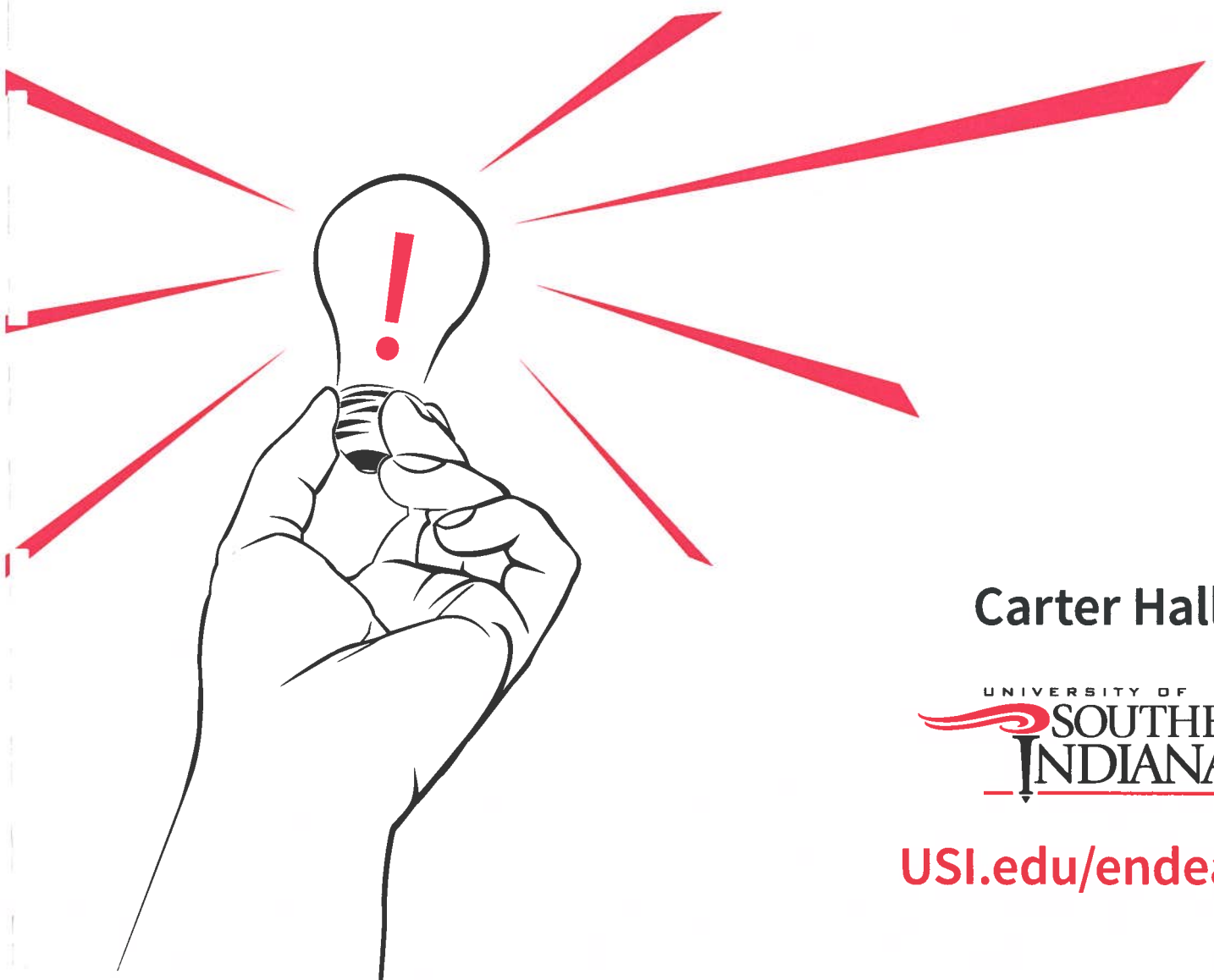


18th Annual Symposium

2019

USI
ENDEAVOR

AWARDS *for*
RESEARCH & CREATIVITY



Carter Hall



USI.edu/endeavor



April 11, 2019

Dear Endeavor Participants:

Welcome to the 18th Annual Endeavor Undergraduate Research and Creative Works Symposium at the University of Southern Indiana. As a participant in the Symposium, you are deepening your undergraduate learning experience and exhibiting initiative that is valued by graduate degree programs and employers.

During the Symposium, take the opportunity to get to know students and faculty from other departments and universities. Building networks outside your discipline is an important part of preparing for the next step after you complete your undergraduate education.

Congratulations on being a participant in the University of Southern Indiana's Endeavor Symposium and best wishes to you.

Sincerely,

A handwritten signature in black ink that reads "Ronald S. Rochon".

Ronald S. Rochon, Ph.D.
President

President's Office



April 11, 2019

Dear Endeavor Symposium Presenters and Sponsors:

Welcome to the 2019 Endeavor Symposium. As I'm sure you've come to appreciate, combining research and learning is one of the best ways to get the most out of your time here at USI, and I hope that the experience has helped to develop strong ties to your education – ties that you will take with you after you leave the university.

You have worked hard on your projects and we are proud to give you the chance to present the results of your work to the USI community.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Strezewski". The signature is fluid and cursive, with a large loop at the end.

Michael Strezewski, Ph.D.
Associate Professor of Anthropology
Director, Endeavor Research and Creativity Awards

Endeavor Symposium Program

Thursday, April 11, 2019

- Beginning at 7:45 **Check-in** for all presenters and sponsors: Pick up your programs and ID badges at registration table (located in the hallway outside Carter Hall).
- 8 a.m. – Noon **Poster Sessions**, *University Center, Carter Hall D* (note: all posters must be removed from Carter Hall D by noon).
- 9 a.m. – Noon **Oral Presentations**, Room UC East 2205 and 2206.
- Noon – 1 p.m. **Endeavor Luncheon** for student participants and mentors, *Carter Hall A-C*. Your badge will serve as your lunch ticket.

Endeavor Research and Creativity Awards Committee

- Dr. Michael Strezewski Director of Endeavor Awards for Research and Creativity,
Associate Professor of Anthropology, College of Liberal Arts
- Dr. Jeannie Collins Associate Professor of Chemistry, Pott College of Science,
Engineering, and Education
- Ms. Rebecca Deeg Grant Administrator, Office of Planning, Research, and
Assessment
- Dr. Ronald Diersing Associate Professor of Engineering, Pott College of Science,
Engineering, and Education
- Mr. Rob Millard-Mendez Professor of Art, College of Liberal Arts
- Dr. Erin Reynolds Assistant Professor of Health Services/Administration, College of
Nursing and Health Professions
- Dr. Mary Ann Shifflet Contract Assistant Professor of Economics, Romain College of
Business
- Dr. Edmir Wade Associate Professor of Chemistry, Pott College of Science,
Engineering, and Education

Acknowledgements

The Endeavor Committee thanks the following for their support of the Endeavor Research and Creativity Award Program and Endeavor Symposium:

- Dr. Ronald S. Rochon, President, University of Southern Indiana
- Dr. Mohammed Khayum, Provost
- Dr. Shelly Blunt, Associate Provost for Academic Affairs
- Michele Duran, Senior Administrative Associate, Office of the Provost
- Megan Doyle, Assistant Director of Special Events
- Romain College of Business
- College of Liberal Arts
- College of Nursing and Health Professions
- Pott College of Science, Engineering, and Education
- USI Honors Program

Endeavor Faculty Mentors

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- Dr. Brian Bohrer
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- Mr. Rob Millard-Mendez
- Mr. John Morris
- Dr. Jessica Rick
- Ms. Heather Schmuck
- Dr. Michael Strezewski
- Dr. Edmir Wade
- Ms. Beth Young

8-9 a.m. POSTER SESSION

Carter Hall D

Gabriela Aguilar	Extraction of Curcuminoids from the Rhizomes of <i>Curcuma longa</i> via Low Temperature Soxhlet Extraction using Polar Protic and Polar Aprotic Solvents
Renee Burch, Sophia Bolte, and Emily Bucher	Is Xerostomia Making You MAD?
Mitchell Collins	Characterization of Smoke Dye Emissions
Ethan Duncheon and Meghan McCrary	Lipid Composition in Bat Skin Reflects the Demands of Flight
Michael Elpers and Brian Jessen	Circumnavigating the Earth with an Ultra-Long Distance Balloon
Cheyenne Ellis, Jacklyn Batayneh, and Shelby DeMoss	Jaw-Dropping Treatments for Temporomandibular Joint Disorder
Seth Gorman, Brodey Murbarger, and Adam Weinzapfel	Quantifying Variable Evapotranspiration Using the Method of White, Manistee National Forest, Michigan
Joshua Graber and Wyatt Helms	Remotely-Operated Hydraulic Transmission Vehicle
Wyatt Helms, Ryan Loehrlein, Zack Snyder, and Sujan Kaphle	The Undergraduate Nano Ionospheric Temperature Explorer (UNITE) CubeSat: Design through Flight Hardware Delivery
Scott Klem	Extraction of Gingerols and Shogaols from Ginger
Bryan Newman	Nitrate Analysis of Groundwater in the Southern Indiana Area
Jamie Schuetter	The Effect of Aromatherapy on Focused Attention
Kennedy Stoll	Characterization of a Putative R2 Retrotransposon and its HGV-like Ribozyme in Vertebrates
Maranda Stull, Katelyn	Student Quiz Bowl at the Indiana Society of Radiologic

Earl, and Kimberly Gisler	Technologists Annual Convention
Maranda Stull, Katelyn Earl, and Jasmine Martin	Scientific Exhibit - Indiana Society of Radiologic Technologists Annual Convention
Mallory Thompson, Taylor Urban, and Kassandra Lawlyes	Charcoal on the "Grill"

9-10 a.m. POSTER SESSION

Carter Hall D

Gabriela Aguilar	Extraction of Curcuminoids from the Rhizomes of <i>Curcuma longa</i> via Low Temperature Soxhlet Extraction using Polar Protic and Polar Aprotic Solvents
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Bryan Newman	Nitrate Analysis of Groundwater in the Southern Indiana Area

Jamie Schuetter	The Effect of Aromatherapy on Focused Attention
Brittni Stratman and Sarah Miller	Does Nitric Oxide Supplementation Improve Athletic Performance in Collegiate Female Volleyball Players?
Kennedy Stoll	Characterization of a Putative R2 Retrotransposon and its HGV-like Ribozyme in Vertebrates
Maranda Stull, Katelyn Earl, and Kimberly Gisler	Student Quiz Bowl at the Indiana Society of Radiologic Technologists Annual Convention
Maranda Stull, Katelyn Earl, and Jasmine Martin	Scientific Exhibit - Indiana Society of Radiologic Technologists Annual Convention
Kaitlyn Sturgell, Caroline Cowgill, and Racheal Herrmann	Putting Breast to the Test: An Observation of Caries Risk and Enamel Defects in Infants
Mallory Thompson, Taylor Urban, and Kassandra Lawlyes	Charcoal on the "Grill"

10-11 a.m. POSTER SESSION
Carter Hall D

Ben Anderson and Kat McIntire	Radio Dramas - Communication In Play
Elizabeth Boik, Abbey Huffine, Gabrielle Wy, Samantha Schnarr, McKenna Deem Blaylock, and Mackenzie Henrichs	Is Seeing Myself as an Object Stressful?
Riley Cornett	The Impact of Family Communication Patterns on Student Academic Motivations

Kourtney Klaus,
Amber Rogers,
and Korissa Jobe

Coconuts About Biofilm Reduction

Meghan McCrary

Molecular Interactions in Bat Skin Suggest Convergent Evolution with Birds

Sarah Parker and
Sam Mosen

Analysis of Middle Woodland Projectile Points from the Mann Site, Posey County, Indiana

Brian Simpson
and Patrick Bennett

3D Modeling Using a CNC Router Indexer

Brittini Stratman
and Sarah Miller

Does Nitric Oxide Supplementation Improve Athletic Performance in Collegiate Female Volleyball Players?

Kaitlyn Sturgell,
Caroline Cowgill,
and Racheal Herrmann

Putting Breast to the Test: An Observation of Caries Risk and Enamel Defects in Infants

11 a.m. - noon POSTER SESSION

Carter Hall D

Ben Anderson
and Kat McIntire

Radio Dramas - Communication In Play

Elizabeth Boik,
Abbey Huffine,
Gabrielle Wy,
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and Patrick Bennett

3D Modeling Using a CNC Router Indexer

Oral Presentations Session 1, UC East 2205

- 9:00 – 9:15 **Samantha Haas** - Art's Influence on Anxiety for Male and Female Undergraduate Students
- 9:20 – 9:35 **Taylor Quackenbush** - Social Media Usage and Its Relationship to Depressive Symptoms
- 9:40 – 9:55 **Zachary Pirnat** - Understanding the Impact of Business Information Visualization on User Responses: Biometric Approach
- 10:00 – 10:15 **Gabrielle Wy** - Making Sense of Body-Worn Cameras: An In-Depth Examination of Special Units across Two Agencies
- 10:20 – 10:35 **Zoe Meuth** - The Effect of Facebook and Instagram on Depression
- 10:40 – 10:55 **Tonderai Sibanda** - CodeAfrica
- 11:00 – 11:15 **Mackenzie Cross** - The Effects of Background Music on Memory and its Influences on Gender
- 11:20 – 11:35 **Crystal Phillips, Kalekidan Yeshiwas, and Charles Messina** - Radio Websites: More than Just a Blog
- 11:40 – 12:00 **Isaac Dickenson** - Synthesis of Near-IR (NIR) Emitting BODIPY Dyes

Session 2, UC East 2206

- 9:00 – 9:15 **Ryan Loehrlein** - Students Experience at the International Case Competition at Maastricht (ICC@M)
- 9:20 – 9:35 **Colin McDuffee** - Music Rotation at a Formatted Radio Station
- 9:40 – 10:00 **Dacie Lindner** - Interactions Affected by Space at a College Campus’s Third Place Lounge
- 10:00 – 10:20 **Teresa Rynkiewich** - UNFair Trade: The History and Meaning of the Fair Trade Movement
- 10:25 – 10:45 **Ryan Loehrlein, Zack Snyder, and Kendall Spiller** - Meshed Networked Unmanned Aerial System Swarming Demonstration
- 10:50 – 11:10 **Allison Hermes and Anne Donaldson** - USI OT/OTA Toy Accessibility Project
- 11:15 – 11:35 **Alexander Dandy** The “MAGIC” of Senior Cohousing in the United States

Oral and Poster Presentation Abstracts

Extraction of Curcuminoids from the Rhizomes of *Curcuma longa* via Low Temperature Soxhlet Extraction using Polar Protic and Polar Aprotic Solvents

Gabriela Aguilar

Faculty Mentor: **Dr. Edmir Wade**

Given recent interest in alternative forms of medicine, nutrition and health-oriented companies have developed products to meet recent demand. As a result, a plethora of different dietary supplements are now available to the average consumer. A majority of these supplements are taken in order to alleviate common ailments associated with aging in order to prolong/improve one's health-span. One such supplement are curcuminoids derived from the rhizomes of the herbaceous perennial plant *Curcuma longa*, commonly known as turmeric. Curcuminoids – curcumin, demethoxycurcumin, and bisdemethoxycurcumin – are a class of secondary metabolites that are popular for their anti-inflammatory and antioxidant activity. Unfortunately, curcuminoids are difficult to extract due to their sensitivity to heat, light, and pH.

The focus of this study is to determine whether or not curcuminoids could be extracted using a Soxhlet apparatus and if so whether or not the type of solvent used has any dictation on type of curcuminoid extracted. Thin Layer Chromatography (TLC) and Column Chromatography (CC) were used to isolate unknown compounds in each extraction and NMR and IR were used to determine the identity of each isolated sample. Note, factors such as temperature and light exposure were taken into account when conducting all extractions.

Radio Dramas - Communication in Play

Ben Anderson and Kat McIntire

Faculty Mentor: **Dr. Leigh Anne Howard**

This research project consisted of writing, producing, and recording radio dramas. The participants were tasked with finding a local (Evansville, IN) historical figure and writing a radio drama around their life, gaining information about them through the University of Southern Indiana archives using old letters, pictures, books, and any other available avenues. After selecting a historical figure, students started scripting the radio drama around the character's life, and began casting roles, as well as selecting a producer for the radio drama. The producer then arranged for the radio drama to be performed and recorded. Recording was done via Zoom digital recorders, and to maintain true historical form, minimal post production was used. The hardest part of this project was aiding the audience in "seeing" what was going on, rather than just hearing through speakers. This project was selected to be presented at the National Communication Association annual conference in Salt Lake City, Utah, in the fall of 2018.

Is Seeing Myself as an Object Stressful?

Elizabeth Boik, Abbey Huffine, Gabrielle Wy, Samantha Schnarr, McKenna Deem Blaylock, and Mackenzie Henrichs

Faculty Mentor: **Dr. Urska Dobersek and Dr. Richard Bennett**

The purpose of this study was to examine the relationship between self-objectification and stress. Thirty-two female students ($M_{age} = 18.53$, $SD = 0.57$) participated in the study ($n_{control\ group} = 17$, $n_{experimental\ group} = 15$). They were considered healthy according to the American Heart Association (2018) with a Body Mass Index of 24.17 ($SD = 3.38$). First, participants completed a demographic questionnaire, a Visual Analog Scale (VAS) of the trait Self-Objectification Questionnaire (SOQ; Noll & Fredrickson, 1998) to measure their state SO levels, and provided saliva to assess their baseline cortisol levels. Then, they changed into baggy (low SO)/revealing (high SO) clothing, and their post-manipulation SO levels were assessed via VAS SOQ. After 30 minutes, each participant provided another sample of saliva to test their post-manipulation cortisol levels. Participants in the experimental group scored statistically higher on state SO ($M = 2.6$, $SD = 20.56$) compared to the control group ($M = -18.37$, $SD = 23.24$), $t(30) = -2.69$, $p = .021$, $d = .96$, suggesting that the SO manipulation was successful. A 2(group: high, low SO) x 2(pre-manipulation cortisol, post-manipulation cortisol) mixed-subject Analysis of Variance suggested a main effect for cortisol where pre-manipulation cortisol was higher ($M = 0.34$, $SD = 0.05$) than post-manipulation cortisol ($M = 0.32$, $SD = 0.04$), $F(1, 30) = 14.77$, $p = .001$, $partial\ eta\ squared = .33$. These results are consistent with the previous literature suggesting that the orienting response (OR), an information processing method that requires cognitive attention, can result in immediate physiological changes such as heart rate deceleration (Cook & Turpin, 1997; Green et al., 2012). At the practical level, wearing more revealing clothing can potentially impact one's performance because of the required cognitive attention of the OR.

Is Xerostomia Making You MAD?

Renee Burch, Sophia Bolte, and Emily Bucher

Faculty Mentor: **Ms. Emily Holt**

Sleep apnea disrupts normal breathing patterns while a patient is sleeping and is closely associated with different risks. Common treatments for sleep apnea include a full-face continuous positive airway pressure (CPAP) machine and a mandibular advancement device (MAD), which have both been proven to cause xerostomia. The purpose of this research is to determine if the use of a full-face CPAP machine causes more xerostomia than the use of a MAD.

The full-face CPAP machine works by allowing a mask that provides a tight seal over the nose and the mouth to send positive airflow through the airways to prevent collapsing. The MAD is a dual arch mouthguard that forces the mandible to protrude, elevating and advancing oral structures. Doing so increases the volume of the upper airway and makes the event of the airway passages narrowing less likely. When it comes to the complications that come with a CPAP machine, xerostomia, mask leakage, and closed nasal passages emerged within 2 weeks to 1 year in approximately 30% of patients. The

severity of xerostomia seen in this study was closely associated with the number of participants that dropped out and the amount of patient compliance. After wearing a MAD all night for 1 week, only 10.5% of participants reported xerostomia, much less than seen with the CPAP.

In conclusion, full-face CPAP and MAD devices can both cause xerostomia. However, in a patient with sleep apnea, the use of a full-face CPAP machine will cause more xerostomia than the use a MAD. This occurs because of the pressure causing a reduction in salivary flow as well as continuous air flow into the oral cavity while this device is being used. Dental professionals should look for signs of sleep apnea in the oral cavity and know who to refer a patient to when it is suspected. Once patients decide their route of treatment, dental professionals need to educate them on the oral effects of different treatment.

Characterization of Smoke Dye Emissions

Mitchell Collins

Faculty Mentor: **Dr. Brian Bohrer**

This study is designed to examine the products formed during the reaction of a smoke dye mixture. For this experiment the mixture was simplified to its three main ingredients, sugar, dye (1-(methylamino)-9,10-anthracenedione), and potassium chlorate. The mixture was formed by weight percentage of the ingredients. The original mixture contained 14.1% dye, 17.2% sugar, 20.6% potassium chlorate with 48.1% other non-active ingredients. For this experiment the three main active components were scaled to 100% and run as a 3-component mixture. To begin testing, solubility tests were performed and a 1:1 ratio of acetone and ethanol was deemed the most effective at dissolving all three components of the mixture. The 3 individual ingredients as well as the mixture were then made into a 50µg/L solution and then examined by GCMS. The first experimental conditions had an inlet temp of 250°C where the second had an inlet temperature of 450°C. The data obtained from the experiment at 250°C showed no apparent reactivity. The data obtained when the mixture was run at 450°C showed a possible degradation in the mixture. The pure sugar sample had more profound peaks at in the 450°C which could lead to the possible degradation found in the mixture. This could be due to the melting point of sucrose which is 186°C. Another possible cause of these more profound peaks is cross reactivity of the solute solvent system. To test this more data needs to be obtained using a temperature probe coupled with the GCMS. Further analysis of that data will help to determine the final products of the smoke dye degradation.

The Impact of Family Communication Patterns on Student Academic Motivations

Riley Cornett

Faculty Mentor: **Dr. Jessica Rick**

Family Communication Patterns theory is heavily debated in the communication studies community as it focuses on how families communicate within establish patterns and rules. A major tenet of this theory is to identify the levels of conformity and conversation in family communication patterns. Previous research has connected family communication patterns to students' actions in higher education, such as attitudes toward assimilating into the community and attitudes about "college culture." Despite the vast amount

of studies focused on family communication patterns theory, little research has been done concerning family communication patterns and the impact patterns have on students' motivations to pursue higher education. The purpose of this research is to identify the ways family communication patterns impact students' motivations to attend secondary education and how these patterns can determine what field the students may pursue. I am currently collecting data using a Qualtrics survey and will be analyzing the results within the next two weeks. I anticipate that this research will find connections between family communication traits and academic motivations, proving the impact that communication patterns can have on the academic careers of students. The knowledge uncovered through the study will be valuable to the academic community, as it could be utilized in higher education to strategize increased student retention.

The Effects of Background Music on Memory and its Influences on Gender

Mackenzie Cross

Faculty Mentor: **Dr. Srikanth Dandotkar**

The effects of listening to background music while simultaneously working on mental processing are controversial. Students often study and do homework while listening to music, or they potentially attempt to do such tasks while sitting in a noisy coffee shop. Over the years, researchers have been searching for an answer as to whether these types of media influence a student's learning. While it still may be up for debate whether background stimulation positively or negatively influences one's memory, it may be helpful to find out whether background music influences males and females differently when trying to memorize words, pictures, or working on their academic work. It is important to address this issue because this could lead to new specific learning ways and techniques that could help students excel even more in their academic endeavors.

The "MAGIC" of Senior Cohousing in the United States

Alexander Dandy

Faculty Mentor: **Dr. Casey Harison**

The question: "What do we do with our elders?" has likely been on the mind of many adults with aging parents. For many, assisted-living and nursing homes were the obvious solutions. However, these solutions receive criticism from many seniors and their children; most seniors today seek to remain semi- or fully independent even after reaching their elder years. While communal living has existed in the United States since the early-to-mid nineteenth century, senior cohousing is a relatively new concept. This movement has its origins in 1960s-Denmark and was brought to the United States by Charles Durrett and his wife Kathryn McCamant in the late-1980s. Since then, but particularly over the last twenty years, the movement has grown, and these senior cohousing communities have exploded in numbers. Additionally, alternative models of senior cohousing have developed: seniors-only communities, multi-generational communities, and "Green Houses"—senior communities with adjacent or on-site healthcare staff.

Additionally, the research will address other diversity-related issues within communities, giving special attention to ability, but addressing also race and gender.

This research seeks to explain the growth of cohousing (senior and intergenerational) in the United States over the past twenty years and the challenges it presents to its community members. The purpose of this research was to provide a historical context for the MAGIC Project (Multi-Ability, Multi-Generational, Inclusive Community) on the University of Southern Indiana's campus in coordination with the university's Center for Healthy Aging and Wellness and Center for Communal Studies.

Synthesis of Near-IR (NIR) Emitting BODIPY Dyes

Isaac Dickenson

Faculty Mentor: **Dr. Priyadarshine Hewavitharanage**

Molecules that undergo chemical changes upon exposure to light are extensively used in biomedical applications. One such application is photodynamic therapy (PDT) which is an alternative cancer treatment that uses a light sensitive drug molecule (photosensitizer), along with light to kill cancer cells. The drug is inactive in the dark and gets activated in the presence of light to produce a toxic substance that kills cancer cells. PDT has many advantages over surgery and radiation therapy. PDT requires photosensitizers that emit light in the near-infrared (NIR) region ranging from 650 nm to 900 nm in the electromagnetic spectrum. The derivatives of 4,4-difluoro-4-bora-3a,4a-diaza-s-indacene (BODIPY) are promising candidates for PDT. However, BODIPY emits light in the visible region. Introduction of various groups through Knoevenagel condensation is a useful method to extend the emission wavelength to the NIR region. However, these reactions are tedious and provide very low yields. We explored different synthetic methods under different experimental conditions to produce NIR emitting BODIPY dyes. Several NIR emitting BODIPY molecules were successfully synthesized.

Lipid Composition in Bat Skin Reflects the Demands of Flight

Ethan Duncheon and Meghan McCrary

Faculty Mentor: **Dr. Alex Champagne**

Flight in vertebrates places physical stress on many areas of the body, including the skin. The stratum corneum (SC) comprises the outermost 10-20 μm of the skin, and is composed of corneocytes embedded in a matrix of lipids, which contribute to the hydration and strength of the SC. Among mammals, bats have a unique SC lipid composition that includes cerebrosides, ceramides with a sugar moiety attached to the headgroup. Cerebrosides interact with water more strongly than other lipid molecules in the SC, and thus may play a large role in hydrating the SC. Furthermore, cerebrosides are prominent in avian SC, suggesting convergent evolution in SC lipid composition between birds and bats to provide the skin with the necessary moisture and strength for flight. We use thin layer chromatography to quantify lipid composition in four regions of the SC in the big brown bat (*Eptesicus fuscus*). In each region, we identified cholesterol esters, free fatty acids, cholesterol, ceramides, and cerebrosides, representing a more complex lipid composition than other mammals. Additionally, we correlate lipid composition with the

stress each skin region experiences during flight. Our results indicate that the lipid composition of bat SC reflects their unique lifestyle.

Jaw-Dropping Treatments for Temporomandibular Joint Disorder

Cheyenne Ellis, Jacklyn Batayneh, and Shelby DeMoss

Faculty Mentor: **Ms. Emily Holt**

Many people suffer from the complications and pain caused by temporomandibular joint disorders (TMJD). The purpose of this research is to inform dental and other health care professionals of the most effective treatment options. Without treatment, TMJD can cause long-term consequences, including frequent headaches, limited movement or locking of the jaw, ear pain, tinnitus, painful clicking, popping or grating in the jaw joint when opening or closing the mouth, and others. For patients with TMJD, will the use of an occlusal splint provide better pain management than physical therapy? Most research concluded that occlusal splint therapy is effective in treating TMJD and the symptoms associated with it. With that in mind, research also claimed that other therapies could be just as effective. One publication notes that physical therapy is found to be effective, but only just as effective as other therapies. It is even noted that a combination of therapies may provide the best treatment results. The research concluded the use of occlusal splints does not provide better long-term pain management than performing physical therapy. An occlusal splint may prove beneficial to treat TMJD short-term, but for long-term treatment, different therapeutic interventions may have better outcomes. Ultimately, it is up to the discretion of the caregiver and the patient as to which type of intervention to implement.

Circumnavigating the Earth with an Ultra-Long Distance Balloon

Michael Elpers and Brian Jessen

Faculty Mentor: **Dr. Glen Kissel**

Our project was to complete a full circumnavigation of the earth using an ultra-long distance balloon. Circumnavigation of the Earth represented the unique challenge of getting a balloon to return to the longitude from which it was launched, after traveling around the globe. Due to the unpredictability of long-distance balloon flights, three separate launches were planned. The balloon was designed to achieve and maintain a constant altitude, called a float altitude. The primary components included in the balloon design were the tracking payload and the balloon. The tracking system used was an Automatic Packet Reporting System (APRS), which sent global positioning packets to amateur radio stations allowed the team to verify the success or failure of the balloon circumnavigation. The balloon designs were made of a thin film of either mylar or polyethylene. The first of the three launches failed to circumnavigate the Earth, its last known location was off the Atlantic coast, east of North Carolina. Despite this flight's failure to circumnavigate, the balloon proved that a predictable float altitude could be achieved.

Remotely-Operated Hydraulic Transmission Vehicle

Joshua Graber and Wyatt Helms

Faculty Mentor: **Dr. Farid El Breidi**

Educational demonstrators are a fun and interactive way for students to learn concepts and become involved in the Science, Technology, Engineering, and Mathematics fields. The goal of this project is to design, build, and test a remotely-operated hydraulic transmission vehicle. The vehicle, along with its controller, is intended for use as an educational demonstration device to illustrate hydraulic system concepts for students at all levels of education. The system uses a remote-control car transmitter and receiver to control a proportional directional control valve changing the direction and amount of flow between a hydraulic pump and motor. An electric motor, set to operate at a constant no-load speed, serves as the prime mover for the hydraulic system. The structure of the system is open such that the operation of components is visible to an observer. In addition to this, the system contains translucent components where possible to allow observation of fluid flow through the system. The vehicle could be used in anything from an outreach event to a senior-level fluid power course. Future work could expand the use of this system to include data acquisition devices for analysis of the system.

Quantifying Variable Evapotranspiration Using the Method of White, Manistee National Forest, Michigan

Seth Gorman, Brodey Murbarger, and Adam Weinzapfel

Faculty Mentor: **Dr. Paul Doss**

A hydrogeological monitoring network along the forested headwaters of the White River in Manistee National Forest, Michigan, collects long-term, high-resolution data to characterize groundwater-surface water interactions. As part of that investigation, quantification of temporally and spatially variable evapotranspiration may provide information on shifts in seasonality over time as a result of climate change. The ability to accurately quantify evapotranspiration is an effective and necessary tool for the creation and improvement of water management strategies. White (1932) developed a method of estimating evapotranspiration from daily water-table fluctuations that occur as a result of vegetative consumption. The study site is underlain by a thick sequence of well-sorted, fine to medium-grained glacial outwash sand. Three piezometers form an east-west transect from the upland to riparian zone adjacent to the White River, and all wells are equipped with instrumentation to record hourly groundwater levels. The unsaturated zone thickness varies from approximately 2.3 to 1.6 m in “excessively drained” sandy soils at water-table well sites, and one piezometer penetrates through approximately 2.4 m of saturated peat to the underlying artesian confined outwash sand. Water-table wells display responses to precipitation and evapotranspiration rates that are, in part, a function of unsaturated zone thickness. An 8.8 cm rainfall event generated a groundwater level increase of 23.7 cm in the “deep” water table well, and a 36.8 cm increase in the shallow well. Specific yield values for the unconfined sand, derived from water-table fluctuations, ranged from 0.12 to 0.17. Calculated evapotranspiration rates are as much as an order of magnitude greater at the shallow well site (0.29 - 0.88cm/day) than at the deeper well site (0.03

- 0.27cm/day). Spatially variable evapotranspiration rates may also be a function of vegetation zonation in this transitional ecosystem.

Art's Influence on Anxiety for Male and Female Undergraduate Students

Samantha Haas

Faculty Mentor: **Dr. Srikanth Dandotkar**

The goal of the proposed study was to examine the utility of art-activity as a healthy way for college students to cope with anxiety. Furthermore, it investigated whether there was a gender difference in how art influences students' anxiety. Participants took an anxiety questionnaire before and after an activity. The experimental group was assigned to an art activity while the control group was assigned to a reading activity. Participants' anxiety score served as the dependent measure. In efforts to avoid subject-bias, the study used a mild form of deception. Participants were told that they were participating in a study about professors, and questions about professors were mixed into the original survey. An analysis of the data collected did not show a significant difference between the art and non-art groups; however, the results did reflect that anxiety for both activities had significantly reduced, especially for female participants.

The Undergraduate Nano Ionospheric Temperature Explorer (UNITE) CubeSat: Design through Flight Hardware Delivery

Wyatt Helms, Ryan Loehrlein, Zack Snyder, and Sujan Kaphe

Faculty Mentor: **Dr. Glen Kissel**

The Undergraduate Nano Ionospheric Temperature Explorer (UNITE) 3U CubeSat has been designed and built by an all undergraduate team at the University of Southern Indiana as part of NASA's Undergraduate Student Instrument Program – 2 (USIP-2). The mission of UNITE is to calculate plasma properties in the lower ionosphere using data from a Langmuir Plasma Probe, to measure temperatures in the interior and on the skin of the CubeSat to compare with a student-developed thermal model, and to carefully track the orbital decay, especially near re-entry, using an onboard GPS unit. Following deployment from the International Space Station in early 2019, UNITE will orbit the Earth for about 450 days. Its Globalstar-based communication system allows nearly 24-hour coverage of the mission, which is complemented by a student-designed mobile app, allowing mission monitoring from one's smartphone. Transmissions have been structured to provide intense data collection the first week of the mission, followed by more modest collection until the CubeSat reaches altitudes below 300 km, where the magnetometer will be sampled to confirm stabilization in the ram direction of the passively stabilized vehicle. Frequent Langmuir Probe and GPS sampling and transmissions will occur below 225 km, even up to re-entry, allowing valuable data collection in the Extremely Low Earth Orbit region.

USI OT/OTA Toy Accessibility Project

Allison Hermes and Anne Donaldson

Faculty Mentor: **Ms. Jessica Mason and Ms. Karen Dishman**

The role of an occupational therapy professional is to ensure that individuals can participate in daily life activities. Hamm (2005) stated that experiences from play provide children with skills that they require later in their childhood and adult lives. Schaefer and Andzik (2016) explained how children are able to learn from their interactions with peers, as well as, through independent play. Children with significant disabilities, including those that hinder their ability to communicate, often struggle to express their needs. Adaptive technology provides children with more opportunities to independently learn through their experiences in the environment (Schaefer and Andzik, 2016). Play has been found to be an important occupation in the lives of children. For some children with disabilities, participation in play is limited due to physical and/or cognitive deficits. Research has shown that children with disabilities are better able to play through the use of switch operated toys. The occupational therapy (OT) and occupational therapy assistant (OTA) students decided to work together to address this community issue. The OT and OTA students make up the University of Southern Indiana's (USI) Student of Occupational Therapy Association (SOTA). The Endeavor Grant gave students the opportunity to learn how to adapt battery operated items through the use of a switch. The funding for the project provided the students with materials such as plush battery-operated toys, jumbo switches, batteries, electric soldering iron kits, and other needed items. The SOTA members together adapted 50 toys which were then gifted to the Evansville Vanderburgh School Corporation and Easter Seals Rehabilitation Center in December and January of 2018/2019. OT and OTA students met their goals of becoming educated on the purpose and process of adapting battery-operated items and developing community outreach skills through collaboration. In the future, students will be able to take these skills into their practice to benefit children and adults within their own communities.

Coconuts About Biofilm Reduction

Kourtney Klaus, Amber Rogers, and Korissa Jobe

Faculty Mentor: **Ms. Emily Holt**

Chlorhexidine gluconate is a mouth rinse recommended to patients who have increased biofilm formation and high caries risk. The purpose of this research is to find a more natural alternative to chlorhexidine gluconate mouth rinse that will deliver comparable results with less side effects. Oil pulling is the oral swishing with natural oil to clean and detoxify the oral cavity. Although this is not a new practice, it is being rediscovered, as the demand for a more natural approach to healthcare is increasing. Clinicians need to be aware of what oil pulling is and the benefits it can have on oral health and overall health.

Will once daily oil pulling with coconut oil result in less oral biofilm formation than twice daily use of chlorhexidine gluconate mouth rinse? Chlorhexidine Gluconate Mouth Rinse versus Oil Pulling- Research shows that in patients with gingivitis, chlorhexidine gluconate mouth rinse, together with proper oral hygiene, significantly reduced biofilm and gingivitis. However, it is not recommended for long term use due to its adverse effects. Research shows that oil pulling has significant benefits for the oral cavity that

include drawing toxins and bacteria out of the gingiva and mucosa. It also shows that these improvements can take up to 30 days to show a significant difference. Conclusion- Once daily oil pulling with coconut oil produces similar effects on biofilm formation compared to twice daily use of a mouth rinse containing chlorhexidine gluconate. Oil pulling is a great addition to any oral hygiene routine and can have a positive impact on oral health and overall health but is not recognized by the ADA. It is not a replacement to biofilm removal techniques such as brushing and flossing. There are no health risks associated with it, but it does take time and dedication.

Extraction of Gingerols and Shogaols from Ginger

Scott Klem

Faculty Mentor: **Dr. Edmir Wade**

Ginger has been used for medicinal purposes for thousands of years. Some common ailments that ginger has been used to treat include nausea, motion sickness, and inflammation. Scientific analysis shows that ginger contains hundreds of compounds and metabolites, some of which may contribute to its healing abilities. Of these, the gingerols and shogaols have been the most extensively researched. These compounds appear to be the major bioactive substances in ginger and are largely responsible for much of its medicinal properties due to their powerful anti-inflammatory and antioxidant effects. Research was conducted to determine the presence of gingerols and shogaols in ginger rhizomes (roots). Extraction of these compounds was completed by distillation and reflux with ethanol. The products were then filtered and analyzed via thin layer chromatography (TLC) and gas chromatography-mass spectrometry (GC-MS). The samples were also subjected to further analysis via nuclear magnetic resonance (NMR) and infrared spectroscopy (IR) in order to identify structural components to help confirm the compounds that were extracted. Further research on this topic would be to replicate the data from this extraction and subject it to further analysis techniques such as high-performance liquid chromatography (HPLC). By determining the quantity of gingerols and shogaols in ginger, a strong reference guide could be made to compare to other plant species that also contain these compounds, especially ones in the same family as ginger (*Zingiberaceae*).

Interactions Affected by Space at a College Campus's Third Place Lounge

Dacie Lindner

Faculty Mentor: **Dr. Leigh Anne Howard**

Building upon Oldenburg's (1999) work in third place, this study seeks answers to how space, specially third place, affects the interactions occurring at a 4-year university in the Midwest. By ethnographically observing a college lounge for several weeks, this study considers the use of space and its attributes in the communicative patterns of professional, social, and independent interactions. By understanding spaces within a college campus, one will gain a better understanding of the college and of culture at broad. Additionally, improved understanding of these interactions provides greater comprehension of how spatial attributes such as furniture, windows, music, and technology contribute to the use of and

communication within the space. Students and others seek areas of third place for various reasons, and college campuses may do well to incorporate more of these areas for the use of their students and staff.

Students Experience at the International Case Competition at Maastricht (ICC@M)

Ryan Loehrlein

Faculty Mentor: **Ms. Jeanette Maier-Lytle**

The Romain College of Business (COB) was invited to participate in an international business case competition at the University of Maastricht in the Netherlands. The team that represented USI's RCOB is Ryan Loehrlein, Victoria Krug, Kevin Schuh, and Te'Ayla Whitfield. The International Case Competition@Maastricht (ICC@M) is a challenge in which 16 competing undergraduate business student teams are tasked to solve businesses cases. The solution is then presented in front of a panel of judges. During the entire competition, the teams addressed challenging international business cases. ICC@M allowed students to engage in corporate and social events organized by strategic business partners. Overall the team prepared for the ICC@M competition over the course of a semester. This was the first International Case Competition in Europe that the University of Southern Indiana was invited to, which makes it one of the most prominent cases the University has competed in. During the presentation the student team will share their experiences competing at an international level.

Meshed Networked Unmanned Aerial System Swarming Demonstration

Ryan Loehrlein, Zack Snyder, and Kendall Spiller

Faculty Mentor: **Dr. Glen Kissel**

This presentation is in support of the University of Southern Indiana (USI) Mechanical Engineering Senior Design project to design, build and test a drone swarm. The drones will be designed to communicate with each other (like a team) to complete a single task. More specifically the goal of this senior design project is to create a drone swarm that can communicate over a Wireless Meshed Network (WMN) to complete the specified task. Through the senior design project, the team will complete four design phases. These design phases are to create the simulation software, create the communication software (with the Xbee Radios), build the ground station, and integrate the ground station with the communication/simulation software. Once the team completes all the phases the drone swarm will be fully operational. When the drone swarm is fully operational the drones will be able to talk among each other to complete a single goal. The team will then demonstrate the drone swarm by spelling USI in the air above the Quad. Since drones have become a low-cost and a vital piece of technology within multiple industries, it's exciting that USI students will have the opportunity to design, build, test, and demonstrate swarm technology while at an undergraduate level. Through this presentation our team will explain the steps we have already completed leading up to our current design.

Molecular Interactions in Bat Skin Suggest Convergent Evolution with Birds

Meghan McCrary

Faculty Mentor: **Dr. Alex Champagne**

The outermost layer of skin, the stratum corneum (SC), protects the body from mechanical abrasion, pathogens, and excessive water loss. The SC is 10-20 μm thick and is composed of corneocytes embedded in a lipid matrix. These lipids help maintain the barrier function of the skin, and in most mammals consist of ceramides, free fatty acids, and cholesterol. However, bat SC contains a more diverse group of lipids including cerebrosides, ceramides with a sugar moiety attached to the headgroup. This lipid composition resembles avian stratum corneum and may indicate convergent evolution between bats and birds. We used infrared spectroscopy to investigate the conformation of lipid chains in the SC of the big brown bat (*Eptesicus fuscus*) at 5° intervals from 15-50° C. Additionally, we exposed the SC to different vapor pressures and measured changes in hydrogen bonding properties as a function of hydration. We found that lipid chains in bat SC respond to temperature in a manner more similar to lipids in avian SC than lipids in the SC of most mammals. Furthermore, the presence of cerebrosides may affect hydrogen bonding interactions between lipids and water in the SC. The similarities between bird and bat SC may be a result of selection to maintain barrier function while simultaneously meeting the mechanical demands of flight.

Music Rotation at a Formatted Radio Station

Colin McDuffee

Faculty Mentor: **Mr. John Morris**

Members of the Management Team of USI's own radio station 95.7 The Spin traveled to Seattle, Washington to take part in the College Broadcasting, Incorporated National Student Electronic Media Conference. At the conference, Program Director Colin McDuffee presented on how The Spin schedules and formats its music for radio play. At The Spin, we play Alternative music. Many other college radio stations are "free format" this means the on-air personality at the time gets to choose what music is played. The Spin takes a professional approach to radio, so we operate using a clock that has specific categories of music that feed into this. The presentation focused on the reasoning and science behind the clock format that The Spin uses, the music categories we choose, and the overall effect our music schedule has on our listenership.

It was a rewarding experience to show to other schools why the University of Southern Indiana's radio station is award winning. Many other college stations do not follow a specific format or operate remotely like The Spin does. We were able to explain to other schools why we choose the format, hour clock, and music rotation that we do, and why those choices make our listenership tune in. The work was received well by the other students in attendance. Some even asked for more information on our clock formatting and music rotation.

The Effect of Facebook and Instagram on Depression

Zoe Meuth

Faculty Mentor: **Dr. Trent Engbers**

In modern society, both social media use and general depression levels across populations have seen an increase. Young adults and adolescents are the age groups that are more widely represented on social media, and they are most likely to be found on sites that have been tested for social comparison, which has been linked to higher depression levels. Due to this link in social comparison on social media and depression, it is very possible that using Facebook and Instagram will increase the likelihood of depression among its users, and this is what this experiment explored. This experiment was set up with three groups, with one group spending time on Facebook, another group spending time on Instagram, and a third group avoiding social media. Once the allotted time was up for the experiment, all participants were asked to complete a survey that collected general demographic information, information about their social media usage, as well as their depression level according to the Beck Depression Inventory-II. What this experiment found was that while Instagram did seem to cause a greater likelihood of depression, Facebook actually seemed to decrease that same likelihood. Instagram being linked to a greater likelihood of depression was expected, as it falls in line with previous studies, but Facebook decreasing the likelihood of depression was an unexpected outcome that was seen in the data.

Nitrate Analysis of Groundwater in the Southern Indiana Area

Bryan Newman

Faculty Mentor: **Dr. Brian Bohrer**

Nitrate based fertilizers used in household plants, farm land, and golf courses are finding their way off the site from which they were applied. Some of the fertilizer gets carried away by runoff water and entering the groundwater system. It enters rivers and eventually enters the ocean. The fertilizer in the water causes increased algae growth which plummets the oxygen concentration and causes the water to go into a hypoxic state that cannot support marine life. This area is commonly called The Gulf of Mexico Dead Zone. Reversing this problem starts with monitoring the groundwater for nitrate in the waterways feeding The Gulf of Mexico. Using UV Spectroscopy and the method of standard addition, the concentration of the nitrate in the Ohio River has been found to be 35.46 ppm.

Analysis of Middle Woodland Projectile Points from the Mann Site, Posey County, Indiana

Sarah Parker and Sam Monsen

Faculty Mentor: **Dr. Michael Strezewski**

The Mann site, noted as a large Middle Woodland site boasting at least 15 earthworks and covering 175 hectares, has been largely inaccessible and unstudied by archaeologists since fieldwork conducted by Indiana University in the 1970s. Unfortunately, the results of these investigations were never fully published, leaving the archaeological community with relatively little information on the material culture at the site. This lack of data is particularly stark with regards to the hafted bifaces (i.e., projectile points and knives). The University of Southern Indiana has a collection of over 500 previously undocumented projectile points and knives originating from the Mann site, which forms the basis for the present analysis. Data on raw material, projectile point type, and heat treatment were collected for the 408 projectile points in the collection. Our findings indicate that certain clear patterns exist in terms of chert usage and projectile point types present at the site. We compare our results to those determined in concurrently undertaken studies of the blades and knives in the university's collection from the Mann site. One clear pattern of note is that while the knives and projectile points varied greatly in the types of raw material used, very high percentages of the blades were of one specific chert, Wyandotte. These patterns may help to indicate geographical origin and trade networks associated with different types of points made and used at the Mann site.

Radio Websites: More than Just a Blog

Crystal Phillips, Kalekidan Yeshiwas, and Charles Messina

Faculty Mentor: **Mr. John Morris**

Crystal Phillips traveled with 95.7 The Spin to Seattle to present on how websites can work for other radio stations. The team member partnered with two other web directors from different schools who presented their versions of their website. Through this presentation, as a team, we were able to showcase different ways to utilize a website for a college radio station. We discussed how to maintain the websites and different ways of passing along the information to future team members. We also showed two different ways of putting websites together: coding vs. plug ins and templates. Through discussion we were able to offer advice to other potential web directors about what they can put on their website, where to put their information, and different analytic websites to use to help better cater their website to their audiences' needs.

Designing a website requires an eye for detail. Placing articles on the home page vs. within a different page, what color scheme and fonts are used, and in what order the pages are placed are all key parts when it comes to designing a website. Web directors can use their analytic reports to determine the best placement for their tabs, articles, videos, and more. This presentation was used to inform audience members on why websites are important as well as how to effectively build them.

Understanding the Impact of Business Information Visualization on User Responses: Biometric Approach

Zachary Pirnat

Faculty Mentor: **Dr. Dinko Bacic**

Business Information visualization (BIV) is the use of computer-supported, interactive, visual representation of business data to amplify cognition to achieve better understanding to improve decision making. Business users leverage BIV to analyze data and determines how to apply it to support decision making. Varying levels of cognition and effort are utilized by the user as data is processed during decision making. This impact on cognition and effort creates the possibility that a visualization's design potentially influences users' responses, beyond decision speed and accuracy. These responses can include attention, stress/arousal, and cognitive workload. The goal of this research is to discover more direct and objective measures of user responses in relation to business information visualization. The personal benefits to be acquired through participation in this research include mastering an emerging analysis tool, discovering new approaches and techniques to gather and analyze data, gaining the ability to apply the objective knowledge acquired towards visualization design in a professional setting. Discovering new and effective means of gathering objective data relating to human computer interaction in the context of BIV is highly valuable in both the realm of Information Systems and global progression. More specifically, understanding how users respond to varying visual designs would allow for professionals to refine their visual designs to create a more specified and predictable user experience. This increases the potential of optimizing the experience for both the information user and report/visualization developers; with potential for better decision making.

Social Media Usage and Its Relationship to Depressive Symptoms

Taylor Quackenbush

Faculty Mentor: **Dr. Srikanth Dandotkar**

Social media has only been around for a few decades. Yet, it has become an integral part of our life. Myspace and Facebook opened a whole new form of connection and communication among people. With this new form of connection also brings new risks such as online bullying, addiction, and other real-life problems. An important question to answer is how much this digital world of social media relates to our lives, or even our health.

This study aims to look at how our online social media usage and how it relates to our mental health. It is possible that the images on social media one gets exposed to can potentially influence one's self-esteem and self-image. For instance, watching other people adventure or socialize with friends may give feelings of loneliness to some. Moreover, the more sites one uses, and the more time one spends on social media, the more likely one may experience these negative feelings. This study looks specifically at how one's social media usage and its frequency relates to one's depressive symptoms, especially in the college-aged population. Participants will be taking surveys to assess social media usage and depressive symptoms. The

exploratory variable will be social media usage and the response variable will be depressive symptoms. No direct correlation was found.

UNFair Trade: The History and Meaning of the Fair Trade Movement

Teresa Rynkiewich

Faculty Mentor: **Ms. Audrey Hillyer**

As a long-time advocate of the Fair Trade Movement, I will be presenting (1) the history of the global fair trade movement, (2) an awareness of the social justice issues of Fair Trade, such as poverty, hunger, lack of education, safe drinking water or housing, and (3) provide the groundwork for community involvement and a learning process for developing a Fair Trade organization on campus.

In 2015, the World Bank statistics stated that 736 million people were living on less than \$1.90 a day, which was 10% of the world's population. The World Bank's target is to reduce this number to less than 3% by 2030. The need to introduce the facts will educate and encourage more people to advocate for social justice programs.

With the Endeavor presentation, my intention is to provide an intensive guide which will include a comprehensive history of the Fair-Trade Movement and present the need for future programs to the USI faculty, students and local communities. It is my hope that this education will create community involvement and awareness about the needs of others in the Fair-Trade Movement by having the faculty teach about and encourage businesses, social justice programs, and support a Fair-Trade club/organization on campus.

There is a continued need to provide up-to-date facts and statistics of the Fair-Trade Movement to students, volunteers, and individuals in local communities, and especially universities. Through awareness campaigns people are getting involved and becoming more knowledgeable. With a strong push and emphasis on Fair Trade, the University of Southern Indiana could be the leading university in the Midwest to train, educate and graduate students who will become strong leaders in the Fair-Trade movement.

The Effect of Aromatherapy on Focused Attention

Jamie Schuetter

Faculty Mentor: **Dr. Srikanth Dandotkar**

The goal of this study was to determine the effect that aromatherapy has on one's focused attention and if it is different for males and females. Participants were randomly assigned to either peppermint oil or water conditions. After arriving to the study session, participants used a computer to complete the Stroop Task. This task was used to record each participant's reaction times. One of the independent variables was aromatherapy with levels as peppermint oil and water. This was a between-subject variable. The second independent variable was gender with levels as male and female. This variable was also between-subject. Participant's average reaction times served as the critical dependent variable. There is not enough evidence to prove that aromatherapy affects the focused attention of males and females differently. The results for male and female participants reaction times were different, specifically females responded

faster than males. Although females had quicker responses, the p-value was .065, therefore it did not reach statistical significance. There was not a significant interaction effect for aromatherapy and gender as well as aromatherapy alone. More research with peppermint oil and attention is suggested.

CodeAfrica

Tonderai Sibanda

Faculty Mentor: **Dr. Paul Kuban**

CodeAfrica is an initiative that I started after being inspired by the Clinton Global Initiative summit. It is aimed at bringing computer literacy to the underprivileged communities in my hometown of Victoria Falls, Zimbabwe. The primary focus of CodeAfrica will be to bridge the gap that exists between young people from underprivileged communities and technology. This will be achieved by providing necessary resources for training in computer literacy, computer programming, and social entrepreneurship.

The targeted population will be those individuals between the ages of 12-18 years, and this program will be available for free to these age groups. However, CodeAfrica will seek to encompass interested individuals outside of these age groups on a first-come, first-served basis for a price yet to be determined.

CodeAfrica is currently in the planning phase as I am still seeking sponsorship to kick start the initiative. I am looking to launch it in the summer of 2020 and for now, I am currently compiling the list of all that is required to make the project a success on its first day of operation going onward.

3D Modeling Using a CNC Router Indexer

Brian Simpson and Patrick Bennett

Faculty Mentor: **Mr. Rob Millard-Mendez**

As the world moves forward with technology we believe that it is important to keep an eye on traditions as the world keeps pushing forward. While there is a trend in shop classes being removed from schools there is a chance that traditional woodworking is going to become more and more scarce. Introducing a digital element to these classes will be helpful for many reasons. It will serve as a new way to problem solve for students. As a student this is a “real” world issue that is always addressed in a woodshop, as someone must work against the materials and the inherent properties that a natural occurring substance has in it. One of the issues that we as a team came up against is how this technology can be integrated into a classroom that leans heavily on tradition.

Both team members involved have a background in traditional design processes and a little background in digital 3-D design for 3-D printing. We took our combined knowledge of the processes and looked to see how well it translated into learning the processes for this new tool. How to navigate learning a new machine would be from set up to breakdown, and what skills we could apply from traditional building into our digital designs.

This is the first time that both presenters have also collaborated on a project together. Our process for design had to be ever evolving, as we worked independently, giving notes on design to each other as context clues on our independent designs that would eventually turn into a single piece of work.

Utilizing the new technology, we found that we were able to expedite our work time. As we cannot spend every moment in the shop, being able to design digitally out of the shop and return with a design so that we could start the machine while we continue to work on the completed parts was advantageous to our process. Having the technology of a CNC Indexer and CNC machine is almost like having a third collaborator. Both presenters have hopes of being educators and seeing this learning curve is helpful for our future endeavors and will help to bridge the gap from tradition to technology innovation in a classroom.

Characterization of a Putative R2 Retrotransposon and its HGV-like Ribozyme in Vertebrates

Kennedy Stoll

Faculty Mentor: **Dr. Kimberly Delaney**

While R2 retroelements have been extensively characterized in arthropods, there has been little investigation in vertebrates. We have putatively identified an R2 retrotransposon in the genomes of the lamprey species *Lampetra aepyptera* and *Lethenteron appendix*. R2 retrotransposons are a class of transposon that move via an RNA intermediate through eukaryotic genomes using Target Primed Reverse Transcription. These elements insert themselves in the middle of the 28S rDNA gene, and the R2 gene is transcribed as part of the larger rDNA cassette and cleaves itself from the pre-rRNA transcript via an HSV-like ribozyme encoded in its 5'UTR. We have characterized these putative transposons via sequencing, locus quantification via qPCR, and a measure of transposition activity via 5' end profiling. We present in vitro transcription/cleavage assays to indicate the function and conservation of the 5' ribozyme activity.

Does Nitric Oxide Supplementation Improve Athletic Performance in Collegiate Female Volleyball Players?

Brittini Stratman and Sarah Miller

Faculty Mentor: **Ms. Beth Young**

This study aimed to provide information about the use of nitric oxide supplementation and its correlation with collegiate female volleyball players and their athletic performance. Female participants were assessed for strength, muscular power, and recovery heart rate at the beginning and end of the trial. This was a double-blind, randomized crossover design and took place over 12 weeks beginning January 2019 and ending April 2019. Participants were randomly divided into two groups; one group received the nitric oxide supplement and the other group received the placebo pill. At the midway point (week 6) participants were once again assessed on strength, muscular power, and recovery heart rate. During week 7, they participated in a washout period where the athletes did not take any supplementation. To conclude the study, the two groups consumed the opposite supplementation or placebo pill in the same manner as before for the remaining 5 weeks of the study. After the end of the 12 weeks, participants will be reassessed using the same criteria as at the start of the trial. Data collected will be analyzed using the SPSS software for basic descriptive statistics and comparison tests. Participants data will be numerically coded

and not contain any identifiable information. Results of this study will indicate the effect of nitric oxide supplementation and its relevance to athletic performance. The conclusion of this study will be reported after all data have been collected.

Student Quiz Bowl at the Indiana Society of Radiologic Technologists Annual Convention

Maranda Stull, Katelyn Earl, Kimberly Gisler

Faculty Mentor: **Ms. Heather Schmuck**

Each year the Indiana Society of Radiologic Technologists (ISRT) hosts a conference to gather radiologic professionals and students from across the state of Indiana. The conference consists of different presentations relative to the field of radiology and competitive events for the students and radiologic technologists. The ISRT conference provided us an excellent opportunity to hear about current issues in the field of radiology and engage in discussions pertaining to those issues. It is important to be an active member of your profession and we were lucky to have the opportunity to begin that involvement now. As part of our engagement in the ISRT, we participated in the student quiz bowl. Students in radiologic imaging programs from across the state formed teams of three to compete in the quiz bowl. The quiz bowl competition format involves question-answer rounds aimed at assessing students' knowledge of the field. This competition gave us each the opportunity to represent USI while testing our knowledge and measuring our ability to recall information against 21 other teams. Our team was successful in the competition bringing home the first-place title.

Scientific Exhibit - Indiana Society of Radiologic Technologists Annual Convention

Maranda Stull, Katelyn Earl, and Jasmine Martin

Faculty Mentor: **Ms. Heather Schmuck**

This scientific research project focused on understanding the relationship between scatter radiation and the radiologic technologist position from the radiation source during mobile radiography. Radiologic technology students questioned the levels of radiation received while doing portable examinations on patients. The research questions identified in this project were: how much scatter radiation is the average technologist exposed to during mobile radiography and should wearing lead during mobile radiography become a standard practice? Methods included exposing a radiographic phantom with an image receptor and hand phantom situated at 90 degrees to the beam path. The image receptor was processed following each exposure and subsequent exposures involved increased distances from the source. Results found that even at 9 feet away, it is possible to still receive scatter radiation during portable examinations. The researchers concluded that wearing lead on portables or any form of mobile radiography can greatly reduce individual exposure to scatter radiation, thus reducing your dose.

Putting Breast to the Test: An Observation of Caries Risk and Enamel Defects in Infants

Kaitlyn Sturgell, Caroline Cowgill, and Racheal Herrmann

Faculty Mentor: **Ms. Emily Holt**

Breastfeeding has been proven to benefit the immune system and slows weight gain. When choosing whether to breastfeed or use infant formula, a mother may also consider the infant's caries risk and rate of enamel defects. The purpose of the literature review is to determine if breast milk will result in a lower caries risk and less enamel defects than infant formula.

Before six months of life, exclusively breastfeeding was shown as a key factor in a healthy immune system, which in turn affects an infant's caries risk and enamel defects rate. Biomarkers in breast milk were shown to prevent T-cell disorders. However, after six months there was no difference between breastfed and formula fed infants' immune systems. A cohort study on early systemic disease in the first month of life and enamel defects, found that children with disease had a much higher incidence of enamel defects.

In relation to dental caries, breast feeding was shown to be more effective at preventing caries than infant formula. After the first six months, it becomes more difficult to determine the influence breastmilk has on an infant's dentition due to more foods being incorporated into the diet. Socioeconomic and biological factors, such as organisms, also come into play after six months of age.

In relation to enamel defects, infants with a lower birthweight were found to have a higher prevalence of enamel defects. A study found that if low birthweight infants were breastfed, their weight and height increased as well as having a lowered incidence of enamel defects. However, there is not enough research to directly link reduced enamel defects and breastfeeding.

Not all mothers can breastfeed due to medical conditions. Nursing staff in labor and delivery and lactation consultants could be educated on the benefits of reduced caries and enamel defects from breastfeeding. In dental practices, education topics should include the negative effects of comfort feeding, use of a bottle at night, and the need to wipe out the mouth after feeding.

Charcoal on the "Grill"

Mallory Thompson, Taylor Urban, and Kassandra Lawlyes

Faculty Mentor: **Ms. Emily Holt**

Tooth whitening has become one of the most frequently requested dental procedures by the public. There are many different methods to tooth whitening such as toothpaste, gels, film, and in-office tooth whitening. The most convenient and most frequently used method is toothpaste containing hydrogen peroxide. Whitening toothpastes have been proven safe and effective to whiten teeth at least two shades. Activated charcoal toothpaste for tooth whitening is a fad circulating at this time. When added to a toothpaste, it is highly abrasive and can increase the surface roughness of tooth enamel. The purpose of this review is to understand the difference between how activated charcoal and whitening toothpaste containing hydrogen peroxide affect the surface roughness of enamel

differently. Toothpastes that contain hydrogen peroxide as a whitening agent have specific acceptance program evaluations that must be followed to test safety and efficacy. These strategies include measurement of enamel hardness to identify any damage to dental enamel and dentin with extreme use of the toothpaste testing, and to identify any effect of the whitener on restorative materials and toxicological assessment, along with cytotoxicity and mutagenicity for the potential of mucous membrane irritation. The outcome of using whitening toothpaste that are free of sodium hypochlorite but contains low concentrations of hydrogen peroxide is stain removal without damage to the underlying tooth structure. One research study showed that activated charcoal toothpaste increases the surface roughness of the tooth and is not recommended due to the teeth needing fluoride to help maintain the enamel structure and strength to be able to prevent caries. In comparison, whitening toothpastes using hydrogen peroxide have been proven a more effective method in at-home whitening than activated charcoal toothpaste. Research showed hydrogen peroxide dentifrice is not as abrasive as charcoal dentifrice and whitens more effectively. When comparing the two products, whitening toothpastes containing hydrogen peroxide are the safer and more effective method for at-home tooth whitening. When questions arise about the charcoal containing products, dental hygienists have the responsibility to suggest methods that will be safe and effective for clients to use.

Making Sense of Body-Worn Cameras: An In-Depth Examination of Special Units across Two Agencies

Gabrielle Wy

Faculty Mentor: **Dr. Marthinus Koen**

Existing research regarding police perceptions of body-worn cameras have primarily focused on those perceptions of patrol officers. While this research base has found that officers, for the most part, have positive perceptions of body-worn cameras, perceptual studies (with few exceptions) have overlooked how officers belonging to special police units have made sense of this technology over time. Drawing from 40 semi-structured interviews conducted with special police units at the Sunnyvale Police Department (pseudonym), a small (<100 sworn officers), suburban police agency, and the Pennybridge Police Department (pseudonym), a mid-sized (<300 sworn officers), city-level department, the current study explores how these units perceived and adapted to the implementation of body-worn cameras over time. Moreover, this paper highlights the factors that were instrumental in shaping these perceptions across the two police agencies.

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