



Spokane Intercollegiate Research Conference

Gonzaga University – April 29th, 2023
Hemmingson Center

Poster Presentation Sessions **A** 10:00-11:00, **B** 11:30-12:30, **C** 1:00-2:00 (Ballroom)
Oral Presentation Sessions **A** 10:30-11:30, **B** 12:30-1:30 (3rd floor)

Invited Speaker – 2:30-3:30 (Auditorium)

Fr. Lokadi Pierre Luhata, SJ

"Zoopharmacognosy and drug discovery: The *Odontonema* story"

Assignments, Names, Titles

Poster Presentations - pages 2-7

Oral Presentations - pages 8-10

Assignments, Names, Titles, Abstracts

Poster Presentations - pages 11-34

Oral Presentations - pages 35-42

List of Faculty Sponsors - page 10

The Spokane Intercollegiate Research Conference (SIRC) provides an opportunity for students from across majors and disciplines, to present their research and scholarship, receive meaningful feedback, and develop scholarly community. SIRC is a great opportunity for students at all levels of their academic career to gain practice speaking and presenting as well as experience a conference environment in a relaxed, friendly setting while learning about the wealth of research in our community.

SIRC is organized by Gonzaga University and Whitworth University, alternating between campuses each year. This celebration of primarily undergraduate research is open to all students in the Spokane area and costs nothing to attend. Although the event primarily supports undergraduate research, we would love to provide a venue for all students in our community to celebrate their research as well. We look forward to seeing you at SIRC!

For more information about SIRC, see www.gonzaga.edu/sirc or <https://digitalcommons.whitworth.edu/sirc/>.

Poster Presentations

Hemmingson Ballroom

A (10:00-11:00am), B (11:30-12:30pm), C (1:00-2:00pm)

Session A (10:00-11:00am)

- A 1** Differences Between Perceptions of Health Care in Urban and Rural Communities
Truong, Jade (*she/her/hers*) – *Whitworth University*
- A 2** The effect of a false step on the initiation of sports movement: a biomechanical analysis
Redfern, Eleanor (*she/her*); Gruler, Mia (*she/her*); Erwert, Ellie (*she/her*) – *Gonzaga University*
- A 3** The Matching Law
Lester, Avree – *Gonzaga University*
- A 4** Intravenous Magnesium Use During Surgery: An Evidence Based Practice Project
Raver, Chance; Glover, Garrett; Lombardi, Benjamin – *Gonzaga University*
- A 5** Rates of Postoperative Pneumonia in Healthy Adults Receiving Neostigmine versus Sugammadex at Providence Sacred Heart Medical Center and Providence Holy Family Hospital: A Multi-Center Evidence-Based Practice Project
Gorthy, Kirstie; Bushnell, Trevor – *Gonzaga University*
- A 6** Oxygen Desaturation in Obese Patients During Induction of General Anesthesia: An Evidence Based Practice Project
Bast, Laura; Barker, Alisha; Burks, Payton – *Gonzaga University*
- A 7** Use of Intravenous Tranexamic Acid in Adult Patients Undergoing Spinal Surgery at Providence Sacred Heart Medical Center: An Evidence Based Quality Improvement Project
Brimhall, Jared; Wenz, Shelley; Solano, Fern; Bushnell, Trevor – *Gonzaga University*
- A 8** Perioperative Administration of Dexmedetomidine
Cleminson, Abby; Shor, Christopher – *Gonzaga University*
- A 9** A multicenter observational evaluation on the use of sugammadex in high-risk patients who develop post-operative pulmonary complications.
Johanson, Brock; Orth, Ben – *Gonzaga University*
- A 10** The influence of Peripheral Nerve Blocks on Pain Management in Cardiac Surgery: A Multi-Center Evidence-Based Practice Project
Hebert, Christina; Kylo, Natalie; Nimri, Emily – *Gonzaga University*
- A 11** The Effectiveness of Model, Lead, Test Procedure on Teaching Rational Counting to a Four-Year-Old Male Student in an Inclusive Preschool Setting
Busch, Emily; Bender, Kelly – *Gonzaga University*
- A 12** Effectiveness of Direct Instruction Rote Counting Format and Error Correction Procedure on Teaching Rote Counting to a Four-Year-Old Male with a Developmental Delay within an Inclusive Preschool Environment
Busch, Emily – *Gonzaga University*

- A 13** The Effects of a Fading Prompt and Errorless Learning Procedure on Responding to Name by a Child with Autism Spectrum Disorder in an Applied Behavior Analysis Clinic
Alderman, Taylor – *Gonzaga University*
- A 14** The Effects of a Response Cost Procedure on On-Task Behaviors by a Third-Grade Female with a Specific Learning Disability in a Resource Room
Bolma, Karianne – *Gonzaga University*
- A 15** The Effects of Shaping and Fading Prompts on Imitating Song Actions by a Two-Year-Old Male with Autism in a Clinical Setting
Ford, Madeline – *Gonzaga University*
- A 16** The Effects of Most to Least Prompting on Hand Waving by a Five-Year-Old Boy with Multiple Disabilities in a Self-Contained Special Education Classroom
Gemmet, Maddie – *Gonzaga University*
- A 17** The Effectiveness of a Token Economy System on Off-Task Behavior of a Tenth Grade Male with ADHD in a High School Classroom
Halbo, Rachel; Henry, Matt – *Gonzaga University*
- A 18** Examining the Effects of a Model, Lead, Test Procedure and Targeted Intervention Worksheets on Solving of Two-Step Algebraic Problems by Two Participants with Disabilities in a Middle School Classroom
Holloway, Lucille; Newson, Jazmine – *Gonzaga University*
- A 19** The Effects of Direct Instruction to Increase Independently Skill Completion of an Adaptive Task by a High School Student with Autism Spectrum Disorder in a High School Self-Contained Classroom
McElroy, Maddy – *Gonzaga University*
- A 20** The Effectiveness of Guided Practice on Teaching Change-Giving by an Adolescent with Autism in a Self-Contained Special Education Classroom
Moreno, Nicole; Ung, Kimberlee – *Gonzaga University*
- A 21** The Effectiveness of a Prompt Fading Intervention on Scissor Cutting Skills by Two Preschool Students in an Inclusive Preschool
Morris, Hailey; Vial, Hannah – *Gonzaga University*
- A 22** The Effects of a Token System on Blur-Outs During Teacher Instruction by a 17-Year-Old Female with Autism in a High School Special Education Resource Classroom
Navarro, Gabi – *Gonzaga University*
- A 23** The Effects of Direct Instruction Flashcards to Increase Basic Addition Math Fact Fluency by a Fourth Grade Student with a Specific Learning Disability in an Elementary Resource Room
Navarro, Gabi – *Gonzaga University*
- A 24** The Effects of a Model-Lead-Test Teaching Procedure Supplemented with Color-Coded Vowel Sounds on Sight Words by a Four-Year-Old Student in a Preschool
Vial, Hannah – *Gonzaga University*
- A 25** The Effect of Using a Model, Lead, Test Strategy to Increase Sight Word Recognition in a Fourth Grade Student with a Specific Learning Disability in a Resource Room
West, Emma – *Gonzaga University*

- A 26** The Use of a Reward System on Decreasing Off-Task Behavior by a Tenth Grade Girl with an Intellectual Disability in a Family Consumer Science Room
West, Emma; Nation, Alivia – *Gonzaga University*
- A 27** The Effectiveness of Direct Instruction Flashcards on Sight Word Recognition by a High School Male with Learning Disability in a Special Education Resource Room
Neuman, Savanna – *Gonzaga University*
- A 28** Prevalence of Microplastics in Wetland Ecosystems: Transfer from Freshwater to Bat Colonies?
Gashi, Emma (*she/her*) – *Gonzaga University*
- A 29** Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults
Edmondson, Avery (*he/him*) – *Gonzaga University*

Session B (11:30-12:30pm)

- B 1** Accurately Estimating Shrub Height Using Unoccupied Aerial Vehicle Imagery
Fenske, Marie; Moore, Malachi; Halma, Sophie – *Whitworth University*
- B 2** Emergence timing impacts trait variation in showy milkweed (*Asclepias speciosa*) seedlings across ontogenetic stages
Dallabetta, Abby (*she/her*) – *Whitworth University*
- B 3** Studying three universal essential genes with functions in nuclear & nucleolar DNA repair
Alcaraz, Matthew (*he/him*) – *Gonzaga University*
- B 4** ZNF16: potential roles in rRNA transcription, gene expression, and cancer
LeBlanc, Lillian (*she/her*) – *Gonzaga University*
- B 5** Exploring an Extremely Large Protein in Bacteriophage
Brady, Alexis – *Gonzaga University*
- B 6** Frequency and Cost of Inbreeding in the Acorn Woodpecker
Borders, Arden (*she/her/hers*); Smith, Sarah (*she/her/hers*) – *Gonzaga University*
- B 7** Examining the relationship of eye and body orientation during path integration in the Atlantic Sand Fiddler Crab (*Uca pugilator*)
Oakes, Joy (*she/her/hers*) – *Gonzaga University*
- B 8** Peripheral blood smear is an effective technique for analyzing *Strongylus vulgaris* infection in Clydesdale horses.
Quinn, Sarah; Jordan, Quinlan; Grant, Christian – *Whitworth University*
- B 9** Greater Intestinal Nematode Parasite Load in the Fecal Material of Pregnant *Equus caballus* May be a Sign of Immunosuppression; Similar Effects Do Not Occur When Nursing
Burton, Abby (*she/her*); Hannah Neuberger (*she/her*); Amanjot Kaur (*she/her*) – *Whitworth University*
- B 10** Rhinoceros Beetles Carry Informational Chemicals About Body Size and Sex
Bell, Micah (*he/him*) – *Gonzaga University*

- B 11** Per and Polyfluoroalkyl Substances Outreach and Education
Bateman, Garrick (*he/him*); Driml, Zoe (*she/her*); Noto, Lily (*she/her*) – *Gonzaga University*
- B 12** Beaver dam analogs have positive effects on macroinvertebrate biodiversity
Swyers, Kate (*she/her/hers*) – *Gonzaga University*
- B 13** Addressing Extreme Heat Events in Spokane, Washington
Gashi, Emma (*she/her*); Brown, Benjamin (*He/him*); Phelps, Emily (*she/her*) – *Gonzaga University*
- B 14** Effects of Microplastics in Zooplankton and Macroinvertebrate Communities
Palacio, Kaitlyn (*she/her*); McRae, Gracie (*she/her*) – *Gonzaga University*
- B 15** Making An Impact: How Focusing on Local Conservation Protects Biodiversity, Geology, & Cultural History
Jansen, Rhea; Divelbiss, Zoë; Nellmapius, Ben (*he/him/his*); Emery, Luke – *Gonzaga University*
- B 16** Assessment of Carbonated Liquid Effects on Bleeding Time and Fish Health in Gill-Injured Bluegill and Pumpkinseed Sunfish
Barone, Jimmy – *Gonzaga University*
- B 17** Utilizing Citizen Science for Microplastic Data Collection
La Carrubba, Sarah (*she/her*); Payne, Sheridan (*she/her*); Zuniga, Joseph (*he/him*) – *Gonzaga University*
- B 18** Lake Arthur Renewal
Hoag, Kelly; Leong, Nick; Reyes, Ana; Hollister, Anna – *Gonzaga University*
- B 19** Relationships Matter: When Environmental Politics & Policy Fall Short
Patterson, Kelly (*she, her, hers*); Richter, Hannah (*she, her, hers*); Morse, Matthew (*he, him, his*) – *Gonzaga University*
- B 20** 50 Years after Celebrating Tomorrow's Fresh New Environment: The Impact of Expo '74 on Spokane and the Spokane River.
Klebeck, Lucy (*she/her/hers*); Duchesneau, Jakob (*he/him/his*); Rogers, Madeline (*she/her/hers*) – *Gonzaga University*
- B 21** Enhancing sustainable water treatment filters for low-income communities.
Luoma, Grace; Bone, Brynna – *Gonzaga University*
- B 22** Identifying Early Fibroblast Cell State Changes in an Angiotensin-II Induced Fibrosis Pump Model
Chon, Ashley – *UW-GU Health Partnership*
- B 23** Protocols for the rapid separation of nuclear, mitochondrial and cytosolic fractions of C57BL/6J mouse brain and subsequent Western blot measurement of concentrations of apoptosis-inducing factor (AIF) and mitochondrial and cytosolic concentrations of hexokinase.
Larkin, Ashley – *Washington State University - Spokane*
- B 24** The Effect of Mobile Attachment on Loneliness and Social Capital
Pinheiro Gonçalves, Rafaela Donato (*she/her*) – *Gonzaga University*
- B 25** Gratitude and Primal World Beliefs: How the Three Good Things Exercise May Impact Social Cognition
Thomas, Tyler – *Gonzaga University*

B 26 Ecologies of Childhood: A Tale of Two Zip Codes

Love, Dominic (*he/him*) – Gonzaga University

B 27 Spokane River Vision Plan

Dodd, Abigail (*she/her*); Plotner, Grant (*he/him*); Schmer, Christiana (*she/her*) – Gonzaga University

Session C (1:00-2:00pm)

C 1 Identification of Omega Amidase Inhibitors Through Protein Thermal Shift Assay

Benton, Kae – Whitworth University

C 2 Expression, Purification, and Activity of Recombinant Human Arylsulfatase B in Escherichia coli

Vickers, Alex (*he/they*) – Whitworth University

C 3 Structural Divergence of O, S, and Se Replacements in Quasiracemic Materials

Needham, Emily – Whitworth University

C 4 Investigating Water Oxidation by (NNN)TEMPO Transition Metal Pincer Complexes

Mottola, Anna – Gonzaga University

C 5 Seeking Better Luminescent Probes: Synthesis and Investigation of [Re(CO)₃(H₂O)(2,9-DCOOHphen)]OTf

Yesiki, Drexler – Whitworth University

C 6 Investigating the effects of uracil damage on the therapeutic potential of DNAzymes

Carson, Paxton – Gonzaga University

C 7 Exploring the DNA-Binding Potential of Novel Chalcones Synthesized by Gonzaga Students

Hoang, Duc (*he/him/his*) – Gonzaga University

C 8 Multiple length-scale analysis of the effects of popular beverages on dental enamel

Rond, Emily – Gonzaga University

C 9 Chalcones with Potential Anti-Depressant Activity

Konell, Olivia (*she/her/hers*) – Gonzaga University

C 10 Exploring Chalcone Derivatives and Their Potential Involvement with the 5-HT_{1A} Receptor

Preti, Caleb – Gonzaga University

C 11 A Supramolecular Amino Acid Assembled Using CB[8]

Vu, Linh – Gonzaga University

C 12 Human-Centered Design for Ethical and Responsive AI Chatbots: Improving User Experience and Communication Efficiency.

Kubicki, Jakob; Moltafet, Ahmad; Manca, Mason – Gonzaga University

C 13 Recloser Cabinet Condensation Mitigation

Knack, Lucas; Butler, Stephen; Anderson, Christopher – Whitworth University

C 14 Optimizing Low Thrust Trajectories for Asteroid and Planetary Missions

Flegel, Caleb (*he/him*); Fairborn, Meg (*she/her*) – Whitworth University

- C 15** A programmable voltage multiplier towards ion mobility spectrometry
Idiaghe, Paul (*he/him*) – *Whitworth University*
- C 16** FRET-Based Molecular Computing
Croft, Moab – *Whitworth University*
- C 17** Investigation of plasma processing on paintability of thermoplastic C-fiber composite materials
Zhong, Xiwen – *Gonzaga University*
- C 18** Analyzing Stability of Symmetric Multistep Methods
Hiatt, Aden – *Gonzaga University*
- C 19** Topological Data Analysis of Information Spread on Twitter
Nguyen, Matt; Garcia, Leon; Recker, Malia – *Gonzaga University*
- C 20** Total Roman Domination in Kneser Graphs
Asplund-wain, Isabella (*she/her*) – *Gonzaga University*
- C 21** Factor Salience for University Belongingness: Positive and Negative Experiences in College Environments
Foster, Kacie; Browning, Samantha – *Whitworth University*
- C 22** Be Here or Belong? International and Racial Minority American Students' Reports on Sense of Belonging in Comparison to White American Students
Lkhadorj, Tuvshinzaya; Ganu, Dollar – *Whitworth University*
- C 23** Context-Dependent Learning Effect and Memory: Blue Versus Red
Rogers, M'kaela (*she/her*); Trower, Rhienna (*she/her*) – *Whitworth University*
- C 24** Using a Social Discounting Task to Measure Differential Personal Information Sharing
Battaglia, Jacob – *Gonzaga University*
- C 25** Pass the Dutchie on the Left Hand Side
Hatch, Tobias; Olona, Anissa – *Gonzaga University*
- C 26** The Behavioral Economic Demands of Personal Information
Yee, Koko (*she/her/hers*) – *Gonzaga University*
- C 27** Can eco-psychology techniques help us cope with the climate crisis?
Allen, Jael (*she her*) – *Whitworth University*
- C 28** Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults
Edmondson, Avery (*he/him*) – *Gonzaga University*

Oral Presentations

Hemmingson 3rd Floor

A (10:30-11:30am), B (12:30-1:30pm)

Session A (10:30-11:30am)

Group 1, Room 312, Faculty Moderator: **Prof. Matsumoto**

Effects of Herbivory on Developmental Variation in Seedling Defense Chemistry
Mauch, Emily – *Whitworth University*

Visualizing Fer Kinase Expression during Zebrafish Embryonic Brain Development
Korkeakoski, Madison (*she/her*) – *Whitworth University*

Structural Design of Quasiracemates: The Pursuit of Predictable Crystal Assembly
Koch, Katelyn (*she/her*) – *Whitworth University*

Role of the calcium binding loop in prolyl aminodipeptidase from *L. heleviticus*
Ryder, Stephanie (*she/her*) – *Whitworth University*

Group 2, Room 306, Faculty Moderator: **Prof. Hitefield**

Interpreting the 2022 Senate Primary Elections
Lorenc, Drew (*he/him*) – *Whitworth University*

Success or Incompletion? How Peacekeeping Operations End
Stoddard, Hannah – *Whitworth University*

Who Owns Development?: A Study of NGO Movements in Relation to Community Input
Iseman, Courtney (*she/her/hers*) – *Whitworth University*

Group 3, Room 308, Faculty Moderator: **Prof. Sheets**

Reinvention
Moore, Emma (*she/her*) – *Whitworth University*

The Invention of You
Hagey, Celia (*she/they*) – *Whitworth University*

Swallowing the Dairy Pill
Vidyarthi, Sakina (*she/her*) – *Whitworth University*

Group 4, Room 310, Faculty Moderator: **Prof. Ong**

Identifying Quality and Asymmetry of Gait in Real-World Conditions
Ramollari, Helio; Idiaghe, Paul; Petersen, Ashtyn – *Whitworth University*

Application of wearable sensor technology in assessing contingent learning ability in infants
Ledesma, Liv (*she/her*) – *Gonzaga University*

Novice Runners Increased Step Frequency and Decreased Force Application as They Gained Running Experience
Garbuz, Christina (*she/her/hers*) – *Gonzaga University*

The Influence of Gait Retraining in Downhill Running on Knee Valgus
Hand, Hailey; Etten, Madelyn; McGrew, Thomas; Garbuz, Christina – *Gonzaga University*

Session B (12:30-1:30pm)

Group 1, Room 306, Faculty Moderator: Prof. Hogle

Mosaic Tile Knot Theory 1
Childress, Jessica; Espinoza, Jesus (*they/he*) – *Gonzaga University*

Mosaic Tile Knot Theory II
Jursek, Alex (*he/they*); Wang, Wenshan – *Gonzaga University*

Analyzing Child Directed Speech
Rocca, Kevin – *Gonzaga University*

Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults
Edmondson, Avery (*he/him*) – *Gonzaga University*

Group 2, Room 308, Faculty Moderator: Prof. Jones

A 3D printed microfluidic PCR device towards detecting SARS-CoV-2
Shaka, Kristi – *Whitworth University*

A biocompatible 3D printed microfluidic device for high-throughput C. elegans analysis
Garcia, McKenzie (*she/her*) – *Whitworth University*

Dry Sliding Wear of Metal-oxide Filled PTFE Composites
Swets, Jackson – *Gonzaga University*

On the dry sliding wear of PEEK-PTFE composites
Anders, Libby (*she/her*) – *Gonzaga University*

Group 3, Room 310, Faculty Moderator: Prof. Zhang-Lea

Places in Names: Exploring State/Brand Congruency and Brand Quality
Hayward, Savannah (*she/her*) – *Whitworth University*

The Impact of Unemployment on Violent Crime in the U.S.
Lindahl, Connor (*he/him*) – *Gonzaga University*

Are intellectual trigger warnings as counterproductive as trauma-relevant trigger warnings? Testing the psychological and academic performance consequences
Smith, Emme (*she/her*); Su, Yuchen (*he/him*) – *Gonzaga University*

Effect of high heat running environment on Achilles tendon morphology, oxygen consumption, and ankle pain level of runners

Riva, Gabriella; Jones, Ethan – *Gonzaga University*

Group 4, Room 312, Faculty Moderator: Prof. Romanowich

Moralization of Conspiratorial Beliefs

Lau, Jalisa; Tenny, Micah; Chicca, Katie – *Gonzaga University*

The Blurred Line Between Myth and Reality in Early America

Brooks, Zach – *Whitworth University*

Virtual Bodies: How the Rhetoric of Embodiment Enables Harm in Virtual Spaces

Immel, Sarah (*she/her*) – *Whitworth University*

Quantifying Contingent Decreases in Social Media Usage

de Merlier, George – *Gonzaga University*

Thank you to all of the faculty members and their support of the students!

Prof. Arpin – *Gonzaga University*

Prof. Bailey – *Gonzaga University*

Prof. Bancroft – *Gonzaga University*

Prof. Bartlett – *Gonzaga University*

Prof. Breno – *Whitworth University*

Prof. Caraway – *Whitworth University*

Prof. Casady – *Whitworth University*

Prof. Colorafi – *Gonzaga University*

Prof. Cope – *Whitworth University*

Prof. Crandall – *Gonzaga University*

Prof. Cravens – *Gonzaga University*

Prof. Cremeens – *Gonzaga University*

Prof. Davis – *UW-GU Health Partnership*

Prof. Denton – *Washington State University - Spokane*

Prof. Wisor – *Washington State University - Spokane*

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Prof. Ghrist – *Gonzaga University*

Prof. Gordon – *Gonzaga University*

Prof. Haydock – *Gonzaga University*

Prof. Hitefield – *Whitworth University*

Prof. Hogle – *Gonzaga University*

Prof. Jones – *Whitworth University*

Prof. Khare – *Gonzaga University*

Prof. Layne – *Gonzaga University*

Prof. Lea – *Gonzaga University*

Prof. Martin – *Whitworth University*

Prof. Matsumoto – *Gonzaga University*

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Prof. Measor – *Whitworth University*

Prof. Medina – *Gonzaga University*

Prof. Mikkelsen – *Whitworth University*

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Prof. Norasakkunkit – *Gonzaga University*

Prof. Ojennus – *Whitworth University*

Prof. Olivares – *Gonzaga University*

Prof. Ong – *Whitworth University*

Prof. Putzke – *Whitworth University*

Prof. Romanowich – *Gonzaga University*

Prof. Sankaran – *Whitworth University*

Prof. Sardinia – *Whitworth University*

Prof. Sheets – *Whitworth University*

Prof. Shimabuku – *Gonzaga University*

Prof. Shultis – *Gonzaga University*

Prof. Silvers – *Whitworth University*

Prof. Swanson – *Gonzaga University*

Prof. Tackett – *Gonzaga University*

Prof. Wheeler – *Whitworth University*

Prof. Zhang-Lea – *Gonzaga University*

Prof. Zhao – *Whitworth University*

Poster Presentations – *Titles, Names, Abstracts*

Hemmingson Ballroom

A (10:00-11:00am), B (11:30-12:30pm), C (1:00-2:00pm)

Session A (10:00-11:00am)

A 1 Differences Between Perceptions of Health Care in Urban and Rural Communities

Truong, Jade (*she/her/hers*) – *Whitworth University*

Abstract: Access to healthcare in rural areas has been shown to be a health disparity in the United States. Despite the research on rural health access, the perception of access between rural and urban populations among younger populations is poorly understood. The purpose of this study was to compare perceptions of healthcare affordability, accessibility, and receptivity between rural, small, and urban areas. Full-time undergraduate and graduate students (18-30 years old) were identified as the target population. The survey was sent and instructed participants to identify their perceptions of healthcare accessibility, affordability, and receptivity in their home community. There was a significant difference in perceptions of receptivity and no difference in perceptions of accessibility also affordability between popular sizes. Participants from rural and urban areas had lower perceptions of receptivity to healthcare than those from small areas. More patients than providers may mean greater demand and long waits for care, shorter visit times, and less chance of building trust with a provider. Additional participants and refined lines of questioning are needed to improve the generalizability and applicability of further research on perceptions of healthcare in younger populations.

A 2 The effect of a false step on the initiation of sports movement: a biomechanical analysis

Redfern, Eleanor (*she/her*); Gruler, Mia (*she/her*); Erwert, Ellie (*she/her*) – *Gonzaga University*

Abstract: Athletes seeking advantages during the initiation of sports movement may choose to use a false step (FS), defined as a backwards step before moving in the intended direction. PURPOSE: This study examined biomechanical changes when performing a FS for a forward sprint, from both parallel and lateral starts, and a jump. METHODS: Athletes (N=34, 21.0 +/- 0.8 yr) had electromyography (EMG) for lower limb muscles on both legs and ground reaction forces recorded during the trials. Three trials were performed: straight run with parallel start, straight run with lateral start, and vertical jump. Three FS and 3 non-false step (NFS) trials were performed for each direction. RESULTS: Straight run: Quadricep activation was significantly larger for FS trials (mean difference (MD)=5.75 % p<.001) and impulse for FS (MD=5.71 Ns, p=.004). Lateral: Higher quadricep activation during FS trials (MD=5.1 %, p=.003), with a trend for the impulse (MD= 2.3 Ns, p=.089). Jump trials did not show differences. CONCLUSION: Significant differences in quadricep muscle recruitment for both running directions is likely due to the powerful horizontal propulsion when performing a FS. Our results suggest implementing the FS when initiating explosive running movements from a straight or lateral start to benefit overall performance.

A 3 The Matching Law

Lester, Avree – *Gonzaga University*

Abstract: The application of the matching law demonstrates how we can perform a behavior based on particular choice alternatives and our environment. The behavior that we choose to partake in is usually the one which results in the most preferred reinforcement. We can apply the matching law to volleyball by looking at who the setter chooses to pass the ball to in order to make a successful kill, thus making winning the match more likely. We want to know if individual players match, and if so, does this matching occur better during a win versus a loss? We looked at statistics for two Gonzaga seasons (2016 and 2018). We chose five of the top players for each season to analyze and focused on their total attempts and kills as well as whether each game was a win or loss. By finding these values and calculating them in proportion to the other four players, we were able to see the effectiveness of the setter's choices in regards to whether they were successful in winning or not. Our results showed that the 2016 season proved to be most successful, with a trend in undermatching, while the 2018 season showed a trend of overmatching. In conclusion, the matching law did not work at the individual level for these volleyball seasons.

Limitations in our study demonstrated that we did not consider the quality of passes, errors in gameplay, and which player sets the ball. It would be important to consider these factors in future research.

A 4 [Intravenous Magnesium Use During Surgery: An Evidence Based Practice Project](#)

Raver, Chance; Glover, Garrett; Lombardi, Benjamin – *Gonzaga University*

Abstract: The purpose of this evidenced based, retrospective, observational, descriptive project is to identify current practice of magnesium use at Providence Sacred Heart Medical Center and Holy Family Hospital. Additionally, this project aims to characterize the sample population by measuring patient and case characteristics of patients undergoing gynecologic, orthopedic, neurosurgical, and general surgery procedures. Investigation of the research evidence is guided by the following PICO formatted question: Among adults undergoing general anesthesia (ETT only) for elective surgery from 2015 to 2020 for non-obstetric gynecologic, orthopedic, neurosurgical, and general surgery; how is magnesium being used and what patient characteristics influence its use? When implemented, the results of this research have the potential to improve patient outcomes and provide an alternative to traditional pain management strategies, leading to shorter hospital stays and reduced healthcare costs. Results will be delivered during the poster presentation.

A 5 [Rates of Postoperative Pneumonia in Healthy Adults Receiving Neostigmine versus Sugammadex at Providence Sacred Heart Medical Center and Providence Holy Family Hospital: A Multi-Center Evidence-Based Practice Project](#)

Gorthy, Kirstie; Bushnell, Trevor – *Gonzaga University*

Abstract: Neuromuscular blockade is used often in anesthesia to facilitate endotracheal intubation, assist with mechanical ventilation, and optimize surgical conditions. Following surgery, it is important that the effects of neuromuscular blocking agents be completely terminated. Two medications commonly used to reverse drug-induced paralysis are sugammadex and neostigmine. Sugammadex, a modified gamma cyclodextrin molecule, inactivates rocuronium and vecuronium by encapsulating the free molecule to form a stable complex, and is associated with increased safety related to a more rapid, complete, and predictable reversal. Neostigmine, an anticholinesterase medication, inhibits hydrolysis of acetylcholine by blocking the action of acetylcholinesterase thereby increasing levels of acetylcholine needed for neuromuscular recovery, but is associated with incomplete reversal, residual neuromuscular weakness, bronchoconstriction, bradycardia, augmented secretions, nausea, and vomiting. Neostigmine is often given in conjunction with glycopyrrolate, an anticholinergic, to help offset a few of the unwanted side effects, such as bradycardia. Residual neuromuscular blockade and subsequent weakness is associated with respiratory complications, including pneumonia, related to impaired contraction of the muscles for ventilation, impaired swallowing, accumulation of secretions, and gastric content aspiration. Prevention of postoperative pneumonia will greatly improve patient safety and reduce health care costs by decreasing morbidity and mortality. This poster will present preliminary findings.

A 6 [Oxygen Desaturation in Obese Patients During Induction of General Anesthesia: An Evidence Based Practice Project](#)

Bast, Laura; Barker, Alisha; Burks, Payton – *Gonzaga University*

Abstract: Obesity rates are continuing to rise each year in the United States. Currently, obesity is associated with multiple comorbidities that require medical care. Anesthesia providers are frequently caring for this population in the operating room with major concerns related to the cardiovascular and pulmonary changes such as increased shunt and decreased functional residual capacity (FRC), safe apnea time, and carbon dioxide elimination. With these physiologic alterations, desaturation can occur faster during the induction period. Apneic oxygenation has been shown to increase the duration of safe apnea time in this population. The purpose of this retrospective, observational, evidence-based practice project (EBPP) was to describe the length of the induction period and desaturation events during induction among obese patients between 2015 and 2019 at Providence Sacred Heart Medical Center (PSHMC) and Providence Holy Family (PHFH), identifying independent risk factors associated with prolonged induction and desaturation events. We will be reporting our preliminary findings.

A 7 [Use of Intravenous Tranexamic Acid in Adult Patients Undergoing Spinal Surgery at Providence Sacred Heart Medical Center: An Evidence Based Quality Improvement Project](#)

Brimhall, Jared; Wenz, Shelley; Solano, Fern; Bushnell, Trevor – *Gonzaga University*

Abstract: In clinical practice we notice that tranexamic acid (TXA) is not used prophylactically in spine cases. We went to the research evidence and learned that there is clear evidence and learned that there is clear evidence suggesting that the use of TXA prophylactically in spine cases, especially multilevel, can decrease blood loss, decrease the need for blood transfusions, and decrease the patients' length of stay. Therefore, this evidence-based practice project aims to evaluate the use of TXA or the prevalence of blood transfusions and impact on length of stay at Providence.

A 8 [Perioperative Administration of Dexmedetomidine](#)

Cleminson, Abby; Shor, Christopher – *Gonzaga University*

Abstract: Emergence agitation (EA) is a transient dissociated state of consciousness occurring in 10% - 30% of pediatric patients after undergoing general anesthesia. Although it is a short-lived cluster of perceptual and psychomotor disturbing behaviors it can increase the risk of self-injury, additional medication administration, and longer recovery room stay. Anesthesia providers are an integral part in preventing emergence agitation and improving outcomes in pediatric patients. The purpose of this evidence-based practice project was to inform anesthesia providers of current care processes related to implementation rates, type, timing, and independent risk factors of intraoperative dexmedetomidine administration and the recovery quality of pediatric patients at Providence Sacred Heart Medical Center (PSHMC).

A 9 [A multicenter observational evaluation on the use of sugammadex in high-risk patients who develop post-operative pulmonary complications.](#)

Johanson, Brock; Orth, Ben – *Gonzaga University*

Abstract: Sugammadex is a newer NMB reversal agent that has shown to offer a quicker, more complete NMB reversal, lower risk of adverse events, shorter PACU time, lower risk of postoperative pulmonary complications (PPC), and lower risk of postoperative respiratory failure as compared to neostigmine. The American Society of Anesthesiologist (2023) now recommends the use of Sugammadex for the reversal of low, moderate, and high neuromuscular blockade. This portion of the project will contain the preliminary findings or our project.

A 10 [The influence of Peripheral Nerve Blocks on Pain Management in Cardiac Surgery: A Multi-Center Evidence-Based Practice Project](#)

Hebert, Christina; Kylo, Natalie; Nimri, Emily – *Gonzaga University*

Abstract: In their first expert-consensus review, the Enhanced Recovery After Surgery (ERAS) Cardiac Society published an article outlining several preoperative, intraoperative, and postoperative strategies to improve patient outcomes and cost savings (Engelman et al. 2019). Despite the negative side effects of opioids, they are often the drug of choice to control post-sternotomy pain. Engelman et al. (2019) emphasizes the importance of multimodal pain management strategies to reduce opioid consumption as well as opioid-reduced anesthesia strategies to promote early extubation.

After an extensive review of the highest level of the research evidence concerning the primary outcome of opioid reduction and peripheral nerve block use in cardiac surgery, 14 were included for full review. The overall level and quality of evidence ranged from IA-IIA. The research evidence demonstrated the use of several blocks including the transversus thoracic muscle plane block (TTPB), pectoralis nerve block (PNB) pecto-intercostal fascial plane block (PIFB), erector spinae plane block (ESPB), and paravertebral block (PVB). The primary objective of this clinical inquiry project is to describe anesthetic practice in cardiac surgery patients at Providence facilities.

A 11 [The Effectiveness of Model, Lead, Test Procedure on Teaching Rational Counting to a Four-Year-Old Male Student in an Inclusive Preschool Setting](#)

Busch, Emily; Bender, Kelly – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effects of the model, lead, test intervention on the ability to rationally count by a typical developing, four-year-old male in an inclusive preschool classroom setting. The dependent variable was the highest correctly rationally counted number with two seconds per count. Frequency recording was utilized to track data within a changing criterion design. The independent variable, model, lead,

test, included the researcher presenting counting chips and modeling the rational counting sequence. The same sequence was lead with the participant, and finally the participant was tested independently. The participant increased his rational counting to ten, showing model, lead, test as an effective strategy to teach rational counting.

A 12 [Effectiveness of Direct Instruction Rote Counting Format and Error Correction Procedure on Teaching Rote Counting to a Four-Year-Old Male with a Developmental Delay within an Inclusive Preschool Environment](#)

Busch, Emily – *Gonzaga University*

Abstract: The purpose was to evaluate the effects of Direct Instruction Mathematics Rote Counting Procedure on the acquisition of rote counting by a four-year-old male with a developmental delay in an inclusive preschool environment. The participant was a four-year-old male diagnosed with a developmental delay who was having difficulty learning to count. The dependent variable was rote counting when the participant verbally expressed the numbers in the correct sequence without additions or omissions within 1.5 seconds of the previous count during the 30-second timing. A changing criterion design was used to evaluate the effectiveness of the counting procedure. The intervention included a Direct Instruction Mathematics Counting Procedure teaching procedure and a model, lead, test error correction. The teaching procedure focused on counting the new part with repeated trials, then embedding the new part in the full counting sequence. Also, a model, lead, test procedure was used with the researcher modeling the counting segment, then leading the participant, and instructing the participant to count independently. The study found Direct Instruction to be a highly effective method of teaching a young participant with a developmental delay how to rote count to 15. This success can be attributed to repeated trials and systematic review of previous counting sequences.

A 13 [The Effects of a Fading Prompt and Errorless Learning Procedure on Responding to Name by a Child with Autism Spectrum Disorder in an Applied Behavior Analysis Clinic](#)

Alderman, Taylor – *Gonzaga University*

Abstract: The purpose of the study was to evaluate the effects of an errorless learning, prompt-fading procedure on the ability of a six-year-old male with Trisomy 21 and autism spectrum disorder to respond to his own name in an applied behavior analysis clinic. The dependent variable was the ability of the participant to respond to his name by making eye contact or orienting his head toward the researcher when his name was called. Event recording data collection was monitored using a changing criterion design. Intervention was split into two fading-prompt phases: prompting with reinforcer and independent. The fading-prompt procedure began with the most intensive prompting level, which was physical prompting with a reinforcer present and then faded to independent responses. Before each of these sessions, errorless learning intervention was used by calling the participant's name paired with the reinforcer present and physical prompting right away in the antecedent, without waiting for an independent response. After 7 sessions of intervention, the participant reached mastery in the prompting with reinforcer phase. The results of this study indicate that errorless learning and a most-to-least fading prompt procedure can be used to teach respond-to-name skills to children with autism spectrum disorder.

A 14 [The Effects of a Response Cost Procedure on On-Task Behaviors by a Third-Grade Female with a Specific Learning Disability in a Resource Room](#)

Bolma, Karianne – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effects of a response cost procedure using stickers to increase on-task behavior of third-grade female with a specific learning disability in an elementary school resource classroom during math instruction. The participant was an eight-year-old with a language disorder who received services in a resource room. The dependent variable was on-task behaviors defined as following instructions and remaining seated. Partial interval recording system assessed the on-task behavior in 30-second intervals. The experimental design implemented was an ABABC reversal design where the intervention was presented, then removed, re-implemented, then faded. The intervention strategy was a response cost procedure using stickers. At the session's start, five stickers were presented. If the participant engaged in an off-task behavior, a sticker was removed. The participant kept any stickers earned or leftover. The results were effective in increasing the

number of on-task behaviors in intervention and fading phases. The study demonstrated response cost as an effective method for increasing motivation and on-task behavior to do well in school for the participant.

A 15 [The Effects of Shaping and Fading Prompts on Imitating Song Actions by a Two-Year-Old Male with Autism in a Clinical Setting](#)

Ford, Madeline – *Gonzaga University*

Abstract: The purpose of the present study was to evaluate the effects of shaping and fading prompts on the mastery of imitation by a two-year-old male with autism spectrum disorder diagnosis in a clinical setting. The researcher conducted a one-on-one intervention with event recording assessing the participant's ability to imitate an action when singing an action song. A changing criterion design was used to evaluate the effectiveness of shaping and fading teaching strategies to teach imitation in the song, "Head, Shoulders, Knees and Toes." During intervention, based on the participant's response, the researcher used praise, modeling, and prompting to guide the participant. Focusing on one action at a time, the researcher taught the steps to complete the action without the song and then taught the participant to imitate the action in the song. The study found the shaping and fading procedures as effective methods to teach imitation two criterion levels to an individual with an autism spectrum disorder diagnosis in a clinic setting.

A 16 [The Effects of Most to Least Prompting on Hand Waving by a Five-Year-Old Boy with Multiple Disabilities in a Self-Contained Special Education Classroom](#)

Gemmet, Maddie – *Gonzaga University*

Abstract: The purpose of the study was to teach the social communication skill of hand waving to a five-year-old boy with multiple disabilities in an elementary special education classroom with a most to least prompting strategy. The participant was a kindergarten student with Mosaic Chromosome 18q deletion syndrome and autism spectrum disorder who was attending school in an elementary self-contained special education classroom. He lacked communication skills including hand waving. The dependent variable of the study was the participant's hand waving and him beginning the behavior three seconds after the instruction and completing the response within 5 seconds. Hand waving was separated into four steps. An event recording system within a changing criterion design assessed the hand waving steps. Most to least prompting gave various levels of support to the target behavior and shaped the skill to an independence response. The procedure allowed the participant to engage in direct, repeated practice of the skill with a prompt hierarchy across the four skill steps. The study was successful in teaching the hand waving skill from 0 to 67% of the 80% goal. Most to least prompting can be used to teach hand waving and other communication skills to young children with disabilities.

A 17 [The Effectiveness of a Token Economy System on Off-Task Behavior of a Tenth Grade Male with ADHD in a High School Classroom](#)

Halbo, Rachel; Henry, Matt – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effectiveness of a token economy system on off-task behavior by a 10th grade participant with ADHD in a general education high school English class. The participant was a sixteen-year-old male with ADHD who exhibited high levels of off-task behaviors. For this study, off-task was defined as use of phone, smart watch, and computer that did not relate to his school activities. A partial interval recording system measured off-task behaviors in sessions of 10 minutes, with 15-second intervals. An ABAB reversal design was implemented, with A being baseline and B being intervention. A token economy where the participant was awarded a tally for each minute he displayed on-task behavior during a 10-minute session was implemented. If the participant was off-task during a given minute, he would receive an X and not receive a tally. The participant could turn in 10 tallies for candy. The participant's off-task behavior was minimized by the implementation of a token economy to near-zero levels. A token economy was a successful form of intervention for off-task behavior for a high school student with ADHD in a classroom setting.

A 18 [Examining the Effects of a Model, Lead, Test Procedure and Targeted Intervention Worksheets on Solving of Two-Step Algebraic Problems by Two Participants with Disabilities in a Middle School Classroom](#)

Holloway, Lucille; Newson, Jazmine – *Gonzaga University*

Abstract: The purpose of this study was to assess the effectiveness of a model, lead, test procedure on solving two-step algebraic equations by two eighth grade students in a general education inclusion classroom. Participant 1 was a thirteen-year-old boy diagnosed with ADHD. Participant 2 was a fourteen-year-old girl diagnosed with a specific learning disability (SLD) and dyslexia. The dependent variable for this study was correctly answered two-step algebraic math problems. Permanent product assessed nine problems divided into three sections based on problem type. A multiple baseline design was used to examine performance across three algebra problem levels: adjacent element multiplication, one-step algebra, and two-step algebra. Guided worksheets were prepared with vocabulary and structured steps to solve that tier's problem type. During the intervention, the researchers followed a model, lead, test format to give guided practice. First, the participants were shown a model to solve the problem type. Then, they were guided through solving example problems. Finally, the participants independently practiced while the researchers monitored the responding. Praise and candy rewarded the participants for participating. Both participants resulted in mastery across all three tiers or problem types showing completion of two-step algebra problems.

A 19 [The Effects of Direct Instruction to Increase Independently Skill Completion of an Adaptive Task by a High School Student with Autism Spectrum Disorder in a High School Self-Contained Classroom](#)

McElroy, Maddy – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effects of Direct Instruction, in conjunction with a model, lead, test correction procedure, on completing adaptive tasks. The participant was a 19-year-old male diagnosed with autism spectrum disorder in a special education self-contained high school classroom. This adaptive task used picture cards to teach vocational skills, including how to complete orders accurately. The dependent variable was the number of correctly completed sets of picture cards representing the adaptive tasks: a pizza lunch and a morning breakfast. Event recording assessed each task's component as independent or not. If all components were completed independently, the task earned one completed set. A changing criterion evaluated each task separately. To teach, the interventions of Direct Instruction and a model, lead, test procedure were implemented. Positive reinforcement was provided to the participant for participation and independently completed task sets. He received a point for each set and then exchanged points for a reward. For both tasks, the participant significantly increased the number of correctly and independently completed task sets. This study found that Direct Instruction and a model, lead, test procedure was a practical, time efficient, and inexpensive way to increase a participant's vocational skills.

A 20 [The Effectiveness of Guided Practice on Teaching Change-Giving by an Adolescent with Autism in a Self-Contained Special Education Classroom](#)

Moreno, Nicole; Ung, Kimberlee – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effectiveness of a Guided Practice strategy utilizing a graphic organizer placemat on the beginning change-giving skill by a thirteen-year-old male with autism in a self-contained special education classroom. The participant was a thirteen-year-old male with autism who needed to learn life math skills, such as change-giving. The dependent variable in this study was the number of problems the correct change was given by the participant. Event recording within a changing criterion design was used to evaluate the effectiveness of the Guided Practice procedure and graphic organizer. The Guided Practice intervention started with the researchers modeling the giving-change steps. Then, the researchers guided his performance by reducing prompting levels to independent responding. A placemat graphic organizer was structured to facilitate the problem-solving steps and provided a physical arrangement for the money. The results showed that Guided Practice was effective in teaching the participant to correctly solved change-giving problems by reaching mastery in all criterion levels. This study showed that Guided Practice combined with a graphic organizer placemat can be effective in teaching giving change money skills to individuals with autism.

A 21 [The Effectiveness of a Prompt Fading Intervention on Scissor Cutting Skills by Two Preschool Students in an Inclusive Preschool](#)

Morris, Hailey; Vial, Hannah – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effectiveness of a prompt fading intervention on cutting skills among two preschool students in an inclusive preschool classroom.

One participant was a four-year-old male with an intellectual disability, and the other one was a three-year-old female who was typical developing. Both lacked the ability to use scissors and cut lines. The dependent variable being measured was cutting three lines (straight, zigzag, and curvy). Permanent product assessed each line type individually across a multiple baseline design. A most-to-least prompt fading intervention was implemented focusing on one line type at a time. The prompting levels from most to least were hand-over-hand help, partial physical prompt, modeling, gestural prompt, verbal prompt, and independence. Prompting began with the most intrusive and faded based on the participant's cutting performance. Results showed that a prompt fading procedure was effective for developing scissor cutting skills across both participants.

A 22 [The Effects of a Token System on Blur-Outs During Teacher Instruction by a 17-Year-Old Female with Autism in a High School Special Education Resource Classroom](#)

Navarro, Gabi – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effects of a token system on the inappropriate behavior of blurting out during teacher instruction by a 17-year-old female with autism in a sophomore English special education resource room. The participant was a 17-year-old female with autism who exhibited high levels of classroom disruptive behaviors like blurting out. The setting was the participant's special education resource classroom that focused on English. The dependent variable was the number of occurrences of blurts-outs during teacher instruction. Event recording tallied the total number of times that the participant blurted out within a 12-minute session during class time. A reversal design was used to assess the intervention's effectiveness. The token system began by giving the participant a card with no blurts-outs on it as a reminder to stay quiet. Every four minutes was assessed. If no blurts-outs occurred, a sticky note was put on the participant's desk. If any blurts-outs occurred, the researcher tapped the no blurt out desk card. For each sticky note earned, the participant received a leveled reward. The token system was effective in reducing the number of blurts-outs to zero.

A 23 [The Effects of Direct Instruction Flashcards to Increase Basic Addition Math Fact Fluency by a Fourth Grade Student with a Specific Learning Disability in an Elementary Resource Room](#)

Navarro, Gabi – *Gonzaga University*

Abstract: The purpose of this study was to test the effectiveness of the Direct Instruction Flashcard instruction on increasing fluency of basic addition facts. The participant was an eight-year-old female in the fourth grade with a Specific Learning Disability. The setting was an intermediate elementary resource room in a Title 1 elementary school. The study took place once a day for six weeks. The dependent variable was correctly said basic addition facts within 20. Event recording assessed if the participant said the correct answer to the addition fact during a 45-second timing. The experimental design used was a changing criterion with three goals of intervention. The Direct Instruction Flashcard procedure used a set of 25 teaching cards embedding 5 target facts and 20 mastered facts to promote discrimination and retention. Each fact was tested individually. If correct, praise was given. If incorrect, that fact was modeled and tested as a correction. The results of the study showed that Direct Instruction Flashcards was an effective strategy to increase fluency of basic addition facts across three sets of math facts.

A 24 [The Effects of a Model-Lead-Test Teaching Procedure Supplemented with Color-Coded Vowel Sounds on Sight Words by a Four-Year-Old Student in a Preschool](#)

Vial, Hannah – *Gonzaga University*

Abstract: The purpose was to determine the effects of a model-lead-test procedure with color-coded vowel sounds on ten high-frequency sight words by a four-year-old typically developing male in a private early learning center. The participant was a four-year-old male who performed higher than his peers at the learning center, so he was chosen for this study to challenge him to learn sight words. The dependent variable was correctly read sight words within three seconds of presentation. Event recording within a changing criterion design assessed the number of correctly read sight words. The model-lead-test with color-coded vowel sounds was used for teaching. The first five words were grouped with a short /u/ sound and coded with blue vowels. The second five words were grouped with a short /a/ sound and coded with red vowels. During intervention, the researcher first showed

a flashcard and told the participant the color represented the specific sound. Then, the researcher proceeded with the model-lead-test procedure. The researcher modeled the correct sound, led by asking the participant to say it together, and then tested the participant to say it independently. These steps were repeated with the word. The results showed mastery in both the intervention and maintenance phases.

A 25 [The Effect of Using a Model, Lead, Test Strategy to Increase Sight Word Recognition in a Fourth Grade Student with a Specific Learning Disability in a Resource Room](#)

West, Emma – *Gonzaga University*

Abstract: The purpose of the study was to show the effects of a Model, Lead, Test strategy to improve sight word recognition by a fourth-grade female with a specific learning disability in an elementary school resource room. The participant was a ten-year-old female in the fourth grade that qualified for special education services with a specific learning disability. The study took place in a resource room at a public elementary school. For the dependent variable, the participant had to verbally say correct sight words which was assessed using event recording system. A changing criterion design was used to evaluate the Model, Lead, Test (MLT) strategy. The intervention was MLT, in which the researcher modeled the word, then instructed the participant to say it with the researcher, then just the participant said the word. Results showed an increase in the amount of correct sight words to a mastery level in the intervention phase which was also maintained. The conclusion is that the project was successful in sight words acquisition.

A 26 [The Use of a Reward System on Decreasing Off-Task Behavior by a Tenth Grade Girl with an Intellectual Disability in a Family Consumer Science Room](#)

West, Emma; Nation, Alivia – *Gonzaga University*

Abstract: The purpose of this study was to evaluate the effects of a reward system to decrease the number of off-task counts by a fourteen-year-old female with an intellectual disability in a high school class. The participant was a fourteen-year-old female high school student who was diagnosed with an intellectual disability and engaged in high levels of off-task behaviors during her family consumer science class. The dependent variables were the amount of times her head was down and eyes were not on the teacher. A partial interval recording system was used to measure behavior. The design was a reversal design to evaluate the effectiveness of a reward system. The reward system included the participant earning a tic tac if her head and eyes were up for four out of five intervals during one session. One point could be earned every 30 seconds during the 10-minute sessions. The results showed a decrease in the amount that the participant engaged in off-task behaviors of head down and eyes not on the teacher during intervention.

A 27 [The Effectiveness of Direct Instruction Flashcards on Sight Word Recognition by a High School Male with Learning Disability in a Special Education Resource Room](#)

Neuman, Savanna – *Gonzaga University*

Abstract: The purpose of the present study was to evaluate the effects of Direct Instruction Flashcards on sight words by a fifteen-year-old boy with a learning disability in a tenth-grade special education resource classroom. The participant was a fifteen-year-old male with a learning disability who knew 73 out of 150 sight words. The dependent variable was the correct number of sight words read. For a correct response, the participant would correctly read the presented sight word out loud in under three seconds. Event recording was used to record the performance on nine sight words. A multiple baseline was the design across 3 sets of sight words. Direct Instruction Flashcards used repeated practice to teach sight words. A correct was rewarded with praise, while an error was corrected with a model, lead test correction procedure. The Direct Instruction Flashcard system was successful in teaching all three sets of three sight words to 100%.

A 28 [Prevalence of Microplastics in Wetland Ecosystems: Transfer from Freshwater to Bat Colonies?](#)

Gashi, Emma (*she/her*) – *Gonzaga University*

Abstract: Falls and falling are the most common reason for older adults and individuals with mobility impairments to transition from their homes to long-term care. Objects which pose tripping hazards significantly contribute to falls both inside and outside the home. Individuals navigating through these environments, especially those with

visual impairments, may not notice unexpected, misplaced, or cluttered items which greatly increase the risk of falls and personal harm. To help design and evaluate new technologies to enable these groups to recognize and avoid these common falls, the HazARd research project utilizes Microsoft HoloLens Augmented Reality (AR) technology to notify the user of potential hazards and safety issues in their living space. Prior work includes the design of AR-based visual notifications for the user, while this work extends the tools to model user understanding of possible hazards. It uses a combination of eye-tracking gaze detection and hand gesture tracking to determine when the user has acknowledged a given AR-based notification and its corresponding hazard so the notification can be dismissed. This system has been implemented and tested with an early group of users to compare their preferences of acknowledgement systems and evaluate the systems' effectiveness in real-world situations.

A 29 Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults

Edmondson, Avery (*he/him*) – *Gonzaga University*

Abstract: Falls and falling are the most common reason for older adults and individuals with mobility impairments to transition from their homes to long-term care. Objects which pose tripping hazards significantly contribute to falls both inside and outside the home. Individuals navigating through these environments, especially those with visual impairments, may not notice unexpected, misplaced, or cluttered items which greatly increase the risk of falls and personal harm. To help design and evaluate new technologies to enable these groups to recognize and avoid these common falls, the HazARd research project utilizes Microsoft HoloLens Augmented Reality (AR) technology to notify the user of potential hazards and safety issues in their living space. Prior work includes the design of AR-based visual notifications for the user, while this work extends the tools to model user understanding of possible hazards. It uses a combination of eye-tracking gaze detection and hand gesture tracking to determine when the user has acknowledged a given AR-based notification and its corresponding hazard so the notification can be dismissed. This system has been implemented and tested with an early group of users to compare their preferences of acknowledgement systems and evaluate the systems' effectiveness in real-world situations.

Session B (11:30-12:30pm)

B 1 Accurately Estimating Shrub Height Using Unoccupied Aerial Vehicle Imagery

Fenske, Marie; Moore, Malachi; Halma, Sophie – *Whitworth University*

Abstract: Determining shrub height and cover is valuable for assessing the health of shrub-steppe habitat in the Western US because many native species depend on shrubs for forage and shelter. Specifically, in Lincoln County, WA, greater sage-grouse (*Centrocercus urophasianus*) and sharp-tailed grouse (*Tympanuchus phasianellus*) are among these species. In September 2020, the Whitney Fire burned over 125,000 acres of sagebrush steppe south of Davenport, WA, removing much of the shrub cover. The height of the shrub regrowth should be known in order to better manage and protect these bird's populations. To assess shrub height across the site, an Unoccupied Aerial Vehicle (UAV) was flown with two passes over a study site at 120 m altitude to capture imagery of shrub heights. The software Pix4D Mapper was used to generate 3D models of the area in order to identify shrubs and estimate individual shrub heights which were compared to field data collected for a sample of shrubs in the coverage area. It is expected that shrub height estimates will be within 20 cm accuracy with measured shrubs. We do not expect the current post-fire shrub regrowth to be suitable for the reintroduction of the greater sage-grouse or the sharp-tailed grouse at this time.

B 2 Emergence timing impacts trait variation in showy milkweed (*Asclepias speciosa*) seedlings across ontogenetic stages

Dallabetta, Abby (*she/her*) – *Whitworth University*

Abstract: Intraspecific trait variation in plants is important for population and community diversity. Ontogenetic variation, which is variation in traits as plants move through developmental stages, is a major component of this intraspecific trait variation. However, not all plants reach the same ontogenetic stage at the same time or in the same way. In this experiment, we tested whether the timing of plant emergence affected trait variation throughout seedling ontogeny. We found that timing of prior life history events (emergence) may lead to trait

differences even among plants at the same ontogenetic stage. Late-emergers may catch up with early-emergers in terms of ontogenetic stage, but they are still lacking in height, leaf mass, and stem mass by comparison. Late-emergers therefore likely have lower competitive ability even at the same ontogenetic stage.

B 3 Studying three universal essential genes with functions in nuclear & nucleolar DNA repair

Alcaraz, Matthew (*he/him*) – Gonzaga University

Abstract: Human Universal Essential (hUE) genes are genes required for viability in all human cells. These genes are typically involved in key cellular processes such as DNA repair, gene expression, and metabolism. For our research, we selected three hUE genes: C1ORF109, SPATA5 and SPATA5L1 because they have been identified to have potential physical interactions between them and their function is largely unknown. C1ORF109 overproduction was previously shown to induce DNA damage. Here we extend those findings by showing that C1ORF109 localizes to the periphery of the nucleolus after induction of damage using a nucleolar-specific endonuclease. The nucleolus is a structure within the nucleus where ribosomes are first assembled and has been associated with the response to stress. Nucleolar caps are specialized structures formed at the periphery of the nucleolus that are thought to be involved specifically in the repair of rDNA. To further understand this change in C1ORF109 localization, we used a nucleolar-specific endonuclease to test whether DNA damage that occurs specifically at the rDNA can trigger C1ORF109 recruitment to the nucleolar caps. These results indicate these genes are involved in the DNA damage response specifically in the nucleolus and might have implications for understanding DNA repair and cancer development.

B 4 ZNF16: potential roles in rRNA transcription, gene expression, and cancer

LeBlanc, Lillian (*she/her*) – Gonzaga University

Abstract: ZNF16 is a zinc finger protein that has previously been shown to contain a transactivation domain and regulate differentiation of blood cells. However, ZNF16 is also expressed in non-hematopoietic cells and its role in these cells has not been explored. Previous results from our group show that ZNF16 is localized to the nucleus and nucleolus. Based on its location within the nucleolus of cells, we hypothesized that ZNF16 may regulate transcription of rRNA within human cells. Additionally, due to its reported role as a transcription factor, we hypothesized that ZNF16 might regulate the expression of other genes in non-hematopoietic cells. In order to test a potential role for ZNF16 in rRNA transcription, ZNF16 was knocked down using siRNAs and rRNA was identified by immunostaining and the fluorescence was quantified in ImageJ. To investigate the role of ZNF16 in expression of other genes, RNAseq was performed after ZNF16 depletion to identify potential ZNF16 targets. To confirm if these genes are bona fide ZNF16 targets, qPCR was run following knockdown of ZNF16 via siRNAs. Additionally, an exploratory analysis of cancer genomics data in cBioPortal revealed that ZNF16 is amplified in several cancer types.

B 5 Exploring an Extremely Large Protein in Bacteriophage

Brady, Alexis – Gonzaga University

Abstract: Bacteriophages are the most abundant biological agent on the earth. The focus of this study is phage, PineapplePluto. This phage has an abnormally giant protein of 4488 amino acids, weighing 496,258 Da, one of the largest proteins found in any phage or prokaryotic organism. The main objective was to focus on the function of this large protein, other phage's large proteins, and if there is any homology of regions or subregions of the large protein gene and polypeptide. To achieve this, many databases were used to determine how similar the proteins and genes were to each other and where any major differences occurred. We wanted to determine the protein function and any similarities. NCBI BLAST database was used as a bioinformatic tool but no significant results arose. We then wanted to look at structural similarities to find if any similar structures could provide a relevant function. HHPRED was used to determine structural prediction and homology detection, but no relevant result for structural similarity of the protein was found. Then, we wanted to compare the protein sequence alignment to observe other genes that also share a large protein. The Clustal Analysis program was used to review any alignment similarity amongst the gene sequences. Finally, we wanted to determine whether the protein had more synonymous mutations or more nonsynonymous mutations and to understand whether the protein was under purifying or divergent selection. A Ka/Ks calculator was used to test the large protein gene found that

PineapplePluto's gene sequence has proportionally more synonymous mutations, indicating the large protein is under a purifying selection. Based on similarities seen in the GAG/POL protein of HIV, the ORF1ab proteins of Coronaviruses, and the entire open reading frame of Polio, our working hypothesis is the large protein is a type of polyprotein.

B 6 [Frequency and Cost of Inbreeding in the Acorn Woodpecker](#)

Borders, Arden (*she/her/hers*); Smith, Sarah (*she/her/hers*) – *Gonzaga University*

Abstract: In *The Origin of Species*, Charles Darwin states that all species have incest avoidance (Darwin, 1859). Insect avoidance is the avoidance of mating with first-degree relatives (e.g., parent or sibling). Acorn Woodpeckers have a highly complex social system of cooperative polygynandry (Koenig, et al., 2016), which is a breeding system where offspring from previous breeding attempts remain on the territory as non-reproductive helpers, and two or more individuals of both sexes compete to breed in a social group (Koenig, et al., 2016). Incestuous breeding is usually avoided due to social group formation and structure. Normally when breeders of one sex have disappeared or died (a breeding vacancy), the breeding positions are filled by (unrelated) individuals from another social group. However, in some cases, the replacement does not take place, or it is filled by related individuals, yet the group still produces offspring (presumably incestuously). Birds that were presumably produced incestuously were studied to determine the net fitness costs and frequency of incestuous breeding in Acorn Woodpeckers. Genotypes for ~15 microsatellite loci were obtained from DNA extracted from blood samples for all members of each social group. Parentage of each offspring was determined and cases of incest were confirmed. We compared the lifespan and reproductive success of the offspring produced by incest to offspring produced by parents that were nonrelatives to evaluate the fitness costs of incestuous breeding.

B 7 [Examining the relationship of eye and body orientation during path integration in the Atlantic Sand Fiddler Crab \(*Uca pugilator*\)](#)

Oakes, Joy (*she/her/hers*) – *Gonzaga University*

Abstract: Navigational mechanisms have evolved to best suit animals in the environment that they live in. The ability to orient and navigate in space allows animals to return to an original location after carrying out essential tasks, such as feeding. One type of navigation mechanism is path integration, when an animal continually computes and stores the distance and direction of its movements in memory as a home vector. One animal known to exclusively use path integration for navigation is the Atlantic Sand fiddler crab (*Uca pugilator*). A poorly understood aspect of path integration is the storage of the home vector in memory. It's been speculated that the body holds the information required to compute the home vector. However, crabs that are misaligned to their burrow are still able to successfully return home, indicating that there is something more than the body orientation involved in path integration. We hypothesize that eye orientation allows the crab to remember the angle between their current position and the direction of their home. It is expected that eye orientation will serve as a better predictor of homing success in comparison to body orientation. Therefore, the relationship between homing error with eye and body orientation was examined.

B 8 [Peripheral blood smear is an effective technique for analyzing *Strongylus vulgaris* infection in Clydesdale horses.](#)

Quinn, Sarah; Jordan, Quinlan; Grant, Christian – *Whitworth University*

Abstract: *Strongylus vulgaris* is a parasite found in Equines which causes serious health problems. Anthelmintics are a class of drugs used to eliminate *Strongylus vulgaris* from the GI systems of Equines. One strategy to improve treatment efficacy of anthelmintics without causing resistance is to only treat horses with high fecal egg counts. Previous studies have found wide variability between individuals, which has made the fecal egg counting (FEC) method unreliable for determining an accurate estimation of the parasitic infection. Another possible method for determining parasitic infection in equines is to perform eosinophil counts. Studies have shown that eosinophils react to intestinal parasites, so increase in eosinophil counts may be used to determine the relative number of intestinal parasites. In this research, fecal egg counts were compared using fecal floats to eosinophil counts using peripheral blood smears of purebred Clydesdales before and after anthelmintic treatment. Eosinophil counts consistently decreased after treatment ($p < 0.05$) while fecal egg counts exhibited decreased counts less consistently ($p > 0.05$). These data demonstrate the effectiveness of using eosinophil counts to determine

Strongylus vulgaris infection. Another benefit of using eosinophil counts is increased accuracy of identifying individual samples without the invasiveness of collecting fecal samples.

B 9 Greater Intestinal Nematode Parasite Load in the Fecal Material of Pregnant *Equus caballus* May be a Sign of Immunosuppression; Similar Effects Do Not Occur When Nursing

Burton, Abby (*she/her*); Hannah Neuberger (*she/her*); Amanjot Kaur (*she/her*) – *Whitworth University*

Abstract: In this experiment, we reviewed how the immunological response during pregnancy affects endoparasites within the intestine of pregnant miniature horse mares (*Equus caballus*). We also evaluated if a similar response occurs within nursing mares. To assess this, we performed fecal egg flotations using Sheather's solution on pregnant, nursing, and nonbred mares. Substantially greater parasitic egg counts were found in the fecal material of pregnant mares compared to the non-pregnant mares, while the nursing mares showed no substantial difference. This supports the hypothesis that pregnant mares are more susceptible to intestinal parasites possibly due to a suppressed immune system which occurs during pregnancy.

B 10 Rhinoceros Beetles Carry Informational Chemicals About Body Size and Sex

Bell, Micah (*he/him*) – *Gonzaga University*

Abstract: Japanese rhinoceros beetle (*Trypoxylus Dichotomus*) males feature large, exaggerated horns that are used to compete for territories. Larger males with larger horns often win these competitions. Agonistic interactions often include what appears to be assessment and end without escalating to physical combat. However, it is unknown how competitors may be able to assess each other. Social interactions between animals require communication of information to make decisions. In many insect species chemical signals can carry a range of information, including social position, nutritional state, morphology, and sex. Specifically, cuticular hydrocarbons (CHCs), which are waxes excreted on the surface, are responsible for diverse forms of chemical communication. We asked whether CHCs in rhinoceros beetles carry information about sex and body size and could therefore explain assessment behavior. The composition of cuticular hydrocarbons of male and female Japanese rhinoceros beetles were analyzed. Multivariate analysis of hydrocarbon composition reveal patterns associated with both sex and body size. We suggest that Rhinoceros beetles could be communicating information through CHCs that would explain behavioral decisions.

B 11 Per and Polyfluoroalkyl Substances Outreach and Education

Bateman, Garrick (*he/him*); Driml, Zoe (*she/her*); Noto, Lily (*she/her*) – *Gonzaga University*

Abstract: Per and polyfluorinated alkyl substances are a group of synthetic chemicals used in non-stick coatings and firefighting foams for aircraft. PFAS accumulates in hotspots around industry-oriented communities, impacting working class citizens. While posing significant consequences for human health, these substances are still not regulated contaminants under the Safe Drinking Water Act. Well-water in Airway Heights (Spokane County, WA, USA) has been significantly impacted by PFAS contamination due to its proximity to the Fairchild Airforce Base and is currently receiving water from the Spokane Aquifer under emergency water order. We have designed three distinct, hands-on NGSS-aligned curricula for elementary schools, middle schools, and high schools to educate students in Airways Heights about the importance of water quality, water filtration, and the history of PFAS in the region. By teaching students about water quality issues in their community, we increase the involvement of tomorrow's community leaders by asking them to think critically about the intersection between pollution and politics. We will measure students' learning through surveys asking them to recall information from the lesson. Further studies should investigate longevity of the learning and how students' attitudes about environmental issues evolve.

B 12 Beaver dam analogs have positive effects on macroinvertebrate biodiversity

Swyers, Kate (*she/her/hers*) – *Gonzaga University*

Abstract: Beavers are often considered ecosystem engineers due to their construction of beaver dams. These dams play an important role in slowing the velocity of water, creating diverse environments for plants and macro-organisms to thrive in. However, reintroduction of beavers is not always possible due to the complex relationship between humans and beavers. Instead, beaver dam analogs (BDAs) can be built to simulate some of the same

impacts as natural beaver dams. Our objective was to test the effects of a series of BDAs on biodiversity of macroinvertebrates on a local river, Thompson Creek. We used activity traps to collect 3 samples at each of the 3 main BDAs installed. We collected 3 samples upstream of all the BDAs in order to compare diversity between the different locations. This procedure was completed three times over a nine-month period. We hypothesized that there will be more macroinvertebrates present from the samples collected at each of the beaver dam analogs compared to the samples collected upstream of the beaver dam analogs and that BDAs will have a positive impact on gamma diversity. The results of this experiment will provide more information on the effect of beaver dam analogs on biodiversity in an ecosystem.

B 13 Addressing Extreme Heat Events in Spokane, Washington

Gashi, Emma (*she/her*); Brown, Benjamin (*He/him*); Phelps, Emily (*she/her*) – Gonzaga University

Abstract: An often-cited impact of climate change has been increasing frequency and severity of extreme weather events. In the United States, the deadliest weather event in recent years has been extreme heat events, killing over 600 each year. Extreme heat events are exacerbated in developed areas, creating urban heat islands (UHI). After the 2021 Pacific Northwest Heat Dome killed 20 Spokane residents, The Gonzaga University Center for Climate, Society, and the Environment created Spokane UHI maps in Summer 2022, an 1800-resondant extreme heat survey in Fall 2022, and a public health preparedness campaign for Summer 2023. Our objective was to translate research findings into flexible, comprehensive education tools to help Spokane organizations, community members, and leaders alike prepare for extreme heat. We developed a Meeting-in-a-Box, a modular presentation tool to tailor extreme heat education for specific audiences, and an ArcGIS story map that allows the community to interact with research findings in the context of other social, environmental, and economic factors. The success of our project may be measured by a decrease in heat-related deaths and illnesses, and by increasing community understanding and resources available of how to stay safe in extreme heat.

B 14 Effects of Microplastics in Zooplankton and Macroinvertebrate Communities

Palacio, Kaitlyn (*she/her*); McRae, Gracie (*she/her*) – Gonzaga University

Abstract: Plastic pollution poses a threat to freshwater ecosystems due to its degradation into microplastics and effects on organisms and their communities. There is limited knowledge about how microplastics affect overall ecosystem functions. The aim of this research is to investigate how zooplankton and macroinvertebrate biodiversity is affected by various levels of realistic microplastic exposure and how these results might inform our understanding of how harmful microplastics could be to existing ecosystems. Zooplankton and macroinvertebrates were collected and distributed into 380 L mesocosms to simulate similar conditions to freshwater ponds. We used three levels of microplastic pollution, control (0 mp/L), intermediate (33 mp/L) and high (66 mp/L) treatment groups. The mesocosms were exposed to microplastics for 3 months and 4 subsamples were taken over the course of exposure. Zooplankton and macroinvertebrates were collected in each subsample and are being identified and counted. Water column and algae samples were taken from each tank at the conclusion of the experiment to be counted for microplastics. We hypothesize that alpha diversity and species richness will decrease among the mesocosms exposed to microplastics. The results from this study will broaden the understanding of how microplastics affect communities using ecologically realistic concentrations and materials.

B 15 Making An Impact: How Focusing on Local Conservation Protects Biodiversity, Geology, & Cultural History

Jansen, Rhea; Divelbiss, Zoë; Nellmapius, Ben (*he/him/his*); Emery, Luke – Gonzaga University

Abstract: The conservation of local natural areas is vital to the protection and acknowledgment of biodiversity, cultural history, and collective knowledge within communities. Through updating trail maps and signage within the Dishman Hills Conservation area (DHC), our project makes crucial contributions to the quality and continuation of these attributes for the Spokane area. We identified which aspects of the DHC were most important/relevant for creating our designs. The focus is on ecological, geographical, and cultural aspects of the DHC with the intention to educate the public on relationships and resources the DHC offers to the community. Research shows that benefits of protected areas not only serve the environment by preserving plant and animal biodiversity, but also increase the health and standard of living of the surrounding community. Fostering respect for environmental conservation

efforts through informative research and advocacy will provide a better understanding of why natural spaces need to be protected. The signs and acknowledgments support the effectiveness of community involvement on conservation efforts for the foreseeable future. Presenting DHC's biodiversity, cultural, and natural histories, through guided hikes and updated signs deepens the community's knowledge of the DHC, and further exemplifies the importance of continued preservation of all conservation areas.

B 16 [Assessment of Carbonated Liquid Effects on Bleeding Time and Fish Health in Gill-Injured Bluegill and Pumpkinseed Sunfish](#)

Barone, Jimmy – *Gonzaga University*

Abstract: As catch-and-release (C&R) fishing has grown in popularity, so has research on the issue of post-release mortality. Hook-related injury is the most influential factor on post-release mortality and gill bleeding is a commonly observed and severe form of hook related injury. Many posts on social media have garnered large viewership showing anglers pouring carbonated sodas over fish gills, resulting in cessation of gill bleeding and a successful release of the fish. Our goal in this research is to test if gill-injured Pumpkinseed and Bluegill survival and bleeding time is affected by the addition of carbonated beverages to the bleeding area. We hope the results of this study provide evidence-based guidance for C&R anglers, as well as broaden our understanding of the topic by testing for species-specific effects and monitoring the fish for a longer period after treatment than previous research.

B 17 [Utilizing Citizen Science for Microplastic Data Collection](#)

La Carrubba, Sarah (*she/her*); Payne, Sheridan (*she/her*); Zuniga, Joseph (*he/him*) – *Gonzaga University*

Abstract: Microplastics, defined as plastics measuring less than five millimeters in length, can be harmful to the environment and to people. Microplastics can be classified as primary and secondary, where primary microplastics are created as micro sizes, while secondary are broken down from larger pieces of plastic. Microplastics are important because they can be found everywhere in the world and have potential negative physical and chemical risks. We designed a citizen science project to collect data on how many microplastics are in Lake Arthur (Spokane, WA). As part of the citizen science project, we aim to educate members of the community on why this research is important to the overall health of the community. To test our citizen science protocol, Dr. Andrea Bertotti's Environmental Sociology class at Gonzaga University will be taught how to collect samples and then be given a brief presentation on what microplastics are and why they need to be studied. The objective of this work is to bring education to the Spokane community, starting with the volunteers who are collecting samples. Future studies should investigate exactly how microplastics impact both human and environmental health.

B 18 [Lake Arthur Renewal](#)

Hoag, Kelly; Leong, Nick; Reyes, Ana; Hollister, Anna – *Gonzaga University*

Abstract: Sense of place is a concept that encapsulates many different ways in which people form connections with the environments they occupy. This sense of place is inadequate on Gonzaga's southern campus including Lake Arthur and the Kardong Bridge that leads to downtown Spokane. Our goal is to bridge the gap between Gonzaga and the greater Spokane area as it is used by members of both communities. A sense of place makes it easier for connections to be drawn between neighboring communities. We implemented interpretive signage in order to create a sense of community since it allows for visitors to be more aware of the history and importance of their surroundings. This was achieved by working with the Berger Partnership to develop interpretive and educational signage that display historical and ecological information about Gonzaga, Lake Arthur, and the Spokane River. The signs have a QR code on them that leads to a website that provides further information. Our contribution to this project will be conducting research and writing the sign and website content. We hope that implementing this signage increases engagement and care in the southern end of Gonzaga campus and tells the story of this beautiful area.

B 19 [Relationships Matter: When Environmental Politics & Policy Fall Short](#)

Patterson, Kelly (*she, her, hers*); Richter, Hannah (*she, her, hers*); Morse, Matthew (*he, him, his*) – *Gonzaga University*

Abstract: Climate change and its impacts are growing in severity around the world. To preserve local resources, prevent further degradation, and protect human health, these issues must be addressed through legislation. However, for policy to work, it must resonate with locals and evoke collective action. Our project examines key attitudes and behaviors surrounding climate change and the public's relationship with nature. Over the past decade, Spokane has experienced a lack of support for policies addressing environmental concerns. To understand the disconnect between Spokane's environmental needs and residents' willingness to act, this study uses public outreach. We began by surveying a diverse pool of participants across Spokane and then conducted interviews with willing participants to gather more insight. Our results compare residents' values and daily habits to their concern for the environment. We believe this study is the first quantitative analysis to explore Spokane's perspectives toward nature and environmental policy. It employs community outreach to accumulate necessary data that will aid in the development of policy that citizens understand and accept. Further studies and research are needed to investigate how Spokane residents' relationships with nature can be modeled in more detail to further understand how to reconnect the community to nature.

B 20 [50 Years after Celebrating Tomorrow's Fresh New Environment: The Impact of Expo '74 on Spokane and the Spokane River.](#)

Klebeck, Lucy (*she/her/hers*); Duchesneau, Jakob (*he/him/his*); Rogers, Madeline (*she/her/hers*) – *Gonzaga University*

Abstract: The Spokane River has historically undergone major transformations, from what was once a host to millions of salmon, to a polluted afterthought of a quickly industrializing city. Now, the Spokane River is a part of the central identity of Spokane, but how did it emerge from its polluted past? In 1974, the first environmentally-themed World's Fair, commonly referred to as Expo '74, occurred in Spokane. This exposition was a turning point in the social and environmental history of Spokane and the Spokane River. 2024 will be the 50th anniversary of the fair and in preparation, we are creating a video that highlights the significance of Expo '74 and the impact that it had on the city of Spokane. We have conducted a series of interviews with community members, with the goal of including a wide range of perspectives about the river and the impact of Expo '74. The video will demonstrate the history and impacts of Expo '74, encourage members of the Spokane community to celebrate and advocate for the river, and bring awareness to the environmental and social changes that still need to happen to allow the Spokane community to connect with the river again.

B 21 [Enhancing sustainable water treatment filters for low-income communities.](#)

Luoma, Grace; Bone, Brynna – *Gonzaga University*

Abstract: Clean drinking water is lacking in San Miguel, Mexico. Their water has reached upwards of 10 mg/L of fluoride at a given time, and it is very unsafe to consume at that level, as the World Health Organization (WHO) standard is 1.5 mg/L. However, it has been found that bonechar possesses the ability to adsorb fluoride. Furthermore, research studies have shown that activating the bonechar with different chemicals will actually enhance the adsorption capacity of the char. I am interested in seeing which of these chemicals will have the best adsorption capacity, and therefore, help the community of San Miguel by enhancing their water filtration systems. This project will test the removal capacity of fluoride by activated bonechar and how fluoride breaks through bonechar filters to see which chemical shows the most improvement compared to nonmodified Caminos char.

B 22 [Identifying Early Fibroblast Cell State Changes in an Angiotensin-II Induced Fibrosis Pump Model](#)

Chon, Ashley – *UW-GU Health Partnership*

Abstract: Cardiac fibrosis is the circumstance in which fibrotic scarring occurs in the cardiac muscle, which in turn becomes problematic in consideration of long-term heart function. Hemodynamic dysfunction and arrhythmias can occur due to this and lead to eventual heart failure. Within this extracellular matrix, fibroblasts play a role as the cell types that produce the connective tissue (collagen) that accounts for the scarring aforementioned. Once activated, these become myofibroblasts—the predominant cell types identified in, for example, the tissues of contracting wounds. The activation of these cell types are due to cardiac episodes. Each mouse model was fed with a Tamoxifen-chow. Several studies have shown that it can potentially hinder fibroblast proliferation.

In terms of fibroblast identification, fibroblasts express the gene periostin, which are visualized through the RTom gene sequence. Proliferating cells were visualized through an Edu assay/staining process.

B 23 [Protocols for the rapid separation of nuclear, mitochondrial and cytosolic fractions of C57BL/6J mouse brain and subsequent Western blot measurement of concentrations of apoptosis-inducing factor \(AIF\) and mitochondrial and cytosolic concentrations of hexokinase.](#)

Larkin, Ashley – *Washington State University – Spokane*

Abstract: Poly-ADP ribosyl polymerase 1 (PARP1) plays a prominent role in maintaining nuclear homeostasis by sensing DNA damage caused by oxidative stress and by sensing the consumption of nicotinamide substrates. Under excessive oxidative stress, PARP1 induces mitochondrial membrane permeabilization (MMP), mitochondria-hexokinase uncoupling and the release of apoptosis-inducing factor (AIF) from the mitochondria. AIF migrates to the nucleus where it promotes chromatin condensation and large-scale DNA fragmentation. Additionally, the enzyme hexokinase, which is mitochondrial under rest conditions, is released into the cytosol under excessive oxidative stress. We will present our optimization of Western blot protocols to measure mitochondrial, cytosolic and nuclear concentrations of AIF and mitochondrial and cytosolic concentrations of hexokinase from brains wild type C57BL/6J mice.

B 24 [The Effect of Mobile Attachment on Loneliness and Social Capital](#)

Pinheiro Gonçalves, Rafaela Donato (*she/her*) – *Gonzaga University*

Abstract: The current study explores the moderating role of mobile phone attachment on loneliness. We hypothesized that mobile phone attachment moderates the indirect effect of social media use on social capital to loneliness, that is, social media use increases social capital and thus decreases loneliness except for people with anxious attachment to their phones. A sample of 152 college students completed an online survey that assessed loneliness, adult attachment styles, mobile phone attachment, social capital, sense of community, perceived social support, and social media addiction.

Preliminary findings revealed a significant indirect effect on social media use predicting increased loneliness through less social capital; That is, as social media use increased, social capital decreased, which related to greater loneliness. Additionally, differently than what our hypothesis predicted, mobile phone attachment did not interact with social media use to predict loneliness or social capital. Interestingly, however, the mobile phone attachment' subscale "need for contact" did positively correlate to loneliness. Therefore, those that use their mobile phones for relationship-facilitating functions reported higher levels of loneliness. Although the sample size is a limitation, the current study provides insight into the relationships between mobile phone attachment, social media use, loneliness, and social capital.

B 25 [Gratitude and Primal World Beliefs: How the Three Good Things Exercise May Impact Social Cognition](#)

Thomas, Tyler – *Gonzaga University*

Abstract: The Three Good Things exercise, which promotes a grateful outlook, has been shown to increase well-being and positivity and decrease negative outcomes such as loneliness. It is unclear why simple gratitude exercises may lead to more general improvements in well-being and happiness. We suggest that changes in Primal World Beliefs may provide one explanation for this effect.

B 26 [Ecologies of Childhood: A Tale of Two Zip Codes](#)

Love, Dominic (*he/him*) – *Gonzaga University*

Abstract: The ecology of childhood is increasingly recognized as crucial in understanding developmental outcomes. In considering the various contexts that children occupy – social, psychological, and physical – researchers note that zip codes are especially strong predictors of child outcomes. Two economically distinct Spokane zip codes (92203 & 99207) were examined and compared on the following variables linked with child outcomes: traffic and traffic pollution, noise exposure, neighborhood disorder, availability or access to green spaces, and exposure to legacy contaminants. Data concerned with traffic, noise exposure, and exposure to legacy contaminants were collected near two schools in each zip code. Publicly available data were used for assessing zip code differences with respect to green spaces and neighborhood disorder. Results revealed that the economically

disadvantaged neighborhood had results consistent with poorer childhood outcomes on all five variables measured. Increased car counts and louder noise from arterials near schools, more crime, less green space, and more lead contamination were all observed.

B 27 Spokane River Vision Plan

Dodd, Abigail (*she/her*); Plotner, Grant (*he/him*); Schmer, Christiana (*she/her*) – *Gonzaga University*

Abstract: Despite facing many threats, the Spokane River lacks a plan with steps towards improvements and prevention of future harms. The Spokane River Vision Plan (SRVP) will be a non-legal document outlining the community's vision of the river into an actionable plan. It was designed to inform two primary groups centralized on the SRVP: stakeholder groups drafting the SRVP and the Spokane community to provide further support. So far, most work developing the SRVP has failed to define a collective vision. To resolve this, we produced a website centered around an informative video, defining the objective of the SRVP while encouraging community support. The video utilizes interviews with current stakeholders who were asked questions about their personal relationship with the river. This method was used to highlight knowledgeable stakeholder perspectives. Results should indicate a connection between the website and community support. To analyze the success of our project, community members can deliver feedback through a survey. If successful, stakeholders will support the main objectives of the SRVP, and if unsuccessful help shape the SRVP how they choose. The video's completion will allow future student groups to advance to drafting stages in Fall 2023 stakeholder meetings.

Session C (1:00-2:00pm)

C 1 Identification of Omega Amidase Inhibitors Through Protein Thermal Shift Assay

Benton, Kae – *Whitworth University*

Abstract: Omega Amidase (ω A) is an enzyme found in the glutaminase II metabolic pathway, which functions to hydrolyze α -ketoglutaramate to α -ketoglutarate. Unlike the glutaminase I metabolic pathway, the glutaminase II metabolic pathway is irreversible. Because of its catabolic role, ω A contributes to growth and generation of dividing cells. The enzyme is present in mammalian tissues, and its structure has been fully defined previously in mice. Expression and purification of human ω A was done to examine its potential for cancer treatments as inhibition of the glutaminase II pathway may have an impact on the generation of cancer cells. The human ω A gene (Nit2) was placed in a pET-14b expression vector and expressed in *Escherichia coli*. Following purification by nickel affinity chromatography, the ω A concentration was determined by Bradford assay. A series of protein thermal melt assays in the presence of potential inhibitors at varying concentrations were performed, including a known uncompetitive inhibitor N-(n-butyl) succinamate. Of the inhibitors tested, only N-N diethyl succinamate appears to alter the thermal stability suggesting it may work as a lead compound for drug design.

C 2 Expression, Purification, and Activity of Recombinant Human Arylsulfatase B in *Escherichia coli*

Vickers, Alex (*he/they*) – *Whitworth University*

Abstract: Mucopolysaccharidosis VI (Maroteaux-Lamy Syndrome; MPS VI) is an autosomal recessive lysosomal storage disease. MPS VI is caused by over 130 known mutations in the human ARSB gene that codes for the enzyme N-acetylgalactosamine-4-sulfatase (arylsulfatase b; ARSB). ARSB is a lysosomal hydrolase that removes 4-sulfate groups from the glycosaminoglycans dermatan sulfate and chondroitin sulfate. Mutations in the ARSB gene cause reduced or eliminated function in ARSB, which lead to a pathological substrate accumulation glycosaminoglycans in the lysosome. By producing a procedure that expresses, purifies, and measures the activity of recombinant human ARSB, future studies can investigate methods to restore deficient ARSB function. Various N-terminal His-tagged recombinant constructs of human ARSB were expressed in *Escherichia coli*. The activity of each ARSB construct was measured using a p-nitrocatechol sulfate activity assay. Each recombinant human ARSB construct expressed ARSB at smaller sizes than expected with no appreciable activity. The ARSB gene was additionally sub-cloned and placed into a GST fusion construct in hopes to improve expression of recombinant human ARSB by facilitating folding, increasing solubility, and restoring activity. Although a GST-fusion of ARSB expressed at the correct size, no activity was observed.

C 3 Structural Divergence of O, S, and Se Replacements in Quasiracemic Materials

Needham, Emily – *Whitworth University*

Abstract: Properties of materials relate to nearly every aspect of our lives. These connections stem from the underlying structure of the molecular building blocks and, thus, understanding the features responsible for molecular assembly is of current interest. Ongoing investigations recorded in the literature show the importance of non-bonded contacts to crystal organization. Structural features that provide weak or ill-defined contributions to crystal packing are less understood and studied but are no less important. Molecular shape is one such contributor that has received less attention. This work explores the effects of pairing L- and D- chemically distinct amino acids with oxalic acid. Mixing sets of quasienantiomers that differ by CH₂, O, S, and Se substitutions gives insight into the molecular recognition profile of these materials. Crystal structures of many of these systems yield molecular alignment that deviates from the expected near-inversion symmetry. Additionally, for several of the systems where S is substituted with Se, the crystal structures show a high degree of isostructurality. And in one case, the components organize with markedly different crystal patterns. Conformational parameters and molecular overlays show the extent of structural differences of the crystal components.

C 4 Investigating Water Oxidation by (NNN)TEMPO Transition Metal Pincer Complexes

Mottola, Anna – *Gonzaga University*

Abstract: This project outlines the design, synthesis, and characterization of (NNN)TEMPO ligands and subsequent transition metal pincer complexes for the successful oxidation of water. The ligands were designed to have redox-active TEMPO groups capable of multi-electron transfers in addition to a redox-active metal center when formed into a complex. These molecules have shown promise in their redox active sites and catalytic activity. Additionally, further investigations are underway to determine their viability as water oxidation catalysts.

C 5 Seeking Better Luminescent Probes: Synthesis and Investigation of [Re(CO)₃(H₂O)(2,9-DCOOHphen)]OTf

Yesiki, Drexler – *Whitworth University*

Abstract: Tricarbonyl rhenium complexes have been used as bioimaging probes, sensitizers for solar cells, and catalysts to reduce carbon dioxide emissions. The insolubility of rhenium complexes limit their application and efficiency. This study attempted to create a water-soluble rhenium complex by utilizing a diimine ligand and a bulky counter ion. Silver triflate and 1,10-phenanthroline-2,9-dicarboxylic acid were used to synthesize [Re(CO)₃(H₂O)(2,9-DCOOHphen)]OTf. IR spectroscopy and NMR spectroscopy confirmed the desired complex was synthesized. UV spectroscopy and fluorescence spectroscopy measured the photophysical properties of the compound over varied concentrations. Solubility tests demonstrated that [Re(CO)₃(H₂O)(2,9-DCOOHphen)]OTf was insoluble in all solvents tested, except for chloroform which was slightly soluble using exceptionally small quantities of the complex. While the complex was not water-soluble, the luminescent properties of the complex determined that protic diimines can be used to synthesize rhenium complexes with noteworthy photophysical properties.

C 6 Investigating the effects of uracil damage on the therapeutic potential of DNAzymes

Carson, Paxton – *Gonzaga University*

Abstract: DNAzymes are catalytically active, single-stranded DNA that coordinate with metal ions to catalyze a number of different reactions in the cell, including mRNA cleavage. This activity makes them an attractive, potential therapeutic for diseases caused by the over expression of specific proteins. However, for DNAzymes to be viable in the cell environment, they must be resistant to chemical insult. This project investigates the consequences of the spontaneous deamination of cytosine on the activity and selectivity of Dz10-23 by replacing such residues in the catalytic core with uracil and observing changes in catalytic activity of mRNA cleavage. To fully understand the potential impact of DNA damage on mRNA cleavage, we report an exploration of how deamination impacts substrate sequence selectivity, metal Binding, and structure. By comparing our results to the recently determined structure of Dz10-23, we provide new insight into the residues integral for the cleavage reaction and their possible mechanistic roles. The results of this project clearly indicate that the effects of spontaneous deamination of cytosine, and likely other forms of DNA damage, must be considered when designing therapeutic DNAzymes

C 7 Exploring the DNA-Binding Potential of Novel Chalcones Synthesized by Gonzaga Students

Hoang, Duc (*he/him/his*) – Gonzaga University

Abstract: As human pathogens are becoming increasingly resistant to most antibiotics on the market, it is imperative for researchers to design new and more effective drugs to combat them. Chalcones are molecules found in plants that can be developed into antimicrobial, antifungal, and antitumor agents. Since 2014, Gonzaga students enrolled in Organic Chemistry II have been synthesizing, on average, 40 chalcone molecules each year. We are interested in exploring if the drug-like qualities of a chalcone are due to its interaction with DNA as prolonged binding to DNA would inflict DNA damage, stall replication and transcription, and ultimately lead to cell death. To test this hypothesis, we performed an in vitro on piperazine-containing and halogenated chalcones using various spectroscopic techniques including UV-Vis, fluorescence, and circular dichroism. The results demonstrated a preference for AT-rich DNA sequences and minor grooving binding for chalcones that could bind to DNA. Positive charges and position of substituents were shown to have significant impact on DNA binding ability, and both groups of chalcones expressed antibacterial activity against several bacterial species. Continued characterization of new derivatives will allow for optimization of these chalcone structures to maximize DNA binding ability for future novel antibiotics development.

C 8 Multiple length-scale analysis of the effects of popular beverages on dental enamel

Rond, Emily – Gonzaga University

Abstract: It is estimated that 2 billion adults and 520 million children suffer from dental caries in making dental decay one of the most common health conditions in the world. Many new and increasingly popular beverages have not been evaluated for their dental health associated risks. In this study, we utilize atomic force microscopy (AFM) and confocal microscopy to monitor changes in enamel surface morphology and demonstrate the early erosive effects of hard seltzer and kombucha. Manufactured HA discs serve as a proxy for real enamel to avoid the variability inherent in actual teeth. The major causes of enamel degradation are assessed through a combinatorial that probed the impact of carbonation, acid type, acid concentration, solution additives, and saliva. The HA discs were soaked in the beverages for various time points and imaged using AFM and a confocal microscope to quantify surface roughness at multiple length scales. Titratable acidity and pH of each beverage are also measured. We find that, in comparison to Coca-Cola serving as an enamel erosion standard, kombucha was found to be equally erosive despite its marketed health benefits. Results from this study demonstrate the substantial impact popular beverages have on the health of the oral cavity.

C 9 Chalcones with Potential Anti-Depressant Activity

Konell, Olivia (*she/her/hers*) – Gonzaga University

Abstract: Clinical depression is a common mental illness characterized by persistent feelings of sadness and/or loss of interest in activities, and can be treated using anti-depressants. Despite the numerous amount of anti-depressant options, of those who are prescribed anti-depressants, only two-thirds respond positively, and about 30 percent of people who go on anti-depressants end up battling treatment-resistant depression, where no anti-depressant has been successful for them. This begs the question of whether or not an anti-depressant can be found for treatment-resistant depression. When thinking of compounds to propose for a drug candidate, a type of compound that can be explored are chalcones. Chalcones are naturally-occurring organic compounds that have been proven to have pharmacological activity. Having a chalcone as an anti-depressant is beneficial because their phenol rings are such that the needed properties of an anti-depressant can be bound to the rings relatively easily. Additionally, they have also shown to be promising in terms of binding to a target receptor. The goal of this research, then, is to find chalcones with anti-depressant activity that target treatment-resistant depression.

C 10 Exploring Chalcone Derivatives and Their Potential Involvement with the 5-HT_{1A} Receptor

Preti, Caleb – Gonzaga University

Abstract: Two leading reasons drugs fail to make it to market are either failing clinical trials or serving too small of an affected population, providing no financial motive for pharmaceutical companies. The latter are called orphan drugs and, in an attempt to repurpose these drugs, St. Louis University created the International Clinical

Compound Library to help repurpose them and save researchers time when researching molecules with pharmaceutical potential as the process for drugs coming to market takes around 7 years. Upon investigation of this library, a Piperazine analog called Piberaline was included for the treatment of depression due to its activity involving the serotonin neurotransmitter. Continued research showed that other analogs are FDA approved and utilized as current standards of care in the treatment of anxiety and depression. With the goal of creating a chalcone derivative of Piberaline, using the molecule and the structures of the current standards of care served as inspiration for the chalcones in this experiment as they are prevalent in the Gonzaga Organic Chemistry Department and have ease of variability. After further computational testing with Autodock Vina, the potential effectiveness of binding with the 5-HT1A serotonin receptor is explored and compared against a commonly prescribed antidepressant, Fluoxetine.

C 11 [A Supramolecular Amino Acid Assembled Using CB\[8\]](#)

Vu, Linh – *Gonzaga University*

Abstract: Artificial miniproteins are structures of interest for biomedical and chemical biology applications, as antimicrobial agents, therapeutics and artificial models for enzymes. One path to large synthetic structures might be through bio-inspired self-assembly of modular, synthetically feasible peptides. We are interested in a supramolecular approach to peptide beta sheets wherein N and C termini of two peptide fragments are clipped together in a ternary complex using CB[8] as a supramolecular host. Herein we describe the synthesis of short peptides terminated with CB[8] recognition motifs.

C 12 [Human-Centered Design for Ethical and Responsive AI Chatbots: Improving User Experience and Communication Efficiency.](#)

Kubicki, Jakob; Moltafet, Ahmad; Manca, Mason – *Gonzaga University*

Abstract: This research proposes a new set of design principles for AI chatbots that prioritize human-centered design and ethical considerations. The study highlights existing and new design principles will lead to an improved user experience, engagement, satisfaction, and success of users while interacting with an AI chatbot. The proposed design principles aim to assist developers in creating chatbots that are more user-friendly and transparent, with an ethical and empathetic approach towards their users. The research proposes that AI platforms utilizing these principles will result in more efficient and effective communication between chatbots and users.

C 13 [Recloser Cabinet Condensation Mitigation](#)

Knack, Lucas; Butler, Stephen; Anderson, Christopher – *Whitworth University*

Abstract: Schweitzer Engineering Laboratories, Inc. (SEL) provides a recloser control device that detects and clears faults in power distribution lines. However, customers have reported issues with condensation forming inside the sheet steel cabinet that houses the device. To address this issue, we conducted physical tests and finite element analysis (FEA) simulations to locate the cold spots that are prone to condensation and to improve the placement and selection of heat sources and insulation in the cabinet. This project will contribute to the development of a recloser control device that better meets the needs of SEL's customers.

C 14 [Optimizing Low Thrust Trajectories for Asteroid and Planetary Missions](#)

Flegel, Caleb (*he/him*); Fairborn, Meg (*she/her*) – *Whitworth University*

Abstract: Determining the optimal path for spacecraft is a crucial part of designing efficient, cost-effective space missions. An emerging category of NASA missions are low-thrust flights, where the ship utilizes an ion thruster to make course adjustments throughout its journey, which is outside the constraints of normal mission planning methods. This project explores the use of a genetic algorithm to find potentially unintuitive trajectories for a low-thrust mission by optimizing sets of mission parameters. A set of these mission parameters, such as launch parameters and thruster variations, is known as an "individual." How individuals are optimized is dependent on the mission goals. The program employs parallel computing to efficiently simulate the flight paths of candidate individuals. The individuals are then ordered by a non-dominated sorting algorithm based on both how closely they meet the mission objectives (such as proximity to the target celestial body or minimizing fuel consumption)

and their distinctiveness from the others. Then through a series of combinations of the best individuals and parameter mutations, the algorithm converges on a potential flight trajectory. This approach has been demonstrated to produce effective results for impact missions (e.g., DART) and rendezvous missions (e.g., OSIRIS-REx).

C 15 [A programmable voltage multiplier towards ion mobility spectrometry](#)

Idiaghe, Paul (*he/him*) – *Whitworth University*

Abstract: Ion mobility spectrometry (IMS) is a technique that can detect and identify samples at extremely low concentrations. Applications include detection of explosives or drugs in airports. IMS requires high voltages to separate ions and provide high sensitivity to identify samples. However, ion separation is highly dependent on the ramp shape of the applied voltage and the speed of this ramp. To this end, in this work, a programmable voltage multiplier prototype was demonstrated thereby enabling applications in IMS using an inexpensive circuit. A custom Cockcroft Walton voltage multiplier circuit was designed and showed voltage multiplication from 1,000 VAC to 20,000 VDC in 50 ms was plausible. The circuit was designed to allow a programmable ramp function where the shape can be controlled using TTL pulses (0-5 V pulse trains) to adjust the timing of up to ten multiplier stages, thereby specifying a ramp shape. A theoretical model was constructed to provide a closed-form solution of the input to provide a specified output. A low-voltage single-stage multiplier prototype, with through-hole components, was constructed and demonstrated voltage multiplication from 5 VAC to 80 VDC within 15 ms. This showed proof-of-principle of the device accessible at the undergraduate level and a promising step towards use in IMS applications. The next steps are the development of a high-voltage surface mount device (SMD) printed circuit board (PCB) prototype and applied to IMS.

C 16 [FRET-Based Molecular Computing](#)

Croft, Moab – *Whitworth University*

Abstract: Various methods of computing were demonstrated in solution using FRET-based interactions upon separate DNA probes which attached independently of each other to a target DNA. A mathematical theory for the FRET interactions is proposed and used for analysis

C 17 [Investigation of plasma processing on paintability of thermoplastic C-fiber composite materials](#)

Zhong, Xiwen – *Gonzaga University*

Abstract: Coupons of a C-fiber composite material are being subjected to a range of processings to improve paintability. Historically, C-fiber parts have been made from materials with a thermosetting matrix. A new class of materials is being used in the aerospace industry that are C-fiber composite with a thermoplastic matrix. Some of the advantages of thermoplastic composite are manufacturability, high strength and high modulus.

C 18 [Analyzing Stability of Symmetric Multistep Methods](#)

Hiatt, Aden – *Gonzaga University*

Abstract: Multistep methods are commonly used to approximate solutions of second-order initial value problems, specifically differential equations in orbital mechanics where drag is not present. Commonly used multistep methods include the Störmer and Cowell methods, often used in combination as a predictor-corrector pair. This project analyzes a special class of multistep methods with symmetric coefficients that possess desirable stability properties in that symmetric methods are less likely to experience instability, with their error only growing linearly in time. This property generally makes them superior to Störmer and Cowell methods for approximating orbital trajectories. Our research investigates how to derive these symmetric methods and analyzes their stability. In particular, we examine stability properties of both implicit and explicit symmetric methods, comparing to similar order Störmer and Cowell methods.

C 19 [Topological Data Analysis of Information Spread on Twitter](#)

Nguyen, Matt; Garcia, Leon; Recker, Malia – *Gonzaga University*

Abstract: The research of information diffusion on social networks is commonly investigated through the application of social network analysis, utilizing graph theory. This proposed study aims to classify diverse forms of

information dissemination on Twitter using topological data analysis techniques. Specifically, by simulating each instance of information diffusion on a predefined graph network across distinct time intervals, tracing the underlying homologies, and analyzing these filtrations via clustering methods, the project seeks to categorize varied information propagation on Twitter. This research is furthering research by the Gonzaga Topological Data Analysis Research Group, which used this methodology to analyze airline flight patterns.

C 20 [Total Roman Domination in Kneser Graphs](#)

Asplund-wain, Isabella (*she/her*) – *Gonzaga University*

Abstract: The total Roman domination number of a graph is the smallest possible sum of the weights 0, 1, and 2 applied to vertices of the graph that satisfy certain rules originating from Roman military strategy. In this poster, we discuss total Roman domination of Kneser graphs. We give exact counts for some graphs and demonstrate bounds for other graphs.

C 21 [Factor Salience for University Belongingness: Positive and Negative Experiences in College Environments](#)

Foster, Kacie; Browning, Samantha – *Whitworth University*

Abstract: Attending a university can be both academically and socially challenging but belongingness is a crucial aspect of a college experience particularly because a sense of belonging is positively correlated with desirable outcomes in higher education, including social and psychological functioning, care, and support, college activities, academic success, self-confidence, and social acceptance (Hotchkins et. al., 2021). Previous research indicates that belongingness is influenced by forms of social engagement, academic engagement, personal thoughts, and surroundings (Ahn & Davis, 2020). Therefore, the researchers investigated manipulatable factors within social engagement (n = 16), academic engagement (n = 15), personal space (n = 16), and surroundings (n = 15) and their influence on college students (N = 62) university belongingness within both positive and negative environments. Participants completed an online survey assessing their perception of belongingness in each of these imagined situations. As hypothesized, researchers found that social engagement negatively affected belongingness, while personal space positively affected belongingness.

C 22 [Be Here or Belong? International and Racial Minority American Students' Reports on Sense of Belonging in Comparison to White American Students](#)

Lkhadorj, Tuvshinzaya; Ganu, Dollar – *Whitworth University*

Abstract: Sense of belonging is a fundamental human need that contributes to better mental health, academic success, self-esteem, and life satisfaction (Baumeister & Leary, 1995). Previous research suggests students' sense of belonging is strongly linked to their involvement in social and academic settings (Cooper & Minness, 2014; Freeman et al., 2007). The purpose of this study was to examine how students of different races and nationalities perceived their belonging at a predominantly white institution. Academic belonging, social belonging, and overall belonging were assessed. Researchers hypothesized that racial minority and international students would report a lower sense of belonging than white American students across all assessments. The hypothesis was only supported for academic belonging, and not social or overall belonging. Findings suggest that belonging is context-dependent, and universities' efforts to enhance student belonging in the social domain may not translate to the academic domain. The findings thus have implications for understanding the varied experiences of minoritized and international students in PWIs and can inform efforts to promote a sense of belonging in these institutions.

C 23 [Context-Dependent Learning Effect and Memory: Blue Versus Red](#)

Rogers, M'kaela (*she/her*); Trower, Rhienna (*she/her*) – *Whitworth University*

Abstract: Godden and Baddley (1975) demonstrated that the environment around us can impact the memory processes of encoding and retrieval. This is known as context-dependent learning, where long-term memory can be improved when the encoding and retrieval environments are the same. Additionally, research regarding color and cognitive tasks has demonstrated that red increased detail-oriented task performance and blue increased creativity-orientated task performance (Mehta & Zhu, 2009). Affect has also been evaluated for its impact on cognitive performance. The researchers investigated whether color contributed to context-dependent learning using two classrooms. Participants (n = 92) were randomly assigned to one of four conditions: red-matched (n =

24), red-mixed-matched (n = 23), blue-matched (n = 23), and blue-mixed-matched (n = 22) lighting. Participants performed a modified encoding and retrieval task and completed a PANAS-GEN (Watson, Clark & Tellegen, 1988) form to rule out affect as an extraneous variable. Results demonstrated statistical significance between the red-matched and red-mixed-match groups. These results contribute to the growing understanding of the influence of color on cognitive task performance.

C 24 Using a Social Discounting Task to Measure Differential Personal Information Sharing

Battaglia, Jacob – *Gonzaga University*

Abstract: A recent social discounting study showed that individuals share personal information in a similar way to money, suggesting that personal information has quantifiable properties for individuals. This is important because many online scams, such as phishing, target sharing different forms of personal information. However, no previous study has tested whether different forms of personal information are shared more or less than others. The current study used a modified social discounting task to test whether there were differences in the amount of personal information shared across four different forms: identification, financial, health, and security information. A between-participant experiment enrolling 100 college-aged participants showed that individuals had a significantly higher discounting rate for health information compared to three other forms of personal information, suggesting that health information was shared more for the participants. There were no statistically significant discounting rate differences between the other three forms of personal information. The results demonstrate that the social discounting task is a viable way to assess differential sharing for personal information. Future research should examine why health information is shared less than other forms of personal information, and whether this increases risk for falling prey to phishing scams targeting different forms of personal information.

C 25 Pass the Dutchie on the Left Hand Side

Hatch, Tobias; Olona, Anissa – *Gonzaga University*

Abstract: Previous delay discounting studies have examined whether individuals who engaged in marijuana use were also rated as more likely to choose smaller sooner rewards (i.e., more impulsive). Results have generally supported this relationship. A complementary task, social discounting, measures sharing as a function of social distance. Previous studies have found delay and social discounting tasks to be negatively related (i.e., more impulsivity = less sharing). Thus, the current study was conducted to determine whether those individuals who engaged in marijuana use were also rated as less likely to share marijuana as a function of social distance. Participants across two semesters self-reported marijuana use and completed a social discounting task for sharing marijuana across seven social distances. Participants were grouped as either current, former and never marijuana users. Comparing social discounting rates across these three groups showed that current users shared significantly less than both former and never users. The results suggest that experience using marijuana is significantly related to social discounting rates for marijuana as a commodity. That is, marijuana is potentially shared at lower rates for current users because it is more valuable to them. Future studies should attempt to corroborate this finding with standardized behavior economic tasks.

C 26 The Behavioral Economic Demands of Personal Information

Yee, Koko (*she/her/hers*) – *Gonzaga University*

Abstract: A study by Romanowich and Battaglia (2023) used a social discounting task to show that health information is shared less than other forms of personal information (e.g., financial, identification, and security). These results implied that health information had less value than other types of personal information, by virtue of being shared at greater rates. However, a more direct commodity value test typically involves asking individuals to pay for that commodity (i.e., demand analysis). Those commodities that individuals are willing to pay more for are through to have greater value. The present study tested previous result reliability and applied a behavioral economic framework of demand analysis to understand differential personal information value. Participants completed an adapted hypothetical purchasing task where they disclosed how much they would be willing to pay to protect some percent of their personal information, in addition to completing a social discounting task. The results showed that individuals were willing to pay the least to protect their health information and were also willing to share a greater amount of their personal health information than other types of personal information,

consistent with previous findings. Thus, personal information value may be profitably assessed via different choice tasks.

C 27 Can eco-psychology techniques help us cope with the climate crisis?

Allen, Jael (*she her*) – *Whitworth University*

Abstract: Most people directly experience the impact of global warming, and even more see its impact on the news (Stanley et al., 2021). These exposures commonly lead to anxiety, depression, and hopelessness about the state of the Earth (Maran & Begotti, 2021). Eco-psychology steps in to provide specific psychological support to those dealing with eco-anxiety (Hall, 2015). Eco-therapy sessions and long-term mindfulness interventions have been shown to help people deal with climate change despair (Shanahan et al., 2019). At present, there are no approved short-term interventions in the eco-psychology field meant to help. Given the potential benefits of a short-term intervention, and the accessibility and share-ability of one, it is important to examine the impact of a single use, short term, self-guided reflection. In this study, the researchers created and administered a short-term intervention to Whitworth University college students (n = 27), compared to a control group (n = 27) who did not complete the intervention. Participants' anxiety and self-perceived action for sustainability were assessed in related to these experimental conditions. Participants' self-perceived action for sustainability was higher in the intervention condition. The findings have implications for the relationship between people's despair about and actions toward climate change.

C 28 Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults

Edmondson, Avery (*he/him*) – *Gonzaga University*

Abstract: Falls and falling are the most common reason for older adults and individuals with mobility impairments to transition from their homes to long-term care. Objects which pose tripping hazards significantly contribute to falls both inside and outside the home. Individuals navigating through these environments, especially those with visual impairments, may not notice unexpected, misplaced, or cluttered items which greatly increase the risk of falls and personal harm. To help design and evaluate new technologies to enable these groups to recognize and avoid these common falls, the HazARd research project utilizes Microsoft HoloLens Augmented Reality (AR) technology to notify the user of potential hazards and safety issues in their living space. Prior work includes the design of AR-based visual notifications for the user, while this work extends the tools to model user understanding of possible hazards. It uses a combination of eye-tracking gaze detection and hand gesture tracking to determine when the user has acknowledged a given AR-based notification and its corresponding hazard so the notification can be dismissed. This system has been implemented and tested with an early group of users to compare their preferences of acknowledgement systems and evaluate the systems' effectiveness in real-world situations.

Oral Presentations – *Names, Titles, Abstracts*

Hemmingson 3rd Floor

A (10:30-11:30am), B (12:30-1:30pm),

Session A (10:30-11:30am)

Group 1, Room 312, Faculty Moderator: Prof. Matsumoto

Effects of Herbivory on Developmental Variation in Seedling Defense Chemistry

Mauch, Emily – *Whitworth University*

Abstract: Chemical defenses in plants allow them to be less susceptible to herbivory, the process of being eaten. Studying how plants vary in their defense mechanisms is important in agriculture, medicine, and ecological sciences. Defense production in toxic plants has been known to change through different ontogenetic, or developmental stages as well as in response to herbivory. Seedlings are innately less toxic than mature plants but can upregulate chemical defenses more effectively when harmed. *Asclepias speciosa*, also known as the showy milkweed, is a perennial, toxic plant native to Eastern Washington. This study assessed cardenolide production of *Asclepias speciosa* through different ontogenetic stages as well as being subjected to herbivory through High Performance Liquid Chromatography. Cardenolide peak areas showed that herbivory and ontogeny interacted with one another, altering the developmental trajectory of cardenolide production in seedlings. Seedling defense therefore should not be studied by plant development or herbivory alone and chemical defenses in plants are subject to change, depending on their specific environment.

Visualizing Fer Kinase Expression during Zebrafish Embryonic Brain Development

Korkeakoski, Madison (*she/her*) – *Whitworth University*

Abstract: Fer Kinase is a non-receptor tyrosine kinase that has been highly conserved during evolution across invertebrates and vertebrates alike. This protein is known to play a role in cell-cell adhesion, cell proliferation, and has been linked to the regulation of cancer cell progression and survival. While it is known that Fer is generally required for proper development, in vivo functions of Fer during various developmental stages are not widely described. Previously, we have shown that Fer is required for normal red blood cell development in embryonic zebrafish, in addition to demonstrating important kinase independent functions of Fer that require it for normal vasculature organization. In this study, we demonstrate Fer Kinase expression in the developing brain during zebrafish embryogenesis with a focus on retinal and neural tube formation, visualized through in situ hybridization with whole mount and cryosectioning.

Structural Design of Quasiracemates: The Pursuit of Predictable Crystal Assembly

Koch, Katelyn (*she/her*) – *Whitworth University*

Abstract: The process of molecular organization proves crucial to uncovering material function with applications ranging from polymer science to complex physiological studies. The ability to predict supramolecular assembly remains the Holy Grail of structural sciences.

Recently studied effects of electrostatic attractions make up the majority of known forces integral to the supramolecular assembly process. However, the present study of crystal structure formation explores the impact of molecular shape on molecular assembly. Using the systematic adjustment of enantiomer shape in a racemic compound forms a quasiracemate consisting of two chemically different components that often mimic the thermodynamically favorable orientation seen in racemate structures. The differences in chemical topology between left and right-handed 4-substituted benzoyl amino acid compounds varied by the benzene ring substituent and amino acid side chain. The crystal structures of quasienantiomer pairs, compared to their relative racemic systems, gave insight into the structural boundaries responsible for the self-assembly process. Quasiracemic crystals were prepared via cocrystallization experiments and analyzed using crystallographic, thermomicroscopic, and lattice energy assessments. Understanding the role of complementary molecular shape

and structure on supramolecular assembly may unveil the ability to manipulate crystal components for predictable lattice assembly.

Role of the calcium binding loop in prolyl aminodipeptidase from *L. helveticus*

Ryder, Stephanie (*she/her*) – *Whitworth University*

Abstract: Prolyl aminodipeptidase (PepX) is an alpha-beta hydrolase, cleaving at penultimate N-terminal prolyl peptide bonds. The structure of PepX from *Lactobacillus helveticus* showed the enzyme bound to calcium. PepX enzymes in lactobacilli contain a highly conserved calcium binding motif with an unknown purpose. The addition of excess calcium or ethylenediaminetetraacetic acid (EDTA) did not have a significant effect on the stability or activity of the enzyme. To prevent calcium binding, a mutation was orchestrated at D196A within the conserved Dx Dx DG calcium-binding motif. Enzyme activity and stability when the mutant could not bind calcium was compared to the wild type enzyme through kinetic and protein thermal shift assays. Activity assays were analyzed by the Lineweaver Burke plot and non-linear least squares regression of the Michaelis-Menton equation to show that the K_m of the mutant is within error of the wild type. The thermal shift assays resulted in a statistically significant two-degree Celsius difference in the melting points, suggesting the stabilizing effect of the loop between the mutant and wild-type enzyme.

Group 2, Room 306, Faculty Moderator: **Prof. Hitefield**

Interpreting the 2022 Senate Primary Elections

Lorenc, Drew (*he/him*) – *Whitworth University*

Abstract: The purpose of this project is to explore the candidates, outcomes, and implications of the Senate primaries in the 2022 midterm elections. In it, we will explore candidate electoral experience, incumbency, the role of candidate gender in electoral success, and other trends in electoral politics. In doing so, we hope to offer an intriguing snapshot into the 2022 Senate primary elections.

Success or Incompletion? How Peacekeeping Operations End

Stoddard, Hannah – *Whitworth University*

Abstract: Since the 1990s, peacekeeping has become increasingly used as a tool for managing conflict. The United Nations has legitimized its use of peacekeeping through authorizing peacekeeping operations (PKOs) within the United Nations Security Council (UNSC). There is extensive research on the effectiveness of PKOs and different measures of success, but very little literature examines the factors which contribute to the end of a PKO. If a PKO is perceived to have achieved its mandate, the UNSC can allow the mission's mandate to expire, thus ending the PKO. However, not all PKOs end having achieved their mandate. This raises the question: What factors influence how PKOs end? In particular, why do some PKOs end with a successful mandate and others do not? By comparing past United Nations PKOs which have ended, I can examine the factors which influence the duration and termination of PKOs. In my findings, I observed that political deadlock in the UNSC, non-compliance from host countries, and insufficient mandates contributed to PKOs ending without a successful completion of their mandates.

Who Owns Development?: A Study of NGO Movements in Relation to Community Input

Iseman, Courtney (*she/her/hers*) – *Whitworth University*

Abstract: Since the 1980s NGOs have conducted significant development projects in the Global South; however, there seems to be a disconnect between local communities and NGO agendas. Donors have been described as "gatekeepers" to development projects, the main agents in deciding projects (Bob, 2006). There is a question of agency: Why do some NGOs follow expressed local community needs and aspirations, while others do not? In this study, I examine how Western-headquartered NGOs and Faith-based organizations (FBOs) compare to locally-headquartered NGOs and secular NGOs, to determine what attributes would lead an NGO to align more or less with community goals. I examine all international NGOs (INGOs) with development projects based in at least one out of the six East African countries, between 2016 and 2021. I used the East African Community 2016-2021 development plan, highlighting critical East African development needs. Each NGO is then ranked on a scale of 1-

10 according to its published mission statements. This study is created to provide NGO managers, donors, and scholars with a view of how NGOs are in discord with community goals. I expect the findings to show that NGOs with Western headquarters and FBOs are less likely to be aligned with community goals.

Group 3, Room 308, Faculty Moderator: Prof. Sheets

Reinvention

Moore, Emma (*she/her*) – Whitworth University

Abstract: “Reinvention” is an autobiographical essay about my first two years of college. It details my journey in becoming the person I am today, and reflects on the lessons I learned while struggling through an eating disorder and coming out the other side. Using intentionally structured prose, this emotional piece aims to convey the mental state I was in during this period, as well as emphasize the stark difference since recovering. “Reinvention” is an essay that questions the motivation behind, as well as the consequences of, becoming the “best” version of oneself.

The Invention of You

Hagey, Celia (*she/they*) – Whitworth University

Abstract: “The Invention of You” is a research-based creative nonfiction piece exploring the relationship between fashion history and the formation of identity. I consulted several sources to develop the piece, beginning with 19th century newspaper and periodical articles reporting on the works and public reception of dressmaker Charles Worth. I then explored secondary research into Worth, the history of fashion displays, and the psychological aspects of viewing and wearing clothes. Finally, I viewed historical fashion face-to-face in a museum, studying and recording my own reactions to interacting with garments. The piece finds that fashion has the capacity both to define who we are and to serve as a vehicle for autonomous invention of ourselves. Ultimately, clothing is inextricably tied to human nature, and for that it is immeasurably valuable.

Swallowing the Dairy Pill

Vidarthi, Sakina (*she/her*) – Whitworth University

Abstract: The essay explores the culture shock of migrating to the US from India using the lens of food. The structure of the essay is inspired by Elisabeth Kübler-Ross’s five stages of grief. The framework, in each stage, connects my experience with adapting to American food with a relevant Indian dish or cuisine in almost a braided structure – hopping between personal and factual information. The essay uses food to talk about themes of leaving home and trying to make a new home by adapting to the difference. The food is the same, I just have found creative ways to make some space on the table.

Group 4, Room 310, Faculty Moderator: Prof. Ong

Identifying Quality and Asymmetry of Gait in Real-World Conditions

Ramollari, Helio; Idiaghe, Paul; Petersen, Ashtyn – Whitworth University

Abstract: Clinicians and researchers do not have adequate options to understand the quality or pattern of gait that the patients use in non-laboratory and non-clinical conditions for extended durations of time. Here we present an algorithm that categorizes and quantifies patterns of gait under normal and reduced-load conditions in non-clinical settings using data from an accelerometer worn by the patients for up to one week.

Application of wearable sensor technology in assessing contingent learning ability in infants

Ledesma, Liv (*she/her*) – Gonzaga University

Abstract: Infants aged 3-5 months old have shown the ability to learn a new behavior under external stimulations, and such learning ability is known as contingent learning. Past studies utilized traditional motion capture to investigate contingent learning for infants and found increased total number of movement and increased out-of-phase movement between two joints (one joint flexing while the other one extending) after receiving stimulation. We aimed to replicate previous study design but utilized wearable sensor technology to assess contingent learning

in infants. Ten full-term infants participated in a mobile paradigm task with additional visual and audio stimulations associated with lower limb kicking movement. We attached wearable sensors on their lower legs to measure joint angular movement. We assessed their intralimb coordination by calculating the percentage of out-of-phase movement for hip-knee, knee-ankle, and hip-ankle coupling. We used custom written algorithm to automatically count for total number of kicks. When stimulation was associated with kicking, infants increased out-of-phase movement between knee-ankle coupling by 8.54%, and between hip-ankle coupling by 9.91%. However, we did not find a significant change in the number of kicks. Wearable sensor technology showed potential in assessing contingent learning in infants, especially for assessing intralimb coordination.

Novice Runners Increased Step Frequency and Decreased Force Application as They Gained Running Experience

Garbuz, Christina (*she/her/hers*) – *Gonzaga University*

Abstract: Novice runners have shown to express a more efficient muscle activation pattern over 6 months of training in a previous study. However, how they modified their step frequency (SF), contact length and force application on the ground across the 6-months remains unclear. Fourteen novice runners completed 3 treadmill running trials over 6 months (at baseline, 3-month, and 6-month). We collected their running temporospatial data to obtain SF. We also calculated their center of mass horizontal traveling distance during stance phase, defined as contact length. We measured the force they applied to the ground in the vertical direction, and calculated average vertical force that they applied during stance phase (avgGRF). We constructed three linear mixed models to assess the effect of training on SF, contact length and avgGRF. We found significant training effect on SF ($p=0.04$) and avgGRF ($p=0.002$), that SF increased by 0.04 Hz and avgGRF decreased by 0.03 of the person's body weight for each 3-month interval. Previous studies showed that higher SF associated with better running economy and better running performance, and our results further supports this statement. The changes we found could be a result of better muscle activation as runners gain running experience.

The Influence of Gait Retraining in Downhill Running on Knee Valgus

Hand, Hailey; Etten, Madelyn; McGrew, Thomas; Garbuz, Christina – *Gonzaga University*

Abstract: Knee valgus is characterized by internal hip rotation and adduction. A greater than normal (6°) knee valgus angle is associated with higher knee injury risk. Running gait retraining has been shown to reduce knee valgus angle and prevent knee injuries on level ground. Downhill running significantly affects knee joint kinematics and force distribution compared to level running, but there is limited analysis on the effect of running gait retraining on knee valgus angle in downhill running. We will ask participants to complete 5-minute running gait retraining with real-time visual feedback to correct their knee valgus angle on level ground, or on a downhill slope. Before and after training, we will measure knee valgus angle and lower limb muscle activation when running on level ground and downhill slope. We hypothesize that when gait retraining is conducted on level ground, participants will reduce knee valgus angle after training only when running on level ground but not on downhill slope. However, when gait retraining is conducted on a downhill slope, participants will reduce knee valgus angle after training on both running surfaces.

Session B (12:30-1:30pm)

Group 1, Room 306, Faculty Moderator: Prof. Hogle

Mosaic Tile Knot Theory I

Childress, Jessica; Espinoza, Jesus (*they/he*) – *Gonzaga University*

Abstract: An overview of basic knot theory concepts and how they apply to mosaic tile knot theory. We will present several examples of mosaic diagrams as they pertain to our current research.

Mosaic Tile Knot Theory II

Jursek, Alex (*he/they*); Wang, Wenshan – *Gonzaga University*

Abstract: In this presentation, we will expand on what was presented by the first knot theory group in their "Mosaic Tile Knot Theory I" presentation. We will dig a little deeper into our current research, providing more details and examples of recent findings we are most excited about.

Analyzing Child Directed Speech

Rocca, Kevin – *Gonzaga University*

Abstract: It has long been understood that mothers talk to their children in a distinctive manner, known to linguists as "motherese" or child-directed-speech (CDS). CDS has been attested in multiple languages, but never in corpora of the size now available. Ours consists of 25,000 hours of toddlers speaking to their parents in their homes. We ask a single question. Do fathers also speak to their children using CDS? Analyzing a corpus this large is beset with problems, including processing time, and the size of primary, and secondary storage. The goal of this project is to transform computational linguistic software developed for much smaller corpora into software capable of processing the amount of data we now have available.

Gaze Tracking and Gesture-based Interface Notification Acknowledgement in Augmented Reality Interfaces for Older Adults

Edmondson, Avery (*he/him*) – *Gonzaga University*

Abstract: Falls and falling are the most common reason for older adults and individuals with mobility impairments to transition from their homes to long-term care. Objects which pose tripping hazards significantly contribute to falls both inside and outside the home. Individuals navigating through these environments, especially those with visual impairments, may not notice unexpected, misplaced, or cluttered items which greatly increase the risk of falls and personal harm. To help design and evaluate new technologies to enable these groups to recognize and avoid these common falls, the HazARd research project utilizes Microsoft HoloLens Augmented Reality (AR) technology to notify the user of potential hazards and safety issues in their living space. Prior work includes the design of AR-based visual notifications for the user, while this work extends the tools to model user understanding of possible hazards. It uses a combination of eye-tracking gaze detection and hand gesture tracking to determine when the user has acknowledged a given AR-based notification and its corresponding hazard so the notification can be dismissed. This system has been implemented and tested with an early group of users to compare their preferences of acknowledgement systems and evaluate the systems' effectiveness in real-world situations.

Group 2, Room 308, Faculty Moderator: Prof. Jones

A 3D printed microfluidic PCR device towards detecting SARS-CoV-2

Shaka, Kristi – *Whitworth University*

Abstract: A 3D printed (3DP) microfluidic polymerase chain reaction (PCR) device was demonstrated by detecting synthetic SARS-CoV-2 at 106 copies/ μ L. The microfluidic device was fabricated using stereolithography 3DP and had a reaction volume of \sim 22 nL. The microdevice showed PCR amplification with 85 base synthetic ssDNA targets and primers designed for a SARS-CoV-2-specific region. The device was 2.5 times faster compared to a qPCR instrument with >60,000 times smaller reagent volume. The 3DP microdevice is a promising technology to significantly reduce the manufacturing costs of microfluidic devices that could be used towards point-of-care applications.

A biocompatible 3D printed microfluidic device for high-throughput C. elegans analysis

Garcia, McKenzie (*she/her*) – *Whitworth University*

Abstract: Optimizing high-throughput analysis while balancing cost effectiveness continues to challenge C. elegans research. More recently, microfluidic devices have been employed to analyze C. elegans quickly, but barriers to cost effectiveness remain. Alternatively, 3D printed (3DP) microfluidic devices offer an inexpensive, fast and highly adaptable method for analysis devices. Recently, a 3DP microfluidic device, consisting of poly(ethylene glycol) diacrylate, has shown favorable cytotoxicity for cellular growth, but the applicability to C. elegans had yet to be demonstrated.

In this work, we demonstrate movement of worms through a fully integrated 3DP microfluidic device using syringe-driven pressure with sufficient regulation to stop worms in a designated field of view and image at high resolution. A glass slide with microtubing or metal reservoirs with mounting wax were investigated. In both cases, generating flow using a closed system allowed for greater control of the pressure flow as well as a faster flow rate (up to 1133 $\mu\text{m/s}$) through the microfluidic 3DP device, while maintaining viability of the worms. However, highest efficiency of flow and pressure control were obtained with the glass slide/microtube interconnect in conjunction with the syringe driven flow. We demonstrate flow rates that allow for analysis speeds of up to 400 nematodes per hour is possible.

Dry Sliding Wear of Metal-oxide Filled PTFE Composites

Swets, Jackson – *Gonzaga University*

Abstract: The addition of nanoscale alpha-alumina to polytetrafluoroethylene (PTFE) reduces wear of PTFE by nearly four orders of magnitude under dry sliding on steel. Ultra-low wear of alumina-PTFE composites is enabled by growth of robust tribofilms on both the composite pin and steel surface. Tribofilms are developed in part through friction and shear stress as a result of sliding with the availability of ambient humidity. PTFE composites reinforced with certain other metal oxide nanoparticles result in wear rates comparable to alumina, while others result in significantly higher wear for reasons that remain unclear. Brass countersurfaces are similarly known to result in higher wear, irrespective of filler choice, including alumina. In the current work, morphological and chemical analyses of worn interfaces are used to determine factors – particularly related to chemical interactions in the interphase region and on the counterface that help promote low wear of metal-oxide PTFE composites.

On the dry sliding wear of PEEK-PTFE composites

Anders, Libby (*she/her*) – *Gonzaga University*

Abstract: The addition of nanoscale metal-oxide fillers to polytetrafluoroethylene (PTFE) has been shown to be highly effective in reducing wear of unfilled PTFE. Despite their ability to reduce wear of PTFE by almost four orders of magnitude, an increase in wear is observed, for instance, when composites are run at high temperatures, in the absence of ambient humidity, etc. In contrast, polyether ether ketone (PEEK) is recognized as a more robust filler for PTFE in terms of achieving wear rates which are lower by over four orders of magnitude compared to unfilled PTFE, under a wider range of conditions. This work reports on the results of dry sliding wear with PEEK-PTFE composites under conditions which are otherwise known to disrupt low wear of PTFE composites filled with metal-oxide fillers. Results from tribological, chemical and morphological characterization of PEEK-PTFE sliding interfaces are presented, giving insight into the mechanochemical mechanisms driving variations in wear rates.

Group 3, Room 310, Faculty Moderator: Prof. Zhang-Lea

Places in Names: Exploring State/Brand Congruency and Brand Quality

Hayward, Savannah (*she/her*) – *Whitworth University*

Abstract: With the vast amount of marketing in America, people have categorized states with native produce and products. This study seeks to discover how brand congruence between a state and product influences consumer perception. For example, will Idaho Real Potato Chips be seen more positively than Dakota Style Kettle Chips? Expanding on previous research (Sloan et al., 2018) on brand congruence with state names, we will examine brand congruence and incongruence, using real brands, as it relates to consumer outcomes. Specifically, our hypotheses predict that there will be a positive correlation between perceived brand congruence and consumer perceptions of quality and value. For this study, data will be collected from approximately 300 participants to test our hypothesis.

The Impact of Unemployment on Violent Crime in the U.S.

Lindahl, Connor (*he/him*) – *Gonzaga University*

Abstract: While the connection has been studied for some time, the COVID-19 pandemic saw major increases in both violent crime and unemployment, reflecting the trend in the 1990's. Furthermore, it is the goal of this paper

to determine if there is a statistically significant relationship between violent crime and unemployment. Conclusions are drawn using panel data from each state in the U.S. by year spanning from 1990 to 2015, where linear regression is performed.

Are intellectual trigger warnings as counterproductive as trauma-relevant trigger warnings? Testing the psychological and academic performance consequences

Smith, Emme (*she/her*); Su, Yuchen (*he/him*) – *Gonzaga University*

Abstract: Since its inception, trigger warnings have become more widely used in contemporary culture, sparking intense controversy in academic and other circles. Some argue that trigger warnings empower vulnerable individuals to psychologically prepare for or avoid disturbing content. In contrast, others say they undermine resilience to stress and increase vulnerability to psychopathology while limiting academic freedom. Our hypothesis focuses on the possibility that trigger warnings lead to feelings of anxiety in students. Specifically, we hypothesized that trigger warnings would cause students more prone to emotions such as anxiety, which will disrupt their academic performance. To this end, we designed a between-group experiment with students who either received a trigger warning prior to a lecture on a controversial subject (theory of evolution) and students who did not receive a trigger warning prior to the lecture as the independent variable. Following the lecture, students will take a content test as well as complete a series of questionnaires regarding their anxiety levels, attitudes towards trigger warnings, and sensitivity to the impact of words.

Effect of high heat running environment on Achilles tendon morphology, oxygen consumption, and ankle pain level of runners

Riva, Gabriella; Jones, Ethan – *Gonzaga University*

Abstract: Global warming has increased the number of days with temperatures above 86°F in the Inland Northwest. Since heat can alter tendon structure by leading to fibroblast cell death and disrupting extracellular matrix metabolism, increase external temperature could contribute to a high tendinopathy injury rate in distance runners. However, the effect of heat waves on human musculoskeletal system and its associated injury risk for runners remain unclear. This study aims to understand how running under high heat environment affects Achilles tendon morphology, metabolic cost, and pain level around foot-ankle area. Ten experienced runners will complete two treadmill running trials, with one week apart, in two temperature settings: normal setting (68°F) and a high heat setting (86°F). We will perform ultrasound scans to measure the anterior-posterior thickness, the cross-sectional area, and blood flow density in the Achilles tendon. We will use indirect calorimetry to assess net metabolic power during running, and we will use questionnaires to assess pain level in foot-ankle area. We will compare the ultrasound measurements, net metabolic power, and pain level in runners when running in normal temperature setting and in high heat setting.

Group 4, Room 312, Faculty Moderator: Prof. Romanowich

Moralization of Conspiratorial Beliefs

Lau, Jalisa; Tenny, Micah; Chicca, Katie – *Gonzaga University*

Abstract: This research focuses on understanding the psychological processes behind the moralization of consistency in beliefs, using fundamentalist Protestant ideology as a starting point. A survey was created to measure the degree to which consistency in belief is moralized, with varying vignettes, and to measure confidence levels in conspiratorial beliefs. The survey will be administered on Amazon Mechanical Turk to a nationwide pool of Protestant and Catholic participants. The data will be analyzed using a moderated mediation analysis to test the hypothesis that the confidence level in conspiratorial beliefs will be higher for Protestants than for Catholics, and that this is mediated by the degree to which consistency of beliefs is moralized. Religious group differences and the moderating role of religiosity will also be examined.

The Blurred Line Between Myth and Reality in Early America

Brooks, Zach – *Whitworth University*

Abstract: In early nineteenth century America, the individuals who witnessed and participated in the American Revolution were dying off, leaving the country in the hands of a new generation. These young Americans relied upon the collective memory of the nation to understand the significance of the American Revolution. In cities such as Boston, this generational transition intensified the conflict over the legacy of the revolutionary spirit. Out of this struggle, George R.T. Hewes, an ordinary shoemaker, was mythically elevated from the realm of individual memory into that of collective memory as a historical figure. Conventional wisdom says that biographies mythologizing individuals fail to properly represent the facts of history, and that individual memory is unreliable at best. However, the complex nature of historical fact demands that the relationship between individual memory and collective memory be unpacked on a case by case basis. Through readings of Washington Irving's *Rip Van Winkle*, James Hawkes' *A Retrospect of the Boston Tea-party*, and Benjamin Bussey Thatcher's *Traits of the Boston Tea-Party*, this paper will make the case that the parallels between the return of Rip Van Winkle and the discovery of George R.T. Hewes indicate that, when individual memory diverges from collective memory, the lines between myth and reality blur, and the two must be delicately woven back together to revivify the collective memory.

[Virtual Bodies: How the Rhetoric of Embodiment Enables Harm in Virtual Spaces](#)

Immel, Sarah (*she/her*) – *Whitworth University*

Abstract: Virtual reality is often promoted for its ability to convey more genuine human presence and interaction than other digital media. While this sense of presence makes it an effective tool, it also increases its capacity for harm. In this paper, I examine the language of embodiment used to promote the reality of virtual exchanges. Looking in particular at the promotional language surrounding the Metaverse, I demonstrate how emphasizing the physical presence of the user dehumanizes others represented within the same space, as seen in the numerous instances of sexual assault in virtual spaces. Not only does Meta's emphasis on embodied experience enable these injustices, it also fails to provide a framework for coping with them after the fact. In place of "embodiment," I suggest that our public discourse around virtual reality should turn toward an object-oriented rhetoric to better make sense of digitally mediated interactions and the kinds of force, harmful and otherwise, exerted through them. By considering digital objects as actants in their own right, rather than embodiments of their human subjects, we can better understand the power they have over us and mindfully respond to—or even prevent—the very real harm which stems from these virtual spaces.

[Quantifying Contingent Decreases in Social Media Usage](#)

de Merlier, George – *Gonzaga University*

Abstract: Social media use among college students has steadily been on the rise, with more and more people feeling that social media is negatively impacting their lives, including Problematic Social Media usage, or PSMU. In this study, we utilized the disequilibrium equation to differentially reinforce homework duration over social media duration. The disequilibrium equation, which utilizes ratios to reinforce contingent behaviors by shifting behavioral equilibria from one behavior towards another behavior. Nine undergraduate participants were asked to devise their own contingencies on their behavior to reduce their social media use over the course of a semester. Half of the eight participants supported the disequilibrium theory to reduce social media use, with the other half decreasing social media use without the differential reinforcement of homework. From the results, we isolated a range of contingencies that were helpful towards participants who successfully applied the disequilibrium theory to decrease social media use and increase homework behavior. A measurement of social validity was taken from participants after data was collected, which suggested that most participants found the behavior shift project to be an acceptable and positive method of changing behavior.