

Summer Research Institute (SRI)



Coordinator: Donna Treloar, MA **Instructor:** Andrew Huerta, PhD **Graduate Teaching Assistants:** Alyssa Higgins and Ru-ben Zecena **Sponsors:** University of Arizona, University of Arizona Graduate College, The Partnership for Native American Cancer Prevention (NACP) training program a collaboration between Northern Arizona University and The University of Arizona Cancer Center funded by the National Cancer Institute, College of Medicine Office of Diversity and Inclusion, Health Resources and Services Administration (HRSA) Centers of Excellence, Western Alliance to Expand Student Opportunities (WAESO)

Adam Alfrey

University of Arizona, Mathematics and Physics

Mentor: Dr. John Schaibley - Physics



Optically Inscribing Excitons for Applications in Quantum Information Science

ABSTRACT: Bound pairs of electrons and holes in two-dimensional semiconductors may play a critical role in the future of information science. Because they re-emit the same polarization of light with which they were excited, the semiconductors can be used as logical computer switches. For example, left-handed circularly polarized light exciting and re-emitting corresponds to a 0 (off) and right-handed light corresponds to a 1 (on). These effects have already been documented in bulk semiconductors but only at low temperatures which reduces their applicability. However, in atomically thin sheets of transition-metal dichalcogenides (TMDs), these excitonic states may be addressable at more practical temperatures due to the increased binding energies associated with TMDs. In addition to temperature, another hurdle in the quest to store information in excitonic states is that in order for these bound pairs to be computationally useful they must persist for longer than they do within one layer (intralayer excitons). In this study, we aim to optically read out polarizations of longer-lived excitons that exist between two layers of different materials (interlayer excitons) as well as demonstrate ability to control their flux with a smooth electric-potential profile. The results herein could help further the search for an electronic switch that does not require relatively large amounts of energy to stay in the on position.

Angelica Boyles

University of San Diego, Sociology and Psychology

Mentor: Dr. Elise Lopez – Social & Behavioral Sciences



A Theoretical Examination for a Sexual Violence Bystander Intervention Program in Bars

ABSTRACT: Sexual violence is a pressing public health concern, and although there are valuable programs that target awareness and prevention on college campuses, such measures only reach a portion of those who are affected by sexual violence. By broadening the scope of such programs to another high-risk setting like bars, more at-risk populations than college campuses alone are encapsulated. Bars serve both college and non-college patrons and include ample ranges in age, enabling a broader community to understand effective bystander strategies. This study examines the Arizona Safer Bar Alliance's (ASBA) Safer Bars bystander intervention program, which has spearheaded the country in bar staff participation in bystander intervention, as an essential step in expanding prevention strategies into public spheres. By utilizing the theoretical framework of the Social Ecological Public Health Model of Prevention as the principal standard, this study examines literature that lends credence to ASBA. This will highlight the significance of the Safer Bars initiative and demonstrate how it integrates standing research into practice in the next steps in combatting sexual violence in alcohol serving establishments.

Cyrena Gibson

University of Arizona, Criminal Justice and Psychology

Mentor: Dr. Chris Weber – School of Government & Public
Policy



Predicting Behaviors of Gun Ownership and Policy Preferences from Racial Attitudes

ABSTRACT: The objective of this study is to further establish a relationship between racial attitudes, and behaviors of gun ownership. This study considers how socioeconomic and psychological factors to predict gun attitudes. In particular, the purpose of the research is to understand how one's orientation towards social groups influences behaviors of gun ownership and policy preference. The data collected for this research is from the American National Election Study, which is a large sample of US voters, voting behaviors and public opinions. Using four group-based measures (anti-egalitarianism, hostile sexism, authoritarianism, and racial resentment) I examine the extent to which these factors predict gun attitudes and ownership behaviors. The results show that group-based attitudes strongly relate to gun attitudes. These findings presented help explain the significance of how racial attitudes and beliefs impact gun control and gun ownership. In turn, we can use these findings to understand voting behaviors when looking at US gun control policies and debates.

Rebekah Jones

Cornell University, Development Sociology Justice and
Public Policy

Mentor: Dr. Michele Walsh – School of Family & Consumer
Sciences



Evaluating Mental Health Courts: Essential Factors, Equity, & Missing Links

ABSTRACT: Over the past 20 years, there has been a substantial rise in the number of mental health courts (MHC) operating in the U.S. The shift towards the use of these problem-solving courts (PSC) as a means of dealing with the drastic overpopulation of the mentally ill in our country's prisons and jails has been supported by some who claim that there are therapeutic benefits of treating mental illness separately in our justice system. However, while a great deal of work has investigated best practices and factors that contribute to positive outcomes in other types of PSCs such as drug courts, evidence has been less conclusive in determining what specific factors contribute to success in mental health courts. Furthermore, many researchers have questioned how to address the racial inequities in the justice system through these specialized courts. This paper adds to the body of literature that investigates the essential factors necessary to achieve positive outcomes in mental health courts, paying special attention to questions of racial equity and potential missing elements related to diversion and completion rates. Using a systematic literature review of potential factors to create an evaluative framework of mental health courts, two semi-structured interviews with Pima County mental health court experts were conducted. The results highlighted the importance of communication between court and treatment actors, use of risk-based assessments, individualized processes, equity in diversion, standardized court training, as well as proper monitoring and evaluation.

Tykeyah Key

Rust College-Holly Springs Mississippi, Computer Science

Mentor: Dr. Jekan Thanga – Aerospace-Mechanical
Engineering



Lost-Cost Milli-Newton Thruster Test Stand for Novel In Space Propulsion

ABSTRACT: Aerospace researchers depend on inexpensive test methods to further their scientific goals, especially for the more current costly space missions. However, given that they are very expensive, for this specific design, we are to construct a model using very little funds. The purpose of this research is to construct a low-cost torsional propulsion test stand on a low-cost budget. The focal point is to design a test stand through SolidWorks, construct the design, test the displacement of the thrusters inside of a vacuum chamber. The displacement is important because the system provides very low thrust, meaning that any sort of displacement mechanism will only move very small distances. The propulsion system within the test stand will be tested inside of a vacuum chamber as a space simulator. Because it would cost a large amount of money, the experiment will happen inside of the chamber because it simulates a space environment without actually being in space. Before testing in space, we are needed to test inside a vacuum chamber. In this paper, the different types of test stands will be explained and rationale. Inside, is information explaining why a torsional test stand is used for this research. Also included will be SolidWorks models, a spreadsheet of the different sensors that were chosen from, how the calibrations and dynamics came about, etc. The goal is to prove a low-cost torsional propulsion test stand can be cautiously designed on a strict budget and measured for displacement of movement.

Chelsea Kosiba

University of Arizona, Music Education

Mentor: Dr. Dawn Corso – School of Music



Preservice Teachers Experience and Motivations to Participate in World Music Ensembles

ABSTRACT: This study focuses on the experiences of preservice teachers in a world music ensemble as part of a required music education course at a Southwestern university. The study was created as a result of the researcher's experience with world music ensembles and her interest in preservice teachers' conceptions about music cultures they are studying. Specifically, how the act of learning about a variety of music cultures helps preservice teachers to further their education and broaden their worldview. The hypothesis is that students will have a differing perspective about music cultures from the start of the class to the finish. Data will be collected through group interviews and observations of students in a required general music methods course for music education students. The students who participate will be asked the same open-ended questions at the beginning and the end of the course while the researcher constructs themes based on student feedback. Additionally, observations will corroborate any differences between answers between both interviews. Results have not been found as this music education course is only available during the Fall. Therefore, the following study will continue into the 2019-2020 school year.

Lukas Nienhuis

University of Arizona, Business Administration

Mentor: Dr. Martin Reimann – Marketing



Trust Relationship Study: A Comprehensive Review

ABSTRACT: In this study, I compare the types of trust relationships between different individuals and groups as found in prominent sociological journals. The lens for comparison focuses on the frequency of use of two main forms of trust: generalized trust and relational trust. Generalized trust is fostered by the bridging reinforcement of positive encounters with strangers, facilitates passive public behavior, and is fully characterized in the form of an acquaintanceship. Relational trust concerns a particular relationship between individuals or groups, and is most characterized in the form of friendship. Through comparison of the diction and notation of the definitions of trust relationships, I developed a framework to classify trust relationships based on perceived depth and value of the relationship. I then established a comprehensive trust definition for each term through a multi-disciplinary lens, asking how to improve the accuracy of trust relationship classifications. The results of this study sought to identify key referencing to specific terminology in academic literature, through a systematic content analysis, and determine the frequency of key terms in the field of sociology. The significance of this study is to elucidate and clearly identify different forms of trust, particularly distinguishing the effects of relational trust in social in everyday relationships.

Rina Nkulu

University of Arizona, English

Mentor: Dr. Rochelle Rodrigo and Reese Davis – English



Where in the World is The Digital Classroom?: Online Learning and Escaping “Any Time, Any Place”

ABSTRACT: Using the work of Fielding (2016) on the rhetoric of “any time, any place” in online learning as a theoretical framework, this paper examined student responses to questions from a large-scale, multi-institutional survey about experiences in first-year online writing courses, focusing on course interaction, engagement, and depth. A majority of the students who were asked to identify characteristics of successful online learners did not identify communication skills as one of these characteristics, in spite of its importance in face-to-face classroom contexts. Identifying this discrepancy aids in the construction of separate “student” and “non-student” online identities, and with that, the concept of an “educational” and “non-educational” Internet. Though it becomes apparent that each of these conceptions possess different expectations and experiences, they shape and impact each other in ways that merit nuanced, further investigation.

Graciela “Zonnie” Olivas

University of Arizona, Public Health

Mentor: Dr. Mary Kay O’Rourke – Community Environment
& Policy



Household Air Pollution and Respiratory Health Outcomes of Hopi Residents

ABSTRACT: Household air pollution from residential solid fuel use is responsible for over 3 million premature deaths each year. The Hopi, a Native American Tribe in northeastern Arizona, burn coal to heat their homes, increasing their risk of respiratory disease. To determine the impact of combustion on respiratory health, this study examined the seasonal concentrations of particulate matter (PM_{2.5}) within Hopi households and its relationship to resident pulmonary function. Average personal PM_{2.5} concentrations were measured both in the heating and non-heating seasons for 14 different households using real-time individual monitors (MicroPEM) set at 5-minute logging intervals. Each participant was administered a spirometry test by a trained technician. Measurements include FVC, FEV₁, and the FEV₁/FVC ratio. Average personal PM_{2.5} concentrations and spirometry test results were matched by the household identification number and stratified by season. Households were included only if the spirometry data was present for both seasons, and results had a session quality grade \geq C). The average PM_{2.5} concentrations for the winter heating season (n=14) were 45.03 $\mu\text{g}/\text{m}^3$ and exceed the WHO standard of 25 $\mu\text{g}/\text{m}^3$. Summer season (n=14) concentrations average 12.3 $\mu\text{g}/\text{m}^3$. Next, we will evaluate the relationship between the MICROPEM average concentrations and the spirometry values by season. Characterizing the magnitude of PM_{2.5} exposure and its impact on respiratory health can increase resident awareness and help identify ways to mitigate exposure.

AJ Olsen

University of Arizona, Psychological Science

Mentor: Dr. Jessica Andrews-Hanna and Dr. Erin Maresh –
Psychology



Dyadic Processes of Self-Focused Language and Moderation by Attachment

ABSTRACT: In order to increase the knowledge of dyadic contributions of emotionality within romantic relationships, the current study highlights first-person singular pronoun use as an indicator of self-focused language. For the purpose of this study, we aimed to (1) explore dyadic effects of first-person singular pronoun use and depression within a relationship, (2) evaluate the extent of the influence that valence has on language use, and (3) investigate how relationship attachment style may strengthen or weaken the association between first-person singular pronoun use and depression. We hypothesize that scores in anxiety or avoidance will act as a moderator in this association and that there will be dyadic effects in this – that is, an individual’s depressive symptoms will influence use of first-person singular pronoun use in their partner. Transcriptions from various guided interaction tasks were used to assess language use. Participants completed both the Experiences in Close Relationships short form and the Depression Anxiety Stress Scale to assess attachment style and depressive symptoms, respectively. Preliminary results provided some trends for goal one and two, and non-significant results for goal 3. The trending results provide some support for the hypotheses, which may be stronger once an optimal sample size is gathered. Overall, these preliminary results present some valuable opportunities when further analyzing the dyadic effects of language use and depression in a relationship.

Javier Ramirez

University of Oklahoma, Human Relations and Women's &
Gender Studies

Mentor: Dr. Marla Franco , Center for the Study of Higher
Education and Cindy Trejo, Student Affairs and
Enrollment Management



Project Outreach FAMILIA: Strengthening the Hispanic Educational Pipeline in Arizona

ABSTRACT: As a recently designated Hispanic Serving Institution (HSI), The University of Arizona (UA) has the opportunity to address Hispanic students' disproportionate access to higher education. In an attempt to better serve Hispanic students, UA submitted a proposal to the U.S. Department of Education's Title V, Part A grant funding. This paper utilizes a case study method approach that focuses on UA's location in Pima County, AZ, and draws on Latina/o Critical Theory as a framework. The grant proposal is analyzed using existing literature to inform best practices most suitable for UA's resources and the surrounding community. The grant proposal consists of four main strategies: high quality dual enrollment mathematics courses, graduate fellows serving as course instructors and mentors to high school students, high school teacher training, and college-going outreach activities that support local college-readiness. These strategies seek to increase college-going Hispanic students throughout the educational pipeline from a tailored, holistic approach. Overall, taking key elements of the grant proposal into account, the strategies meet the needs of Hispanic high school students residing in Pima County and have great potential in promoting postsecondary educational attainment.

Helena Rodriguez

University of Arizona, Psychology

Mentor: Dr. Vanessa Perry – Disability Psychoeducational
Studies



The Evaluation of Psychology and Counseling Graduate Program Materials

ABSTRACT: Disclosures of experienced mental health problems are pertinent to the helping field. Moreover, the prevalence of mental health disclosures in graduate applications and their impact on admission has yet to be addressed in counselor education research. The current study examined the inclusion and exclusion of mental health diagnoses in psychology and counseling graduate applications. Faculty from psychology graduate programs including Psychology, Counseling, and Marriage and Family Therapy utilized three personal statements with varying degrees of disclosure to effectively evaluate the applicant, as well as address their own perceptions of disclosure. Preliminary results suggest factors such as explicit motives for future research, as well as demonstrations of readiness to enter the program are regarded highly by faculty personnel. Additionally, statements with a disclosure were regarded as troublesome, implicating disregard for ethical and professional boundaries. Concurrently, there was a high prevalence of evaluators' personal experiences disclosing of a mental health diagnosis; those with similar experiences favored and praised the inclusion of the disclosure, whereas those less exposed viewed disclosures as negative and concerning. Evidently, the research provides ample information pertaining to the effects these disclosures have on prospective graduate students. Given the magnitude of graduate students needing to disclose a mental health diagnosis, as well as psychology professionals who attest to the benefits of psychotherapy, psychology graduate students should be encouraged to disclose. In turn, disclosing could reduce the regression rates of students in need of effective treatment. More importantly, positively broaden the scope of discussion surrounding stigma in mental health care professions.

Neida Rodriguez

University of Arizona, Anthropology

Mentor: Dr. Diane Austin – Applied Anthropology



Beneficial Opportunities While Gardening in Southern Arizona and Sonora Area

ABSTRACT: In gathering information about the potential benefits and challenges of gardening produce and herbs in Southern, AZ. While also evaluating the prices of produce and herbs sold at local stores is to see if gardening produce and herbs has overwhelming benefits such as cost effectiveness, physical and mental wellbeing, or social inclusion in comparison to buying produce at local grocery stores. The steps taken to receive results have been through ethnographic methods by conducting interviews with home gardeners and community gardeners in the Southern, AZ and Sonoran area. As well as quantitatively by collecting the prices of produce and herbs at different local grocery stores. Gardening has been found challenging due to time, effort, insects, animals, finding certain plants or seeds, heat, and funding. There are rewards from gardening such as peace, joy, reconnection to identity, a sense of community, and educating others on gardening. A running community garden and local gardeners have not been found in Nogales. Further research will be conducted to gain information about gardening in the Nogales area in order to create a successful model of a garden with environmentally compatible plants. The garden will be an addition to an ongoing project with the Bureau of Applied Research in Anthropology where a house displays methods of sustainable practices to implement in one's own home.

Romy Sandoval

University of Arizona, Business Economics

Mentor: Dr. Price Fishback – Economics



Missouri's Response to the US Great Depression

ABSTRACT: The United States Great Depression motivated state governments across the nation to implement policies that would alleviate the economic burdens intensified by the financial crisis of the 1930s. The Missouri Legislature passed numerous bills between 1929 and 1941 to promote growth in revenue that could be used to recover from the financial climate. This study analyzes the ideological foundations of federalism and tax reform to identify Missouri legislation that helped the state sustain the hardships of the depression. In particular the paper examines Missouri session laws, newspapers and treasury reports contained four critical pieces of legislation that the state passed to recover from the economic downturn of the 1930s. The data used was triangulated to understand the political, public, and financial implications of bills that were passed. Critical laws implemented included a remission of tax penalties and the ability to pay taxes in the form of installments used to ease the burden felt by Missouri citizens in a financially unstable climate. The introduction to a general sales tax also created an influx of revenue for the state while the regulation of intoxicating beverages was also used to increase state revenues. This research shows that laws passed by the Missouri legislature in the 1930s affected the amount of revenue received by the state during the Great Depression, but further research is needed to conclude the statistical significance of the laws identified herein.

Caitlyn Seymour

Northern Arizona University, Psychology

Mentor: Dr. John B. Allen and Michael Medrano -
Psychology



The Effect of Worry on Cardiac Response

ABSTRACT: Flexible regulatory systems indicate a healthy and responsive body. Worry has been associated with autonomic inflexibility and lack of control over the heart. This study utilized a sample of 35 undergraduate students in order to identify the effects of trait and state worry on cardiac response both during times of rest and times of worry. The participants were placed in one of three trait worry groups (low trait worriers, mid trait worriers, high trait worriers) based on scores from the Penn State Worry Questionnaire. This study hypothesized that high trait worriers would experience a decrease both in heart rate variability (HRV) and respiratory sinus arrhythmia (RSA) compared to low trait worriers. Participants of all worry levels were instructed to worry as they normally would on a day to day basis while heart rate data was collected using an electrocardiogram (EKG). Based on the design of our study, we expect to find results that align with that of past literature, which identify worry as a mediator that leads to reduced RSA and HRV.

Mike Shen

University of Arizona, Neuroscience & Cognitive Science
and Linguistics

Mentor: Dr. Aneta Kiear – Speech, Language & Hearing
Sciences



Facilitating Phonological Processing with Repetitive Transcranial Magnetic Stimulation (rTMS)

ABSTRACT: Stroke-induced aphasia is a disorder that hampers a person's language processing abilities. In particular, the ability phonological processing enables our brain to transform acoustic sounds into words and is often impaired in patients with stroke-induced aphasia. Furthermore, previous studies show that the supramarginal gyrus (SMG) brain region contributes to the proper function of this ability (Gold & Buckner, 2002; Rapcsak et al., 2009; Sliwinska, Khadilkar, Campbell-Ratcliffe, Quevenco, & Devlin, 2012). Thus, the current study investigates whether repetitive transcranial magnetic stimulation (rTMS), a non-invasive brain stimulation technique, can help patients perform better on phonological tasks.

The experiment employs a 2x2+1 design in the rTMS procedure (excitation/inhibition to left/right SMG and a sham condition), with patients completing phonological tasks during functional magnetic resonance imaging (fMRI) before and after rTMS. Tasks are threefold: phonology, semantics, and visual control. To ensure validity in comparisons, all lexical items are carefully matched for their lexical characteristics (frequencies, orthographic length). Participants are asked to make judgement on pairs of items based on the three different tasks (whether they are 1) pronounced in the same way, 2) similar in meaning, and 3) spelled in the same way). Their reactions times, accuracies, and brain scans are analyzed.

Preliminary results show significant differences between post-rTMS – pre-rTMS reaction times differences (average change in reaction times: excitatory rTMS (-320.12 ms) vs. inhibitory rTMS (+37.5 ms)) for auditory stimuli.

Cedric Vicera

University of Arizona, Philosophy

Mentor: Dr. Vignesh Subbian and Patrick Essay – Biomedical Engineering



Persona Identification in Tele-ICU Data of Mechanically Ventilated Patients

ABSTRACT: Assessing the capabilities of utilizing remote monitoring data obtained from critically-ill patients has become a pressing challenge in improving coordination of care in intensive care units (ICUs) and research in cohort discovery in critical care telemedicine. Analyzing large-scale remote monitoring data using computational methods can offer effective qualitative and quantitative comparisons of critically-ill patients. This paper identifies specific personas across seven cohorts of critically-ill respiratory failure patients. Moreover, this study asks: how effectively can cohort discovery via tele-ICU systems develop personas for critically ill mechanical ventilation patients? Using the electronic ICU (eICU) Collaborative Research Database, the collected data is extracted and preprocessed to develop a script to filter patient data down into a persona with the intent of identifying unique patient characteristics. This specific persona would contain information such as age, gender, and the top three most common admission diagnoses. This study shows that using the eICU database coupled with computational methods can generate robust patient personas. Future interventions can use these patient personas to drive further research which will plot and visualize the distribution of numerical data across cohorts.

Maliah Wilkinson

University of Mississippi, Communication Sciences &
Disorders

Mentor: Dr. Mary Alt and Dr. Genesis Arizmendi – Speech,
Language & Hearing Sciences



Moving Towards Culturally Competent Research in the Field of Speech-Language Pathology

ABSTRACT: Cultural competence is the capability to successfully communicate in intercultural environments. In the field of speech-language pathology, performing culturally competent research is significant because research is the foundation of evidence-based practice. As a health-care field, individuals receiving services are diverse and research should be done with diverse populations in a way that validly reflects each person's culture. Although there are clear guidelines for how to be a culturally-competent practitioner, there are no such guidelines for researchers. To better understand the state of cultural competence in the field of speech-language pathology, an analysis of the literature was conducted, yielding 45 relevant articles. This analysis aimed to examine what the literature says about cultural competency in research. There was only one article that directly addressed this need. Some themes identified in the literature were questions about how cultural competence looks and how to implement cultural competence into research. These themes were used to create a 10 question open-ended survey that was emailed to 5 participants. A comparative analysis of what the literature says and responses to the survey was conducted. Results from the study suggest a lack of publications related to cultural competence in research and demonstrates a need for more research on this topic to take place. The survey responses imply that researchers have an unclear understanding of what cultural competence looks like in research. Holistically these findings indicate a need for increased awareness in research on cultural competence is and how it should be implemented in research.

Yinan Xu

University of Arizona, Mechanical Engineering

Mentor: Dr. Jekan Thanga – Aerospace-Mechanical
Engineering



A Differential Correction Scheme to design Lagrange points Constellations

ABSTRACT: The Moon surface has unique resources which can be exploited for potential economic benefits, such as In-Situ Resource Utilization (ISRU) applications. The surface exploration of the moon can be greatly enabled by designing a constellation around it. However, there are multiple challenges to deploy a lunar constellation such as complex dynamics around the Moon; unstable spacecraft orbits near the moon; deploying constellation near Moon is not cost-effective as it results in a large number of spacecraft. One solution to these challenges is to find the optimal coordinates to position the spacecraft. The Lagrange points in the Earth-Moon system offer unique vantage point for lunar surface coverage. Additionally, the Lagrange points permit several types of orbits around them. However, a constellation deployed at the Lagrange points has to address several problems such as selecting the required Lagrange points; optimal orbits; and design of participating spacecraft. This work presents an algorithm to design Halo constellations around the Lagrange points. The algorithm will first develop a collection of Halo orbits around a Lagrange point, and then identify a viable constellation by eliminating orbits which result in colliding spacecraft. The Halo orbit is generated by differentially correcting a set of user input initial conditions. Following this we also describe the algorithm to check for spacecraft collisions using a collision matrix. Finally, we demonstrate our algorithms by designing a Halo orbit constellation around the Lagrange point L_2 . Thus, developing algorithms to design constellations that will enhance the future of lunar exploration.