URCAF:

Undergraduate Research and Creative Activity Forum

PROGRAM & ABSTRACT SUBMISSIONS

Friday, April 7, 2023
RHATIGAN STUDENT CENTER
WICHITA STATE UNIVERSITY

SCHEDULE

8:45 – 9:30a	Student Registration, RS 257 Ashton Bridges Judge Registration, RS 261 Olive
9:30a – 12:30p	Oral Presentations
9:30a – 1:00p	Poster Presentations: RSC First & Second Floor
12:30 – 2:00p	Lunch, RSC One meal ticket is provided to each presenter and judge.
2:00 – 2:30p	URCAF Awards Ceremony, RS 266 Pike

ORGANIZING COMMITTEE

Kelly Anderson, Chair
Associate Professor, Dental Hygiene, College of Health Professions

Abu Asaduzzaman
Associate Professor, Electrical Engineering & Computer Science, College of Engineering

Monowar Hasan
Assistant Professor, Department of Electrical Engineering and Computer Science, College of Engineering

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Student Representative

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Shirlene Small
Associate Educator, Sociology, Fairmount College of Liberal Arts and Sciences

Andrew Swindle
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Rannfrid Thelle
Associate Professor, History, Fairmount College of Liberal Arts and Sciences

Heidi VanRavenhorst-Bell
Associate Dean and Assistant Professor, Human Performance Studies, College of Applied Studies

Kim Wilson
Professor, College of Applied Studies

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POSTER PRESENTATIONS

Anna Brake
Faculty Mentor(s): Dr. Nikki Keene Woods
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Applied Sciences

SURVEY ON THE ACCEPTABILITY OF A FETAL MONITORING DEVICE

Pregnant mothers living in rural areas are faced with reduced access to adequate maternal and fetal healthcare, leading to disparities in delivered care and contributing to increased adverse birth outcomes for mothers and babies. Using remote monitoring may help mitigate these issues. This project focuses on piloting a survey that will allow pregnant mothers to provide their input to the design process of a wearable fetal echocardiogram (fECG). This monitor will allow continuous monitoring of fetal health and the communication of this information to healthcare professionals. This fECG would allow healthcare providers to better monitor fetal health in order to provide more timely medical interventions for high-risk patients, thereby reducing fetal mortality. The survey includes 30 questions evaluating participant demographics and using a five-point Likert scale to determine the acceptability of using a wearable medical device during pregnancy. A convenience sample of women of childbearing age (18-49) will be used for the pilot survey. Data collection with occur in March. At the end of the survey, participants will be asked follow-up questions concerning the survey methodology. Results will be analyzed using descriptive statistics and qualitative methods will be used to summarize the main themes of the open-ended questions. A principal objective of the pilot survey is to determine the most effective means of conducting a survey, whether online, verbally or by paper form completion of surveying participants is superior. Additional objectives include assessing whether the survey is easily understood, participant cooperation, and ways of improving and optimizing the survey method. The project goal is to refine and fine-tune the survey to maximize participant cooperation and comprehension, as well as the quality of the data gathered.

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Madison George
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Poster Presentation: Applied Sciences

CORRELATION BETWEEN PARENT/TEACHER CONFERENCE ATTENDANCE AND STUDENT GRADE

Many factors outside of the school can impact a student's academic success. One factor is the involvement of the parent/guardian. When students have a guardian who is actively involved, they tend to perform better because they have that additional person in their life who is pushing them to succeed. A way that guardians show their involvement is by attending parent/teacher conferences. This is a time for the teacher to share what they are doing in class, as well as how the student in performing. When guardians attend these conferences, they are kept in the loop on those things and able to ask questions or voice concerns. The teacher can also provide the guardians with things that can be done to improve the students grade in the class if they are struggling. These parent/teacher conferences are important times where crucial information is shared and when students have guardians that are involved and attend these conferences, their grade and performance in the class are traditionally quite higher than those students who do not attend, as the data will show. Another area this research will discuss is how parent/teacher conference attendance compares between regular and honors-level courses.

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Elleana Lopez Finkeldei, Sydnie Mathes, Alexis Reece, Sarah Rogers
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Poster Presentation: Applied Sciences

STANDARD REFERENCED GRADING: A SHIFT IN AMERICAN EDUCATION

Standards Referenced Grading is a system of grading that "measures a student's mastery of grade-level standards" put forth by individual states by "prioritizing the most recent, consistent level of performance" (Wichita Public Schools). In simple terms, the classic 0%-100% grading system used in higher education today is beginning to disappear in the K-12 system, per the decision of various district administrations. This grading scale has swept

through the nation at an exceptional rate, so it must be good right? Yet we ask ourselves, is this grading system fulfilling its purpose to equalize education across the country while still sufficiently preparing students for higher education and/or life? In this study, we surveyed Kansas educators regarding their experience with traditional and SRG grading systems, asking not for the data behind graduation rates, pass/fail rates, or student performance. But the data behind the real classroom experience. What's working, what's not, how can we improve, and are SRGs the future for all levels of education?

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Jada Nichols
Faculty Mentor(s): Dr. Daniel Bergman
College of Applied Studies
Poster Presentation: Applied Sciences

INCORPORATING TECHNOLOGY IN THE CLASSROOM: A HELP OR HINDRANCE

Throughout my time studying education, I have heard a variety of opinions regarding applying the use of technology in the classroom. I have also encountered many of the pros and cons first-hand during my student teaching experiences. To better understand if technology enhances student engagement, or if it leads to further distraction, I will observe my students as they complete both paper worksheets and assignments that incorporate technology and compare how frequently they are spotted off task.

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Jessica Orchard, Nancy Martinez, Yareli Mendoza
Faculty Mentor(s): Ms. Martin
College of Health Professions
Poster Presentation: Applied Sciences

ORAL HYGIENE CARE FOR THE DISABLED ADULT

Purpose: Oral Hygiene Care for Adults with Disabilities is a dental hygiene program created to provide education for the disabled adult population. This program aims to give caregivers and adults efficient oral health instructions and modifications to maintain a stable quality of life.
Methods: Scholarly articles from National Library of Medicine, PubMed, The Journal of the American Dental, and the National Council on Disability were the main resources to find information about the oral health of adults with physical disabilities. The delivery was through a PowerPoint with a demonstration to measure the audience's comprehension.
Results: The residents at The Timbers had an increased understanding of why oral hygiene is important for overall health. These adults with disabilities received instruction on how to modify their oral health aids according to their individual needs.
Implications: The presentation of this research would decrease the amount of caries and tooth loss for disabled patients. This would improve the oral health of the disabled population in the community. The significant association between oral health and systemic conditions was also discussed with the residents so that they would have the necessary education to take care of their oral hygiene. This contributes toward the Healthy People 2030 oral condition objectives by promoting oral care, which can potentially reduce cavities, gum disease, and encourage oral health.
Recommendations/Conclusion: In the future, it would be beneficial to revisit the residents of The Timbers to obtain information about what oral hygiene aid modifications they implemented into their oral hygiene routine and how successful those modifications were. This information would help other dental hygienists know what modifications to suggest to adults with disabilities. With a better understanding of what teaching methods are most helpful and what oral hygiene modifications are most beneficial, the team could improve on their oral hygiene presentations to this demographic in the future.

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Cassidy Parks
Faculty Mentor(s): Donna Robinson
College of Health Professions
Poster Presentation: Applied Sciences

THE KEY TO CLEAN SMILES: WATERPIK VS STRING FLOSS

The aim of the evidence based project was to find the best evidence to answer the question, “What is the best evidence that using a waterpik prevents plaque buildup in adults better than string floss?” To answer this question, five students conducted literature studies using PubMed, ScienceDirect, and CINAHL Complete to gather articles with evidence to answer the question. Each student contributed one article as research into the evidence of this question. These articles were chosen in relation to the data being the best, current data relevant to the question. After data retrieval, the clinical application of this question was discussed as it related to the public health setting. The evidence showed that using the waterpik over string floss does not significantly improve plaque removal, but does show signs of greater reduction in gingival bleeding. Studies also indicated the waterpik was recommended to patients that have limited dexterity, as it requires less fine motor movements. Cost was another factor placed into consideration as waterpiks are far more expensive than traditional floss. In addition to being more cost effective, traditional floss also is more readily available to anyone in the general public. Overall, the waterpik is very comparable to string floss, when used consistently. However, there are certain patients that might greatly benefit from use of a waterpik, namely those with dexterity limitations in the upper extremities. In the application of this data to the public health setting, it can be useful in education of patients on oral hygiene. These studies can be useful in showing patients the effectiveness of different methods of flossing and finding the best option for them to keep hygiene that is conducive to oral and systemic health.

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Emily Bradley, Reagan Ebenkamp, Alesia Smith, Holly Smith
Faculty Mentor(s): Kelly Anderson
College of Health Professions
Poster Presentation: Applied Sciences

ORAL HEALTH EDUCATION OF ADOLESCENTS LIVING IN A RESIDENTIAL FOSTER HOME

Problem Statement: The goal of this project is to improve the oral health of an under-served adolescent population (ages 10-18) in a residential foster home whose parents can no longer care for them. This vulnerable population lacks stable living conditions due to neglect, substance abuse, and family dysfunction. Oral health care remains some of the most difficult health services to access for children and teens in foster care. The American Academy of Pediatrics recommends that every child and teen entering foster care have a dental evaluation within 30 days of placement. Many dentists do not accept Medicaid; therefore, this population has little access to care and is more susceptible to dental decay, gingival, and periodontal disease.
Purpose: The objectives of this project were to offer preventative educational modalities to a group of adolescents in a residential foster home in Wellington, Kansas, and their caregivers.
Methods: Research was conducted utilizing fourteen published resources through databases such as PubMed, ProQuest, and Wiley online library. Research revealed 12.2% of people were living below poverty level in Wellington, Kansas, and there is only one dental clinic accepting Medicaid. Most children in the foster care system have medical and dental coverage only through Medicaid. Students from the dental hygiene program at Wichita State University provided an oral health education program about oral hygiene instructions, education about fluoride products, and proper nutritional habits at a foster home named AAHN’s Place (meaning pride). A PowerPoint presentation was given to both adolescents and caregivers (n=15), which included hands-on activities, brochures, and visual aid.
Results: The adolescents and caregivers’ knowledge of nutrition, home care, and fluoride improved through anecdotal findings. Of the various educational methods, the audience was most responsive to the video regarding the progression of decay and periodontal diseases, pamphlets, and the hands-on learning activity.
Implications: For future access to care for children in the foster system, dental hygienists can provide care and education utilizing an Extended Care Permit. Kansas law allows dental hygienists to provide services directly to this population by using portable equipment to screen for disease, give oral health education, and refer to a dentist for further care. There are also programs in Kansas such as Miles of Smiles that offer dental services to children and adolescents from a mobile van or in schools. Only through these types of programs can oral health improve for adolescents who have no resources in foster care.

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Rahul Madhavan
Faculty Mentor(s): Rajprasad Loganathan
Concurrent High School Student
Poster Presentation: Concurrent High School Student

TESTING THE ROLE OF EXERCISE TRAINING FOR THE PHYSIOLOGICAL MAINTENANCE OF THE DROSOPHILA TESTIS STEM CELL NICHE

Stem cell niches are microenvironments that feed stable signals to maintain stem cell physiology. The Drosophila testis stem cell niche called “the hub” is a well characterized system that regulates stem cell survival, maintenance, and aging. The effects of exercise and its role in the regulation of stem cell niches is unknown and could have profound implications for our understanding of stem cell health. This project aims to investigate the response of the JAK-STAT signaling pathway, a pro-stem cell homeostasis pathway in the testis niche, to exercise training. We will require an equipment called Power Tower (currently being constructed at the WSU GoCreate) to allow the flies to undergo three weeks of exercise training. Their exercise intensity will gradually increase from weeks 1 through 3. The training protocol takes advantage of the Drosophila’s innate negative geotaxis ability (the directional movement against gravity) by forcing them to climb continuously in the container or until the apparatus is turned off. They will then have their stem cell number counted in the niche and compared against a control group of same-aged flies. We expect to test the hypothesis that exercise training will correlate with an upregulation of JAK-STAT signaling and an increase in stem cell viability within the treatment group. We will provide an overview of the experimental plan designed to test our hypothesis and preliminary data obtained during preparation for this study.

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Melisa Alfonso
Faculty Mentor(s): Dr. Wei
College of Engineering
Poster Presentation: Natural Sciences & Engineering

POROUS MATERIALS FOR CAPACITIVE DEIONIZATION

Highly efficient capacitive deionization (CDI) relies on unimpeded transport of salt ions to the electrode surface. Porous materials were evaluated to determine a good candidate to provide superb conditions for ion adsorption.

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Ayshea Banes
Faculty Mentor(s): Nick Solomey
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

ESTIMATING AT EARTH THE ULTRA-HIGH ENERGY NEUTRINO FLUX FROM THE ACCRETION DISKS IN THE GALACTIC CORE

The purpose of this research is to determine at Earth the high-energy neutrino flux coming from the galactic core, Sagittarius Aâˆ— (Sgr Aâˆ—) and from the many other accretion disks within the galactic bulge. It is estimated that there are 10,000 such accretion disk within the cubic parsec of the galactic core alone and many more in the galactic bulge. There are various neutrino detectors, such as IceCube, which can detect energetic neutrinos, however, the direct galactic core neutrino flux is very low, so very few neutrinos from the galactic core are measured. We created two models to simulate the galactic core neutrino flux. The first model is a simple linear simulation that predominately relied on the properties of the accretion disks and Sgr Aâˆ—, which included the quantity, sizes, and distances of the accretion disks. To better estimate the neutrino flux, we replaced the linear accretion disks distribution with a more robust code that randomly distributed the accretion disks and generated bodies of varying sizes. This was then used to determine the ultra-high energy neutrino flux to be 2.797 Â· 10^âˆ’11cm^âˆ’2s^âˆ’1. Since it is very hard to determine neutrino direction from interactions of neutrinos, we envision an application where the energetic galactic core neutrinos are gravitationally focused by the Sun with a “light” collecting power of 10^11â€“10^12 and they can interact in a planet’s atmosphere where the produced showers containing energetic charged particles can produce Cherenkov rings imageable by an orbiting spacecraft or upward going muons which can be observed in a cosmic ray experiment.

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Kaylyn Booker
Faculty Mentor(s): Yongkuk Lee, Nikki Keene Woods Nikki Keene Woods
College of Engineering
Poster Presentation: Natural Sciences & Engineering

DESIGNING A RELIABLE AND EFFECTIVE FETAL ECG EXTRACTION ALGORITHM BASED SIMULATED ABDOMINAL ECG SIGNALS WITH DIFFERENT PREGNANCY CASES

With heart defects being the leading cause of prenatal death, fetal electrocardiogram monitoring is critical to reduce fetal mortality. Current gold-standard techniques for fetal electrocardiogram (fECG) monitoring are Doppler ultrasound as well as invasive methods. Invasive fECG utilizes a probe screwed into the fetus' scalp during labour, this method may only be used when membranes are broken and has an increased risk of infection or complications. Doppler is limited to use in clinic as it is complicated to operate and not suitable for long-term monitoring. Emerging non-invasive methods utilize maternal abdominal electrodes but have a lower fetal ECG extraction accuracy due to the overlapping of the maternal ECG and other noise with the fetal ECG. The objective of this study is to address the technical barriers currently limiting the ability to provide a long term, skin wearable ECG device. By using a synthetic abdominal ECG simulator, we have been able to create multiple different pregnancy cases. Various fetal ECG extraction algorithms were then applied to the simulated data to evaluate which method provides accurate r-peak detection. Preliminary results show the extraction method blind source separation (BSS) to have the highest positive predictive value (PPV) and sensitivity (Se), specifically independent component analysis BSS (BSS-ICA). This extraction method will be evaluated by applying it to data collected from pregnant patients to further test the accuracy apart from simulated data.

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Emily Caswell
Faculty Mentor(s): Dr. Nils Hakansson
College of Engineering
Poster Presentation: Natural Sciences & Engineering

CHANGES IN CENTER OF PRESSURE DYNAMICS RELATED TO BASE OF SUPPORT TO QUANTIFY POSTURAL STABILITY

Postural stability can be assessed using a variety of observational tests, including the Romberg Static Balance Test. Such observational tests are subjective, relying on the visual observations of the test facilitator.
In contrast, use of the force plate system provides a quantifiable method of recording the center of pressure (COP) trajectory during standing balance trials to assess postural stability. This study aims to assess the validity of the assumptions that during successful balance, the COP exists within the base of support (foot/shoe), and a COP deviation outside the base of support signifies a loss of postural control via a tap or step with the non-balancing foot. These assumptions are evaluated in attempt to provide another objective and quantifiable method of analyzing postural stability. For this study, 15 subjects performed a modified Romberg static balance test while the test facilitator recorded any instance and times of loss of postural control via taps or steps with the non-balancing foot. Balancing trials were performed while the force plate system collected quantitative ground reaction force data. Reflective markers placed on the perimeter of the subject's shoes outline the base of support within the force plate system. The COP is traced with respect to the area of base of support outlined by the markers, and using an open-source algorithm, times are identified for which the COP deviates outside the perimeter of the base of support. The results of this analysis will be compared to video footage of the balancing trials performed to determine if the derived times correspond to visually identified loss of balance. This study is a probative first step in evaluating the potential for further research on quantifying postural stability using the relationship between COP dynamics and base of support; such explorations could provide insight into neurological issues associated with postural control problems.

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Ximena Chanez
Faculty Mentor(s): Bhisham Sharma
College of Engineering
Poster Presentation: Natural Sciences & Engineering

SCIENCE AND ART OF 3D PRINTED CERAMICS

Art is a medium that allows people to connect with diverse cultures and historical periods. Unfortunately, not everyone has access to these artifacts as most are located in faraway international museums that can be expensive to visit. The global trend of museums digitizing and uploading STL files of their collections provides an opportunity to replicate these pieces using additive manufacturing. Our solution to this accessibility issue was to use clay and a 3D printer to recreate any desired artwork. We explored the feasibility of the Delta Wasp 2040 and various clays, ultimately settling on a mixture of Nepheline Syenite, Silica, Grolleg Kaolin, OM4 Ball Clay, and plasticizer, for optimal print quality. Multiple STL files were printed to test other printing parameters like layer height, nozzle size, pressure, and print speed. Finally, we curated and printed STL files from different museums and other online sources and were able to replicate them. Our work shows that it is possible to recreate art pieces in a cost-effective and easily replicable way, making them accessible to everyone, and reviving history, culture, and eras.

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Lauren Coffman
Faculty Mentor(s): Dr. Yongkuk Lee
College of Engineering
Poster Presentation: Natural Sciences & Engineering

PORTRAYING SKIN-LIKE ELECTRODES USING A BIOMIMETIC SKIN PHANTOM

Lightweight wearable electrodes advance modern medical technology and the lives of patients. To produce these medical devices, human subjects must be available for testing. Obtaining a diverse group of human subjects is challenging; therefore, our solution is to fabricate a skin phantom for companies that is low-cost and easy to produce. The skin phantom consists of the lower deep tissue layer and the upper stratum corneum. The upper layer consists of hundreds of holes in 0.2 mm diameter cut by a laser cutter to achieve a porosity of 1.4%. The deep tissue layer consists of 0.9% saline solution in polyvinyl alcohol (PVA) to create cryogels using a freeze-thaw technique. Our objectives include 1) completing fabricated skin phantom, 2) analyzing performance data with impedance measurements and stimulated ECG signals, and 3) finally comparing the impedance of our skin-like electrodes with one of medical grade electrodes on the phantom. To confirm the skin phantom has a similar skin impedance range, five human subjects undergo testing to obtain a baseline for electrical performance. Current testing includes collecting skin impedance data from five test subjects and the active skin phantom with a simulated ECG signal. Our results so far show that the skin phantom is easy to produce, low in cost, and eliminates the need for human test subjects when conducting experiments for wearable electrodes.

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Whitney Crawford
Faculty Mentor(s): Martin Ratcliffe
College of Engineering
Poster Presentation: Natural Sciences & Engineering

TRANSITING EXOPLANET OBSERVATION AND IMAGE ANALYSIS

Exoplanet research today is one of the fastest growing areas of interest for astronomers, with the total number of exoplanets discovered reaching 5,000 in number and captured by both researchers and astronomers alike. However, analyzing captured images requires using complex astrometry programs and careful guidance to achieve accurate results. Results come in the form of the star's light curve, which represents the amount of light that a camera is exposed to over the observation period. The goal of this research is to determine if an amateur astronomer can successfully choose a target star, operate a telescope to capture a set of images of the star, and then use photometry to analyze the light curve of the star. A dip in the light curve would indicate an object transiting the star, thus indicating the possibility of an exoplanet. This project was done in conjunction with a wide-aperture telescope and the image analysis tool AstroImageJ, which is widely used in the astronomy community. The light curves obtained from this project indicate the possible existence of exoplanets and will be compared to existing light curves to further determine their validity. This research also aims to serve as a tutorial for future exoplanet research.

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Pedro Cupertino
Faculty Mentor(s): Dr. Adam Lynch
College of Engineering
Poster Presentation: Natural Sciences & Engineering

INTEGRATED PROJECTS: ANALYSIS OF POWER TRANSMISSIONS SCALED TO TURBOMACHINERY

Power-transmitting turbomachines areâ€¯transmitting power from input shaft to an output shaft. Yet scaled products with similar feature has been shown to drive greater student engagement. Therefore, we evaluated the effect of integrating undergraduate and graduate engineering classes using a unifying a power transmission device. Each class worked on a different technical component of the product using their course specific body of knowledge. A uniformed Six Sigma DMAIC project methodology was employed as well as consistent Entrepreneurial Mindset team building in class.
PURPOSE / HYPOTHESIS: o identify the impact on students' knowledge assimilation and industry preparation based on an integrated project in complementary engineering classes covering different levels of the same product development, namely a battery operated, power hand tool who's central drive transmissions can be scaled to many other industrial motor as well as transportation applications, such as turbomachinery.
DESIGN / METHOD: The study sample consisted of 187 students enrolled in 6 engineering classes: Statics, Circuits, Machine Elements, Statistical Process Control, Leadership, and Lean Manufacturing at a large public research university in the central United States in Spring 2023. The central project theme in all classes was a simple, yet tangible power transmission, a drill. Each course evaluated the device with subject specific analysis. The sub-assemblies of analysis included the hard carrying case, batteries & charging stations, the main drill body, statistical process control of the components, project management, and lean manufacturing principles along with a business plan for a new enterprise startup.
RESULTS: These integrated projects jointly serve as a pilot program is currently in its third week of a sixteen-week semester. For each course project, there are consistent team deliverables, such as a team charter, which are due each week for all courses in the integrated project framework.
CONCLUSIONS: While the study of turbomachinery at large industrial scale is critically important, giving students equipment that they can easily hold in their hands and transport around campus may ensure more lasting curiosity and desire to pursue and fortitude to persevere the rigors of an engineering program. Tangible and accessible projects appear to provide greater immediate willingness to endeavor more challenging yet abstract projects in the future.
KEYWORDS: Project Based Learning, Entrepreneurial Mindset, Turbomachinery

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Jack Dalton
Faculty Mentor(s): William Parcell
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

STRATIGRAPHY OF MORRISON FORMATION (UPPER JURASSIC) BENTONITE BEDS, NORTHEASTERN BIGHORN BASIN, WYOMING

Beds of weathered volcanic ash (bentonite) are prevalent throughout the Upper Jurassic Morrison Formation of the western United States. However, most reported bentonite beds are thin and tend to be interlayered with other lithologies. Here, a new Morrison site is reported from the northeastern Bighorn Basin of Wyoming where bentonite beds are anomalously-thick and dominant, constituting the majority of the studied forty-seven-meter interval. The purpose of this study is to produce a stratigraphic framework of this new site and interpret both its depositional environment and overall position within the Morrison Formation. The abundance of bentonite indicates that the site lies within the upper Brushy Basin Member of the Morrison, deposited during the Tithonian stage of the Jurassic. However, the prevalence of the bentonite in this section indicates that it represents a localized subunit of the Brushy Basin that is here named the Cody Bentonite. Currently-ongoing research involving x-ray fluorescence (XRF) and lithostratigraphic data has been utilized to subdivide the deposition of the Cody Bentonite into two distinct stages, with subunits of the Cody Bentonite being identified through similar means. Additionally, interpretations of XRF data indicate that the Cody Bentonite was deposited over a prolonged period of time, potentially ranging from thousands to millions of years, corresponding with prolonged volcanism and contemporaneous with a minor transgression-regression of an inland sea.

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Jenna Ercolani
Faculty Mentor(s): Dr. Laila Cure
College of Engineering
Poster Presentation: Natural Sciences & Engineering

IDENTIFYING AND VALIDATING PERCEIVED WORKLOAD METRICS FOR EMERGENCY MEDICAL SERVICES

Emergency Medical Services (EMS) use workload surrogates to inform decisions such as staffing and dispatching. The most common workload surrogates are overall call volume and Unit Hour Utilization (UHU). However, these surrogates have not been validated as workload metrics in EMS context and their validity has been challenged given that they do not account for indirect work or for the variability in effort associated with different calls. This study investigates the relationship of commonly used EMS operational metrics with perceived workload to evaluate their appropriateness as surrogates. We applied a modified version of the NASA Task Load Index survey to ambulance crewmembers at various points in time during several shifts to assess the corresponding perceived workload and paired the responses with operational measures based on dispatch data. The operational metrics studied included: overall call volume, UHU, priority stratified call volume, initial acuity stratified call volume, call response utilization, mean time between calls, and coefficient of variation of time between calls. Linear regression models were used to evaluate the influence of each metric on perceived workload. Logistic regression models were used to identify if there were well defined values of the candidate metrics indicating having incurred a fair day's work. We found that overall call volume (p-value=0.0002, R^2=0.32) and UHU (p-value = 0.004, R^2= 0.23) explain less than half of the variability in perceived workload. Priority-stratified call volume (p-value =0.002, R^2=0.65) explained more of this variability, while priority-stratified call volume was also statistically significant in identifying incurring a fair workload. We conclude that call volume is insufficient to represent perceived workload.

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RJ Kunde, Henry Hartjes
Faculty Mentor(s): Brandon Buerge
College of Engineering
Poster Presentation: Natural Sciences & Engineering

FLIGHT SIMULATION OF AN AIRSHIP USING A SIX DEGREE OF FREEDOM MODEL

The objective of this research was to develop a highly precise aerodynamic model of an airship through the utilization of a six degree of freedom Simulink simulation, followed by integration with X-Plane 11 to enable pilot-in-the-loop functionality. This work was inspired by prior research conducted by S. B. V. Gomes on the flight dynamics of airships, with specific reference to the YEZ-2A, an ellipsoid shaped aircraft measuring 425 feet in length and 105 feet in diameter, possessing a gas envelope of 1.7 million cubic feet which permits buoyancy control via ballonets.
Our model was generated using the MATLAB programming language, in conjunction with Simulink and X-Plane 11 flight simulation software. We extracted a broad array of aircraft flight parameters from Gomes' wind tunnel test results, enabling us to construct the most accurate model feasible. We imported sixty data sets encompassing maximum control surface deflection and over 30 degrees in both side slip and angle of attack for precise interpolation. Future work will involve the integration of a ground-based tether into the model, which will facilitate ground control, data collection, and power transmission to the airship in real time.
This research was instigated by the extensive expertise of Dr. Brandon Buerge at Wichita State University in the field of airships and lighter-than-air vehicles, as well as private sector interest. Airships are ideal for remote, high-endurance, long-range missions, making this research area exceptionally stimulating.

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Logan Mauch
Faculty Mentor(s): Wei Wei
College of Engineering
Poster Presentation: Natural Sciences & Engineering

EXPLORATION OF NEXT-GENERATION CAPACITOR ELECTRODE MATERIALS

In modern times, the number of personal electronic devices is at an all-time high - from tablets and cell phones to fitness trackers to the seemingly infinite supply of "smart" devices. Most of these devices rely on the ability to store electric energy for later use. This demand has created a wave of research in the topic of next-generation energy storage techniques to accommodate higher capacities in ever smaller form factors. This research explores the performance of capacitors made with varying electrode materials applied in a variety of thicknesses all tested using the same electrode base material, electrolyte, spacer, and cyclic voltammetry test parameters.

Stewart McClelland
Faculty Mentor(s): Dr. Ikramuddin Ahmed
College of Engineering
Poster Presentation: Natural Sciences & Engineering

CARBON FOOTPRINT ANALYSIS OF WICHITA STATE UNIVERSITY'S ELECTRICITY USAGE

This research's main intent is to update the carbon footprint in respect to scope 2 emissions of Wichita State University from a previous study in 2019. All data was collected by the team as a part of the First Year Research Experience program. The data that will be collected and used in this study will be gathered from the Wichita State's electricity bills, natural gas bills, and a survey of student, faculty, and staff commuting and parking. This data will then be converted into kg CO2. This data was then categorized and ordered into the largest emission sources to the least. Analysis of the collected data will provide us an opportunity to suggest changes that Wichita State could make to approach a carbon neutral footprint more quickly. Additionally, this study should be used for future revisions of Wichita State's carbon footprint as was the intention of the previous study as well.

Treavor McLeland
Faculty Mentor(s): Yongkuk Lee
College of Engineering
Poster Presentation: Natural Sciences & Engineering

USING A VIRTUAL REALITY HEADSET AND FLEXABLE ELECTRONICS TO TRACK EYE MOVEMENT BY USING EOG FOR EYE THERAPY

Some people are born with abnormal visual development that leads to visual impairment in those individuals. To help correct this people with these impairments will need to seek treatment from a professional to correct it. This will take time out of someone's day as they will need to drive the individual to the professional so that they can have proper care in treating their visual impairment. The objective of this study is to see if virtual reality can be used for eye therapy by recording the EOG data to see if the therapy is working. This study will be using dots on a wall going horizontally and vertically and the patient sitting some distance away from the wall with their eye level being on the center dot. Participants will then wear an virtual reality headset and flexible electrodes that will then record the EOG data. This data can then be used to see if the therapy is working or not and if the gathered data is in line with EOG of correct therapy EOG data. The short term goal for this study is to see if it is possible to use EOG to determine how far someone is looking.

Kevin Nguyen
Faculty Mentor(s): William Hendry
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

CHARACTERIZING A NOVEL HAMSTER CHEEK POUCH XENOTRANSPLANTATION MODEL

Preclinical tumor models are an integral element in cancer biology and therapeutics research. An effective tumor model informs researchers about the progression and biological characteristics of tumors in a natural environment by emulating the disease in a practical and reproducible way. This report aims to assess the proteomic status of a hamster cheek-pouch xenograft system seeded from a spheroid/organoid culture derived from the FaDu and CAL27 Human Neck Squamous Cell Carcinoma (HNSCC) cell lines via immunohistochemistry (IHC). Comparison of the IHC results between the cultures and the transplant masses showed differential protein expression between the FaDu and CAL27 lines as well as differences between the cultures and their xenograft masses. These results indicate that the hamster pouch is a viable transplantation site that maintains readily measurable protein expression but may induce phenotypic changes that make reproducibility difficult. Development of an improved preclinical model and optimized analytical techniques will improve our understanding of tumor biology and prediction of tumor response to therapeutic approaches.

Nhu Nguyen
Faculty Mentor(s): Dr. Wei Wei
College of Engineering
Poster Presentation: Natural Sciences & Engineering

EXPLORATION OF PEROVSKITE SOLAR CELL, A FUTURE ENERGY DEVICE

The energy and environmental issues promote the research about renewable energy sources that are pollution-free and contribute towards reducing the greenhouse effects. Out of many renewable energy sources, Solar Photovoltaic (PV) systems are most popular which convert solar energy into electricity. Commonly used PV systems are silicon based. However, Perovskite Solar Cells (PSCs) based on metal halides are gaining popularity as the most promising and competing PV technology because of its high power efficiencies coupled with low production cost and ease of fabrication. Organometal halide perovskite solar cell follows a general perovskite crystal structure of ABX3, where A is a larger cation such as methylammonium (MA+), formamidinium (FA+) and B is a smaller cation such as lead (Pb+2) or tin (Sn+2) and X is an anion consisting of halide such as Iodine (I-), chlorine (Cl-) or bromine (Br-). PSCs include five layers: fluorine-doped tin oxide (FTO) glass, electron transport layer (ETL), Perovskite layer, hole transportation material (HTM), and counter electrode (Ag, Au, Pt, carbon etc). This project researches the performance of PbI2 with Methylammonium Iodide (MAI) as a perovskite layer, poly(3-hexylthiophene-2,5-diyl) (P3HT) as a hole transportation material, and mesoporous carbon as counter electrode, which led to a high efficiency of up to 12.17%.

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Thu Nguyen
Faculty Mentor(s): Yongkuk Lee
College of Engineering
Poster Presentation: Natural Sciences & Engineering

FABRICATING A SOLID-STATE REFERENCE ELECTRODE WITH LONG-TERM STABILITY FOR SWEAT MONITORING SYSTEM

Valuable biomarkers such as glucose or enzymes are found in human sweat, making it a great resource in diagnosing and measuring biomarker concentrations. However, many commercial sweat monitoring systems are bulky and expensive. Therefore, our goal is to develop a wireless system that is flexible, reliable, and non-invasive. The first step of this project is to fabricate a solid-state reference electrode with long-term stability and Ag/AgCl electrode is chosen due to its ease of fabrication. From the previous works, silver (Ag) wires are first immersed into 1M FeCl3 solution to form a thin layer of AgCl and then coated by 1 mM MCH to reduce the dissolution rate of AgCl. The current study focuses on investigating various salt-containing membranes as the third layer to minimize potential drifts on the reference electrode. The two mixtures of PVB + NaCl + methanol, and PVA + KCl + DI water have been explored and drop casted on the fabricated reference electrodes. The potential differences between the electrodes and commercial reference electrode in different pH solutions are measured by using a digital multimeter to test the stability. Energy dispersive X-ray spectroscopy (EDS) is used to determine the concentration of each element in the solution to discover how each solution contributes to the performance, and to detect the drawbacks. Results show that the mixture of PVA + KCl + DI water takes a much longer time to dry out compared to the mixture of PVB + NaCl + methanol. The EDS results indicate that the solution of PVB + NaCl + methanol is not effective since sodium and chloride molecules are not detected. This result can be improved by modifying the concentration or changing the compound. The outcome of this research may provide additional information for future research regarding the fabrication of Ag/AgCl reference electrode.

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Jasmine Quah
Faculty Mentor(s): Doug English
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

GOLD CYANIDE EXTRACTION BY COLLOIDAL SYSTEMS

Gold cyanide, [Au(CN)2]Â¬-, is a compound formed during the gold mining process as the cyanidation of gold solubilizes the metal for reclamation. The cyanide used in this process is harmful for the surrounding environment as well as being harmful for humans; therefore, much research has been done on alternatives to the cyanide reactant as well as the methodology itself. The harmful effects of gold cyanide plants could be reduced with an alternative reclamation process that captures both gold cyanide complexes and remaining cyanide in solution. Because gold

cyanide and cyanide are negatively charged, both should associate with positively charged vesicles in a colloidal state. By mixing a metal slurry with a solution positively charged vesicles, the gold cyanide complex associates with the spherical bilayer of surfactants allowing for centrifugation and extraction of gold from the mixture. Similarly, the not complexed cyanide in solution should associate with the vesicles of which can be filtered out of solution with a spin column. The concentration of gold remaining in the supernatant and the concentration of nitrogen extracted with the vesicles can then be measured with inductively coupled plasma (ICP) analysis. The intensity results from the ICP analysis should then correlate to the relative concentrations of gold and nitrogen extracted from the original metal slurry.

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Bao Nhu To
Faculty Mentor(s): Mark A. Schneegurt
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

MICROBIAL GROWTH AND DISTRIBUTION IN LAYERED ICES RELEVANT TO MARS

Layered ice systems are analogs of natural environments expected on Mars. The presence of liquid water on Mars suggests that life may exist inside brine trapped between layers of pure water ice accumulated from frost and aeolian dust deposits. We are investigating the proliferation and survival of bacterial cells entrapped in layered ice systems under laboratory conditions by freezing and melting brine layers at low temperatures. Halophilic bacteria (Halomonas sp. str. GSP3, Halomonas sp. str. BLE7, and Oceanobacillus sp. str. SAF16) were isolated from JPL SAFs, Basque Lake, and the Great Salt Plains. Cultures were grown at a high salt concentration (15% NaCl) in R2A medium and frozen brine layers were formed at -40°C. The brine layer was melted at -12 Â°C and allowed to fractionate into dense liquid brine and a frazil ice layer, while top and bottom layers of pure water remained frozen. The microbes were in the brine layer to monitor their survival, activity and movement throughout the brine, frazil, and pure water ice layers. Microbial cells may exhibit migration patterns within the layered ice systems, as we observe cell partitioning and distribution. All three bacterial species exhibited high survival rates and appeared to partition more cells in the brine layer than the frazil layer. We are extending our research by creating layered ice analogs with NaClO3 salts, which have extremely low freezing points and are common on Mars. This project will help us monitor the activity of microbes in Mars-like conditions through layered ice systems and inform planetary protection protocols. The layered ice systems assist in studying the characteristics of these halophilic microbes and their potential to survive in entrapped layered ices. Supported by NASA and K-INBRE.

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Tina Tran
Faculty Mentor(s): Crystal Dozier
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Natural Sciences & Engineering

ARCHAEOLOGICAL FLOTATION ANALYSIS AT THE ETZANOA SITE (14CO3): PRELIMINARY ARTIFACTUAL AND GEOARCHAEOLOGICAL INSIGHTS FROM A SINGLE PROFILE COLUMN

The archaeological site known as Etzanoa (14CO3), is an Ancestral Wichita village site located along the Walnut River in Cowley County, Kansas. Occupied most heavily during the Great Bend Aspect (approximately AD 1425-1700), the Wichita State Archaeological Field School has focused on an area of domestic features for the last several years. In those regular excavations, all sediments were screened with Â¼ inch mesh, leaving smaller artifacts unrecovered. The present paper presents the preliminary results of a targeted sampling regime collected in 2022, in which total sediments of a 1.2 meter vertical section of the excavation was processed for flotation. The resulting 11 samples underwent archaeological flotation to recover microartifacts (such as lithic debris, pottery, and charcoal) and pertinent geoarchaeological data in the way of sand grading, to better understand the depositional history of the locale.

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Zach Vanfossan
Faculty Mentor(s): Yongkuk Lee
College of Engineering
Poster Presentation: Natural Sciences & Engineering

DESIGNING BIOWEARABLE SKIN SENSORS FOR WIRELESS PPG SIGNAL MONITORING

Wearable sensors that can accurately read signals given from the body is an avenue of biomedical research and industries that has yet to reach it's full potential. Current devices used in the medical field can be seen as uncomfortable to the user, often needing cuff-based devices and other invasive techniques to accurately collect data. This presentation will describe the process and steps taken in the fabrication and testing of a user comfortable, skin-wearable, wireless PPG monitoring sensor. The objectives of this research project is to first develop a circuit capable of PPG sensing and wireless communication via Bluetooth Low Energy, confirm its functionalities using a PCB prototype, fabricate a miniaturized sensor flexible materials, and finally test the flexible, wearable PPG sensor with human subjects. The patch is carefully crafted to ensure intimate integration the human skin, while the PPG readings are wirelessly transmitted to a portable device. A short-term goal of this device is to make a more non-invasive procedure that can quickly relay vital information of a patient to the health care professional, improving the care and speed at which patients can be examined. Future application of this device could expand to extract important cardiac outputs including heart rates and stroke volumes to enhance early detection of cardiovascular diseases and ultimately improve cardiovascular health.

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Elisabeth Benteman
Faculty Mentor(s): Dr. Jennifer Pearson
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

POSITIVE FAMILY AND PEER INFLUENCE ON LGBTQ+ YOUNG ADULTS

The purpose of the current study is to examine the joy related to LGBTQ+ identities and how it may be related to experiences with family and peers. This area of research is of interest due to its relatively unexplored nature; most prior research on LGBTQ+ identities focus on stigma and negative outcomes. Respondents for this study identified as LGBTQ, were between the ages of 18 and 28, and were recruited through social media and physical advertisements. Interview data from 8 participants was then collected using semi-structured interviews conducted by student researchers. Interviews were transcribed and coded using open and axial coding. The two main findings of this study were as follows: first, effort by family members to be accepting, affirming, or understanding caused LGBTQ+ young adults to have more positive (or at least ambivalent) feelings about their family. Second, the shared experience of being LGBTQ+ led to many positive friendships for those in our sample. These findings emphasize the importance of acceptance and shared identity in LGBTQ+ interpersonal relationships.

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Bethany Hollingsworth
Faculty Mentor(s): Jennifer Pearson
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

LGBTQ JOY: THE INFLUENCE OF COMMUNITY CONTEXT

Previous literature studying LGBTQ+ individuals and community involvement has asserted that LGBTQ+ positive community support results in the improved mental well-being of LGBTQ+ youth and adults (Wright, Wachs, and Gamez-Guadix 2022) and less chance of risk factors (Eisenberg et al. 2020; Elmer, Van Tilburg, and Fokkema 2022; Fish et al. 2019; Watson et al. 2020). The purpose of the current study is to investigate what community resources facilitate positive identity and joy. To address these questions, student researchers conducted 8 in-depth interviews, which lasted approximately one hour and included questions about the participants' identities, relationships with community, family, and school, and experiences of joy. We used grounded theory analysis (Strauss & Corbin, 1990) to analyze data from the interviews. Preliminary findings suggest that connecting to the LGBTQ+ community fostered positive identity development and a sense of belonging in participants. Conversely, leaving hostile religious communities also resulted in positive identity development and self-acceptance. These results demonstrate that community spaces that affirm and connect LGBTQ+ individuals encourage identity exploration, resulting in a sense of self-confidence and belonging. However, the negative self-perception experienced within hostile community spaces

that reject LGBTQ+ identities may translate into defiance and eventual self-acceptance, resulting in a sense of relief once the individual leaves the community setting.

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Logan Hutchens
Faculty Mentor(s): Dr. Erin O'Bryan
College of Engineering
Poster Presentation: Social Sciences & Humanities

EFFECT OF REPEATED MAZE TREATMENT ON SENTENCE FORMULATION ACCURACY AND RESPONSE TIME

The purpose of the current study was to examine the effects of repeated use of the maze task from the field of sentence processing as a treatment for sentence formulation in people with aphasia in terms of accuracy and response time. Aphasia is a language impairment resulting from stroke or brain injury, including difficulty with word finding and formulating sentences. The maze task involves formulating sentences one word at a time by choosing the correct of two options at each step. This quasi-experimental design study included seven participants with chronic aphasia. The treatment involved performing the computerized maze task for six sessions. In order to investigate how effective the treatment was, accuracy and response times were recorded during each treatment session for later analysis. Preliminary results indicated that, overall, participants' accuracy on the task increased and their response time decreased with repeated performance of the task. Further analysis is needed to see if these effects are significant. Additionally, follow-up is needed to determine whether these effects persist in the long-term. The study also allowed investigation of how the participants with aphasia comprehended the meaning of the sentences at each step. The data collected from the current study can be used in comparison with previous research on adults with typical language abilities who performed the same task. This comparison allows examination of the strategies that each person with aphasia utilized when processing the sentences and, thus, what they may need to focus on in further therapy.

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Zoie Liska, Dianna Pham, Abbie Hutton, Shivani Nagrecha, Dr. Carryl Baldwin
Faculty Mentor(s): Dr. Carryl Baldwin
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

MOTIVATION FOR EXERCISE: AN EXPLORATIVE STUDY EXAMINING PREFERRENCE FOR GROUP VERSUS SOLO PHYSICAL ACTIVITY

Exercise is a vital component of human well-being, as regular physical activity is known to increase overall health, decrease psychological distress and depression, and decrease mortality risk from all causes (Box et al, 2019). Despite its importance, 25% of Americans remain sedentary and a vast majority of the population do not meet the minimum activity guidelines set by the Centers for Disease Control (CDC, 2022). Enjoyment of exercise is seen as a key component of engaging and staying consistently committed to physical activity (Engels et al., 2022). This research study analyzes the factors associated with a preference for exercise mode--group versus individual exercise regimens. Anticipated influencing factors include Self-Determination Theory (SDT), Big 5 personality traits, gender differences, occupation, and regular usage of a fitness tracker. Researching these motivational factors will inform a larger endeavor aimed at increasing physical activity among diverse populations. This study will administer a five-part survey including a demographics section, exercise mode and frequency component, Ten-Item Personality Inventory (TIPI), Behavioral Regulation in Exercise Questionnaire (BREQ-3), and Exercise Motivation Inventory (EMI-2). Once data are collected, regression analyses will be used to determine what, if any, factors are associated with mode preference and level of physical activity engagement. It is hypothesized that those who regularly wear fitness trackers will have better adherence to exercise regimens, and those who score higher in extroversion will be more likely to engage in group versus solo physical activity. The results will be used to design physical activity engagement campaigns, tailored to individual populations, that emphasize enjoyable aspects of exercise.

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Lauren Madison
Faculty Mentor(s): Dr. Mythili Menon
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

NA'ABUKO: A CONSTRUCTED LANGUAGE INSPIRED BY AFROFUTURISM

An alien race has come to earth. Their announcement is that all members of what is now known as the Black diaspora were deposited by them onto Earth millions of years ago. This foreign alien race has now come back to return their people to their planet of origin. The language that results from years of assimilation and co-mingling after relocation on this new planet is Na'abuko.

This project investigates two primary research questions: How would members of the Black diaspora's language change as they learn the language of their ancestors and how would an alien language and African American Vernacular English (AAVE) evolve over time into one language? This investigation aims to look at linguistics and the development of a new language through the lens of afrofuturism - a movement in literature, music and art that features futuristic or science fiction themes that incorporate elements of Black history and culture with the hopes of creating positive racial dynamics for the future.

The language of Na'abuko takes inspiration from Swahili, Arabic and AAVE, languages that are commonly spoken throughout the Black diaspora. This new language takes traits from the Swahili class system for referring to nouns instead of the feminine and masculine forms of nouns common in Romance languages. Na' abuko also uses the reduplication system for pronouns from Swahili. Additionally, Na'buko takes its word order of Verb-Subject-Object from the Arabic language along with their dentialveolar and fricative phonemes such as /Ã°Ë¤/ and /dË¤/ . This new language also incorporates the double negatives, tense and aspect, as well as indexical elongation of vowels to indicate superlatives that is common in AAVE. Because this language was developed in space, atmospheric factors create sounds that are more guttural and airy such as /Ä§/ and /Ê•/.

Mia Maupin
Faculty Mentor(s): Jennifer Pearson
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

LGBTQIA+JOY AND THE IMPACT OF IDENTITY

Research about LGBTQIA+ individuals is often focused on negative experiences correlated with identity. Many studies document higher rates of bullying, harassment, and assault among LGBTQIA+ people; however, there is a noticeable gap in the research that focuses on positive aspects of the community. This study analyzes how LGBTQIA+ individuals experience and think about joy, specifically, what provides them joy within the LGBTQIA+ community. Data was collected through qualitative interviews both in person and via zoom (N = 8). Common themes included seeking out like-minded others and those with similar identities. Participants commonly reported that when they were in spaces where their identities were represented and visible, they felt safer and better able to express themselves authentically. Additionally, a lack of ability to connect with similar identities could lead to negative consequences such as stereotypes or ostracization. This study will further discuss the impacts of identity on LGBTQIA+ joy and the importance of representation within the community.

Trevor McDowell, Ryker Percival
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Poster Presentation: Social Sciences & Humanities

TEACHER BURNOUT

What is teacher burnout, how does it happened and how to avoid it.

Vincent Rumback, Haley Keeler
Faculty Mentor(s): Dr. Daniel Bergman
College of Applied Studies
Poster Presentation: Social Sciences & Humanities

REMOVING BIAS FROM SELF-EVALUATION

Self-Evaluation is a crucial tool for developing skills in any field. Teaching can especially benefit from this practice, as teachers are often too caught up in their lesson and classroom management to be able to focus a critical eye on their own methods and behaviors. The advent of technology allows us to record and review our performances so that we may apply that critical eye to our own work. However, people inevitably behave differently when they know they are being watched or recorded even if it is by themselves, and this difference in behavior keeps us from being able to investigate our true behaviors entirely. To solve this problem of behaving differently when being observed, we propose using a variety of new methods to remove this psychological barrier and allow for true unfiltered self-observation. Strategies like having a para in the classroom randomly record without scheduling, or having a constantly running recorder that you randomly pull tape from can give us drastically new insight into how we naturally behave when we aren't "putting on or best face" for the recording. This unfiltered look at our own teaching behaviors can result in bettering ourselves in ways we did not even know we needed, and in ways that could have been previously invisible.

Abigail Smith
Faculty Mentor(s): Meg Gray
College of Fine Arts
Poster Presentation: Social Sciences & Humanities

CHALLENGES IN TEACHING PIANO

My poster covers three topics; Piano with Dyslexia, Andragogy and Creativity in piano lessons. In each of these sections I cover what is and how to accommodate for these students who fall under these categories.

Taylor Wallace, Robin Moore, Jennifer Demers
Faculty Mentor(s): Dr. Jennifer Demers
Fairmount College of Liberal Arts & Sciences
Poster Presentation: Social Sciences & Humanities

VOTING DECISIONS ANDN PERCIEVED CREDIBILTY OF SEXUAL ASSAULT ALLEGATIONS AGAINST CANDIDATES IN THE 2020 PRESIDENTIAL ELECTION

Purpose: Presidential candidates Donald Trump and Joe Biden were accused of sexual assault or harassment by multiple women during the 2020 election. This is the first heavily publicized occurrence of both primary political parties endorsing candidates with sexual misconduct allegations against them. Perceived credibility of the allegations may differ among participants for various reasons, including party allegiance, the systematic influence of rape myth acceptance in the United States, and differential media coverage of the allegations. As such, there is a gap in literature concerning how these sexual assault and harassment allegations and their perceived credibility impact voter perceptions of the candidates and subsequent voting decisions. The current study explores perceptions of the sexual assault allegations against both candidates and how they impacted voting decisions. Participants surveyed online through Qualtrics consisted of 1,332 people residing in the continental United States who were recruited through Facebook ads beginning in the fall of 2020 and ending prior to the election. Participants described their perception of the credibility of allegations against both candidates, why they were voting for their chosen candidate, and why they weren't voting for the opposing candidate. Open-ended responses will be analyzed using qualitative methods. Specifically, thematic analysis will be conducted to identify overarching themes. Findings may provide insight on voters' perceptions of the credibility of sexual assault allegations against both presidential candidates in the 2020 election, as well as their relative impact on voting decisions.

Julia Edmondson
Faculty Mentor(s): Erin O'Bryan
College of Health Professions
Oral Presentation: Applied Sciences

CHOIRS FOR ADULTS WITH NEUROLOGICAL DISORDERS: A REVIEW OF BENEFITS AND LOCAL INTEREST SURVEY RESULTS

Research is emerging about an exciting approach to communication challenges. Music therapists and speech language pathologists have begun to collaborate in activities referred to as neurological choirs. Known by other names such as aphasia choirs, neurological choirs are community singing groups made up of participants with various neurological challenges. These could be the result of strokes, traumatic brain injuries, or degenerative diseases and lead to difficulties with communication. Examples of such conditions include aphasia, Parkinson's disease, Amyotrophic Lateral Sclerosis (ALS), and Huntington's disease, among others. Several research studies have already been conducted on the topic of neurological choirs. The current project reviews the scholarly literature on possible benefits and drawbacks of neurological choirs and suggests areas for future research and implementation. Although further research is needed to determine the full scope of benefits of these choirs on functional communication, there is preliminary evidence of improvements in well-being and potential for great success in conjunction with other therapies. The current project also surveys individuals with neurological disorders and their care partners to determine interest levels and factors that might influence participation. The literature review and results from the survey will be included in the research presentation. Additionally, high-quality future research studies and the expansion of neurological choirs will be proposed and discussed.

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Keely Orr
Faculty Mentor(s): Daniel Bergman
College of Applied Studies
Oral Presentation: Applied Sciences

TEACHERS TAKE THE TEST

Question: Does the testing and evaluation of teachers improve teaching? Through a new teacher's path to becoming a licensed teacher, they are tested, observed, and judged in many different ways many different times. Purpose: There is an extensive amount of evaluating and testing done on new teachers that seems to be redundant or not necessary. This study is to test if teacher evaluations are necessary, explain how they help or hurt a teacher, and educate other non-teachers on the different types of evaluations and tests a student teacher goes through. Study methods: I will be using my fellow classmate's evaluations of their teachings throughout the years. I will primarily look at the SATIC coding and KEEP evaluation sheets. I will compare previous sheets to current sheets to assess for growth of that teacher, and talk about what they have changed because of the evaluations.

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Alex Smith
Faculty Mentor(s): Mythili Menon
College of Fine Arts
Oral Presentation: Applied Sciences

CREATING A GAME FOR REFUGEE CHILDREN IN MIDDLE SCHOOL TO LEARN SCIENCE

There are 3.4 million refugee students around the world that are out of schools and not getting the education they deserve. In order to alleviate this, a game-based platform that can be played anywhere is under development. The goal is to verify the potential of digital games as a valuable tool for refugee students and highlight the significance of game-based language education more broadly. The game will supplement the middle school science curriculum, incorporating the Kansas Science Standards and the Next Generation Science Standards. Using Unreal, we provide quests where the player will take pictures and learn about their surroundings. The content will be presented in the form of subtitles having both the refugee students' native language and English. We expect the game will become a free and accessible educational tool for refugee students and will contribute to the improvement of their opportunities for education, thereby helping them integrate into U.S. society. The long-term benefits of this project include a safe social setting for learning, freeing up time for parents, and reducing emotional trauma. While the science curriculum is currently in development, this can be expanded to math, biology, and more. Using this quest-based gameplay, the student will take tests over what they learn and earn in-game rewards such as customizing their own character.

David Liu
Faculty Mentor(s): Moriah Beck
College of Health Professions
Oral Presentation: Natural Sciences and Engineering

DEFINING THE INTERFACE BETWEEN PALLADIN AND ACTIN USING CROSSLINKING MASS SPECTROMETRY

Palladin was discovered in 2000 and has been shown to play a significant role in actin growth, also known as polymerization, which is a key mechanism in cancer metastasis. A single immunoglobulin domain (Ig3) of palladin has been identified as the portion which binds directly to actin and there are several lysine amino acids which have been shown to be responsible for this interaction with actin. Ig domains have not been previously associated with actin binding and it is not yet known which amino acids on the surface of actin participate in its interactions with palladin. Currently we are conducting chemical crosslinking mass spectrometry (XL-MS) experiments to gain a better understanding of which residues are found at the interface between actin and palladin. For crosslinking experiments, actin is polymerized before addition of crosslinking reagents that will form covalent bonds between specific chemical groups on the surface of palladin and actin. Future experiments to confirm the XL-MS results will entail the expression of beta and gamma actin in Pichia pastoris. We will use site directed mutagenesis of actin residues identified in XL-MS to determine exactly which residue on actin is responsible for its interactions with palladin. This approach, if successful, will be a powerful tool for identifying specific residues that are involved in the palladin interaction with F-actin, which would consequently allow us to examine the biological role of this interaction, both in vitro and in vivo, using actin-binding-deficient or cancer-associated palladin mutants and has application in the development of therapies to drastically slow pancreatic cancer metastasis.

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Kylie Meier
Faculty Mentor(s): Dr. Ehsan Salari
College of Engineering
Oral Presentation: Natural Sciences and Engineering

MODELING CONDUCTOR ELONGATION IN OVERHEAD TRANSMISSION LINES

The U.S. transmission grid is rapidly aging with 70% of transmission lines older than 25 years. Maintenance of transmission lines has traditionally involved visual inspection of line degradation, which is costly and time consuming given the large size of the grid. The objective of this study is to model the sag degradation of transmission lines over time by calculating and predicting the inelastic elongation in conductors. Using inelastic elongation as a health index, we analyze the sag degradation of transmission lines under various environmental and operational scenarios representing the impact of climate change and large-scale electrification. We employ historical atmospheric and operational data to calculate thermal and mechanical stresses acting on transmission lines, and physics-based models to calculate inelastic elongation accumulated in a conductor given the long-term stress profile. Sensitivity analysis is performed on the severity and frequency of extreme weather events as well as the magnitude of power flow on transmission lines. The obtained results show that inelastic elongation can serve as a quantifiable and predictable health index to inform inspection and maintenance decisions. Sensitivity analysis results show that an additional increase in power flow leads to the maximum rate of increase in inelastic elongation, which is further compounded by inelastic elongation due to severe weather events.

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Zarin Mira
Faculty Mentor(s): Maggie Schoonover, Kristyn Smith Kristyn Smith
College of Engineering
Oral Presentation: Natural Sciences and Engineering

COSMOSHOX: A VIRTUAL REALITY GAME BASED ON THE H.A.R.V.I.E AUGMENTED REALITY USER INTERFACE FOR LUNAR EXPLORATION

CosmoShox is an upcoming Virtual Reality game named Cosmos-Game, based on the H.A.R.V.I.E Augmented Reality user interface (UI) program created by participants of the 2022 NASA SUITS program from Wichita State University. This game is designed to focus on the Artemis mission, which aims to establish long-term presence on the Moon. The main goal of the Cosmos-Game is to provide an immersive and engaging experience for players through an innovative spacesuit UI, which includes features from H.A.R.V.I.E, along with additional features such as lunar search and rescue, analyzing exotic particles, handling, and controlling network-connected devices, and navigation to the target destination.

The Cosmos-Game features various categories that have undergone extensive research and ongoing development, aiming to provide users with a realistic and challenging lunar experience. The game will require players to complete various tasks by following instructions given within the game. The UI will allow for easy access to status monitoring, geological scanning, mapping, and navigation, as well as ROVER control on the lunar surface. Additionally, the game includes features such as searching and rescuing stranded team members, analyzing exotic particles of the planet, and controlling network-connected devices, such as cameras, rovers, and robots.
By incorporating Virtual Reality technology, CosmoShox aims to provide a highly immersive and interactive experience for players. The game is designed to be both entertaining and educational, as it offers a realistic simulation of lunar exploration, including the various challenges and risks that come with it. The ultimate goal of CosmoShox is to inspire and educate a new generation of space enthusiasts while advancing the development of human space exploration.

Zarin Mira
Faculty Mentor(s): Monowar Hasan
College of Engineering
Oral Presentation: Natural Sciences and Engineering

SECURE MACHINE LEARNING FOR REAL-TIME EDGE

Machine learning applications are becoming increasingly popular on various computing platforms such as edge computing devices, cloud servers, IoT devices etc. This is because they enable designers to create control systems that are more intelligent, autonomous, and privacy-aware. However, these applications usually come with heavy workloads, which is why edge applications require “real-time” guarantees. This means that application tasks must be completed within a predefined timing bound, often referred to as “deadlines. Unfortunately, current off-the-shelf ML frameworks like Caffe, Darknet, and cONNXr do not consider the strict delay requirements imposed by real-time applications. Moreover, they are often not “security-aware,” which can compromise the confidentiality of information, the processing of data, and the integrity of the application tasks. To address these issues, ML applications may require isolated execution in a trusted environment that is protected from other applications. For instance, when critical applications like biometrics use machine learning, they must execute in a trusted environment to prevent them from being compromised by other applications. One way to provide security for ML tasks is to execute some (or all) of the machine learning layers within a “confined environment” known as trusted execution environments (TEEs). TEEs offer tamper-resistant execution and are available in recent trusted execution technologies such as SGX, Arm TrustZone, and RISC-V. In this research project, we focus on the Arm TrustZone TEE and investigate its integration with existing ML frameworks within real-time schedulers and a confined environment (OP-TEE) with limited resources. Our goal is to explore the feasibility of adopting secure, TEE-enabled ML frameworks for real-time applications and to evaluate the implementation of isolated execution of ML workloads. We will also measure the performance overhead (timing, CPU, memory usage) of such integrations. The outcome of this research will enable us to understand the benefits and limitations of using Arm TrustZone for secure machine learning on real-time edge devices.

Kolade Oke
Faculty Mentor(s): Dr Yildirim Mehmet
College of Engineering
Oral Presentation: Natural Sciences and Engineering

ENERGY EFFICIENCY AND INFRASTRUCTURE OPTIMIZATION (INTEGRATION OF BATTERY STORAGE AND SOLAR)

This research analyses how we can integrate the solar power source backed up by a battery bank with the grid and the demand to make it effective, efficient, and resilient. Renewable energy sources such as solar panels are becoming more affordable, and more and more homes, industrial plants, and office buildings are installing renewable sources. With an increase in demand, i.e., the number of users installing solar panels, the price of this renewable electricity source is decreasing, which essentially should imply more solar adaptation. We can rely on renewables to help save our world from global warming caused by fossil fuels. However, one of its disadvantages is that there is no constant supply of electric power at every point in time using renewables such as solar or wind. For example, we do not get solar radiation at night when it is dark. We have more solar energy production when it is sunny, usually in the afternoon. To minimize the impact of unavailability of renewable energy, one can store the energy in batteries while when the renewable energy is available and discharge the energy from the batteries when there is no renewable power or when there is a disruption in power. In this paper, we will use investigate how size and operation of solar and battery system could be run and optimized under different scenarios and will present the results and lessons learned.

Yi Sheng Tan
Faculty Mentor(s): Dr. Yimesker Yihun
College of Engineering
Oral Presentation: Natural Sciences and Engineering

DESIGN OF AN INTEGRATED UNIVERSAL ROBOTIC 5 (UR-5) GRIPPER

The design of robotic grippers is crucial to developing efficient and effective robotic systems. These grippers are responsible for grasping and manipulating objects, which is critical in many industrial applications. One of the primary challenges of designing a robotic gripper is ensuring that it can handle a wide range of object shapes and sizes while maintaining a firm and stable grasp. To address this challenge, this study presents a novel gripper design that utilizes systematically integrated four bar linkages, 3D printing technology, and honeycomb infills to enhance its durability and cost-effectiveness compared to existing designs. The gripper can lift objects ranging from 0.025g to 4kg, providing a more stable grasp than conventional two-finger grippers, and is powered by a single high-torque stepper motor. The gripper's unique motion mechanism enables simultaneous arm and finger movements, avoiding the use of gear systems, which reduces wear and potential slippage. Additionally, the gripper is highly affordable, costing less than $500, which is significantly cheaper than other available alternatives. Future work will include analyzing the gripper's force and path using multibody dynamic and motion analysis software, followed by experimental validation using force sensors and a Universal Robot 5 (UR-5) settings.
Keywords: Robotics, 3D-printing, Gripper

Kazune Tazawa
Faculty Mentor(s): Suresh Keshavanarayana
College of Engineering
Oral Presentation: Natural Sciences and Engineering

PURE BENDING OF HONEYCOMB CORE

Honeycomb core is a cellular structure consisting of hexagonal cells. Honeycomb cores are widely used because of the ability enable sandwich structures to achieve high strength and stiffness with small density. Honeycomb is originally a natural structure in a beehive. Honeycomb cores are made by joining thin corrugated ribbons, which could be plastic or metal. The key property of honeycomb core is its relatively high-pressure resistance performance compared to the amount of material used, thus making it attractive for aerospace applications. We used two different types of honeycomb specimens conducting pure bending tests in two different force directions. This test applies both compression and tensile stresses on one structure at the same time. Each type of specimen is cut in three different ribbon directions. The aim of this research is to find the difference of strength and stiffness of honeycomb structure depending on the material direction and type of loading applied.

Ramith Umange
Faculty Mentor(s): Jen Chi Cheng
Fairmount College of Liberal Arts & Sciences
Oral Presentation: Social Sciences & Humanities

THE RESILIENCE OF LUXURY GOODS COMPANIES: AN ANALYSIS OF LVMH AND KERING'S SHARE PRICES DURING THE COVID-19 PANDEMIC

This research investigates the impact of the COVID-19 pandemic on the share prices of luxury goods companies LVMH and KERING. The study focuses on the period from January 2020 to December 2021 and employs a quantitative approach, utilizing primary and secondary data from financial databases and news sources. The study finds that despite the significant disruption caused by the pandemic, the share prices of LVMH and KERING have risen considerably during the pandemic period. This is attributed to several factors, including the resilience of the luxury goods market, the shift towards online sales, and the successful adaptation strategies implemented by the two companies. The study also reveals that LVMH and KERING have outperformed other luxury goods companies during the pandemic period. These findings have significant implications for investors, policymakers, and other stakeholders in the luxury goods industry. The study suggests that LVMH and KERING's successful response to the pandemic has helped them maintain their market position and suggests that other companies in the sector could benefit from similar strategies.

Ramith Umange
Faculty Mentor(s): John Dreifort, Alberto Wilson III
Fairmount College of Liberal Arts & Sciences
Oral Presentation: Social Sciences & Humanities

REIMAGINING NAPOLEON'S VICTORIES: ANALYZING THE STRATEGIES THAT COULD HAVE LED TO A FRENCH VICTORY AT WATERLOO

"Reimagining Napoleon's Victories," explores the Battle of Waterloo in 1814 and analyzes Napoleon's battle tactics to locate the key moments in battle that could have led to a French victory. Waterloo marked the final defeat of Napoleon Bonaparte, a major turning point in European history. This research examines the Battle of Waterloo beginning with early nineteenth century European war strategy and, specifically, Napoleonic warfare, and locating where the battle's development challenged Napoleon's decision-making factors that contributed to Napoleon's ultimate defeat, the tactics and strategies employed by the opposing forces, and potential alternatives that could have led to a different outcome. Using a mix of primary and secondary sources, this research delves into the granular experience of the Battle of Waterloo accounting for: troop size, strength and weaknesses of the opposing forces, terrain, weather conditions, and leadership styles. The primary focus of this research lies in identifying the points of inflection in the battle's development that include alternative deployment of troops, increased intelligence-gathering, and revised tactics to break through enemy lines. The paper argues that had Napoleon employed different strategies, such as a more aggressive approach, or better coordination among his commanders, he could have potentially turned the tide of the battle in France's favor. Similarly, alternative scenarios such as delaying the attack, or positioning troops in different locations, could have led to a different outcome.

Lucas Hofer-Holdeman
Faculty Mentor(s): David MacDonald
College of Fine Arts
Exhibition/Performance

NOCTURNE

Lucas Hofer-Holdeman's Nocturne is meant to evoke imagery of a wading pool at night. Ripples catching flecks of moonlight are prevalent in the right hand of the piano, while the flute is reminiscent of the smooth flow of the water. Inspired by a piano sonata by Aram Khachaturian, the piano's left hand marks the gradual ebb of the wading pool as it is slowly drained into a rapid brook. Here, the flute takes on another persona-- the fear of possible swimmers in the fast-paced stream, and the piano becomes jagged rocks in the bed of the rapids. All is well, however, as the brook leads to another tidepool, which again fills with tranquil water, this time with a gentle tide growing to a crescendo of crashing waves at the end.

Emma Lippert
Faculty Mentor(s): Dr. David MacDonald
College of Fine Arts
Exhibition/Performance

FLOWERS

Flowers is a three movement long piece that was inspired by the culture and symbolism surrounding different types of flowers. I worked with a friend of mine who is a talented percussionist from start to finish on this piece. Roses are seen as a symbol of love and passion, so much so that sometimes they feel like a cliche. Love is a complicated thing, yet it is extremely hard to explain in words. It can be painful, but life wouldn't be worth living without it. I used a typical binary form for this movement to signify the popularity and possible overuse of the roses, as most love songs and pop songs are in binary form. The Lotus is one of the most common symbols of spirituality, often being linked with meditation and wellness. These flowers are often found in ponds. They delicately float on top of the water during the day, and at night, they rest underneath the water. In this movement I played with a written down dictation of the harmonic series. The harmonic series, or overtone series. This allowed me to achieve this ethereal feel. Cherry Blossoms often symbolize birth and death, beauty and violence, etc. Their falling leaves are a symbol of the fleeting nature of life and new beginnings. I used a few different versions of a pentatonic scale in this piece, and two different time signatures to play off the birth versus death, beauty versus violence symbolism surrounding cherry blossoms.

Alex Smith
Faculty Mentor(s): Mythili Menon
College of Fine Arts
Exhibition/Performance

GAME-BASED EDUCATION FOR ALL

There are 3.4 million refugee students around the world that are out of schools and not getting the education they deserve. In order to alleviate this, a game-based platform that can be played anywhere is under development. The goal is to bridge the gap for refugees with lesser education and to provide an alternate and fun learning experience. Using Unreal, we have been creating a game that will increase students' concepts in both English and their native language. The concept is to explore the world around them, providing quests where they will take pictures and learn about their surroundings. Topics such as science and social studies are currently in development, but can expand to math, biology, and more. Using this quest-based gameplay, the student will take tests over what they learn and earn in-game rewards such as customizing their own character.

Molly Kay Wenzel
Faculty Mentor(s): Dr. David MacDonald
College of Fine Arts
Exhibition/Performance

SANDMON DOES MOVEDANCE

A "sandmon" is a groovy monster that lives near the oases of the desert. Although they spend most of their days alone, when a weary traveler happens upon their territory, the sandmon will perform its signature Movedance; a groovy dance that entertains all that witness it. Some say that the sandmon has the best dancing abilities in the world.
This piece is a study on meter. The piece moves between grouping notes in groups of fives and groups of threes, which allows for a groove that moves and changes throughout the piece. The short articulations throughout add flair to the piano while the two flutes dance around with more connected notes to portray an upbeat melody.

Shelly Dang, Bryana Loisranoi, Brooke Stover, Haley Ward
Faculty Mentor(s): Dr. Natalie Delacruz
College of Applied Studies
Poster Presentation: Applied Sciences

AN EXTRA MILE FOR A HEALTHY SMILE

Purpose: An Extra Mile for a Healthy Smile brought awareness to elementary-aged students in rural areas lacking water fluoridation and adequate access to dental care. There was emphasis placed on the importance of oral hygiene instructions, oral aides, fluoride, and local resources.
Methods: The target population were third-grade students from Belle Plaine, KS. An online data search in PubMed, Medline (EBSO), Cochrane Library, Centers for Disease Control (CDC) as well as the U.S. Census Bureau was performed to identify oral health awareness between August 2022 and November 2022. The method of delivery included PowerPoint presentation, flyers, educational activity, and a review of knowledge. Students' knowledge was gauged by fielded questions regarding basic oral health knowledge, conducted by the team. At the conclusion of the presentation an increase in knowledge was evident from the response of the participants.
Results: The third-grade students from Belle Plaine, Kansas, gained more knowledge that regarded the importance of their oral hygiene, oral aids available, access to fluoride, and local resources that are available near their area. Results fielded from the third graders after the presentation resulted a significant increase in oral health knowledge. Majority of the students participated answered all questions correctly regarding brushing habits, diet, and fluoride. Which national policy would this project meet?
Implications: An area of future research could be the correlation of decay prevention with alcohol-free mouthwash in children. This would aid the presentation by furthering the education given to underserved communities and another option to help aid oral health in the area.
Additional Materials: Data was collected through the CDC, U.S. Census Bureau, and Kansas Department of Health and Environment, influencing the focus of the presentation. Flyers were distributed allowing for further knowledge to be extended to parents and where to find oral hygiene necessities.