

CONFERENCE PROCEEDINGS

Listed below are abstracts of student-faculty collaborative work presented at regional, national, and international conferences.

Mitchell Revalski

(Paul Wiita, Faculty Sponsor)

Exploiting Kepler to Study Quasar Variability

Presented at the 221st American Astronomical Society Meeting, Long Beach, CA, January 6-10, 2013

Variability of emission across all bands on both short and long-term time scales is a defining feature of active galactic nuclei. We present here an analysis of the optical light curves of four flat spectrum radio loud quasars, highlighting the two most recently released quarters of Kepler satellite data. Long cadence data sets were analyzed to search for flare activity and potential variability. Power spectral densities (PSDs) were used to probe for periodicities and to characterize the variability. We analyzed the raw data and also analyzed that same data after we made corrections to remove artifacts including null values, downlink gaps, and thermally induced irregularities. Often significant differences arose in the PSDs due to these corrections. The standard Kepler pipeline reduction was found to remove nearly all of the long-term variations in question. Additionally, we applied end matching to the raw corrected data so as to remove a first-order linear term; this should improve the accuracy of the PSDs. Average PSD slopes for the raw and end matched data sets were $\alpha = -1.76$ and -1.60 , respectively. These values are consistent with ground-based analyses of other quasars and blazars. One of our objects showed significant but modest flare activity whereas the others were in low activity states. No significant periodicities or quasiperiodicities were detected for these objects. This work was supported in part by NASA Kepler GO Grant NNX11AB90G to SSI and MUSE funds at The College of New Jersey.

Gabriel Randazzo and Lisa LaJevic

(Lisa LaJevic, Faculty Sponsor)

Cleaning Our World Through Art: Exploring Ecology Through Contemporary Art.

Presented at the National Art Education Association (NAEA) Conference, Ft. Worth, TX, March 7-10, 2013

Recent literature suggests the importance of incorporating contemporary art in the classroom (Mayer, 2008; Walker, 2001). Often exploring global issues, contemporary art investigates interdisciplinary themes that are prevalent in everyday life/culture, and challenges viewers/students to examine issues and formulate their own beliefs. Highlighting this philosophy, our presentation focuses on how contemporary artists who explore important ecological issues can be incorporated into the art classroom. Investigating artists such as Moose, Scott Wades and Alexandre Orion, and their working with reverse graffiti, an ecological reductive artmaking process that is created by removing dirt from a surface, we offer practical, innovative lesson ideas that integrate art with science. Supporting the conference theme, we explore global environmental issues such as pollution, and creative lessons that make a difference by actively cleaning up our community/ies through art. This presentation helps push traditional art education boundaries by promoting student understandings of art, ecology, world, and self.

Jessica Scardino

(Lynn Gazley, Faculty Sponsor)

Religious Attendance and Happiness: An Application of Interaction Ritual Theory

(1) Presented at the 83rd Annual Meeting of the Eastern Sociological Society, Boston, MA, March 21-24, 2013

(2) Presented at the 83rd Northeast Regional Honors Council Conference, Philadelphia, PA, April 4-7, 2013

(3) Presented at the 108th Annual Meeting of the American Sociological Association, New York, NY, August 10-13, 2013

Previous research on the relationship between religiosity and happiness has emphasized that happiness results from the social cohesion experienced by belonging to a faith community and the development of positive coping skills. I propose that this relationship can also be explained using "Interaction Ritual" Theory (Collins 2004). Using data from the 2010 General Social Survey (GSS), this study examines the relationship between religiosity and happiness using a binary logistic regression. Findings indicate that when controlling for age, race, sex, and socioeconomic status, there is a positive relationship between the frequency of religious attendance and increased happiness levels. I then explain these findings considering religious services as an "Interactional Ritual" (Collins 2004). While this study uses an application of "Interaction Ritual" Theory in order to explain the positive relationship between happiness and religious attendance, the quantitative analysis may serve to support elements of Collins's theory by providing a measurable dimension of the emotional effects of ritual participation.

Francisco Estevez and Shahzore Qureshi

(S. Monisha Pulimood, Faculty Sponsor)

Students Organizing Against Pollution: Computational Thinking Across Boundaries

Presented at the ITiCSE 2013 ACM SIGCSE Conference, University of Kent, Canterbury, United Kingdom, July 1-3, 2013

There is a growing need in computer science education to develop courses that demonstrate the articulations between computer science and an array of computing-dependent fields. This poster describes an effort to develop a model for students and faculty to collaborate across disciplines and with a community organization to develop computational solutions to address complex real-world problems. Students in computer science classes are collaborating with students in journalism classes and Habitat for Humanity, to develop a web-based system that manages pollution related data. This is an initiative aimed at empowering citizens in the Trenton area of New Jersey with the opportunity to learn, share, and contribute pollution data while encouraging them to become participants in environmental advocacy and public policy deliberations on these issues. While students focus on the objectives of the individual courses, they are also deeply engaged in the complexities of privacy, security, accessibility of data, user-centered design, etc. as they ponder civic justice issues.

Amanda Soler, Tiffany Piatt, Leeann Thornton

(Leeann Thornton, Faculty Sponsor)

Molecular genetic and biochemical analysis of the role of CYP72A cytochrome P450s in regulating plant growth

Presented at the American Society of Plant Biologists National Conference, Providence, Rhode Island, July 20-24, 2013

Plant metabolic responses to environmental conditions require thousands of enzymes that must work in delicately balanced concert to facilitate plant growth and defense against pests. Plants with the most tightly regulated metabolism and growth are more likely to thrive. The cytochrome P450s (CYPs) are a group of enzymes that catalyze biochemical reactions in all organisms, and they are particularly important in plant metabolism. There are hundreds of CYPs in plants, and they are grouped into subfamilies based on genetic similarity. Our approach is to combine a molecular genetic analysis with biochemistry to describe subtle differences in apparently redundant CYPs from Arabidopsis. The CYP72A subfamily appears to contribute to producing defensive secondary metabolites in response to stress and herbivory. The subfamily is found in all plants but appears to be diversifying in recent evolutionary history. We are examining double and triple mutants to determine the role the enzymes play in maintaining optimal plant growth in Arabidopsis. We are examining the structural constraints of the subfamily that will provide insight into the biochemical activity of the group from multiple plants. We are also optimizing expression of the CYP72A enzymes in yeast for direct analysis of substrate interactions. This work provides insight into the ongoing evolution of plant genomes and the metabolites produced by CYP72As.

Shannon Grooms

(Emily Bent, Faculty Sponsor)

(Re)theorizing the Margins: A Comparative Analysis of Gloria Anzaldua's *Borderdwellers* and Kate Bornstein's *Gender Outlaw*

Presented at the 22nd Annual Women and Society Conference, Poughkeepsie, NY, October 25-26, 2013

This paper is a comparative analysis of Gloria Anzaldua's conceptualization of the border dweller (1987), and Kate Bornstein's gender outlaw (1994). It underscores the theoretical similarities between these two divergent concepts, and in doing so, provides a framework for understanding the experiences of those forced to exist outside of culturally and geographically enforced binaries. The author reads Anzaldua's, *Borderlands/La Frontera: The New Mestiza* as a queer text, and places central concepts such as: the border dweller, the coalitque state, and new mestiza consciousness into direct conversation with Bornstein's theories on gender and male privilege, in *Gender Outlaw: On Men, Women and the Rest of Us*. Based on this theoretical analysis, the author suggests that the border dweller and gender outlaw experience parallel identities from the spiritual and physical consequences of being 'caught in between'. Where the *border dweller* experiences a hybridity that comes from the two locational oppositions, (i.e. the US/Mexico border), the *gender outlaw* experiences this hybridity as two oppositional genders, or the feeling of being neither fully male nor fully female. Taken together, this paper proposes that the border dweller and the gender outlaw offer us a new understanding of the margins and the marginalized experience than previously conceptualized in feminist scholarship.

Nahrin Ahmed

(Blythe Hinitz, Faculty Sponsor)

Umar and the Bully: Teaching Anti-Bullying to Muslim-American Students

Presented at the World Organization for Early Childhood Education (OMEPEP USA) Conference, Washington, DC, November 21, 2013

This lesson was designed to enhance the development of minority students in activating specific background knowledge to teach anti-bullying. The intended goal is to increase participation through the use of information by making it familiar to minority populations. The lesson about anti-bullying is meant to address the role of the bystander to protect a victim of bullying. Elementary anti-bullying school lessons are commonly taught to the largest population of students to address the needs and issues of the majority. However, lessons tailored to specific subsets of students have shown positive gains in overall students' social/emotional wellbeing and their academic achievement (Macpherson, 2009). The anti-bullying lesson I covered was taught to fourth-grade students of Muslim-American background and their parents of Arab and/or South Asian ethnicity. We used the book, *Umar and the Bully*, by Shabana Mir, which tells a story about an incidence of bullying taking place at an Islamic school. We used this to discuss bullying and responses to bullying in terms, linguistically and religiously, specific to this population. The purpose of the lesson was to give Muslim students understanding of anti-bullying concepts taught in public schools by accommodating it to their populations' unique set of terminology and surroundings. Five months after the lesson was taught, the following school year, now as fifth-grade students, they revisited the lesson of *Umar and the Bully*. The students anonymously responded to how they would handle the role of a bystander from both religious and individual points of view. The students' answers showed their tendencies in responding to bullying as a bystander, to have an ingrained religious element.

References:

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Mitchell Revalski

(Paul Wiita, Faculty Sponsor)

Investigating AGN Variability Using Combined Multi-Quarter Kepler Data

Presented at the 223rd American Astronomical Society Meeting, Washington, DC, January 5-9, 2014

The study of long- and short-term variability in active galactic nuclei (AGN) yields deeper insight into the physical nature of their emissions from the accretion disk around, and relativistic jets powered by, a galaxy's central super-massive black hole. We have now obtained a total of eleven quarters of Kepler data on four radio-loud AGN. Our prior work involved calculating power spectral densities (PSDs) on these data both with and without corrections for various instrumental artifacts. We now focus on combining these data sets into one continuous set for each object which spans approximately 2.5 years at a 30 minute sampling rate with >98% duty cycle. The process of stringing together these data is complicated by the quarterly rolls the Kepler space satellite telescope conducts, which causes each target to fall on a different CCD four times per year. We attempt to overcome this problem with a scaling procedure that maintains the original percentage of variations and scales all eleven quarters to the overall average. We calculate PSDs on these stitched light curves both with and without various end-matching techniques applied to increase the accuracy of the PSDs. The PSDs computed for the stitched light curves allow us to probe a full decade lower in frequency than our previous work and show comparable slopes to the PSDs calculated for individual quarters, suggesting we are linking the quarters appropriately. Our average PSD slopes are consistent with ground-based observations of other quasars, falling approximately between -1.6 and -1.9. In addition, we have used original codes to bin and average individual PSDs to reduce the bias introduced on the slope-fitting process induced by the uneven population of points in the PSDs. This allows for a more accurate power-law fitting and tends to steepen the overall slope by approximately 0.1 in the majority of cases. We note increased flaring in one of our objects on the order of 15%, with our remaining three objects being more quiescent with occasional flaring. This work was supported in part by NASA Kepler GO Grant NNX11AB90G and MUSE funds through The College of New Jersey.

Susan L. Knox, Aubrey N. Johnston, and Rajesh Nagarajan

(Danielle Guarracino, Faculty Sponsor)

Synthesis of 2,2'-dimethyldodecanoyl ACP to understand substrate specificity in LasI catalyzed Pseudomonas aeruginosa quorum sensing

Presented at the 247th American Chemical Society National Meeting & Exposition, Dallas, TX, March 16-20, 2014

Bacteria use signal mols. called autoinducers to est. local cell population densities. This mechanism, referred to as quorum sensing, aids bacteria to form biofilms. The LasI AHL (acylated homoserine lactone) synthase enzyme in Pseudomonas aeruginosa uses 3-oxododecanoyl ACP and S-Adenosyl-L-methionine substrates to make 3-oxododecanoyl homoserine lactone autoinducer. To understand the importance of a carbonyl group in C3 position of acyl-ACP substrate in LasI catalyzed AHL synthesis, we decided to compare the catalytic efficiency (k_{cat}/K_m) of 2,2'-dimethyldodecanoyl ACP substrate with 2,2'-dimethyl-3-oxododecanoyl ACP to understand substrate specificity at the 3-oxo position. We used a Meldrum's acid procedure to make the beta-ketoester, dimethylated at C2 position, reduced the carbonyl at C3 via a hydrazone intermediate, and then prepd. acyl-CoA through an N-acyl imidazole intermediate. The final acyl-ACP purifn. will be done using phosphopantetheinyl transfer enzyme. We will use a colorimetric assay to det. the catalytic efficiency of this substrate.

Jennifer Schablik, Joyce Seifried, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

A Biology Module for the Integrative STEM Classroom: Nucleotide Base Colorimetric Detection using Silver Nanoparticles

Presented at the National Association of Biology Teacher (NABT) 2014 Professional Development Conference, Cleveland, OH, November 13-15, 2014

The purpose of this summer research project was to develop a lesson plan that implements basic concepts of nanoscience into the classroom to make students more aware of possible careers in the STEM discipline. The lesson plan is proposed as a criminal investigation where a forensic scientist develops a way to code for a sample of DNA using nanoparticles through the reduction of silver nitrate with sodium borohydride. Interactions between DNA nucleotide bases (Adenine, Thymine, Cytosine, Guanine, and Uracil) and colloidal silver nanoparticles were investigated through a color change in solution at multiple concentrations (50 mM, 10 mM, 1 mM, 100 μ M). This work describes the interaction of silver nanoparticles with DNA nucleotide bases and how these interactions alter the absorption spectrum of visible light, resulting in a visible color change specific to each nucleotide base. A color change is important in the biological sciences as an indicator for molecular interaction. The lesson provides a hands-on investigation and visual representation of the absorption of visible light, a topic emphasized by the Next Generation Science Standards (NGSS). A spectrophotometer was used to record absorption data so students can graph and discuss the nanoparticle absorption of light. The activity was demonstrated in a high school science course in order to measure the effectiveness of the lesson and student understanding. Assessments include a pre and post lesson survey as well as in class discussion.

Joyce Seifried, Jennifer Schablik, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

An Integrative STEM Approach to Teaching about Hydrophobic Interactions using Self-Assembled Monolayers

Presented at the National Association of Biology Teacher (NABT) 2014 Professional Development Conference, Cleveland, OH, November 13-15, 2014

Hydrophobic materials are found in modern day commercial products, including windshield coatings, water repellent clothing and umbrella coatings, all of which display the biological property of hydrophobicity. The purpose of this summer research project was to design a water droplet maze for an inquiry based lesson to introduce the concept of hydrophilic, hydrophobic, and super hydrophobic interactions on specially made surfaces. The lesson was designed so that a biology teacher could explain why molecular-level structure is important in the functioning of designed materials, which is a specific standard of the Next Generation Science Standards (NGSS). In our research, we optimized a procedure so teachers can make three different surfaces and then pose questions to students to see if they can use observational skills to distinguish between different surfaces. In the lesson plan, students measure the contact angle of the water droplet to the surface in order to identify the surface. A contact angle measurement is a well-established scientific technique to measure the hydrophobicity of the surface. The lesson is flexible enough for students to use either a protractor or phone application to measure the contact angle. If a water droplet has an angle greater than 90° then it is hydrophobic. If the angle measures greater than 150° then it is super hydrophobic. Through observation and play, students will learn hands-on about how a self-assembled monolayer can alter surface interactions. The activity was demonstrated in a high school science class, and in order to measure student understanding and the effectiveness of the lesson a pre- and post-survey were administered.

CONFERENCE PROCEEDINGS AND BIBLIOGRAPHIC LISTINGS

Brandon Gottlob

(Deborah Knox, Faculty Sponsor)

Real Time Occupancy Notification: A Comparison Between Passive Infrared and iBeacon Implementations
Presented at the 46th Association of Computing Machinery (ACM) Technical Symposium on
Computer Science Education (SIGCSE), Kansas City, MO, March 4-7, 2015

iBeacon technology has the potential to transform occupancy detection from the traditional passive infrared motion sensor approach because of its portability, relatively low cost, and capabilities beyond motion detection alone. This project implements study room occupancy detection in the TCNJ Library using a Raspberry Pi with a PIR sensor and an Estimote Beacon. The scalability of each approach is directly compared by cost, ease of setup and maintenance, and accuracy. Prototype occupancy detection systems that are set up in study room environments provide end-users with a listing of available rooms in real-time through new functionality in the TCNJ Library iOS app. Using iBeacon sensors can bring extra functionality to existing systems and new environments where portability is essential.

Lianna Lazur

(Ruth J. Palmer, Faculty Sponsor)

A Life History of Eunice Kennedy Shriver: Advocate and Change Agent for the Intellectually and Developmentally Disabled

Presented at the National Council on Undergraduate Research (NCUR) Conference, Lexington, KY, April 3-5, 2014

This work presents the life history of Eunice Kennedy Shriver, 1921-2009. Life history, a form of narrative research inquiry, focuses on individual history to uncover how experience contributes to turning points in a person's life. Narrative researchers collect stories from multiple data sources, then retell or re-story the narrative to reveal the individual's experiences. Drawing on multiple field texts, this investigation adopted Clandinin and Connelly's (2002) re-storying approach, which allowed the inquiry to journey inward (internal conditions), outward (the environment), backward and forward (temporality), and into contexts (the boundaries of the inquiry landscapes). The results uncovered Kennedy Shriver's moral sensitivities, relentless passion, and uncompromising persistence. As a sociologist and social worker, she immersed herself in the societal issues of her time. Her interaction with her disabled sister aroused deep empathy; and the recognition that there were no services available to offer a quality life to her sister fired her lifelong mission to all disabled people. Kennedy Shriver's passion translated outwardly into action. She espoused her family's dedication to public service and, as a member of the Joseph P. Kennedy, Jr., Foundation, she steadfastly focused on its goals: the prevention of disabilities and the improvement of ways in which society dealt with mentally disabled persons. She also headed President John Kennedy's Committee on Mental Retardation, and contributed to the establishment of the National Institute for Child Health and Human Development. Her practical work included the establishment of summer camps for children with disabilities, out of which grew her most important contribution, the founding of the Special Olympics, first for summer and then winter sports. All together, this life history illuminated the experiences and actions of this outstanding woman who changed the global community, and now stands as a model of change agency and advocacy for the intellectually and developmentally disabled.

Amanda Intili and Lisa LaJevic

(Lisa LaJevic, Faculty Sponsor)

(1) *Pre-Service Teaching and Art Workshops for Underserved Populations*. Presented at the National Art Education Association (NAEA) Convention, New Orleans, LA, March 26, 2015

(2) *Responding to an Art Education Crisis*. Presented at the Art Educators of New Jersey (AENJ) Conference, Long Branch, NJ, October 5, 2014

Recently, nonprofit organizations and schools have reduced their art programs because of budget cuts. Wanting to provide quality visual arts opportunities while increasing pre-service teachers' experiences working with underserved populations, our college designed workshops for local communities with limited funding and access to the arts. Pre-service art teachers traveled to a nonprofit arts organization and elementary school to offer free arts programming. The

workshops were based on arts integration models that stimulated connections between art/design, self, and everyday life. This presentation weaves together the experiences of the coordinator and pre-service teachers with participants' artwork. As action researchers, we engaged in self-reflective inquiry, an important component of teacher education. Although we encountered challenges, all involved parties found the workshops valuable. The findings hold implications for our teacher education program as we examine the relationship between the college and community, as well as the future of other arts and design education programs.

Joyce Seifried, Jennifer Schablik, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

An Integrative STEM Approach to Teaching about Hydrophobic Interactions using Self-Assembled Monolayers

Presented at the National Association of Biology Teacher (NABT) 2014 Professional Development Conference, Cleveland, OH, November 13-15, 2014.

Hydrophobic materials are found in modern day commercial products, including windshield coatings, water repellent clothing and umbrella coatings, all of which display the biological property of hydrophobicity. The purpose of this summer research project was to design a water droplet maze for an inquiry based lesson to introduce the concept of hydrophilic, hydrophobic, and super hydrophobic interactions on specially made surfaces. The lesson was designed so that a biology teacher could explain why molecular-level structure is important in the functioning of designed materials, which is a specific standard of the Next Generation Science Standards (NGSS). In our research, we optimized a procedure so teachers can make three different surfaces and then pose questions to students to see if they can use observational skills to distinguish between different surfaces. In the lesson plan, students measure the contact angle of the water droplet to the surface in order to identify the surface. A contact angle measurement is a well-established scientific technique to measure the hydrophobicity of the surface. The lesson is flexible enough for students to use either a protractor or phone application to measure the contact angle. If a water droplet has an angle greater than 90° then it is hydrophobic. If the angle measures greater than 150° then it is super hydrophobic. Through observation and play, students will learn hands on about how a self-assembled monolayer can alter surface interactions. The activity was demonstrated in a high school science class, and in order to measure student understanding and the effectiveness of the lesson a pre and post survey were administered.

Eric Mauro and Ambrose A. Adegbege

(Ambrose A. Adegbege, Faculty Sponsor)

Programmable Logic Controller based Embedded Quadratic Programming for input-constrained Internal Model Control

Presented at the European Controls Conference, Linz, Austria, July 15-17, 2015

Advanced control algorithms such as optimization-based controls are known to offer superior performance as well as systematic constraints handling when compared to classical control strategies. However, the complexity of such advanced control methods makes their implementations difficult, especially on controllers with limited computational capacity such as the programmable logic controllers (PLC). This paper presents the capability of a low-cost low-end PLC for online computation of advanced control. In particular, an online quadratic program within the framework of input-constrained internal model control is implemented, and the effectiveness is illustrated using a hardware-in-the-loop experiment.

Jillian Manzo

(Blythe Hinitz, Faculty Sponsor)

Maria Montessori's Legacy of Peace Education

Presented at the 67th OMEP World Assembly and Conference, Washington D.C., July 27-August 1, 2015

In 1907, Maria Montessori established the Casa dei Bambini in San Lorenzo to create social change, to help children in need, and because it was an opportunity to bring scientific pedagogy into education. Montessori's concern for the physical and mental health of every child and her

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“observation of free children” resulted in what is known today as the Montessori Method. Maria Montessori was profoundly influenced by World War I, the events of the interwar period, and World War II. She observed how WWI and the interwar period brought trauma to children who could do nothing about the conditions they faced. Montessori responded to these years of conflict by incorporating peace education into her method. Her belief that humanity must be educated and “make the child our principal concern” in order to seek common goals, parallels the principles World OMEP was founded on. Today’s society is still filled with conflict and has not achieved the peace Montessori called for in her numerous essays and speeches on peace and education. Drawing from a series of interviews with Montessori Educators in New Jersey and Pennsylvania, this study looks at how Montessori’s legacy of peace education is continued in the twenty-first century. The focus of the interviews includes peace activities and lessons, the peace materials used, how the environment is set up to promote peace, the impact peace education has on children, and how world events today shape the directress’ role as a peace educator. Expected results from research in progress: Montessori’s peace education philosophies are the basis of peace and sustainability lessons and activities in Montessori classrooms in the United States today.

Mario Erisnord
Collegiate Advising

Presented at the 87th annual Eastern Psychological Association Conference, New York, NY, March 3, 2016.

This study evaluated learning outcomes (LOs) of a mandatory 4-year prescriptive academic advising model in a psychology department at an undergraduate institution. Some of the advising courses were delivered in structured seminars, while others consisted of elective workshops. The freshman year sequence achieved 12 of its 14 LOs, a revised junior year sequence achieved 7 of 14. Across the freshman-senior year spectrum only one of four identified LOs was achieved suggesting weakness in the less structured workshop models. Recommendations moving forward consist of interviewing students, faculty, department chairs, and staff to obtain qualitative data that might affirm and expand upon these findings. We anticipate that action steps will include: re-evaluation of the LOs better to align with developmental needs and corollary modification of the courses/workshops to reflect new LOs.

Caroline Parent, Megan Krause, and Aleks Waciuta
(Karen Becker, Faculty Sponsor)

Texting and Driving PSA Campaigns: Changing Attitudes, Not Behaviors: Explaining the Disconnect Through Theory of Planned Behavior

Presented at the Eastern Communication Association Conference, Baltimore, MD, April 1, 2016. The National Highway Traffic Safety Administration reported in 2012 that distracted driving led to the deaths of 3,328 people and injured another 421,000 people. Although the number of anti-texting and driving campaigns has exploded, the fatality rates have only moderately diminished with 2,959 deaths in 2013 (distraction.gov). Text messaging while driving has reached epidemic proportions. This paper examines teens’ prevailing attitudes toward texting and their actual behavior using the Theory of Planned Behavior (TPB) as a theoretical foundation for understanding why the behavior continues, despite increased awareness of the danger. People often engage in risky behaviors without thinking about the consequences of these actions. TPB helps to explain why this occurs. This study reports on research conducted at a Northeastern college evaluating the relationship between the attitudes toward texting and the actual behavior of text messaging while driving. The data suggest negative attitudes toward texting while driving, for both themselves and others who drove distractedly. Also, it was demonstrated that most respondents agreed that they should not text while driving, and cited strong norms with their peer groups against texting and driving. Yet, many still reported that they texted as they drove. Thus, perceived behavioral control was low, suggesting that respondents felt it was impossible for them to stop texting while driving. This is extremely important since this could mean there is something much deeper than just attitudes and subjective norms influencing individuals’ behaviors. Campaigns today focus heavily on the attitudes and social norms of text

messaging while driving in hopes of reducing this behavior. The conclusion of this paper looks at strategies and message tactics that switch emphasis from attitude to behavioral control.

Zachary Nelson

(Ambrose Adegbege, Faculty Sponsor)

Projected Gauss-Seidel Algorithm for Multivariable Algebraic Loops with Applications to Constrained Control

(1) Presented at the American Society for Engineering Education Northeast Section Conference, Kingston, RI, April 28-30, 2016

(2) Presented at the American Control Conference, Boston, MA, July 6-8, 2016

This work considers algorithms for the fast computation of multivariable algebraic loops comprising the feedback interconnection of a nonlinear map and a nontrivial static gain. Such algebraic circuits constitute delay-free loops which have received significant interests in engineering such as in audio and speech processing, control systems, and computational mechanics. When designing compensations for systems with saturating inputs, it is standard to introduce algebraic loops into the control loop to improve the system's overall performance. The goal of this research was to investigate if the Projected Gauss-Seidel (PGS) algorithm shows good promise for both real-time and embedded control applications. In order to demonstrate the trade-off between the number of iterations, speed, and accuracy, we solved several algebraic loops using the Gradient Projection algorithm, PGS algorithm, Lemke algorithm, and Matlab's quadprog function. The algorithms were run on a machine with an Intel Core i7-3635QM processor and 8 GB of memory using Matlab. We limited our testing to a 2-by-2 benchmark example taken from literature. We compared the algorithms in all nine solution space regions for algebraic loops with both symmetric and asymmetric feedback gains. The Matlab simulations show that the proposed PGS algorithm has the ability to solve symmetric and asymmetric algebraic loops with minimal computations per iteration. All iterates fall within the feasible set and can be terminated prematurely for a fast but approximate solution. The PGS solution also outperformed the other algorithms in terms of iterations and CPU time to reach the optimal solution. A further direction is to embed the PGS algorithm on control hardware such as a Programmable Logic Controller (PLC) or a Field Programmable Gate Array (FPGA). It would also be attractive to improve upon the convergence rate by incorporating adaptive step length computation or by incorporating sub-space optimization.

Sarah Wallin

(Jean Brechman, Faculty Sponsor)

Cord Blood Banking Information: Seeking and Scanning in the General Population and in a Sample of Expectant Parents

Presented at the American Marketing Association Marketing and Public Policy Conference, San Luis Obispo, CA, June 23-25, 2016

Stem cells contained within umbilical cord blood (UCB) have the potential to improve and save lives. Since the first transplant, performed in 1988, stem cells derived from UCB have been used in more than 30,000 transplants worldwide. Unfortunately, expectant parents still do not fully understand the significance of cord blood storage. Approximately one out of every three expectant parents does not realize they have the option to preserve their baby's cord blood. Of the two-thirds that are aware, 74% describe themselves as minimally informed (Perlow, 2006). In spite of efforts to supply prenatal patients with balanced information on public and private cord blood banking options, these numbers have not improved much in the past decade (Katz et al., 2011).

Parents' decisions (to bank or not, publically or privately) are affected, in part, by their interactions with doctors and other health professionals. In addition, their decisions may be affected by their interaction with nonmedical sources, including both mass media and interpersonal. In order to understand more about the ways in which expectant parents' receive and use information about UCB banking, our current research focuses on two information use behaviors - seeking and scanning. Traditional research on information use emphasizes individuals' engagement with information sources, that is, those that they have deliberately

sought out (Bright et al., 2005; Muha et al., 1998). This active search for information is called *information seeking*. In contrast, *information scanning* takes place when people come across information through routine media use even when they do not actively look for it (Lee, Zhao, Pena-y-Lillo, 2016). While information seeking is an active behavior, this does not discount the possibility that information acquired through “routine patterns of exposure to mediated and interpersonal sources can be recalled with minimal prompt” (Niederdepppe et al., 2007, p. 154; Hornik et al., 2013) and may play a role when examining influences and motivations for making significant health-related decisions such as UCB banking.

Studies of expectant parents’ knowledge acquisition and decision-making as it relates to cord blood banking are extremely limited. The majority of relevant literature utilizes non-U.S. samples of pregnant mothers and no single study investigates both information seeking *and* scanning behaviors. While it is reasonable to assume that pregnant women (and/or their partners) would seek out information on UCB banking, it is less clear how much UCB seeking and scanning occurs within the general population as they are not immediately faced with the issue. It is therefore likely that the knowledge they gain about UCB banking is not driven by active searching. It is probable that the information they encounter is incidental.

This research study aims to extend our understanding of how seeking and scanning behaviors influence decisions about umbilical cord blood banking. Our primary purposes are to (a) describe the extent of both seeking and scanning from mediated and interpersonal sources and (b) explore ways to improve marketing communication that will build awareness and knowledge acquisition in the general population and, more specifically, among expectant parents.

METHODS

Respondents were men and women between the ages of 18 and 40 ($n = 213$). The sample was fairly even distributed across gender (46.9% female) and age ($M = 29.1$, $SD = 5.5$). Eighty-seven percent of the sample had completed college. Importantly, a sub-sample consisted of expectant parents (i.e., pregnant women ($n = 40$) and males whose significant other was pregnant at the time of the study ($n = 56$)). Age and education in this sub-sample were consistent with that of the entire sample.

Upon successful completion of a screening questionnaire, respondents were directed to a self-administered survey powered by Qualtrics. Respondents completed items about their general knowledge and familiarity with cord blood banking, information seeking and scanning behaviors, beliefs about cord blood banking and intentions to bank.

Sought and Scanned Information Exposure about Umbilical Cord Blood Banking. Respondents were asked to think about the prior 12 months, and whether they (a) actively sought out or (b) inadvertently came across information on cord blood banking from a variety of sources.

UCB Communication Preferences. Respondents were provided with a list of ways in which information about UCB could be communicated to expectant parents and asked to indicate which, if any, they would find helpful in the decision-making process using a 6-point scale ranging from “Not at all helpful” to “Very helpful.” Open-ended feedback was also collected.

RESULTS

Expectant parents encounter (*scan*) information more often ($M = 1.21$ sources, $SD = 1.78$) than men and women not currently expecting ($M = .72$, $SD = 1.31$), $t(171.2) = 2.2$, $p = .026$. They also actively seek information from more sources ($M = .33$ source, $SD = .96$) than their non-expectant counterparts ($M = .10$, $SD = .44$), $t(127.99) = -2.17$, $p = .03$. Seventy-two percent of the general population reports never having encountered information relating to UCB. Six percent ($n = 7$) have come across UCB in one source, 9.8% in two sources ($n = 11$). About 13% ($n = 15$) encountered information about UCB from three or more sources. A slightly higher ratio of expectant parents report having encountered information about UCB in one or more sources. Ten percent have found information from two sources, 23.9% ($n = 23$) percent from three or more sources. A majority of men and women (general population) do not seek out information about UCB (94%). Seeking behavior is higher among expectant parents, though still surprisingly low - 86.5% indicated they have not searched for information on UCB.

Seeking behavior across multiple sources is significantly correlated with expectant parents’ intentions to bank. That is, the more sources an individual actively consults for information about

UCB banking, the higher his/her intentions are to bank privately, $r(94) = .287$, $p = .005$, or publicly, $r(94) = .256$, $p = .012$. Consulting a greater number of sources in active search is also significantly, and negatively, correlated with intentions to discard UCB as medical waste at the time of delivery, $r(94) = -.235$, $p = .021$.

The most common source of information about UCB, that men and women (general population) encounter inadvertently is the Internet ($n = 25$; 21.4%). Additionally, nearly one fifth of individuals report having come across UCB information in online social networking contexts (e.g., facebook, $n = 21$; 17.9%). Eleven percent hear about UCB from family or friends and slightly fewer (10.3%) gain exposure from books, brochures or pamphlets. A small percentage (4.3%) is informed about UCB from their OB/Gyn or another health professional, without seeking it out. Expectant parents most often encounter UCB information in books, brochures, pamphlets ($n = 29$, 30.2%), followed closely by information contained on the Internet ($n = 26$; 27.1%). One-fifth of expectant parents scan information from online social networks ($n = 20$; 20.8%), followed by their OB/Gyn or other health professional ($n = 17$; 17.7%), family members and friends ($n = 13$, 13.5%) or other expectant parents ($n = 11$, 11.5%).

As noted above, it is a small percentage of individuals who seek out information about cord blood. Of those looking for information, the Internet is the most frequently consulted source ($n = 6$, 5.1%) by members of the general population. Expectant parents also look to the Internet for information ($n = 10$, 10.4%) followed by an OB/Gyn or medical professional ($n = 9$, 9.4%).

When asked to comment on a variety of ideas that could prove helpful in improving communication about and understanding of UCB, the entire sample indicated that efforts, ranging from free informational seminars for expectant parents to a non-partisan website, would be instructive and welcomed. Those that were considered to offer the most amount of assistance in the decision-making process included: Coverage from your insurance company for harvesting and/or storage ($M = 4.86$, $SD = 1.15$), availability of research on the viability of cord blood collection and storage ($M = 4.97$, $SD = 1.00$), availability of research on current and projected medical conditions treatable with cord blood ($M = 4.85$, $SD = 1.05$) and pre-banking advice from pediatricians ($M = 4.74$, $SD = 1.07$).

CONCLUSION

In anticipation of the annual conference, we hope to present additional data that will further illuminate ways in which marketers can improve awareness and understanding of cord blood banking options. Prior to the conference, an open-ended variable relating to individuals' preferences for availability and modes of UCB information delivery will be coded and analyzed. Consistent with this year's conference theme, "Fostering Change for Communities and Society", we look forward to sharing and discussing the implications of our research and how our findings can be used to support changes in the way that cord blood banking information is presented. An increase in knowledge about cord blood banking - both in public discourse and in targeted efforts for expectant parents - can ultimately improve and save lives, making this information critical to fostering change in cord blood education and awareness for both the individual and public-at-large.

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Caroline Wood, Manuel Figueroa

(Manuel Figueroa, Faculty Sponsor)

Analytical method to fabricate reproducible SERS substrates

Presented at the American Chemical Society Conference, Philadelphia, PA, August 21, 2016.

The objective of this research study was to design an analytical method to fabricate reproducible surface enhanced Raman scattering (SERS) substrates using printable silver nanoparticle ink as the main component. Printable ink is used in the electronics industry as a low-cost alternative to make conductive paths as the particles can sinter at low temperatures. The ability to control the sintering process through a preheating treatment makes it an attractive way to make SERS substrates over conventional colloidal particles as well as its low-cost and high amplification factors. Central to making reproducible SERS substrates is understanding the relationship between heat and interparticle spacing. The optimal Raman signals occur at a point before nanoparticles coalesce and when many small spaces between the particles are present. Thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) systems were used to find the temperature at which the capping agent on the nanoparticle sublimates, thus allowing the nanoparticles to move closer together, forming aggregates. Scanning electron microscope (SEM) micrographs were collected and then analyzed using an elliptical approximation method on ImageJ to determine interparticle spacing. Rhodamine 6G was used as the analyte to assess the SERS amplification and reproducibility. The thermal pre-treatment allows for the formation of interparticle gaps of the length scale of 10 nm or lower. The resulting Raman intensity increases when the heating method produces a greater abundance of smaller interparticle gaps. In addition to heating temperature, other variables have been observed in the ink preparation method including the effect of drop coating and spin coating samples. These experiments have been applied to two types of printable nanoparticle inks and TGA and DSC results show similar trends indicating the sublimation of the nanoparticle capping agent. Therefore it is expected that the fabrication method can be applied to multiple types of printable nanoparticle ink, making it a more useful method in producing SERS substrates. These results will be discussed to show how their importance in determining the optimal parameters for fabricating highly amplifying SERS substrates.

Tristan Gibson; Hazel D. Dean, ScD.; Brian R. Edlin, MD

(Brenda Seals, Faculty Sponsor)

Prevalence of Opioid Injection among People Using Opioids Nonmedically in the United States: A Data Synthesis

Presented at the Annual Biomedical Research Conference for Minority Students (ABRCMS), Phoenix Convention Center, Phoenix, Arizona, 11/1/2017-11/4/2017. Sponsored by Morehouse College Public Health Leader Fellowship Program & National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention

The opioid epidemic has created an immense health burden in the United States. An estimated 33,091 people died of an opioid overdose in 2015, a 330% increase from 2010. Opioid injection

increases the risks of death and viral infection, but little is known about its prevalence. We examined data on heroin and nonmedical pharmaceutical opioid use in 10 national datasets, including the National Survey of Drug Use and Health (NSDUH), Monitoring the Future, Youth Risk Behavior Survey, Treatment Episode Data Set, and the National Vital Statistics System. The only nationally representative study of the U.S. population, NSDUH, is a household survey that excludes people who are homeless or institutionalized. Among the U.S. civilian population living in households in 2015, an estimated 29.5 million people had ever used opioids nonmedically, of whom an estimated 2.4 million (8%) had ever injected opioids. Of the 2.4 million people with an opioid use disorder in the past year, however, an estimated 600,000 (25%) had injected opioids. Among the 526,686 admissions to substance use treatment centers for opioid use in 2015, 294,130 (56%) were for opioid injection. Of the 33,901 people who died from opioid overdose in 2015, we estimate that at least 24%-44% had injected opioids. Of students in grades 9-12, 1.80% had ever injected an illegal drug of any type. Of students in grades 8, 10, and 12, 0.30% reported injecting heroin in the last 12 months. Probably at least 8% of all people in the United States in 2015 who had ever used opioids nonmedically had injected them. As opioid use became more severe, frequent, disabling, and fatal, the percentage of people who injected increased to as much as 56%. These data highlight the need for interventions to prevent opioid injection and reduce the harm it causes.

Krystal Ramsen

(Anne Peel, Faculty Sponsor)

Presented at the New York State Reading Association Convention, Saratoga, NY, November 12-14, 2017

Even in inclusive classrooms, many students are often still being othered because of the way their behavior or intellectual abilities are perceived. This research sought to address this issue by investigating how children with disabilities are portrayed in children's literature and what implications that might have for young readers. The current report shares findings from a content analysis research project that analyzed representations of difference in children's literature. Texts were selected from a wide range of sources including college curricula, diversity web sites, and on-line book sellers. A sampling of 21 books were ultimately selected because they targeted young readers and had protagonist characters that had a disability or were perceived as different within their community. The selected texts also represent a wide range of genres ranging from picture books, to graphic novels, and memoirs. Data was analyzed using a critical literacies framework that considered each portrayal along a spectrum from otherizing to educative to emancipating. To help guide the exploration of each piece, a transactional rubric was created. Data analysis revealed that most of the narratives contained portrayals that created an otherizing or educative effect on the reader. The first-hand representations are labeled emancipating because there is a sense of truth behind their portrayal and they cause the reader to reflect back on their previous notions of difference and disability. Fictionalized portrayals written from an outside perspective reinforced the idea that individuals with disabilities are fragile or incapable. To be emancipating, children's books selected for literacy classrooms should present readers with the opportunity to build an understanding of the difference being discussed. The literature needs to present children with a raw and real representation of the disability or difference. Children should walk away from the book learning something about disabilities, or challenging the ideas presented within the text.

Kimberly Pfaff

(Blythe Hinitz, Faculty Sponsor)

Nursery Rhymes for Historical Times

Presented at the National Association for the Education of Young Children (NAEYC) Conference, Atlanta, Georgia, November 17, 2017.

The culminating project for the students of ECED 504 involved a group history project, for which the professor's book entitled, *History of Early Childhood Education* was the source of study. Each student was assigned a chapter to research and become an "expert", as an in-class presentation of the information followed, with each student teaching the others about their chapter in a creative,

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interesting lesson format. Chapter 12, *Federal Government Involvement (1900-1950)*, was the chapter I used to create the nursery rhyme book, *Nursery Rhymes for Historical Times*. The book included ten parodied rhymes to explain the significant parts of the chapter. Chapter 12 emphasized the importance of the government's involvement during the progressive era; with pre- and post-wartime circumstances surrounding children's rights and welfare programs of those times. The chapter highlighted the United States Children's Bureau in 1912 as significant to beginning a movement to protect the rights and welfare of children, particularly those at-risk. Rhymes such as *Hey Diddle Diddle*, *London Bridge is Falling Down* and *Hickory, Dickory, Dock* were written to describe the emergency nursery school programs created to service children of working mothers in the wartime era, as well as the implementation of a National Advisory Committee that was formed to supervise the nursery schools and ensure high quality programs. Additionally, the Lanham Act was highlighted with *Baa Baa Black Sheep*, to illustrate the importance of funding for child care facilities during and after World War II. Under each rhyme was a background statement to provide a clear explanation with relevant facts about the historical context, primarily child care issues during periods of war with the rise of governmental and societal responsibility for each.

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