematics Impact on Poetry

Philip Golden / pgolden2@bellarmine.edu / Faculty Advisor: Daylene Zielinski

Poetry and mathematics, while disparate, have many connections both obvious and not. An exploration into both fields shows clear links. In this thesis, I explore how mathematics has, and continues to, impact the structure of poetry. In the first part, I take traditional poems and poetic forms and analyze the underlying mathematics found in each. I begin with basic level mathematic, such as counting and arithmetic, and work towards deeper mathematics, pulling from linear algebra, differential equations, ring theory, and more. In the second part, I create a new poetic form, with guidelines and an original example, by choosing two college-level mathematical concepts and allowing those to inform how I create this new form.

POSTER 25

Mathematic Modeling Behind Diet Plans

Joseph Isakson / jisakson@bellarmine.edu / Faculty Advisor: Anne Raymond

One popular topic in today's society is that of the diet plan. This research explores the mathematical models of two of the more popular trends to determine what variables within a diet makes a diet plan optimal and desirable. In particular, this project examines Intermittent Fasting and the Ketogenic Diet and how these specific diets compare. Common variables among the models of these diets as well as variables that set the diets apart are examined. Initial results reveal that the key common variable that factors into these diets is the amount of protein intake. In addition, the variable representing the difference between daily calories expended and daily calories consumed should be positive. The research shows that while alternative diets plans are structured differently, the success of each diet plan depends heavily upon these two important components.

POSTER 26

Mathematical Modeling and Infectious Diseases

Bekkah Trachtenburg / btrachtenburg@bellarmine.edu / Faculty Advisor: Kate Anne Raymond

Infectious diseases might not seem like a mathematical problem, but with mathematical modeling we can see a lot of different aspects of diseases and their effects. The different aspects include the growth rate of the disease, the change when different characteristics of the disease are increased or decreased, and more. I focus on the susceptible, infected, recovered framework (SIR). This mathematical model is one of the most known models that uses the amount infected, susceptible and recovered people to help make a theoretical prediction of the spread of the infectious disease throughout the population over time. The mosquito population is one key factor related to the spread of infectious diseases. My research uses the SIR model to look at the genetically modified mosquitos in Africa and how they have lowered the risk of Malaria.

MEDICAL LABORATORY SCIENCE

POSTER 27

Overcoming Spatial Challenges in the Laboratory: Reducing Turn-Around-Times for Bacterial Meningitis

Bradley Chapman / bchapman2@bellarmine.edu / Faculty Advisor: Karen Golemboski

Bacterial meningitis is a very serious form of meningitis and can lead to death without a quick response. Traditionally, bacterial meningitis was identified through culture, but the time necessary for growth also provided the bacteria adequate time to do significant, potentially lethal, damage. New technology in the form of polymerase chain reactions has allowed the identification of the organism responsible for bacterial meningitis without needing to wait for a culture. While negative results are reported automatically at a certain local medical facility, positive results are stuck in middleware and require a medical laboratory scientist to call the patient's nurse and manually release the results.

Due to the relevant instruments being placed in an area with low foot traffic, significant delays before positive results are reported are common, with nearly 40% of delays lasting over an hour and delays range from as little as 7 minutes to over 3 hours. Bacterial meningitis at this location is uncommon enough that collecting statistically significant data within a reasonable time frame is not possible. As a surrogate, Clostridioides difficile (Formerly known as Clostridium difficile) delays were monitored due to being tested on the same instrument and having the same reporting methodology but also having significantly more positive results. Given that each hour of delay can have permanent clinical consequences for bacterial meningitis, a goal was set to reduce the percentage of delays over an hour to under 20%.

POSTER 28

Saving Platelets: Improvement Project to Reduce Blood Bank Wastage

Amber Gustafson / agustafson@bellarmine.edu / Faculty Advisor: Karen Golemboski

Blood, plasma, and platelets are lifesaving products that are collected voluntarily. These precious products are sold to various hospitals for transfusion services. Each product has a shelf life which is determined by storage requirement. The shortest life span of all these products is platelets. Room temperature storage of platelets prevents clumping, which would render the platelets inert, but also increases the chance of bacterial growth. Routine testing and transportation of the platelets bring the shelf life to 3-5 days at the hospital.

Due to the short life span of platelets, wastage of this resource costs hospitals millions of dollars annually. In addition, mismanagement and wastage of platelets mean that the product can no longer be used for patients. The national benchmark of platelet wastage is 7%. Better management of platelets within the hospital is needed to ensure quality healthcare at a reasonable cost.

A hospital recently found themselves wasting close to $10,000 a month in platelets alone. An intervention of retraining the laboratory professionals to actively manage platelet inventory was enacted. This included measures such as maintaining a recommended number of platelets in stock, cancellation of standing orders and transferring short date products to other facilities.

This retraining allowed for a decrease in platelet wastage from 28% to 7%, saving thousands of dollars a month. Better management of the platelet inventory allows for reduced healthcare costs and improved utilization of products to the benefit of patients.

POSTER 29

Imported Case of Plasmodium Malariae

Courtney Welp / cwelp@bellarmine.edu / Faculty Advisor: Karen Golemboski

Malaria infections are caused by any of the five species of Plasmodium (falciparum, vivax, ovale, malariae, and knowlesi). It is essential to identify the parasite and determine the type of species because the severity and clinical course vary among the five. Malarial infections are known to present with fever, chills, sweating, headache, weakness, and other symptoms that may mimic viral infections. The symptoms of malaria are not specific and can be misdiagnosed in non-endemic areas. Changes in hematological parameters play a vital role in malaria diagnosis. The direct destruction of red blood cells at the time of the release of merozoites (a process shared by

Plasmodium species) is associated with a reduction in hemoglobin levels, frequently leading to anemia.

The following case study is of a 16-year-old boy who presented to the emergency room after emigrating from Tanzania two months prior. His symptoms included intermittent head and neck pain, dizziness, and fatigue. Urinalysis results suggested further evaluation of hemolytic and hepatic complications. Hematological parameters revealed a decrease in hemoglobin concentration and hematocrit. The unusual inclusions on the blood smear were identified and confirmed for Plasmodium malariae. This case is significant because malaria is endemic in Tanzania with many clinical cases caused by Plasmodium falciparum (>85%), but cases due to Plasmodium malariae are rare. The hematological changes in this patient were attributed to Plasmodium malariae. The patient was treated with antimalarial medication, Chloroquine and Atovaquone-proguanil.

POLITICAL SCIENCE

POSTER 30

Dissecting the Man of Steel: The Evolution of Superman as a Reflection of American Society

Marie Gould / mgould@bellarmine.edu / Faculty Advisor: Jonathan Blandford

In this project, I will be analyzing the numerous narratives of Superman comics throughout history and connecting them to political ideologies and social changes that were occurring at the time they were written. In making these connections, I hope to show not only how Superman has not always been the "American Boy Scout" that we know, but that his stories reflect the trends and beliefs of society as they evolved. In doing so, I also hope this project will bring notice to the idea that comics can serve a scholarly purpose and literary message instead of just an escapist fantasy.

Other Presentations: Kentucky Honors Roundtable, University of Louisville, February 28-29, 2020

POSTER 31

Justice, Not Vengeance

Jillian Sauer / jsauer@bellarmine.edu / Faculty Advisor: Elizabeth Hinson-Hasty

In 2017 the Kentucky DOC reported that Kentucky prisons housed 2,521 persons categorized as “elderly”. Even though individuals in this population are more susceptible to violence and risk developing age-related illnesses the care of these individuals is not a financial priority for those in power. These individuals occupy a unique position as a marginalized group within a marginalized group, and one which is growing rapidly. As a result, it is necessary to develop a response drawing from Catholic social teaching and criminal justice ethics which addresses the unique problems faced by this population. At the core of this response is the truth that at no point does justice require, nor allow, punishment to deny the dignity of the individual.

Accepted for presentation at Southern Regional Honors Conference, Birmingham, AL, March 19-21, 2020

PSYCHOLOGY

POSTER 32

Social Support, Self-Efficacy, & Gender in College

Kasey Phelps / kphelps@bellarmine.edu / Faculty Advisor: Christy Wolfe

This study aims to measure the relationship between social support and academic outcomes. This study explores how this relationship may be influenced by an individual's identity. This study focuses mainly on the role of gender identity, beyond dichotomous female/male sex, but also examines the roles of many identity variables including first-generation status, race and ethnicity, socioeconomic status, and the personality variables need for approval, conscientiousness, and extraversion. Academic outcomes are measured with self-efficacy, GPA, major choice, and major retention.

RADIATION THERAPY

POSTER 33

An Evaluation of RO-ILS for Interventions in Error Prevention

Sierra Chamberlain / schamberlain@bellarmine.edu / Faculty Advisor: Carol Scherbak

Radiation therapy is a technologically advanced field that is constantly evolving. With this constant evolution in technology, the possibility of an error occurring increases. This research examines case studies provided by RO-ILS Quarterly reports, peer reviewed articles, books, and resources provided by the American Society for Radiation Oncology (ASTRO) . Based on these readings, new protocols for radiation therapy departments were created. These new protocols will decrease errors seen in radiation therapy resulting in the overall improvement of patient safety. Minimizing the chance of error will result in ideal patient care.

POSTER 34

Radiation Therapist Burnout Due to High-Risk Procedures

Victoria Veith / vsallee@bellarmine.edu / Faculty Advisor: Carol Scherbak

Radiation therapist burnout is becoming prevalent in potentially high stress field. The purpose of this study is to examine the effects of high-risk procedures on radiation therapists. In this study, high-risk procedures are defined as stereotactic radiosurgery (SRS) and stereotactic body radiation therapy (SBRT)/ stereotactic ablative radiotherapy (SABR). The study was conducted by distributing surveys designed specifically for this research topic to radiation therapists. The survey consisted of 18 multiple choice and open answer questions and was completed through Google Forms.

SECONDARY EDUCATION

POSTER 35

The Effects of Small-Group Collaboration on Student Attitudes Towards Mathematics

Philip Golden / pgolden2@bellarmine.edu / Faculty Advisor: Jessica Ivy

Collaborative group work has become a prevalent teaching strategy in high school mathematics classrooms, and for good reason. When implemented effectively, studies show that collaboration improves student learning outcomes. However, there are other factors to consider when deciding on best practices for teaching, one being student attitudes towards the content. In particular, student attitudes towards mathematics (which aren't generally positive) are important to consider. In this study, students in a high school mathematics classroom took a survey before and after a unit that implemented collaborative strategies. Results of the study indicate that student attitudes towards math improved after working collaboratively during the unit.

Accepted for presentation at Southern Regional Honors Conference, Birmingham, AL, March 19-21, 2020

GRADUATE STUDENTS

LEADERSHIP IN HIGHER EDUCATION

POSTER 36

"We Live in Two Worlds": Foreign-Born College and University Presidents – Perspectives, Leadership, and Resiliency

Kristie Johnson / kjohnson34@bellarmine.edu / Faculty Advisor: Donald Mitchell

This qualitative study explored the lived experiences of foreign-born college and university presidents in the United States to determine how their cultural background and traditions influenced their leadership and prepared them to lead. The phenomenological research design also examined the strategies foreign-born university presidents, who self-identify as people of Color, utilized to navigate to and through the presidential pipeline and ways in which resiliency was demonstrated. The study was grounded in asset-based community development and provided a framework to understand how the presidents contribute to their campus and local community.

Fifteen foreign-born college and university presidents representing ten countries participated in semi-structured interviews. The presidents were geographically located across the United States and represented public, private, 4-year, and 2-year institutions.

Findings revealed the importance of education, family obligations, and the influence of culture on their decision to immigrate to the United States; the challenges of living in two worlds, straddling multiple identities, and how they negotiate their sense of belonging in the United States; challenges encountered on their pathway to the presi-

dency; accent discrimination, biases, and having to work harder than their peers; and, assets the presidents bring, resiliency demonstrated, and the importance of a legacy.

Recipient of Provost Research Grant Award

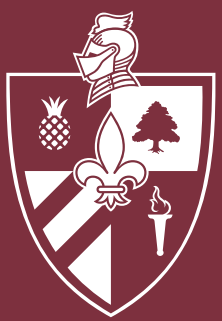
MEDICAL LABORATORY SCIENCE

POSTER 37

Reducing the Occurrence of Unlabeled Samples within an Emergency Department

Brenda Victor / bvictor@bellarmine.edu / Faculty Advisor: Karen Golemboski

Each year, it is estimated that as many as 180,000 deaths happen due to medical errors. These numbers continuously rise and can only be estimated because medical records are often error-prone (Carver, Gupta, Hipskind, 2020). Errors in laboratory testing are most frequently found in the pre-analytical stage of testing. One of the ways to reduce pre-analytical errors are to avoid unlabeled and mislabeled samples. In a hospital, the emergency department is one of the most labor-intensive and fast-paced environments compared to the other departments. Due to this, most identification errors happen in the emergency department. To mitigate these errors within a particular hospital that has an unacceptably high rate of unlabeled specimens, an intervention was introduced which included an infographic describing the correct processes in specimen collection and specimen labeling. These infographics were introduced in every emergency room and are meant to encourage the staff within the emergency department to recall the step-to-step processes in specimen collection and labeling to reduce medical errors. The aim of this intervention is to have a reduction in unlabeled samples by encouraging the staff to remember the specimen labeling process detailed in the infographic. The post-intervention data were compared to the pre-intervention data by analyzing the number of unlabeled samples before and after the intervention was started. A run chart was used to analyze the number of samples on a weekly basis.



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