2022 CELEBRATION OF STUDENT RESEARCH + CREATIVITY

BELLARMINE UNIVERSITY

ABOUT THE BECVAR ARTISTS IN RESIDENCE PROGRAM

The Lansing School of Nursing and Health Sciences established the Artist-in-Residence program in the 2002-2003 academic year. This program examines the art and science of Nursing and Health Sciences 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.

BECVAR ARTIST IN RESIDENCE: BRIANNA BRAGG

Brianna Bragg is a senior student double-majoring in Communication and Health Services with a minor in Marketing Communications. On campus she is involved as a peer career navigator with the Career Development Center and serves as president of the Health Care Administrators of Bellarmine student organization. During her time at Bellarmine, she has identified her goal of pursuing a career path that allows her to use her creativity and skills in communication along with her passion for improving health and wellness. She is specifically interested in pursuing public health policy to create a more equitable system. For her honors senior thesis, she researched the impact of history on current social determinants of health and Black health disparities and how narratives can be used to influence health equity policymaking. This research served as the foundation for her BecVar Artist in Residence program which used creative digital communication as a tool to educate about health equity.

Artist Statement: *The Root of the Problem* is a digital media project aiming to raise awareness of the structural determinants of health contributing to health disparities.

Using tree imagery, this interactive web page outlines how structural racism is a root cause of health disparities among Black Americans. Specifically, this web page traces how historical policies shaped adverse social determinants of health that contribute to poor chronic disease health outcomes among marginalized populations.

Artist Statement: Logan Funderburg is a junior at Bellarmine University who is currently studying English and Creative Writing. He plans to teach English to high school students upon graduation from Bellarmine's Master of Arts in Teaching program. He believes a liberal arts education, rooted in interdisciplinary work, prepares students to interact with the world in the most effective manner. This belief spurred his intrigue with the BecVar Artist in Residence program and led him to the idea for his project, *Su Cuerpo*. The collection of poems revolves around the physical and metaphorical bodies that surround us in our everyday lives. The worlds of health science and the humanities both revolve around the body, yet they do so in different ways. Logan explores this concept and more in his project.

A Question of Life
*As we live our lives
we begin to die our deaths.*

*For every inhale
there is an exhale,
eventually.*

*Kids get shivers
sent down their spines
when they first recognize
their perfectly human mortality.*

*Perhaps that is what death feels
like. A feeling of frozen,
of stuckness, of I don't want
to exhale if it means that's it.*

*Or perhaps death just feels
like life. Because as we live
we die and as we are dying
we are surely still living.*

Madison Montgomery is working to be in production with movie-making or gaming-focused companies. In 2021, she received her bachelor's degree in Design, Arts and Technology and Studio Art, with an emphasis in Digital Art. In addition to completing the BecVar Artist in Residence Program, she has been featured in exhibitions in the Bellarmine University McGrath Gallery, the Martin Luther King Jr. Art Exhibit, the Creative Spirit Art Gallery, and the Celebration of Student Research and Creativity. She was featured in the January Unity Play Showcase, had a publication in Ariel Magazine, and has interned at Solid Light Inc. in downtown Louisville. Montgomery currently lives and works in Louisville.

Artist Statement: Mental illness can be caused by genetics, long-term physical health conditions, and uncontrollable environmental factors. Each illness alters a person's thoughts, feelings, and/or behaviors in distinct ways. Though there is much left to discover about the causes and effects of mental illness, recent studies lead scientists to believe that our brains are physically affected by these disorders. I thought it would be interesting to study this subject and create a project that could visualize the effects of illness on the brain. As part of my BecVar artist's residency, I researched this issue in order to create a project that could visualize the effects of illness on the brain. My goal was to create an app that could serve as a teaching tool and help to reduce the stigma associated with mental health disorders in our society.

I learned several new programs and programming languages to create this interactive game. These include the Unity Game Engine, a free-to-use software-development environment for building video games; Blender, which is used to create 3D models; and the C# coding language. I also partnered with Micah J. Davisson, a Music Technology student at Bellarmine, who created an amazing LoFi Soundtrack to accompany the visual work. With all these tools, I was able to design an interactive learning experience that raises awareness about mental health and reflects my interest in trying to make the world a better place. The BecVar opportunity was very valuable to me because it allowed me to explore and learn new medias. They trusted me throughout the entire process to create something new. This experience has been incredibly valuable to me because it has opened up new doors to potential career opportunities. I'm extremely thankful for this opportunity, and the many people who have helped me along the way!
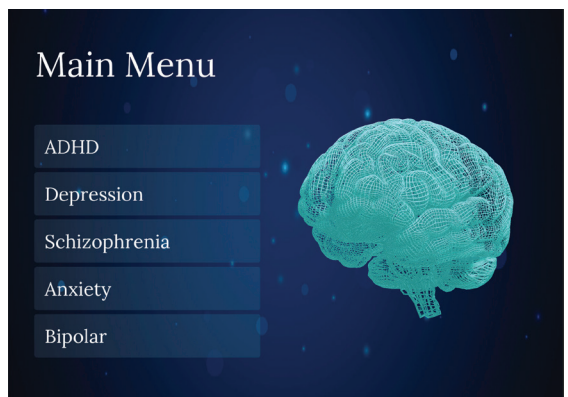
Artist Statement: Tate Wortham was born in 1999 in Louisville, Kentucky. In 2022, he will receive his degree in Digital Art from Bellarmine University and hopes to pursue a degree in medical illustration. Wortham specializes in anatomy and portraits which reflect his roots in the sciences. He also uses religious and mythological symbolism, further reflecting the interests of his youth. In 2020 he was given an apprenticeship at Artfully Insane, a tattoo parlor in Louisville.

Wortham will finish the BecVar Artist in Residence program in 2022. He will be featured in the group exhibition *American Gothic* at Folx Gallery and he had a solo exhibition at McGrath Gallery in January 2022 titled *A True Religion*. His work has been recognized over the years by the likes of actresses Jenn Lyon and Stephanie Beatriz, athletes such as Tom Brady and Odell Beckham Jr., and musician Phoebe Bridgers. Wortham currently lives in Louisville as a full-time student and visual artist.

Cover by: Tate Wortham

2022 CELEBRATION OF STUDENT RESEARCH + CREATIVITY VIRTUAL POSTER SESSIONS

ACTUARIAL SCIENCE AND ECONOMICS

POSTER 1

An Econometric Analysis of Collegiate Player Performance to Create a Model for Forecasting Contributions to Team Success

Evan Seely / eseely@bellarmine.edu / Faculty Mentor: Michael Ackerman

At the conclusion of each basketball season, each conference selects 1st, 2nd, and sometimes 3rd all-conference teams based on player performance for that season. Often, these all-conference teams reflect biases in the media rather than evaluations based on player performance alone. The baseball statistic Wins Above Replacement, WAR, is useful in quantifying the impact of each player through the number of wins contributed to his respective team by comparing each player to a designated replacement level player. This statistic can also be applied to basketball analysis to perform a similar function as in baseball, despite a vastly different formulation. However, the WAR statistic has limitations in its player analysis in basketball, particularly through failing to include defensive statistics and having no established definition of a replacement player. In this presentation, I utilize the Wins Above Replacement statistic along with other key statistics, particularly in the defensive aspect of the game, to create an econometric model to better determine which players contributed the most to their team's success. This helps determine which players should be selected to the all-conference team at the end of the collegiate basketball season.

Accepted for presentation at the Southern Regional Honors Council in Birmingham, Alabama March 30, 2022 - April 2, 2022

POSTER 2

Hold 'Em or Fold 'Em: A Discussion of Long-Term Probabilities in Texas Hold 'Em Poker

Evan Seely / eseely@bellarmine.edu / Faculty Mentor: Susan White

Texas Hold 'Em Poker has ten distinct possibilities in the final round of betting. Given the constant probabilities for each of these outcomes and the finite number of five card possibilities with a fifty-two card deck, I plan to utilize Markov chains based on the independence that exists between each hand of poker and the constant probability for each of the ten possible outcomes to determine the long-term probabilities of winning with a particular hand. These long-term probabilities using a Markov Chain determine how many hands will occur before a certain outcome appears again. This model can be expanded to the entire game with two, three, and four card hands given the finite number of hands of those sizes based on the same theory of constant probabilities and independence between hands given a fifty-two card deck. By using these assumptions, this paper avoids discussion of giving up on a round, also known as folding, to ensure each hand plays out to the end. These findings are useful for these players to develop appropriate betting strategies throughout the game to most effectively use their poker chips to profit from gambling on this game.

How should you bid? An analysis of bidding on eBay using Game Theory

Maya Sorensen / msorensen@bellarmine.edu / Faculty Mentor: Michael Ackerman

Bidding on eBay is all fun and games – until your flawless strategy doesn't win you the item you want. With maximum amounts each bidder is willing to pay and days of waiting for bidding to close, bidding on eBay can become quite a game. A common way to visualize and mathematically predict the best way to bid is through a game theory model. Game theory is the study of mathematical models of strategic interactions among rational people. The model can show what decisions each bidder can make and the probabilities of winning associated with each. This study constructs a hypothetical game theory model of two people wanting a particular item and analyzes it to show how one bidder should strategize to win. The model is then compared to a data set comparing real life bids to determine if the game theory model is a good strategy. Finally, if more than two bidders enter the game, how will the model change and how well will a winning strategy work in real life?

Financial Derivatives and Their Applications

Aaron Weedman / aweedman@bellarmine.edu / Faculty Mentor: William Fenton

The goal of this paper is to analyze financial derivatives and determine how the value of a derivative changes based on other values. Another important aspect is the ability to assess risk based upon the derivative. Because derivatives are a good option for manipulating risk, a goal of mine will be to determine how risk is increased or decreased through derivatives. Research will mostly be collected from the current value of derivatives, as well as derivative values from the near past. The key results from my studies will be the value of derivatives compared to other securities with the implementation of risk reduction or risk maximization strategies.

A Million Dollar Question: P vs NP

Dalton Crisp / dcrisp@bellarmine.edu / Faculty Mentor: Gregory Kelsey

A famous million-dollar question in mathematics is the P vs. NP problem. More specifically, the question asks if every problem that has an easily verifiable solution, can also be solved quickly. If yes, P would equal NP. Otherwise, P would not equal NP. The research of my project shows the origin of the question and why it is so important. We experience P and NP problems all around us without realizing it. The question may be a simple one to understand but it is far more difficult to prove. We may not find a solution to this question for years to come or we may never be able to prove this complex problem. My research dives into how we could potentially solve this problem and what approach would we take. If the question were to be solved, what results would humanity discover? Like checkers, chess could also be solvable or sudoku could be completed much faster. Essentially, if you can solve sudoku faster, then you have discovered a way to cure cancer. These are all the same problems categorized under P vs NP. Not only would the proof of P vs NP be a fascinating discovery, but the everyday questions we face would be solvable and change the world for mankind. The process in which we approach daily questions would change as we would better understand them from a different perspective.

The Mathematics of Beats

Karie Skelton / kskelton@bellarmine.edu / Faculty Mentor: Daylene Zielinski

For my poster, I plan to research and present on "The Mathematics of Beats." For this poster, I will investigate the math behind the drums as an instrument. I will explore the difference between asymmetric and symmetric rhythm cycles. According to Rachel Hall, a rhythm pattern of period $p=2n$, is asymmetric if its corresponding function $f:Z\_2n \to \{0,1\}$ does not have two onsets that are separated by half a measure. I will also investigate Burnside's Lemma: $1/|G|$ ($\sum$▓ ⟦(|Fix(q)|)⟧) , where G is the general symmetry group and ($\sum$▓ ⟦(|Fix(q)|)⟧) are the elements in the fix for each of the symmetries. For my poster, there are two conditions which are one, the beats per measure must be even and two, we only care about rotational symmetries. An orbit is a set of symmetries to get back to the original. An example of what I have been researching is three beat measures and their fixes. Three beat measures have six symmetries which are the rotation by 120 degrees, the rotation by 240 degrees, a vertical reflection, a left reflection, a right rotation, and the identity. Fix(R_120) and Fix(R_240) are two because there are only two measures that can get back to their original by these rotations. Fix(V), Fix(L), and Fix(R) are all four because there are only four measures that can get back to their original by these reflections. Thus, two symmetries have an order of two and three symmetries have an order of 4. The identity has an order of eight, since there are eight total measures created from three beat measures. According to Burnside's Lemma, there are four unique patterns: 1/6 (8+2+2+4+4+4)=24; 1/6 (24)=4. We know this is true because there are four unique total measures created from three beat measures.

BIOCHEMISTRY & MOLECULAR BIOLOGY

NBvolvR: A Platform for Continuous Nanobody Evolution

Jacob Santana / jsantana@bellarmine.edu / Faculty Mentor: Mark Dela Cerna

Nanobodies are ~15kDa proteins derived from the variable domain of camelid antibodies. With high thermal stabilities, strong affinity to antigens, high solubility, and low immunogenicity, nanobodies have tremendous potential for biomedical applications. Development of nanobodies remains costly and time-consuming. This project aims to develop a platform for continuous evolution of nanobodies against targets using E. coli as a host. Recently, a fusion protein, EvolvR, consisting of Cas9 nickase and an error- prone polymerase, was developed as a technology for continuous evolution in E. coli. This has since been used to engineer metabolic pathways and evolve antibiotic resistance. Meanwhile, protein fragment complementation assays have been used to study protein-protein interactions. In this technique, two proteins are each linked to fragments of a third protein which forms a functional unit when the two proteins are interacting. In this project, we will combine the utility of EvolvR as an evolution platform and the principle of protein fragment complementation as a selection tool to rapidly and continuously evolve nanobody targets. We are currently exploring the applicability of the lactamase fragments, which have been used in in vitro complementation assays, as a selection tool conferring resistance towards lactam antibiotics. We will construct "NBEvo," a plasmid containing the fragment-linked naïve nanobody and all components necessary for its evolution. A second plasmid,

"pTarget," will also be constructed that contains a cloning site for any protein fused to the other half of lactamase. It is our hope that this platform can be used to evolve nanobodies against targets that can be expressed in E. coli and can help in making continuous evolution projects more accessible.

POSTER 8

Identification of Inhibitors of PRL3 Phosphatase and Pseudo-Phosphatase Activity

Tristan Whalen, Kaiser Kate Weafer, Jacob Santana / twhalen@bellarmine.edu / Faculty Mentor: Mark dela Cerna

Phosphatase of Regenerating Liver 3, or PRL3, is an oncogene that is involved in cancer progression and metastasis. It belongs to the protein tyrosine phosphatase (PTP) superfamily, which, in coordination with protein kinases, regulates cellular phosphorylation. Protein phosphorylation, in turn, regulates a wide range of signal transduction pathways. Several studies have shown that PRL3 is highly expressed in several different tumor tissues and overexpression of PRL3 correlates with poor patient prognosis. In addition to its phosphatase activity, PRL3 acts as a pseudo-phosphatase and its interaction with magnesium transporter, CNNM3, has also been implicated in disease progression. PRL3 is, therefore, an important oncology drug target. This project aims to identify molecules that inhibit the phosphatase activity of PRL3 and block its interaction with the CBS domain of CNNM3. We are currently validating hits from a small molecule virtual screen targeting an allosteric site in PRL3 for their ability to block dephosphorylation of a synthetic substrate, DiFMUP. Recently, a nanobody that recognizes PRL3 has also been developed, and several molecules have been identified that inhibit PRL3 activity. We will ascertain if these molecules and the nanobody are also able to block the PRL3:CNNM3 interaction using in vitro pull-down assays. We hope that results from this project can lead to development of tools to further study PRL3 biology and to the development of PRL3-targeting anti-cancer agents.

POSTER 9

Investigation of Mycobacteriophages Along the Banks of Beargrass Creek

Reed Mullins / hmullins@bellarmine.edu / Faculty Mentor: Joanne Dobbins

Mycobacteriophages are a type of virus that use bacteria from the genus Mycobacterium as hosts. There are thousands of mycobacteriophages that have already been found, and there are efforts to discover more in the hope that they may be useful for future medical treatments or research. To expand on this knowledge, a soil sample was collected from Beargrass Creek in Louisville, Kentucky. The soil samples were mixed with phage buffer (0.1 M Tris pH 7.5, 0.1 M MgSO4, NaCl) to allow for bacteriophages within the soil samples to mix into the buffer. The mixtures were then filtered so that only the potential bacteriophages would remain, and this was combined with Mycobacterium smegmatis and top agar before being plated on 7H10 media containing ADC (albumin, dextrose, NaCl), carbenicillin, cycloheximide, and 0.1 mM CaCl2. These were allowed to grow for 48 hours before being checked for plaques. If they presented with a potential plaque, the plaques were swabbed and grown on a fresh plate. Sample 14 from the coordinate location 38.214285, -85.709575 presented with possible plaques over two growth cycles.

BIOLOGY

Non-medical prescription stimulant use among college students: How impulsivity, distress intolerance, perfectionism, academic stress, and willingness can influence this phenomenon

Ariel Aileen Becker / abecker3@bellarmine.edu / Faculty Mentor: Jean M. Lamont

Non-medical prescription stimulant use is an increasing concern among college students because of dependence, psychological problems, conditioned associative learning, physiological problems, and risky behavior associated with use. Academic stress may increase non-medical prescription stimulant use. Moreover, personality characteristics such as perfectionism, distress intolerance, and impulsivity, may be expected to exacerbate this relationship. This study investigates the intersection between academic stress and personality in college students and how it impacts their non-medical prescription stimulant use. In a longitudinal design, participants (N=159) at a private, liberal arts college in Kentucky completed measures of academic stress perfectionism, impulsivity, distress intolerance, and non-medical prescription stimulant usage, then completed measures of academic stress and willingness to take non-medical prescription stimulants over the course of the 2021 fall semester. It was expected that academic stress will increase nonmedical prescription stimulant use, and that high levels of perfectionism, distress intolerance, and impulsivity may make the relationship between nonmedical stimulant use more likely to occur. Academic stress predicted increased willingness to use at middle and end of the semester. Perfectionism predicted willingness to use only at middle of the semester. Impulsivity moderated the relationship between academic stress and willingness at middle of the semester but not at the end. Distress intolerance trended toward moderating the relationship between academic stress and willingness at middle of the semester but not at the end. Perfectionism did not moderate the relationship between academic stress and willingness either at the middle or end of the semester. Longitudinal analyses were not significant. Implications of future directions are discussed.

Polycystic Ovarian Syndrome Genetic Origins

Lauren Henry / lhenry@bellarmine.edu / Faculty Mentor: Carrie Doyle

Polycystic Ovarian Syndrome (PCOS) remains an extremely common, yet understudied syndrome experienced by 6-12% of the female population. Not only does it cause painful side effects manifesting both physically and mentally, but it also poses a threat to the fertility of those affected. For this reason, a more in-depth analysis to better understand how to catch this condition early and prevent fertility complications later on is certainly warranted. PCOS is suspected to be genetic due to correlations among immediate female family members. Based on previous research, a good starting point for analysis is the INSR gene. Various mutations within the INSR gene can result in the clinical manifestation of type A insulin resistance. This type of insulin resistance is the most common symptom reported by both lean and obese PCOS patients and has been hypothesized to be due to a mutation in exon 17. In this study, we attempted to isolate this mutation in a population of young women, both with and without PCOS. Initial results indicate that the genetic marker most of note in exon 17 may only be present among certain ethnic groups and may not serve as a universal marker of PCOS. Additional case studies implicating mutations in exons 3 and 19, however limited,

were used as a framework to identify genetic mutations in these alternate regions. Further studies are being performed to determine if mutations on either exon 3 or 19 are more common in PCOS women and may provide a testable marker for diagnosis.

POSTER 12

The Effects of the Intersectionality of Weight Bias, Race Bias, and Gender Bias on Medical Students' Perceptions of Obese Patients

Anna Stanton / astanton@bellarmine.edu / Faculty Mentor: Jean Lamont

BACKGROUND: Current literature on bias in healthcare indicates that weight bias is a growing issue in medicine and often manifests in unequal treatment towards obese patients, negative attitudes toward obese patients, and a tendency for providers to initially recommend weight loss to their obese patients. This is especially true for obese female patients, who receive more weight-loss recommendations than male patients. In addition to weight and gender bias, racial bias is extremely prevalent in healthcare and can result in negative outcomes for patients, with Black patients being seen as less compliant than White patients and systematically undertreated for chronic pain compared to White patients. Nevertheless, research to date has not examined how outcomes may be impacted for obese patients who may experience both gender and racial bias. That is, because obese Black female patients occupy both a gender and racial identity toward which physicians have been shown to hold bias, these patients may be expected to be subject to worse physician attitudes and worse treatment recommendations. OBJECTIVE: The purpose of the present study is to examine healthcare provider attitudes and treatment recommendations for obese patients depending on the race and gender of that patient. METHODS: Participants were medical students recruited from medical schools in the United States and were compensated by being entered into a raffle to win one of nine $50 Visa gift cards. Once recruited, they were sent a survey through SurveyMonkey. After informed consent was obtained, demographic information was collected, then participants were randomly assigned to one of four conditions in which they viewed a patient profile of either (1) a Black obese male, (2) White obese male, (3) Black obese female, or (4) White obese female. All patients presented with the same non-weight-related pain condition (i.e., chronic migraines) and weight-related pain condition (i.e., back pain). Participants read the profile and then reported on their overall attitudes towards the patient (i.e., the patient's self-care and self-discipline, patient's likelihood to adhere to their advice) and their overall health assessment of the patient (i.e., overall health of patient, the severity of the patient's condition, treatment recommendations). EXPECTED RESULTS: Based upon prior literature, it is expected that participants will overall have more negative attitudes towards obese women than obese men, as well as more negative attitudes toward obese Black patients versus obese White patients. Also based on prior literature, we expect female patients to receive weight-loss related recommendations for pain conditions more so than male patients. Moreover, we hypothesize that Black patients will receive fewer recommendations for pain treatment than White patients. Exploratory analyses will also examine the intersection between gender and race on attitudes toward patients as well as treatment recommendations. As Black women occupy identities that are subject to both gender and race bias, physicians may hold the most negative attitudes and make the worst treatment recs for them. Conversely, as White men occupy identities that are least likely to incur gender or race bias, physicians may hold the least negative attitudes toward and make the best treatment recs for

them. IMPLICATIONS: These expected results would provide much needed insight into the intersection of gender and race on weight bias in healthcare settings. They would suggest that implementation of and participation in bias training in medical school is needed for preventing biased interactions with patients.

Water Consumption Behaviors Effect on Dental Health

Grace Staples / gstaples@bellarmine.edu / Faculty Mentor: Carrie Doyle

Fluoride is a mineral which has demonstrated the ability to aid prevention and protect from dental caries when applied to the surface of the teeth. Dental caries is often referred to as dental cavities and is diagnosed when there is tooth decay. In an effort to make fluoride as widely available as possible, the last seventy years has seen fluoridation of community tap water sources increase across the United States. The positive outcomes of community water fluoridation are obvious, however, the increased consumption of non-fluoridated bottled water sources in the United States has been rising dramatically over the last two decades. The impact of increased consumption of non-fluoridated water sources has not been extensively studied in the field, however, there is reason to believe there are detrimental impacts to be seen because of the increasing consumption of bottled water sources. During the course of my study, I have developed a survey which has been distributed to subjects at a local dental clinic located in Louisville, Kentucky. The purpose of the survey is to acquire knowledge of the subject's individual water drinking habits pertaining to the consumption of fluoridated tap water or non-fluoridated bottled water. Information regarding prevalence and severity of dental caries cases from participating subjects dental charts was then recorded and paired with their corresponding survey responses. The data was then analyzed to examine the relationship between the prevalence of dental caries and the consumption of various water sources. The fluoride levels of various bottled water sources were examined, enabling me to make predictions and recommendations on the best brands to consume to ensure adequate fluoride exposure for maintaining good oral health.

Analysis of Enzymatic Activity of the H51Q Mutation in Alcohol Dehydrogenase 1 Expressed in E. coli

Serah Mathew, Shelby Stanley / smathew2@bellarmine.edu, sstanley@bellarmine.edu / Faculty Mentor: Savita Chaurasia

Alcohol Dehydrogenase 1 (ADH1) is an enzyme that is responsible for metabolism of alcohol in our body and is vital for our health. This is also an important enzyme in beverage and pharmaceutical industry. This study was carried out to investigate how a mutation in the catalytic site of ADH1 could affect its activity. In this study, the ADH1 gene from the yeast species Saccharomyces cerevisiae is mutated through site directed mutagenesis. The mutation is an H51Q substitution which occurs at the NADH binding site. Histidine at the 51st residue is involved in hydrogen bonding and the formation of a bond network due to its polar nature. A change to glutamine was chosen to preserve the formation of hydrogen bonding. The mutation was introduced by site-directed mutagenesis and subsequent kinetic analysis was used to determine the change in activity as a result of the mutation. Results showed an overall increase in activity in mutated ADH1 protein compared to wild type ADH1. Through Michaelis-Menten analysis it was concluded that the mutation allowed for ADH1 to reach maximum saturation at a faster rate than the wildtype. The mutant

reached maximum saturation at a substrate concentration of 0.64 M with an initial velocity of 0.071 mol NADH/min while the wildtype was still increasing in velocity and never reached maximum saturation with the highest initial velocity being 0.091 mol NADH/min. Further research can be done to explore how this mutation could be implemented in the drug industry to assist in the breakdown of ethanol. While this enzyme produces a toxic product, the ALDH enzyme could also be further researched to see how it could better break down acetaldehyde which could lead to increased liver function. Information obtained in this experiment could result in further research on this mutation and the implications it could have in human physiology regarding the metabolism of alcohol.

Using CRISPR to Understand the Role of Two Genes in Gonadogenesis in the Model Organism C. elegans

Peyton Young / pyoung@bellarmine.edu / Faculty Mentor: Mary Kroetz

C. elegans is a nematode model organism commonly used in research settings because of its small size and similarity to humans. It shares many features with humans, particularly seen through the comparison of the human proteome to C. elegans proteome. Of the known protein sequences of C. elegans, 40%-80% have human homologous genes, making C. elegans an ideal organism for study of human proteins and their functions. Additionally, there are also two sexes of C. elegans, male and hermaphrodite. The hermaphrodite sex is phenotypically female with two X chromosomes (XX) but is able to produce sperm for a short window of time, allowing for self-fertilization. The males, having only one X chromosome (XO), can arise through non-disjunction during hermaphrodite reproduction, but are more frequently generated as a product of mating. Of the two sexes, my research focuses on the males, especially the development of the gonad and the genes involved in this development. Two genes were identified as possible key players in gonadal development, C10E2.6 and pig-1, based on essentiality and expression during gonadogenesis. Essentiality is defined as a gene that is necessary for the organism to grow into an adult capable of reproduction. During male gonadogenesis, several structures that are critical to reproduction are formed. These include the Seminal vesicle, Valve region, Vas deferns, Cloaca Spicules, and the Cloacal opening. To study the purpose of the genes of interest in gonadogensis, the two genes will be removed from the gonads of one set of C. elegans per gene and will be compared to worms with the normal anatomy stated previously. The effects of the absence of the two genes will be observed in order to determine the role of C10E2.6 and pig-1 in gonadal development of C. elegans.

Extracting DNA from Embalmed Tissue to Study Genetic Predisposition to Degenerative Disc Disease

Conner Lynn / clynn@bellarmine.edu / Faculty Mentor: David Porta

INTRODUCTION. According to a prominent study, 80-90% of people will show some evidence of degenerative disc disease (DDD) by age 50. Researchers have proposed that a Q326W substitution in the COL9A2 gene increases susceptibility to DDD. The role of collagen IX in intervertebral discs is not completely known, but due to its increased flexibility compared to other types of collagens, it is thought to connect collagen II with other components of the cartilage which are important to the integrity of the disc. Collagen II can be found within the nucleus pulposus and the inner portion of the annulus fibrosis. Following previous research that demonstrated successful genomic

DNA (gDNA) isolation from embalmed tissues, this project attempted to analyze the COL9A2 gene in samples collected from an embalmed 87 y/o female cadaver donor with obvious lumbar DDD who died from ovarian cancer. METHODS. Samples were isolated from four tissues for gDNA extraction: parotid gland, cerebellum, genioglossus muscle and occipital lobe following approval from the donor institution. DNA samples were subsequently analyzed for concentration and purity. COL9A2 specific primers were designed for polymerase chain reaction (PCR). Following PCR amplification and DNA sequencing, samples were compared with published National Centre for Biotechnology Information (NCBI) sequences using BLASTn analysis. SUMMARY. DNA was successfully extracted from each tissue, but cerebellar and cerebral tissues yielded DNA of the highest purity. Nucleotide BLAST alignment did not show evidence of the Q326W substitution; however, studies suggest that this substitution is present in only 4% of patients with a form of DDD. CONCLUSION. While the Q326W substitution was not identified in this cadaver, the ability to successfully extract and amplify DNA from embalmed tissue was confirmed. This is a preliminary project and additional genes and donors will be studied in the future.

Submitted to American Association of Clinical Anatomists

POSTER 17

Repurposing Phosphatase Virtual Screen Hits as Potential PTP1B Inhibitors

Rahim Shalash / rshalash@bellarmine.edu / Faculty Mentor: Mark dela Cerna

PTP1B is the founding member of the largest phosphatase family, the protein tyrosine phosphatase (PTP) superfamily. As a phosphatase, PTP1B regulates cellular phosphorylation levels in coordination with kinases. Specifically, PTP1B is involved in the attenuation of leptin and insulin signaling by dephosphorylation of the insulin receptor, insulin receptor substrates, and JAK2, all of which are endogenous substrates. Its role in these signaling pathways makes PTP1B an important therapeutic target in diabetes. Furthermore, there is recent evidence that suggests pro-oncogenic activities of PTP1B, particularly in breast and prostate cancers, among others. The activity of PTP1B has also been suggested to regulate cell-cell adhesion, anti-apoptotic pathways, and pro-metastatic signaling. Arguably, PTP1B is the most well-characterized and well-studied phosphatase and is the archetypal PTP. There are currently more than 750 compounds that interact with PTP1B, according to the PHAROS database. Despite this, no FDA approved drug currently acts on PTP1B. Our project aims to identify novel inhibitors of PTP1B. As phosphatases have highly conserved active sites, we are repurposing hits from a related phosphatase virtual screening to test if they also inhibit PTP1B activity. These molecules are screened from a library of purchasable molecules but currently do not have known activity. We hypothesize that any molecule that might be identified through this study can be the basis or the scaffold for PTP1B-specific small molecule inhibitors.

POSTER 18

Characterization of Bisphenol-A (BPA) Sensitive Mutations Using the C. elegans Model System

Claire Harper / charper@bellarmine.edu / Faculty Mentor: Mary Kroetz

Bisphenol A (BPA) is a polymerizing agent abundantly used in the manufacturing of polycarbonate plastics and epoxy resins. Over the years, BPA has become the focus of major concern due to its structural similarity to estrogen and its functioning as a major endocrine disrupting chemical leading to adverse health and reproductive effects in many organisms. Previous BPA toxicology studies have revealed the

alarming reproductive abnormalities within rodent models induced by small BPA doses. Additionally, BPA exposure to humans has been shown to have harmful effects to various organ systems causing damage at all stages of life and affecting many body processes as well. While research surrounding the harmful effects BPA is relatively abundant, there is not much known about the genetic mechanisms responsible for BPA sensitivity. In a previous study, a forward genetic screen was conducted in C. elegans to identify mutations with increased sensitivity to BPA. The genetic screen resulted in 41 different mutant strains of C. elegans with increased sensitivity to BPA and gave rise to one particular strain of highly BPA sensitive nematodes which was named bin-1 (BPA-intolerant nematode-1). The aim of this study is to further characterize the bin-1 strain and additional mutant BPA sensitive strains of C. elegans created by the forward genetic screen in order to gain farther insight into the genetic mechanisms of BPA sensitivity.

COMMUNICATION & HEALTH HUMANITIES

POSTER 19

Access Denied: Examining History's Impact on Black Health Disparities and Role of Narratives in Health Policy

Brianna Bragg / bbragg@bellarmine.edu / Faculty Mentor: Jessica Hume

The COVID-19 pandemic has shined a light on the long-existing chronic disease health disparities experienced by Black Americans that are the result of historical structural barriers. Policies in American history like the National Housing Act of 1934 systemically disadvantaged Black Americans. The resulting "redlining" that occurred because of racism in this time period has had lasting effects on Black Americans' access to healthcare, healthy food infrastructure, and economic prosperity. To advance health equity, there must be greater awareness of the important role history has played in the creation of structural barriers to essential social determinants of health and the development of collective trauma affecting the health of the Black population. Theories of narrative communication offer a unique avenue to advocate for equitable health policies to ameliorate the lasting effects of history. Reflecting on quantitative survey results collecting people's perceptions of determinants of health and the role of history, this paper suggests ways in narratives about the history of Black health disparities can be used to communicate to key stakeholders in an effort to increase health equity advocacy efforts.

Presented at Johns Hopkins Richard Macksey Undergraduate Humanities Symposium / Recipient of the Student Government Association Research Grant Award

COMPUTER SCIENCE

ComicSpace: A Chat Room for Comic Recommendations

Jaylon Kiper / jkiper@bellarmine.edu / Faculty Mentor: Nathan Johnson

People interested in geek culture sometimes have a hard time connecting with people sharing similar interests. Sometimes it's hard to get into a new form of reading if you're new to comic books. This chat-based web application for comic fans to connect with each other. This system is being made for users to compare what comics they are interested in, as well as give recommendations on what are the best runs and series based on a user's preferences. This project involves coding and designing the user interface and web scraper for the ComicSpace chat application. The main web pages are designed using HTML, CSS, and JavaScript for both the login and chat rooms. For the web scraper program, I'm looking into more development on the topic and using the League of Comic Geeks website to pull the information. The main function with this program will involve a Python program using Beautiful Soup 4 libraries. It will allow the application to do searching and filtering based on users' interests, navigating the HTML tree, and find what comics are for them. This project is a presentation on how my skills at Bellarmine University with learning a new language and system can show my versatility in the field.

Monsters & Meanings: Semantic Analysis as a Tool for Table-Top Roleplaying Games

Adam Fischer / afischer2@bellarmine.edu / Faculty Mentor: Nathan Johnson

Monsters & Meanings: Semantic Analysis as a Tool for Table-Top Roleplaying Games Adam Fischer / Faculty Sponsor: Dr. Nathan Johnson Human communication hinges on our ability to express ideas in the form of language. Unsurprisingly, humans often seek to interact with machines in a similar manner to the way that we engage with one another. As such, those in the field of computer science frequently engage in the processing of natural languages in the creation of tools such as virtual assistants or predictive text. While natural language processing can be broken into a variety of components, one of the most easy to understand is the idea of semantic analysis, the process of extrapolating meaning from text without human intervention. In general, semantic analysis has a variety of uses in increasing accessibility in the usage of technology and processing text or speech. In an effort to create a system which uses this technology and could theoretically be applied to other areas, Monsters & Meanings utilizes semantic analysis to compare written descriptions of fictional monsters to those contained within Table-Top Roleplaying Games (TTRPGs) and provide a user with a monster description and stat block most similar to the description that they entered. Within the sphere of TTRPGs, the creation of user content is often difficult to translate from storytelling to the mechanics of a TTRPG such as Dungeons & Dragons. However, with Monsters & Meanings, users can streamline this process as the system strives to match their imagination with content already part of Dungeons & Dragons through the power of semantic analysis.

Machine Learning Rapid Response Triage System

Justin Mattix / jmattix@bellarmine.edu / Faculty Mentor: Nathan Johnson

The pandemic showed us that, during a crisis, hospitals may become overcrowded, and doctors and staff may be a scarce resource. In this work, I developed the Rapid Response Triage system which uses Classification and Decision Trees. The system takes inspiration from modern triage systems in hospitals. After a patient is admitted to, for example, an emergency room, symptoms, and data are collected and fed into the model. The model then computes a possible diagnosis and sorts the patient into a department to receive the most effective care. The system is housed within a Windows-based application where the user is presented with an overview of the hospital including various floors. Another interface allows the user to search a patient's name and access the list of symptoms and the department the patient was sent to. This patient data will be held within a MySQL database. The heart of the project is a CART model that decides where the patient should be sent and assigns a possible diagnosis to the patient. This system will be written using Python.

Using a Neural Network to Train Object Detection Software

David Jones / jjones12@bellarmine.edu / Faculty Mentor: Nathan Johnson

This project focuses on the detection of stop signs. I focused on this due to the advent of self-driving cars creating a need for this type of software. Stop signs were chosen as the main object to be detected due to how important they are when driving. Neural Networks are most commonly used to make predictions based on prior data, these predictions range from determining future stock prices to the movement of objects in space. This project uses a CNN(Convolution Neural Network) to train an object detection system. This is done by inputting images put through an image augmentation program into YOLOv3 as a dataset to train the model. Approximately 50 images were rotated, blurred, and augmented in various ways to create a dataset. Hardware is implemented through a camera used for real time object detection.

Playground: A Web Application for Children's Learning

Claire Michelle Roeder / croeder@bellarmine.edu / Faculty Mentor: Nathan Johnson

The implementation of online learning in response to COVID-19 has left many children with poor academic performance and behavioral issues. Learning outside of the traditional classroom setting has made it harder for children to focus and interact, and many students face technological barriers that keep them from succeeding remotely. At an age where so much development is taking place, these issues can grow into larger obstacles as the child gets older. This program, Playground, is designed to familiarize students with computers while also providing activities that promote healthy minds and social skills. It aims to create a healthy balance between engagement with technology and awareness in the physical world. Playground, a web application platform, allows students to log in from their browser and complete a variety of exercises such as journaling, critical thinking activities, mindfulness exercises, and collaboration with other students.

Machine Learning and Climate Change

Claire Michelle Roeder / croeder@bellarmine.edu / Faculty Mentor: Robert Kelley

The degradation of our environment can be attributed to a multitude of factors. It can be daunting in such a large, fast-paced society to find concrete solutions that combat climate change, whether it be individually or legislatively. However, climate change is a time sensitive issue that is not only a matter of environmental health, but of human health, so it is imperative that our society finds the means to take action. The purpose of this study is to use machine learning on environmental datasets and compare the results with traditional methods of environmental predictions. This provides the potential to assess the climate crisis in a faster and more efficient manner so that more time may be spent on taking initiative. In this study, data sets pertaining to emissions, water quality, green space, and other environmental topics are evaluated using several different machine learning algorithms.

A Truly Fixed Election, an Exploration of US Census Data in comparison with Election Results

Aaron Bone / abone@bellarmine.edu / Faculty Mentor: Nathan Johnson

In the 21st century, US Elections appear to be more of a spectacle than a democratic process. After our previous 2020 election especially, with claims of fraudulence arising from both sides of the aisle, the act of selecting our leaders has taken a turn towards dramatization on a grand stage. But what if this process isn't as temperamental as it seems? What if the election is merely a result of demographics–demographics that the US Census Bureau has already collected. In this paper, I will showcase correlations between voting results and demographics to build consistent trends that can be applied to any geographical location to forecast results before any poll. In this project, I use Python to analyze the ACS, The American Community Survey, distributed by the US Census Bureau. The ACS gives demographical data for any state in the US, and after training a machine learning module against previous district winners as targets, we can get a sense of how an election will play out across any zip code. I then turned this data set into a visualization through a program made in C# in order to visualize our city of Louisville and show how specific candidates would play out.

DanceBrush

Elizabeth Fultz / efultz@bellarmine.edu / Faculty Mentor: Nathan Johnson

Dance and graphic art are created through very different processes with very different results. While dance is full of movement and takes place in the physical world, graphic art is more static and is usually created in a virtual space. This project combines these two art forms by taking the movements in the physical world and translating them into a graphic piece. DanceBrush is a virtual reality program that uses external sensors to track movement and then translates that movement into color in the virtual space creating a piece of art. Movement, specifically dancing, is a temporary art form unless it is videoed or otherwise recorded. DanceBrush takes the movements of a dancer and records those movements as streaks of color to create a unique art piece that is more permanent than the dance itself. Not only does this allow for a dance to be seen in a completely different way, it allows for dances that are specifically choreographed to create a certain design, adding another layer to the

meaning and creativity that can be achieved. This project is being made using VIVE 3.0 Trackers, SteamVR Base Stations, Unity, and SteamVR. The code will be hosted on GitHub and may be made available through Steam in the future.

Lavaro
Maitham Alghamgham / malghamgham@bellarmine.edu / Faculty Mentor: Nathan Johnson

Going through every single voicemail to find the voicemail you want is time-consuming for some people. Lavaro is a simple stand-alone application that helps people be more productive in a work environment. The system notifies you via text when you have an email or a voicemail. In Lavaro, you receive a text for each voicemail and a link that directs you to voicemail. Lavaro uses Java as its foundation and the Twilio API to process voicemail, email communication, email tracking, text notification, incoming calls, and more. Twilio is a global cloud platform that provides an API for making and tracking calls and emails.

POSTER 29

Modeling Floorplans and How to Navigate Them
Drake Thomas Hovsepain / dhovsepian@bellarmine.edu / Faculty Mentor: Nathan Johnson

Knowing how to evacuate a room or a building in the event of an emergency is usually the individual's responsibility. Designing a building or floorplan that is safe and easily evacuated should be a priority for building owners. Software that models the behavior and ability of groups of people to leave a room or building during an emergency would be useful to predict the safety of various floorplans before they are constructed. This software represents the first steps of a simulation that models the movements of several individuals seeking to exit a room. The individuals or 'agents' may not be able to move directly towards an exit; they will navigate around obstacles such as furniture, doors, and hallways to reach their exit. Navigation consists of two distinct actions. The first is choosing a 'waypoint,' which is part of the map to travel to. These waypoints represent the beginnings of hallways, the exits of individual rooms, and other areas that define borders between sections of the floorplan. For example, someone in the corner of a subdivided room or office wouldn't see the doorway of the exit, they would first leave that section of the room and begin looking for a way to progress. Once the agent chooses a waypoint to travel toward, they will use A* to find their path. A* is a cost-based search algorithm that finds the shortest path towards a goal. The cost of movement is an important consideration. The presence of certain obstacles, constricted areas, or environmental hazards like smoke and fire can increase the time it takes to move through an area.

POSTER 30

Barnemat - a Norwegian programming language
Emil Bjørlykke Berglund / eberglund@bellarmine.edu / Faculty Mentor: Nathan Johnson

The educational system in Norway is starting to implement basic computer coding and algorithm classes at the elementary and middle school levels, a time when most students have yet to master English as a second language. Yet, the most widely used programming languages are English-based. If children don't grasp English fully, learning a programming language is more difficult. Barnemat is meant to fill the gap between learning to code and fully understanding English. Barnemat is a Norwegian-

based programming language with the goal of allowing Norwegian school children to learn the basics of coding without the obstacle of understanding English first. Barnemat can act as a gateway to learning English-based programming languages in the future. Barnemat uses antlr4 to generate the lexer and parser as well as ASM bytecode for the compiler. It generates a Java bytecode file when compiled and is runnable on the JVM. The first version of Barnemat contains basic datatypes and is able to perform basic tasks such as variable declaration and initialization, printing, repetition statements (loops) and selection statements (if-then-else).

Dating Application

Denys Ladden / dladden@bellarmine.edu / Faculty Mentor: Nathan Johnson

Many modern dating applications utilize artificial intelligence to find compatible matches. The matches often are made based on a set of preferences selected by the user, which can be overwhelming and unnecessary. Attraction isn't always about our preferences but about what we find common in our life. This application uses k-means clustering to match users based on life interests. Inferring compatibility based on interests with a few additional settings such as age, for example, reduces the burden for the user and results in higher quality matches. The software runs on Apple devices using Swift, Google Cloud Services such as BigQuery, and more.

POSTER 32

Making the Old with the New: Gameboy Bizcuit Builder

Jacob Morris / jmorris7@bellarmine.edu / Faculty Mentor: Nathan Johnson

For the oldsters and hipsters, relics of the past are the coveted treasures of the modern day. The same nostalgia applies to video games; there's a minimalist appeal that comes from the limited graphics and simple game design of previous generations -- games such as Fight'N Rage which is meant to mimic classic "beat em ups" and Princess Remedy: In a World of Hurt which harkens back to the earlier shooter RPGs. The Bizcuits engine is designed allow users to rapidly build videogames within the aesthetic framework of the Gameboy. The Bizcuits engine is built from scratch using C#. The renderer, file system, and UI are created within the application. The focus of this engine is to easily create games that players could mistake for a typical 90s game. Every component of the engine is designed to streamline this overall creation process for a Gameboy game by having the console's specifications or limitations built into the engine.

POSTER 33

Efficiency of Solving a Maze

Christina Porter / cporter@bellarmine.edu / Faculty Mentors: William Fenton, Nathan Johnson

Solving mazes has been used in a variety of problems such as helping global positioning systems, emergency services, or rescue workers find the shortest distance in a city grid to a destination. Some maze algorithms encompass the maze solver's unknown position in the maze, such as wall-following, while other algorithms require you to know your relative position in the maze. This software creates a random maze in Java, then takes your known relative position in the maze and calculates the distance from your position to the end node. This software then uses the A* algorithm to find the shortest path to the end of the maze before calculating the total time it takes to both create and solve the maze.

Creating a Note Detector that Translates Sounds into Notes Using a Raspberry Pi

Divya Manirajan / dmanirajan@bellarmine.edu / Faculty Mentor: Nathan Johnson

The goal of this project is to create a musical note detector using a Raspberry Pi connected to a USB microphone. This note detector software is able to listen to sounds generated by an instrument or voice and output the notes played. An RGB LED is integrated into the design to notify the user if the note detected is sharp, flat, or natural. The device uses a breadboard, a set of resistors, a Raspberry Pi, an RGB LED, several connecting wires, a USB microphone, and a monitor. The circuit then shows the note detected on a monitor while also displaying a red light if the note is sharp, a blue light if the note is flat, and a green light if the note is natural. The software is written in Python and executed on a Raspberry Pi.

URL Scanner for Phishing Detection

Cameron Herbert / cherbert@bellarmine.edu / Faculty Mentor: Nathan Johnson

In today's world, cyber-attacks are more frequent, targeted, and complex. In 2021, for example, hackers launched attacks on the colonial pipeline, a large chemical distribution company, and a few of the biggest social networking platforms too. All of these attacks impacted the companies themselves as well as a significant portion of the general public. The attack on the pipeline, for example, caused many to hoard gas using flammable containers. There was also a marked increase in gas prices. These events in 2021, among others, have demonstrated our society's increasing need for cyber security. One of the most common cyber attacks is the phishing scam. These kinds of attacks are very hard to combat because they can be carried out without requiring the victim to download any software. The victim is simply sent a fake login page where their credentials are stored by the hackers and used to gain access to the system they are targeting. In this project, I provide a scanner that determines if submitted links are a phishing scam or not. I am making a web page that gives users a few lines of HTML code that they can copy and paste on their website which will allow them to host this URL scanner. When a URL is submitted, it is sent to the SlashNext Real-Time Phishing Defense API. The API checks if the URL is already in the database and returns the results. If the URL is not already in the database, it runs it through an AI scan then returns the results. The project is intended to make this anti-phishing technology available to people to use on their own sites to help their users.

ECONOMICS

The Political Economy of Border Wall Construction

Molly Rovinski / mrovinski@bellarmine.edu / Faculty Mentor: Francis Hutchins

During the 2016 presidential election, the construction of a border wall along the United States – Mexico border came to the forefront of the political sphere in America. Since, state governments along the border have continued the call for increased border security through increased fencing. However, the ideation of a border wall was not a new one for American border security, with the majority of the wall having been constructed from 2006 to 2009 following the Secure Fence Act of 2006. The

purpose of this paper is to explore the political economy of wall construction along the border. The argument is made that the wall was not constructed in a manner to best deter migrant crossings and increase national security, but rather in areas that serve the interests of elected officials, government bureaus, and private companies.

ENVIRONMENTAL SCIENCE

POSTER 37

Great Lakes Rivermouth Wetlands: Impacts of Lake Levels and River Flows on Wetland Area

Elisabeth Hernandez / ehernandez@bellarmine.edu / Faculty Mentor: Carlson Mazur

Great Lakes rivermouth ecosystems are biodiverse freshwater estuaries where lake water and river water mix, creating unique nutrient dynamics and wetland development. These coastal wetlands provide ecosystem services including recreation, food, and cultural value, and also hold intrinsic value as they are home to a wide variety of wildlife and plant communities. The understanding of the individual effects of lake levels and river flows on wetlands is well-established. However, the current understanding of the effect of dynamic interactions between river flows and lake levels on coastal wetland development is not well known. In this study, aerial photographs were interpreted to understand how wetland plant communities have changed on a decadal scale in response to long-term patterns in lake levels and river flows. Four rivermouth ecosystem sites on Lake Michigan were selected for this study, which varied in geomorphology and surrounding urban development. Wetland area and wetland vegetation type were delineated in ArcGIS from orthorectified historic photographs ranging from 1951 to 2016 at each site. Historic water level and streamflow data were also used to perform statistical analyses of rivermouth wetland response to fluctuations in lake levels and streamflow. The results showed less wetland area when both lake levels and river flows were high. The unique geomorphology of each site influenced wetland area and response to hydrologic drivers. The results of this study provide insight into the effects of climate change and anthropogenic stressors on Great Lakes wetland ecosystems and can help guide decision-making regarding wetland restoration, conservation, and urban planning.

POSTER 38

The Effects of Increasing Ocean Temperatures on the Survivorship of a Subtropical Population of the Sea Urchin, Arbacia punctulate

Rhianna Clemons / rclemons@bellarmine.edu / Faculty Mentor: Roberta Challener

Most sea urchin species have critical ecological roles in their ecosystems, such as keystone grazers. There is an increasing need to understand the impacts of rising temperatures on species that are vital to the health of their environments. Studies have shown that increasing temperatures may significantly negatively affect several important biological processes including reproduction, development, and excretion in many species including sea urchins. However, very little is known about the sea urchin species Arbacia punctulata. In this study, individuals were exposed to 21˚C

(control, n = 12) and 27˚C (experimental, n = 12) for seven days and survivorship was assessed. On average the control treatment survived 5.5 days while the experimental treatment survived 1.4 days. Results suggest that A. punctulata exposed to increased temperatures over an extended period will be significantly compromised.

EXERCISE SCIENCE

POSTER 39

Mindfulness Meditation as a Potential Mechanism to Decrease Negative Affective Response to High Intensity Exercise

Macy Berghoff / mberghoff@bellarmine.edu / Faculty Mentors: Andrew Carnes, Sara Mahoney

The majority of Americans do not meet the physical activity recommendations of accumulating 150 minutes of moderate intensity physical activity or 75 minutes of vigorous intensity activity, and 2 days of resistance training per week (HHS, 2018). Common reasons cited for this include lack of time and lack of enjoyment of exercise, with higher intensity exercise eliciting the most negative emotional response and perceived exertion (Saanijoki et al, 2015). However, higher intensity exercise also takes less time to complete and receive benefits from. This research aims to discover if practicing a short term mindfulness meditation protocol lessens the negative responses associated with high intensity exercise. Participants completed a high intensity bout of exercise in the laboratory, consisting of four, 30 second sprints on a cycle ergometer. Data on perceived exertion and affective responses was measured utilizing the Borg Rating of Perceived Exertion Scale, Felt Arousal Scale, Exercise Feelings Inventory, and Subjective Exercise Experiences Scale. Participants were then asked to complete a short-term mindfulness mediation protocol over the next two weeks, or complete a reading protocol as an active control. Participants were not told whether their group was the control group or the treatment group. The participants will return to the laboratory March 21-March 30, 2022, to repeat the same exercise testing protocol and collect the same affective data. Participant characteristics and outcome measures will be compared between groups at baseline using independent t tests. Changes in the measured outcome variables will be compared between groups and across time points (baseline, post intervention) using 2-way analysis of variance with repeated measures on time. Post hoc t tests will be used to elucidate any significant main or interaction effects. Based on prior research targeting low to moderate intensity exercise and mindfulness meditation, we hypothesize that this intervention of mindfulness meditation may decrease the negative affective response to high intensity exercise. If significant differences in negative emotional response to exercise, and perceived exertion are found, this could indicate that practicing mindfulness meditation may be a practical means to increasing physical activity engagement.

An Analysis of the Perceived Psychological and Physical Effects of a Physical Activity Program During In-Patient Pediatric Cancer Treatment

Zoë Winters / zwinters@bellarmine.edu / Faculty Mentor: Beth Ennis

The inactivity that coexists with cancer treatment often results in physical and emotional detriments, fatigue, depression, longer rehabilitation programs, and decreased independence. Previous research demonstrates that utilizing physical activity programs in cancer treatment, especially to maintain pre-existing fitness levels, can decrease these detriments. In an interview, a physical therapist emphasized the importance of including physical activity programs in a pediatric stem cell transplant ward due to its ability to increase outcome measures. Further research could clarify which activity plans are the most conducive to improving health and quality of life for each population group and cancer type.

Accepted at Kentucky Honors Roundtable Conference at Murray State, March 4 - 5, 2022

Perceptions of ACL Injuries in the Pandemic Shortened Season Among NCAA D1 Men's Lacrosse Players

Lindsey Keller / lkeller@bellarmine.edu / Faculty Mentor: Chelsey Franz

At a mid-major NCAA division 1 university, sports medicine staff identified a spike in ACL tears on the men's lacrosse team during the spring 2021 COVID-19 shortened season. The COVID-19 pandemic caused athletes to lose access to their campus facilities, coaches, strength and conditioning staff, and athletic trainers during preparation for the spring 2021 season. Our study examined the role that COVID-19 played in these injuries. Research on the impact this virus has on athletic injuries is still emerging. This study adds to the literature regarding injuries that may be linked to a pandemic shortened season.

Presented at Kentucky Honors Roundtable March 4 - 5, 2022

MATHEMATICS

Exploring mated Misiurewicz polynomials with finite subdivision rules

Jeremiah Zonio / jzonio@bellarmine.edu / Faculty Mentor: Gregory Kelsey

Polynomial mating is a process of taking two relatively simple dynamical systems and creating a new more complicated dynamical system. This helps mathematicians decompose complicated dynamical systems into regions of simpler dynamical systems. In this paper, a combinatorial process know as a finite subdivision rule is used to provide a graphical representation of mating dynamical systems resulting from Misiurewicz polynomials.

Presented at Kentucky Academy of Sciences Undergraduate Research Conference hosted by Western Kentucky University

The Fundamental Group and its Applications in Complex Dynamics

Jeremiah Zonio / jzonio@bellarmine.edu / Faculty Mentor: Gregory Kelsey

The fundamental group is a common tool used to provide an algebraic image of a topological space. This is particularly useful for navigating the effects of topological transformations on spaces resulting from complex dynamics. This paper hopes to provide a soft introduction to the fundamental group and how it is used in complex dynamics.

Stochastic Processes

Zenia Nava / cnava2@bellarmine.edu / Faculty Mentor: William Fenton

In researching Stochastic Processes, I have learned the background/ history and the key foundational concepts of this area of mathematics, and I have applied it to an example from the sports world. Stochastic Processes were discovered around the 1950s from various trial and errors. As time has passed, they have become a common tool for various mathematical models of systems used by many. My research focuses on a particular type of stochastic process called a Markov chain and I have gained knowledge on how it plays an important role in modern operations and math research.

Mathematics of the Violin

Lily Miller / lmiller6@bellarmine.edu / Faculty Mentor: William Fenton

The purpose of this project is to examine several aspects of the mathematical connection with the violin. We create a background for the reader by providing an explanation of the history of the instrument as well as the different parts and their functions. There is a strong connection between the field of mathematics and music, and we analyze this connection and apply it specifically to one instrument. We look at the equation for frequency of a vibrating string, $f = 1/L*(T/(m/L))^{(1/2)}$ where L is the length of the string, T is the tension of the string, and m is the mass of the string, and how this equation changes when the string, note, or harmonic played changes and the associated sine graphs for each frequency. We also look at the frequencies of octaves of the violin, and the geometric series that are created from these, and the arithmetic sequence that is created from the frequencies of harmonics. Visual representations including graphs of sine waves and diagrams of the structures of the violin are important in the development of this project.

The math in fly-fishing; anglers and angles

Baylor Younker / byounker@bellarmine.edu / Faculty Mentor: William Fenton

The intent of this research project is for people to understand fishing, but more particularly fly fishing, in a precise and scientific manner. We use mathematical language to give precise and defined terms that a mathematics guru can understand and relate to. The methods and steps come from personal experience and teachings from various fishermen I met in along the way. The physics of fly casting can be defined by the transfer of impulse, integral of force over a time interval. This combination of mass and speed through the rod from base to top and from the transfer of impulse through the fly line all the way to the tippet of the leader. Since both the rod and the

fly line are tapered the smaller amount of mass will reach high speeds as the loops in rod and line unfurl to a perfect gentle presentation. Asides from these findings, this is one of the best ways I have found to associate two things I really love, math and fishing. The results will hopefully encourage my peers and professors to go outdoors and give fly-fishing a try!

MEDICAL LABORATORY SCIENCE

POSTER 47

Suspected Transformation of Chronic Myelomonocytic Leukemia with Aberrant Dendritic Cell Population

Christopher Cassetta / ccassetta@bellarmine.edu / Faculty Mentor: Karen Golemboski

This patient is a 64-year-old female presenting with mild anemia, splenomegaly, lymphadenopathy, leukocytosis, monocytosis, and a low platelet count. Symptoms and presentation pointed to a possible myeloproliferative neoplasm with extramedullary involvement (EMI). A subsequent bone marrow aspirate and lymph node biopsy were performed, and features indicated acute transformation from an underlying chronic myelomonoctyic leukemia (CMML). In addition, the lymph node biopsy originating from her left axilla showed aggregates of unknown cells, and further investigation demonstrated these to most likely be a population of plasmacytoid dendritic cells (pDCs). CMML alone is rare and presents a challenge to diagnose and classify as it shares similarities with both myelodysplastic syndromes and myeloproliferative neoplasms, so the addition of EMI and pDC proliferation makes this an even more difficult case.

POSTER 48

Hemolytic Disease of the Fetus and Newborn - A Case Study

Declan Hamm / dhamm2@bellarmine.edu / Faculty Mentor: Karen Golemboski

This case study involves a severe case of hemolytic disease of the fetus and newborn, which was treated with multiple intrauterine transfusions. Hemolytic disease of the fetus and newborn can have many complications for the newborn, ranging from mild anemia to severe anemia, kernicterus, and in the most extreme cases, death. The patient presented with decreased fetal movement and fetal red cell destruction. She had multiple alloantibodies identified and fetal hemoglobin was monitored frequently to determine the efficacy of the intrauterine transfusions. With careful consideration of maternal alloantibodies and the identification of crossmatch compatible blood units a favorable prognosis is common for cases of hemolytic disease of the fetus and newborn even in moderate to severe cases.

NURSING

Midwifery Care's Potential to Improve Birth Outcomes and Experiences for Black Women and Infants

Neville Wintergerst-Burch / nwintergerst-burch@bellarmine.edu / Faculty Mentor: Pamela Power

Black women and infants experience higher morbidity and mortality rates compared to white women and infants in the United States. Forces of racism and poverty often lead to inadequate access to prenatal care for Black women, and care received is often compromised by implicit bias or systematic barriers related to insurance coverage, impersonal provider-patient relationships, and healthcare literacy. Despite the rich history of Black Granny midwives in the United States, most Black women began using physicians for obstetric care in the 20th and 21st centuries. This integrative review explores how improving access to midwifery care for Black women could improve birth outcomes and maternal satisfaction with the obstetric experience. This thesis demonstrates how midwifery care can benefit Black women by producing safe maternal and infant birth outcomes, creating trustful provider-patient relationships, and promoting maternal autonomy. It also addresses the barriers that prevent Black women from utilizing midwifery, including the low Black representation among midwives. Removing these barriers and instead implementing programs that increase midwifery access could improve the birth experience for Black women and infants.

PHYSICS

POSTER 50

Partial Automation of Data Analysis in a Z Prime Boson Search

Ethan Colbert / ecolbert@bellarmine.edu / Faculty Mentor: Akhtar Mahmood

Analysis of data from the ATLAS experiment at the LHC has been a research focus in the Department of Physics at Bellarmine University (BU). At BU, analysis has largely been focused on Z boson decays and searching for evidence of a Z' (Z Prime) boson. The data are stored in the form of .xml files, with one file representing one collision event inside the ATLAS detector. Previous analyses have been conducted on an event-by-event basis, using the Hypatia software package. While this allows for high-quality visualization and effective event analysis, it is highly time-consuming. I propose and implement a piece of software that partially automates this type of analysis by applying filter parameters (cuts) programmatically. It looks for both the e+e- and Q+Q- decay modes. Cuts implemented primarily include transverse momentum: pt > 10 GeV/c for the muon decay mode and pt > 20 GeV/c for the electron decay mode. The program takes as input a directory containing data files and outputs a list of the names of files likely to contain Z (or Z') boson decays, i.e., lists events that meet filter criteria. Identified events can then be analyzed more quickly using previous methods.

Presenting at the Southern Regional Honors Council in Birmingham, Alabama on Saturday, April 2, 2022

POLITICAL SCIENCE

A Public Choice Perspective on the Regulation of Social Media

Aubrey Kirchhoff / akirchhoff@bellarmine.edu / Faculty Mentor: Aaron Hoffman

Since 2016, misinformation has been a growing in the United States. False news and conspiracy theories on social media create political unrest and instill distrust in public health officials. In response, American politicians have drafted several proposals designed to regulate social media platforms and minimize the amount of misinformation present. Using frameworks drawn from public choice economics, I will analyze the actions of the key players in the effort to find a legislative solution to the misinformation crisis: politicians, voters, and large technology companies. Under public choice economic theory, it is assumed that each of these actors are primarily motivated by their own self-interest. I show that under these conditions, politicians will fail to effectively solve the misinformation crisis due to a desire to satisfy the conflicting interests of the American public and large technology companies. Finally, I will show that not only is this outcome theoretically true it is observable in reality.

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PSYCHOLOGY

Invisibility and liminality in Kentuckiana's undocumented population, in their own words

Sophie Amaya / samaya@bellarmine.edu / Faculty Mentors: Francis Hutchins, Miguel Rincon Perez

The controversial topic of illegal immigration has repeatedly and deeply divided the United States. There has been, in recent years, a spotlight on immigrants from Latin America, and impersonal statistics, as well as oftentimes negative claims, are being spread in news articles everywhere. For this research, survey questionnaires and ethnographic interviews were used to facilitate a sample of undocumented immigrants from Louisville, Kentucky, and Southern Indiana (An area known as "Kentuckiana") to provide insight into their experiences. This thesis aims to examine the effects of this uncertain status on the well-being of Latin American immigrants in this region, where not much research is done on the undocumented population. There are numerous reasons why an individual may feel the need to escape their home country. Widespread poverty, extreme violence, and political turmoil often lead to uninhabitable conditions, and many immigrants have faced years of chronic stress before making the dangerous journey to the United States. To the undocumented person, the United States is frequently an unwelcoming environment. For the purposes of this research, the transition immigrants go through when they cross is examined as a rite of passage, one that often does not reach completion. This leaves the individual "stuck" in a deeply uncomfortable liminal space: they do not belong in their new home, but they are not able to return to their country of origin. This, among other factors,

leads to negative mental and physical health outcomes. This research aims to provide real-life testimonies to support statistics about undocumented immigrants' well-being, as well as give a widely misrepresented population the opportunity to voice feelings that they may otherwise fear sharing.

POSTER 53

A Call to Action: Juvenile Incarceration vs. Restorative Justice

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The purported goal of the juvenile justice system is to care for the children who enter it. But, as much research has shown, that "care" is often demonstrated through control, retribution, and isolation. The simple act of labeling someone delinquent often functions as a life sentence for many children, carrying with it negative consequences both during incarceration and after—the trauma, educational breaks, isolation, and stigma extending far beyond the walls of the detention center. In contrast, the paradigm of restorative justice offers a chance of reparation in a non-punitive way, without exposing the juvenile offender to the negative consequences of incarceration. It allows the victim to face their offender and speak their truth, while still holding the wrong-doer accountable, empowering them to repair the harm they caused, and intervening in future harm. Informed by the recognition that our juvenile justice system, as it currently operates, largely fails to prevent crime/harm and provide justice for people who are harmed, while simultaneously reproducing great harm for those caught in its clutches, this thesis uplifts restorative justice as an intervention with real potential. By showcasing the harmful and problematic history of the juvenile justice system, thoroughly detailing the negative consequences of juvenile incarceration, and highlighting the benefits of restorative justice, this thesis serves both as an informative starting point and a call to action for any who are concerned with the treatment of our young people.

POSTER 54

Associations Between Blue Light Exposure, Sleep Quality, Emotion, and Cognition in College Students

Anastasia Koester / akoester@bellarmine.edu / Faculty Mentor: Christy Wolfe

The human sleep cycle is heavily influenced by the body's response to light. Exposure to light suppresses the production of melatonin, 'the sleep hormone.' Because electronic devices use LEDs, the blue light emissions could negatively impact sleep cycles. This study explored the correlation between exposure to blue light and circadian rhythms by surveying college students. The data was then analyzed using a regression model to determine if an increased exposure to blue light will correlate to lower quality sleep, as determined by sleep quality, quantity, and the time it takes participants to fall asleep. This study will be useful in educating college students about what can impact their sleep and how they can change their daily routines to improve their sleep cycles. This study explores the correlation between blue light exposure and its effects on the circadian rhythm. The exploration of how blue light emissions can affect human behavior has become more necessary with the continual development and increased usage of smartphones, computers, televisions, and other devices which

rely on LED's and therefore expose users to blue light emissions.

POSTER 55

Adult ADHD online communities: Impact on understanding one's identity and diagnosis

Correna Tate / ctate@bellarmine.edu / Faculty Mentor: Stella Kanchewa

Adults with Attention Deficit Hyperactivity Disorder (ADHD) frequently turn to the internet as a source of information and engagement with other individuals who have the same diagnosis. Furthermore, many individuals with ADHD view it as a part of their personal identity, rather than simply a medical diagnosis. Online user groups for adults with ADHD are under-researched but hold a very important role for many individuals. Participants (n=143) from five online groups were surveyed. Participants were asked open-ended questions about their ADHD diagnosis and their experiences with online groups for individuals with ADHD. Results demonstrate both the diversity of adult ADHD experience, the way that individuals in these user groups understand the disorder, and the way that individuals in these groups interact with one another. Participants were also asked to complete measures of ADHD social identification and ADHD collective self-esteem and private self-esteem. It is hoped that this research can help illuminate the experiences of many adults with ADHD and inform mental health practitioners about the culture and identity of patients who participate in these online groups.

POSTER 56

Liminality and invisibility in Kentuckiana's undocumented population

Sophie Amaya / samaya@bellarmine.edu / Faculty Mentor: Francis Hutchins

The controversial topic of illegal immigration has repeatedly and deeply divided the United States. There has been, in recent years, a spotlight on immigrants from Latin America, but the feelings of the people themselves are rarely publicized. Furthermore, much of the research that is done on this population focuses on migrant labor communities and those on the Southern border region. For this research, survey questionnaires and ethnographic interviews were used to facilitate a sample of undocumented immigrants from Louisville, Kentucky, and Southern Indiana (An area known as "Kentuckiana") to provide insight into their experiences. This thesis aims to examine the effects of this uncertain status on the well-being of Latin American immigrants in this region, where not much research is done on the undocumented population. There are numerous reasons why an individual may feel the need to escape their home country. Widespread poverty, extreme violence, and political turmoil often lead to uninhabitable conditions, and many immigrants have faced years of chronic stress before making the dangerous journey to the United States. However, to the undocumented person, the United States is frequently an unwelcoming environment. For the purposes of this research, the transition immigrants go through when they cross is examined as a rite of passage, one that often does not reach completion. This leaves the individual "stuck" in a deeply uncomfortable liminal space: they do not

belong in their new home, but they are not able to return to their country of origin. This project aims to use a theoretical framework to contextualize feelings and experiences as reported from undocumented individuals, as well as give a widely misrepresented population the opportunity to voice sentiments that they may otherwise have been unable to share.

Presented at Southern Regional Honors Council conference in Birmingham this year, March 30- April 2, 2022 / Recipient Joe and Angela Schmidt Honors Research Award

POSTER 57

Looking For A More Effective Online Learning Experience: Accounting for Attention & Personality

Caroline Smith / csmith18@bellarmine.edu / Faculty Mentor: Courtney Keim, Christy Wolfe

While online instruction has become a ubiquitous method of learning, exacerbated by the COVID pandemic, it should be implemented in ways that accommodate disabilities (Morris & Anthes, 2021) and personalities. Online instruction could grant people with diminished attention and high energy the ability self-pace or fidget, which can aid in learning (CBC, 2017). We hypothesize that individuals with high levels of extraversion and attention abilities will report lower learning satisfaction/success in online courses and higher learning satisfaction/success for in-person classes. 160 college students with experience with both online and in-person courses completed measures of extraversion (personality citation), satisfaction and success (Keller & Karau, 2013), and attention skills (Span et al., 2002). Results indicate no correlation between extraversion or attention and satisfaction/success with online classes. Extraversion was correlated with success for in-person classes (r = .11), but in the opposite direction than predicted. Results may be used to inform in-person course instruction.

Presented at 18th Annual River Cities I-O (RCIO) Psychology Conference 2021

POSTER 58

Young Children's TV Show Preferences and Perceptions of Women in STEM

Lauren Berck / lberck@bellarmine.edu / Faculty Mentor: Christy Wolfe

STEM positions are predominantly held by men throughout history. Women are beginning to bridge the divide, yet the stereotype of math and science being for men is still reinforced to children by their parents, their teachers, and especially what they watch. Children watch television nearly every day and are extremely influenced by the television characters they see. Children tend to trust characters of their same gender and are more likely to retain the lessons from the characters they trust. Since most of the shows children watch tend to display gender stereotypes, especially the stereotype of men being good in STEM, children are likely to enforce these stereotypes. The increase of women in STEM has increased interest in STEM for girls, but boys still tend to hold more rigid gender bias. If boys are more exposed to feminine educational shows, there may be an increase in flexibility when it comes to gender stereotypes in STEM. This study will look at whether or not there is any statistically significant difference between boys who are more interested in feminine educational shows and a more positive attitude of women in STEM.

SPANISH

Evaluation of the Antidiabetic Potentials of Eriodictyon californicum, Lomatium dissectum, and Verbascum Thapsus

Elena Cseh / ecseh@bellarmine.edu / Faculty Mentor: Savita Chaurasia

Diabetes mellitus is a diverse group of metabolic disorders rapidly becoming a health concern around the globe. The prevalence of the disease is increasing globally, and without proper treatment and management, it can be deadly. While diabetes can be diagnosed and treated, many people lack the economic and structural resources necessary to manage this condition, and they turn to traditional medicines. Traditional medicines are typically cheaper and available in larger quantities than medicines distributed by pharmacies, and patients can also have difficulty accessing doctors and hospitals. Many patients also are more comfortable and familiar with these medications as well due to cultural reasons. Traditional medicines have been used as the sole treatment method, or as a complementary treatment. This experiment will study the following three plants for diabetic management fernleaf biscuitroot (Lomatium dissectum), common mullein (Verbascum thapsus), and yerba santa (Eriodictyon californicum). These plants have been used in traditional medicine in North America for common diseases and have not been heavily researched for the management of diabetes. This research will explore the antidiabetic potential of these plants by conducting crude extraction, a total phenol content assay, and testing the effects of the plant extracts on α-amylase and glucose uptake in Saccharomyces cerevisiae. This information could be used to further future research into these plants to help develop potential treatments in both the western medicine and more traditional medicine spheres.

Presented at Kentucky Honors Roundtable / Recipient of the Student Government Association Research Grant Award

HEALTH PROFESSIONS

POSTER 60

Athletic Training Student Learning Outcomes are Similar in Telehealth and In-Person Standardized Patient Encounters

Alma Mattocks / amattocks@bellarmine.edu / Faculty Mentor: Sara Mahoney

Standardized patient (SP) encounters have been implemented into athletic training education with positive student learning outcomes. New research has shown that telehealth encounters using a SP may be an effective strategy to utilize in addition to traditional education. The objectives of this study were to determine if telehealth encounters using an SP had similar outcomes in athletic training student knowledge acquisition and confidence as in-person SP encounters; and if observers in SP encounters had similar outcomes in athletic training student knowledge acquisition and confidence as active participants.

A pretest/posttest, non-randomized, controlled trial was used. Nine athletic training students participated in the study. All participants completed a pretest knowledge and confidence assessment, followed with an SP encounter either as the control (in-person) or treatment (telehealth), and as either an active participant or observer. After the encounters, participants completed a posttest knowledge and confidence assessment.

Separate repeated measures ANOVAs revealed a statistically significant difference between pretest and posttest composite scores for both knowledge and confidence respectively ($F = 14.01$, $p = 0.007$, $\eta\_p^2 = 0.667$; $F = 61.86$, $p < 0.001$, $\eta\_p^2 = 0.898$), with no significant difference between the treatment and control groups for either knowledge or confidence ($F = 0.10$, $p = 0.765$, $\eta\_p^2 = 0.014$; $F = 0.09$, $p = 0.771$, $\eta\_p^2 = 0.013$).

Separate repeated measures ANOVAs evaluating active participants and observers found significant differences between the pretest and posttest knowledge and confidence scores respectively ($F = 14.12$, $p = 0.007$, $\eta\_p^2 = 0.669$; $F = 88.44$, $p < 0.001$, $\eta\_p^2 = 0.927$), with no significant difference between the active participant or observer roles for either knowledge assessment ($F = .0.21$, $p = 0.658$, $\eta\_p^2 = 0.030$) or confidence rating scale ($F = 2.67$, $p = 0.146$, $\eta\_p^2 = 0.276$).

Students who experienced telehealth encounters demonstrated similar increases in confidence and knowledge to in-person encounters no matter which role they were in. Athletic training educators should consider implementing telehealth standardized patient encounters into their educational curriculums even if not all students are able to be active participants.

Submitted to the Athletic Training Education Journal and Simulation in Healthcare Journal in April 2022 / Recipient of Provost Research Grant Award

LEADERSHIP IN HIGHER EDUCATION

POSTER 61

Exploration of Commuter Student Belonging at Private, Four-Year Institutions

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There has been substantial research conducted around facilitating student success at institutions of higher education and exploring the student experience of undergraduate students, specifically, those students who take part in the residential communities which have become synonymous with the college experience. Through these studies, higher education administrators have learned the significant role residential communities play in a student's success and persistence and have used these findings to inform master plans for institution's capital improvements, programmatic initiatives for residential communities and more. Although this research is helpful for informing the decisions of higher education administrators as they create plans for student success at their institution, it is important to note this literature and the prevailing student development theories and academic research focuses primarily on residential students at higher education institutions or utilized samples which neglected to differentiate between students who commute to campus and those who live on campus throughout the academic year. The purpose of this study is to identify if the prevailing theories of student development still reign true for students who commute to campus and what are the factors which contribute to the sense of belonging for students who commute to campus.

Recipient of Provost Research Grant Award

MEDICAL LABORATORY SCIENCE

POSTER 62

Exploring a Pre-analytical Intervention to Improve Turnaround Time for a Respiratory Pathogen Panel

Melissa Metzler / mmetzler01@bellarmine.edu / Faculty Mentor: Karen Golemboski

Clinical laboratory turnaround times (TAT) are a reliable indicator of laboratory effectiveness and are often used by clinicians as a benchmark for laboratory performance. For patients with acute respiratory infections, studies have shown that rapid diagnosis can be beneficial in terms of both patient outcomes and finances. Fast diagnosis reduces unnecessary antibiotic treatment, and length of patient stays in the hospital. Having results within several hours (~ <4 hours) is key to maximizing these benefits. At a hospital system in Louisville KY, the average TAT for the FilmArray Respiratory Panel (RPP) (BioFire Diagnostics) was 6.1 hours for the month of September 2021. This project explores practical solutions to decrease the turnaround time for RPPs, primarily focusing on pre-analytical processes: specifically, the time from specimen receipt into an off-site reference laboratory (that is a division of the hospital system)

to specimen loading onto the instrument. Before this intervention, all microbiology specimens were received by central processing, and then delivered as a batch to the Microbiology department. In our process change, central processing was instructed to bring RPP specimens from hospital directly to the Microbiology department, who would then receive and run the specimen. After the implementation of this intervention, the average TAT decreased from 6.11 hours to 4.57 hours.