WILL COMMON CORE MAKE US "STANDARD"?

Candice Nolan (Graduate)
Literacy Studies

Kimberly McKay (Graduate)
Literacy Studies

Holly Marshall (Graduate)
Literacy Studies

Jo Ann Marx (Graduate)
Literacy Studies

Marianne Chumley (Graduate)
Elementary Education

Kathleen Burriss (Faculty Sponsor)
Elementary Education

Education reform has been described as a swinging pendulum. Currently, most states in the U.S. have chosen to adopt uniform national, or Common Core, standards. The foundation for national standards extends primarily from the state of Massachusetts. Repeated high performance on standardized tests provides Massachusetts with long-standing credibility in the educational arena. In contrast, despite multiple attempts, the state of Tennessee continues to generate low test scores and continues to place near the bottom as compared with other states. In an effort to further understanding, this poster examines the differences in the two states' demographic information, teacher preparation, per pupil expenditure, assessment, and standards for Math and English/Language Arts before the adoption of Common Core. On average, Tennessee and Massachusetts had more similarities than differences. As a result, this study also discusses the relevance of the findings to Tennessee educators and policy makers as well as proposes some significant changes in current practices.

IMPROVING READING COMPREHENSION FOR ESL STUDENTS

Elena Heath (Graduate)
Educational Leadership

Dorothy Valcarcel Craig (Faculty Sponsor)
Educational Leadership

ESL students can struggle with reading comprehension for various reasons, such as a lack of background knowledge, minimal vocabulary development, and cultural differences. The purpose of this action research study is to determine how to improve reading comprehension for ESL students. This research project adopts a case study approach, because the investigator plans to utilize a small population of ESL students. The research will take place over one academic semester. The following strategies will be implemented in the action research study: compare and contrast and character analysis, literature circles, questioning, and visualization. The data that will be collected are the following: graphic organizers, literature circle charts, observation notes, student-created book of visualization pictures, student self-assessments, and multiple choice tests. This study seeks to improve practice for ESL students by showing teachers and students how to further enhance reading comprehension skills.

MATHEMATICAL MODELLING FOR TEMPERATURE DISTRIBUTION ON THE UPPER SURFACE OF A JUMLA DESIGN METAL STOVE

Harish Bhatt (Graduate)
Computational Science

Scott Handy (Faculty Sponsor)
Chemistry

One of the fundamental problems in Mathematical Modelling of any real world problems (physical, biological, etc.) is to come up with the appropriate assumptions for the problem and a suitable numerical approach to solve the resulting model. To develop the mathematical model for the temperature distribution on the upper surface of Jumla design stove is very difficult due to its complex geometry. Instead of developing model for the actual problem as a first step, I developed a two dimensional Mathematical Model for the temperature distribution on the upper surface of Jumla design metal stove to build an idea about the actual problem on the basis of fundamental laws for convective heat transfer inside the oven in combination with appropriate boundary conditions. Prescribing a suitable analytical velocity field I solved the resulting elliptic partial differential equation by using five-point stencil in the finite difference method. The results obtained suggest that air velocity, insulation, and the level of height are the main parameters, which influence the heat transfer inside the oven.

YUNUS' IDEA OF SOCIAL BUSINESS: IMPLICATIONS FOR SOCIAL WELFARE

Mohammed Alauddin Majumder (Graduate)
Economics and Finance

E. Anthon Eff (Faculty Sponsor)
Economics and Finance

This paper attempts to analyze the theory of social business- a brain child of Dr. Muhammad Yunus and a very recent addition to the economic thoughts. It tries to show the welfare implications of social business with the help of graphical illustration. It also provides an overview of the idea. The graphical analyses draw upon the simple framework of monopoly and competitive markets. The analysis reveals that the companies with social business format do much better than those with traditional format in terms of social welfare but they turn loser since they have to sacrifice profit. However, the ambiguity remains if the loss the entrepreneurs and investors bear can be considered loss as such. We can argue that since entrepreneurs and investors in the social business world convert their motives willingly, the loss is supposed not to generate any disutility or negative welfare. In that sense, our conclusion about the welfare effect of social business is compelling one.

EFFECTS OF ACTIVITY BREAKS ON ATTENTION, FOCUS, AND ACADEMIC PERFORMANCE

Jill Walker (Graduate)
Education/Curriculum & Instruction ESL

Dorothy Craig (Faculty Sponsor)
Education/Curriculum & Instruction ESL

With increasing pressure to perform well on standardizing testing, many school officials wonder if physical activity and recess breaks have a place in the classroom, or if time would be better spent on additional academic instruction. The purpose of this study was to examine whether physical activity breaks in the classroom have a positive effect on attention, focus, and cognitive performance of students. The participants of the study included 24 fourth-grade students during the spring semester. This study utilizes a qualitative approach to describe how taking movement breaks during long periods of academic instruction effect student learning. Data sets for this study include the following: observation field notes, reflective journals, student surveys, and student grades. Once completed, findings will be shared with colleagues to improve teaching practices.

USING GAMIFICATION TO ENGAGE GENERATION X AND Y COMPUTER SCIENCE IN PEERSPACE

Michael Chasteen (Graduate)
Computer Science

Cen Li (Faculty Sponsor)
Computer Science

Introductory computer science (CS) courses suffer high drop-out and failure rates that reach up to fifty percent nation-wide. The causes of these events can be attributed to students' unwillingness to support or aid others, disdain for working in groups, and a lack of motivation. A key factor in solving these issues may lie in the generation gap that is present between instructors and students. If this is not carefully considered when addressing the previously mentioned problems, then students may not be interested in any proposed solutions, even if they are required to participate. This could prove to be less productive in the effort to raise success rates in any CS course. The goal of PeerSpace is to promote peer collaborative learning by providing carefully designed peer collaborative exercises within a friendly, peer-supportive, online social network environment. To attract students to be more active in PeerSpace social activities, the idea of gamification has been explored by adding online social games, point based level systems, and individual and group rankings. PeerSpace provides tools- such as discussion forums, blogs, and an online chat mechanism-that facilitate social interaction among students. Students are encouraged to participate in this community by being rewarded with contribution points that allow them further advances in a leveling system that displays their rank to other users. A new games module has been implemented to act as a magnet application and construct new social connections between students in order to provide the students with a larger support network. This module features several games including "Four in a Row" and "Who am I?" which is based off an identity guessing game and designed for users to learn about fellow class members and professors. The system was launched in fall 2011 with positive initial response and feedback from the students.

COMMUNICATING SCIENCE THROUGH PHOTOGRAPHY: AN ANALOGUE PERSPECTIVE

Alison Carey (Graduate)
Biology

Jonathan Trundle (Faculty Sponsor)
Electronic Media Communication/Photography

Photography has revolutionized science communication and has become an integral part of both documenting and sharing scientific research. In many ways our perception of the natural, microscopic, and ephemeral world can be credited to photography and advances in imaging. Photography has the ability to maintain accuracy while appealing aesthetically to an audience, potentially increasing comprehension, awareness, and interest. The ability to improve scientific literacy through such mediums should not be overlooked. As we begin to break away from traditional forms of communication, we may promote increased interest and, ultimately, better understanding among a broad audience. This project is an exercise in using artistic mediums to communicate science to a diverse audience. Black and white film and silver gelatin prints are utilized in demonstrating photography as both an art and an effective means for communicating science.

USING PROBLEM-BASED LEARNING EXPERIENCES TO TEACH MATHEMATICS TO ELEMENTARY AND SPECIAL EDUCATION MAJORS

Brandon Banes (Graduate)
Mathematics

Diane Miller (Faculty)
Mathematics

Diane Miller (Faculty Sponsor)
Mathematics

During fall of 2011, the researchers taught a mathematics course for pre-service elementary and special education majors using problem-based learning (PBL) experiences and problem solving. To determine potential benefits of teaching through PBL and problem solving, the researchers completed comparative analyses between students from both a traditional number concepts course (control group) and students from a number concepts course taught using PBL experiences and problem solving (experimental group).The research questions focused on comparing PBL experiences with a traditional lecture methodology in three areas: (1) constructing knowledge about basic mathematics concepts, skills, and generalizations; (2) the effect on attitudes toward mathematics; and, (3) the effect on mathematics anxiety. The Mathematics Anxiety Rating Scale (MARS) was used as a pre- and post-test instrument for both groups to determine the change in mathematics anxiety from the beginning of the semester to the end. The Mathematics Content Knowledge Test (MCKT) was administered as a pre- and post-test instrument to measure differences in construction of content knowledge for both groups. The Attitudes toward Mathematics Inventory (ATMI) was used as the pre- and post-test instrument to measure changes in attitudes toward mathematics for both groups. There is a dearth of literature on the use of PBL in mathematics instruction. Thus, the results of this study will inform teacher educators about the potential benefits of using PBL experiences in mathematics courses for elementary and special education majors

HOW DO MIDDLE SCHOOL STUDENTS PERCEIVE READING?

Lisa Steele (Graduate)
Elementary & Special Education

Beverly Boulware (Faculty Sponsor)
Elementary & Special Education

The purpose of this mixed method study was to examine middle school students' perceptions of reading in order to build positive attitudes toward literacy. The participants included 61 middle school students located in an urban school district. Quantitative data consisted of written rating charts delineating the genre most preferential to the individuals and survey questions; qualitative data were composed of oral and written comments. Positive themes emerging from data included excitement, developing better readers, improving grammar, gaining knowledge, reading about a favorite topic, relaxing and escaping from reality; the negative categories included boredom, poor reading skills, opposition to reading, compulsory reading only, and laziness. Consistent with existing literature, findings indicate students would be more inclined to read given the freedom to choose their own reading materials. Data confirmed freedom of choice as an important motivational factor, including not only the material, but choice of the mode of reading as well.

UNSECURED DEBT - AN ALTERNATIVE FOR SINGLE MOTHER FAMILIES DURING PERIODS OF INCOME SHORTFALL

Anca Traian (Graduate)
Economics

Charles Baum (Faculty Sponsor)
Economics

This paper studies the use of unsecured debt as a mechanism to smooth consumption if there is a shock to income caused by childbirth for single mother families. Because in the U.S. there is no law mandating paid maternity leave, new mothers may be forced to take unpaid maternity leave to take care of their babies. The consequence of the decrease in income is felt more severely by low-income families, who cannot rely on other assets to overcome these shortfalls. Using data from the Panel Study of Income Dynamics, the paper shows that single mother families do not rely on unsecured debt as the main resource to smooth consumption during periods of income shortfall. A change in total family income causes an increase in unsecured debt held by the household, but the effect is small. The results show a larger impact on the unsecured debt if the labor income or wages of the head of household are used as main explanatory variables. The additional models that examine the response of consumption to income shocks caused by childbirth suggest that single mother families reduce their food and total consumption, but the adjustment is also small.

COMPUTATIONAL NEUROSCIENCE - MODELING THE BRAIN

Ankit Shah (Graduate)
Computational Science

Scott Handy (Faculty Sponsor)
Chemistry

With thousands of people being affected by the nervous system disorders every year, understanding the brain and the nervous system at a variety of scales has become indispensable. Even though a number of researchers have made important contributions to decrypt this complex system, the system is yet to be fully understood. So far, the rules that govern the system have been identified and attempts are being made to simulate this entire system, which falls well within the scope of computational neuroscience. Computational neuroscience is the study of brain function in terms of the information processing properties of the structures that make up the nervous system. Topics in this field include modeling the neuron, action potential, ion channels, sensory processing, memory, synaptic plasticity. There are a number of worldwide endeavors to address these topics, such as the 'Blue Brain Project'. I will report on projects that attempt to simulate this complex system.

PREDICTING TEST ANXIETY AMONG COLLEGE STUDENTS WITH READING DIFFICULTIES

Roseanna Hatton (Graduate)
Psychology

Aimee Holt (Faculty Sponsor)
Psychology

Tests have important life consequences and are important for achieving academic and career goals (Zeinder, 1998). The pervasive effects of test anxiety are well documented in the literature (e.g., Bembenutty, 2008; Casbarro, 2005, Cizek & Burg, 2006; Keogh, Bond, French, Richards & Davis, 2004; Schunk, Pintrich, & Meece, 2008) as well as its impact on academic achievement (e.g., Bembenutty, 2009; Keogh et al.; Schunk et al.). Although there is some research that has demonstrated certain variables (e.g., self-efficacy for learning, metacognitive self-regulation) were predictive of test anxiety among college students (Bembenutty, 2008; 2009), very few studies (e.g., Burlision et al., 2009) analyzed these variables for students with a history of low academic achievement. The current study explored whether prior reading achievement (i.e., Nelson-Denny Diagnostic Reading Test - Reading Comprehension scores), motivational factors (i.e., Self-Efficacy for Learning Performance, Control of Learning Beliefs, as well as Intrinsic and Extrinsic Goal Orientation of the Motivated Strategies for Learning Questionnaire - MSLQ), and the use of learning strategies (i.e., Metacognitive Self-Regulation, Effort Regulation, Time and Study Environment, Elaboration, Critical Thinking, and Organization of the MSLQ) would predict test anxiety among college students who have demonstrated underachievement in reading. The sample consisted of 62 university students attending a midsized, southeastern university enrolled in a reading enrichment course. A multiple hierarchal regression was used to examine the data. Findings indicated that prior achievement in reading was the best predictor of Test Anxiety scores. Self-Efficacy for Learning scores were found to be negatively related to Test Anxiety scores in step 2 of the model. The use of learning strategies and motivational variables, however, did not significantly add to the prediction of Test Anxiety scores in the full model. The full model explained 37% of the variance in Test Anxiety scores on the MSLQ.

ANALYSIS OF VARIOUS SWINE TISSUES AND THEIR EMITTED VOLATILE ORGANIC COMPOUNDS

Samantha Keene (Graduate)
Department of Chemistry/Forensic Institute for Research and Education

Ngee Sing Chong (Faculty)
Department of Chemistry

Ngee Sing Chong (Faculty Sponsor)
Department of Chemistry

The objective of this project was to identify volatile organic compounds (VOCs) emitted during early stages of decomposition that would be valuable in training cadaver recovery dogs in addition to enhancing the knowledge of the odorous compounds related to the decomposition process of animal carcasses. In turn, this knowledge would be vital in developing remediation tools for odor control during mass burial of livestock resulting from natural catastrophes or pandemic illnesses as well as providing a reliable approximation of the postmortem interval (PMI) associated with human remains. The decomposition of various body parts of the swine yielded valuable information regarding the unique VOCs that are associated with specific organs and tissues. The VOCs produced were analyzed by gas chromatography-mass spectrometry (GC-MS) via a pre-concentrator that allowed the quantification of VOCs down to low parts-per-billion levels with minimal interferences from the carbon dioxide and moisture released during decomposition. The temporal trends of the emitted VOCs and the relationships of the emitted compounds to the chemical composition of the tissues and organs were studied.

EXAMINATION OF CLASS LENGTH AND ITS EFFECTIVENESS IN THE HIGH SCHOOL SETTING

Sarah Hatcher (Graduate)
Educational Leadership

Dorothy Craig (Faculty Sponsor)
Educational Leadership

For the 2010-2011 school year, Smyrna High School implemented a modified block schedule by extending classes to ninety minutes on Tuesdays and Wednesdays. Since then, Smyrna High School has experimented with two other versions of a modified block schedule in the 2011-2012 school year. Class length, effective use of class time, and student learning have all been important issues over the last two years and at times a point of contention among faculty, students, and administration. Proper implementation of a block schedule should include meetings with all stakeholders as well as on-going professional development training for teaching on a block schedule (Imbimbo & Gilkes, 2009). Unfortunately, no definite conclusions can be drawn from the body of research available on block scheduling. Some researchers have discovered declining test scores on the ACT and in college math preparedness among the disadvantages of block scheduling (Harmston, Pliska, Ziomek, & Hackman, 2003; Zelkowski, 2010). Advantages include a calmer campus atmosphere, a potential increase in attendance, stronger student-teacher relationships, and more class time for higher-order thinking skills (Mondie 2009; Patterson 2003; West, 1996). Surveys for faculty and students were administered to gather data about class length and the use of Developing A Well Grounded Student time (DAWGS time). Also, eight faculty members at Smyrna High School were interviewed to gain more insight and depth about student learning and other issues associated with the block schedule. This study is currently in data analysis and will be complete and ready for presentation for the March 30th event.

G15

RETHINKING THE FUNDAMENTAL LAW OF ROAD CONGESTION

Abhradeep Maiti (Graduate)
Economics & Finance

Joachim Zietz (Faculty Sponsor)
Economics & Finance

Evaluation of any economic policy should be based on a comparative cost-benefit analysis. But, evaluation of an economic policy is not straightforward. Human beings as economic agents often have prior expectations about an economic event and make decisions based on the expected outcomes. As a result, we often find that there exists a significant variation between the average return and marginal return due to a change in a policy parameter. This work is an extension of a recent paper by Duranton & Turner (American Economic Review, October 2011). In this paper the authors try to find evidence in the support of the 'fundamental law of road congestion'. This 'law' has been attributed to Downs (1962). This law simply says that in an urban area, the total available expressway gets exhausted by an increase in traffic congestion. In other words, any increase in the available expressway in an urban region will be met with a proportionate rise in the commuter traffic.

This question is interesting on many levels, as pointed out by Duranton & Turner (American Economic Review, October 2011). First and foremost, if adding new highway lane miles doesn't take care of the problem of traffic congestion, then we might have to find a new way to take care of the problem, as each year an American household spends a considerable amount of time in daily commuting. Secondly, the problem needs careful consideration due to the requirement of maintaining a cleaner environment. Thirdly, we need to understand this question to spend public resources more efficiently and cut down on the loss to individual work-hour.

EFFECTS OF REPRODUCTIVE STATE ON INNATE IMMUNITY, HORMONES, AND BEHAVIOR IN FEMALE FENCE LIZARDS (*SCELOPORUS UNDULATUS*).

Alison Carey (Graduate)
Biology

Matthew Klukowski (Faculty)
Biology

Matthew Klukowski (Faculty Sponsor)
Biology

Reproduction is an energetically expensive process for females, often requiring physiological trade-offs. Metabolic expenditure is significantly elevated during vitellogenisis in reptiles, and as the allocation of energy shifts during reproduction, hormone levels, immune functions, and behaviors may alter in response. Reproduction has been found to effect immune response in several vertebrates. Similarly, induction of an immune response has been found to effect reproductive investment. The purpose of this study was to determine the potential effects of reproductive state (early-, late vitellogenesis, gravid, and post-reproductive) on innate immunity, hormones, and behavior of female fence lizards. Reproductive state was determined based on a female's combined body condition and triglyceride levels, a method previously used to reliably predict reproductive state; laparotomies were performed on a subset of females to confirm condition. Innate immunity was measured by the bacterial killing capacity of plasma and circulating leukocyte counts. Baseline steroid hormone levels and territorial aggressive behavior were also examined in determining the interactions between reproduction, behavior, and hormone levels.

INVESTIGATING THE ROLE OF OXIDATIVE STRESS IN AG AND ZNO NANOPARTICLE TOXICITY IN DEVELOPING ZEBRAFISH (DANIO RERIO)

Shara Nizamaddin (Graduate)
Biology

Ryan Otter (Faculty)
Biology

Matt Elrod-Erickson (Faculty)
Biology

Matt Elrod-Erickson (Faculty Sponsor)
Biology

Due to their unique physical and chemical properties, which are not present in their conventional bulk forms, nanomaterials have great potential for industrial development. In particular, silver (Ag) and zinc oxide (ZnO) nanoparticles have gained popularity and are in widespread use on account of their antimicrobial and UV protective properties. However, the safety of these materials has not been fully examined. A number of studies, including our own, have demonstrated the toxicity of nano Ag and nano ZnO to developing zebrafish embryos. Generation of reactive oxygen species (ROS) is one of the most commonly cited reasons to explain this toxicity. However, evidence supporting this explanation is limited. To test the role of ROS in the observed toxicity, a fluorescent dye assay was utilized to directly visualize ROS in treated and untreated embryos. The level of expression of oxidative stress response genes was also examined by qRT-PCR as another measure of oxidative stress.

EFFECTS OF MATERNALLY TRANSFERRED METHYLMERCURY CHLORIDE ON OXIDATIVE STRESS IN NERODIA SIPEDON NEONATES

Patrick Cusaac (Graduate)
Biology

Frank Bailey (Faculty)
Biology

Frank Bailey (Faculty Sponsor)
Biology

Chronic oxidative stress can lead to long-term damage in major organ systems, such as the liver. Cause and response interactions of stressors are relatively well studied, however studies showing the effects of heavy metal toxicity on stress are lacking, particularly in squamate reptiles. The purpose of this study was to show the effects of maternally transferred methylmercury chloride on baseline elevation of oxidative stress in Nerodia sipedon neonates. Adult females were dosed with one of three dosing treatments (control, 0 ug/g, and 10 ug/g MeHgCl per gram of snake) and allowed to birth. Neonatal liver concentrations of Malondialdehyde (MDA, a free radical byproduct of polyunsaturated lipid peroxidation) were measured to quantify oxidative stress. Liver MDA levels differed significantly across doses $(F(2,10) = 5.320, p = 0.034)$, with post – hoc comparisons showing MDA levels in the 10 ug/g treatment as significantly less than the controls. It can therefore be concluded that MeHgCl does affect background oxidative stress in N. sipedon neonates.

IMPACT OF CURRICULUM ON MIDDLE SCHOOL STUDENTS' ENJOYMENT AND AEROBIC FITNESS LEVELS

Sultan Alsahl (Graduate)

Don Belcher (Faculty Sponsor)
Health and Human Performance

Increasing rates of obese children have become a major challenge to governments, health organizations, parents, and even to the children themselves. This also challenges physical educators to encourage their students to participate in various activities. Physical education teachers continue to try new approaches and strategies to engage their students in appropriate activities designed to enhance not only their current state of fitness but also their commitment to healthy, active lifestyles. Physically active video games are now recognized as one way to enhance physical activity levels in children, and teaching games for understanding is a curricular model that has shown success in motivating students to participate in physical education. An experiment was conducted with sixth-, seventh-, and eighth-grade Physical Education classes over a six week time frame. The research determined whether aerobic fitness level improved over the six week interventions in PE classes. Additionally, the study examined the middle school students' enjoyment among three different units of instruction: Dance Dance Revolution (DDR), PE class using teaching game for understanding approach (Soccer), and regular PE class. Aerobic fitness was measured utilizing the Fitnessgram PACER test protocol. This was administered prior to the six week intervention and then again at the end of each unit of instruction. The Physical Education Activity Enjoyment scale was administered at the beginning (to measure perceived motivation to participate) and at the conclusion of each unit (to measure actual motivation). Statistical analysis was utilized to determine any differences based on unit of instruction, grade level, and gender across the two assessment measures.

CORRELATES OF FORCED SEX AMONG HIGH SCHOOL STUDENTS IN A SOUTHERN STATE

Dustin Alvis (Graduate)
Psychology

Gloria Hamilton (Faculty)
Psychology

Gloria Hamilton (Faculty Sponsor)
Psychology

The occurrence of forced sexual intercourse is important to a comprehensive understanding of adolescent sexual activity. Archival data used in this study consisted of YRBS data concerning prevalence and correlates of forced sexual intercourse among adolescents in one southern state. Analyses of YRBS survey results established that incidences of forced sexual intercourse occur among adolescents in the United States and are correlated with other risky behaviors. Given these results, it must be kept in mind that not all sexual activity among teens is voluntary. A comprehensive program of sex education must include a component on dating violence, coercion, rape, and other types of forced sex.

COMPONENTS OF EFFECTIVE SUMMER READING INTERVENTIONS

Ryann King (Graduate)
School Psychology

Stuart Bernstein (Faculty Sponsor)
Psychology

The current study examines the need for a systematic and intensive summer reading intervention by using baseline assessment data from a summer school program. Participants included a diverse population of economically disadvantaged kindergarten through sixth-grade students with a broad range of reading skills. The following hypothesis questions were addressed: how far behind are students who enroll in summer school? How much change can be expected during the summer? What curriculum structure supports that change? What are the barriers to creating and delivering instruction? Findings from the summer reading camp indicated that there is a need for additional reading support among economically disadvantaged students. Review of summer reading camp results and intervention effect sizes revealed there is a significant percentage of students with skill deficits in fluency and decoding that are impeding progress toward their prospective target grade-level benchmarks (50th percentile).

COGNATE USE IN PROMOTING SECOND LANGUAGE ACQUISITION IN BEGINNING LEVEL ADULT ESL STUDENTS WHOSE L1 IS SPANISH

Robbin Meric (Graduate)
Educational Leadership

Dorothy Valcarcel Craig (Faculty Sponsor)
Department of Educational Leadership

This study examines the effects that the explicit teaching of cognates has on the second language acquisition process of adult English Language Learners (ELLs) whose first language (L1) is Spanish. Research has shown the impact that cognate instruction and use have on the acquisition of English.

 Due to the findings of previous studies and the potential of this learning strategy, this qualitative action research focuses on the following overarching questions: 1) Can the explicit teaching of cognates promote second language acquisition in the researcher's beginning level adult ESL classroom in English Language Learners (ELLs) whose first language (L1) is Spanish? If so, how? 2) Can the explicit teaching of cognates aid in the acquisition of English academic vocabulary? If so, how? 3) Can the teaching and use of cognates in the beginning level ESL classroom impact a student's morale? If so, how?

The participants of the study are 11 beginning English as a Second Language (ESL) students who are part-time students in a government-funded adult learning center. To ensure triangulation, data sets are collected for each overarching question. These data sets include observation checklists, student artifacts, quiz scores, participant field journals, and small-group open discussions. After the data was collected, it was coded, and emerging themes and patterns were identified and analyzed.

THE MEMORY MAY BE FORGOTTEN BUT THE EMOTION REMAINS

Tara Duffie (Graduate)
Psychology

Gloria Hamilton (Graduate)
Psychology

Gloria Hamilton (Faculty Sponsor)
Psychology

This study examined whether positive emotions of geriatric patients with dementia remain after the memory of experiencing a pleasant activity has been forgotten. An experimental group of 8 participants with dementia and a control group of 7 participants without dementia were recruited from a long-term care facility. Participants were invited to view a computer program they found enjoyable and, after the program ended, were asked to "Point to the face on this card that shows how you feel" immediately after, 10 minutes after, and 30 minutes after viewing the program. All chose the happy expression each time. The participants were also asked if they recalled using the computer 10 minutes after leaving the computer. While all participants without dementia agreed that they had seen the program, none of the participants with dementia responded that they had seen the program. Results indicated that while dementia patients were unable to recall use of the computer, they selected the face that was happy as their emotional state, indicating that the positive emotions remained even while the cognitive memory of the original pleasant event had been forgotten. These findings indicate that positive interventions and events in the daily lives of geriatric patients with dementia can engender positive feelings that remain even after the original events are forgotten. Implications of the results of this study could be communicated to families and staff members of agencies who work with persons with dementia to increase quality of daily life.

SPATIAL CONFIGURATION OF WORD PAIRS AFFECTS N400 COMPONENT OF ELECTROENCEPHALOGRAPHY

Tyler Hubbard (Graduate)
Experimental Psychology

William Langston (Faculty)
Psychology

Cyrille Magne (Faculty Sponsor)
Psychology

Embodied theories of cognition posit past motor and perceptual interactions with the environment are recruited during conceptual tasks (Barsalou, 1999). There is some debate as to what extent embodiment plays a role in language processing (Louwerse and Jeuniaux, 2010; Barsalou et al., 2008). To date, few studies have utilized neuroimaging methods to investigate this issue. The purpose of the present study is to address this question using Electroencephalography (EEG). Word pairs (64 semantically related and 64 unrelated) were presented vertically on a computer screen. In addition, all the related pairs were made of words possessing a spatial relationship (e.g., attic-basement). Half the related pairs were presented in a consistent spatial configuration (e.g., "attic" on top of "basement"), and the other half was presented in an arrangement not compatible with how the objects appear in the environment (e.g., "basement" on top of "attic"). Participants were asked to judge whether the pairs were semantically related or not. A previous study found that unrelated word pairs usually elicit larger N400 responses than related pairs, reflecting a harder time with semantic integration (Kutas and Federmeier, 2011). Based on embodied theories, a larger N400 was also expected when the related pairs were presented in an incompatible spatial arrangement. In line with this hypothesis, the result of our study revealed that inconsistent trials produced larger N400 components than consistent pairs. In addition, the N400 effects observed for inconsistent and unrelated pairs were similar. Overall, the EEG data suggest it is harder to judge whether attic-basement is semantically related when the pair is presented inconsistent with how they appear in the environment. Interestingly these results were corroborated with the participants' behavioral performance, showing a lower accuracy for inconsistent than consistent pairs. The results will be discussed in line with the previous literature regarding embodied cognition.

AMBULATORY ACTIVITY MONITORING OF CHILDREN AND YOUTH WITH MOBILITY LIMITATIONS

Saori Ishikawa (Graduate)
Health and Human Performance

Minsoo Kang (Faculty Sponsor)
Health and Human Performance

Background/Purpose: As with typically developing youth, engaging in physical activity is critical to maintain health-related fitness in children and adolescents with disabilities. Quantification of the physical activity levels using pedometers and accelerometers in children and adolescents with mobility limitations has recently allowed researchers to track real-life outcomes of new interventions in this particular population. The question remains concerning the reliability of ambulatory activity monitoring in functionally challenged youth's activity level. The purpose of the analysis, therefore, was to document the minimal number of days required to reliably estimate a habitual walking activity in children with arthrogryposis and lower limb salvage. Methods: Ambulatory children and youth with arthrogryposis (n=13; 10 boys; mean age 10.9±3.8 years) and limb salvage (n=19; 8 boys; mean age 15.7±2.8 years) were recruited through three pediatric specialty care hospitals. Daily step activity was measured with the two-dimensional accelerometer over 7 consecutive days. Generalizability theory was employed to identify sources of variance in step counts and to determine the number of days necessary to obtain a reliability coefficient of ≥ .80. Results: Mean step counts were 9998±3562 steps and 9619±5576 steps for arthrogryposis and limb salvage groups, respectively. For youth with arthrogryposis, variance in step counts attributable to participants was 28.7%, and 9 days were required to obtain a stable measure of ambulatory activity. For youth with limb salvage, 60.6% of variance in step counts was attributed by participants, and 3 days were necessary to obtain a stable measure of step activity. Conclusions: Due to relatively greater variability in step counts across days of the week, longer monitoring period was required to reliably estimate the habitual activity level among children and youth with arthrogryposis, while relatively greater variability in step counts across individuals resulted in requiring shorter monitoring period among those with lower limb salvage.

EXPLORATORY ANALYSIS OF THE EATING ATTITUDES TEST (EAT-26) CATEGORY FUNCTION

Amanda Cole (Graduate)
Health and Human Performance

Minsoo Kang (Faculty)
Health and Human Performance

Norman Weatherby (Faculty)
Health and Human Performance

Brittney D. Oliver (Graduate)
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Norman Weatherby (Faculty Sponsor)
Health and Human Performance

Background: Questionnaires about eating behaviors should be simple and clear for the survey participant. The Eating Attitudes Test (EAT-26) uses six categories, ranging from never to always for measurement of problematic eating behaviors. Six categories can be unnecessarily burdensome for the participant. Purpose: To perform an exploratory analysis to determine the optimal number of answer categories for the EAT-26 using Rasch analysis. Methods: A total of 216 college students completed the EAT-26. Rasch analysis was conducted using Winsteps software. To determine the optimal number of rating scale categories, each category threshold was assessed for its functioning using Linacre's guidelines. If a category was deemed unnecessary or redundant, it was removed. Results: The original six categories did not meet the guidelines. Based on the Rasch analysis results and the categories of the questionnaire, categories were combined in multiple forms and were further tested. A total of four different category combinations were tested. It was found that instead of the six-category scale, the best was a four-category scale, combining the categories 2 and 3; and 4 and 5. Conclusions: The current EAT-26 has too many categories. The instrument may be better with only four categories. Future studies should evaluate if four categories provide valid results.

DEGREE OF PHYSICAL ACTIVITY IN PHYSICAL EDUCATION CLASS AMONG ELEMENTARY SCHOOL STUDENTS IN AL-JAHRA CITY, KUWAIT

Salem Alshaammari (Graduate)
Health and Human Performance

Don Belcher (Faculty Sponsor)
Health and Human Performance

Physical activity helps to prevent many diseases that children encounter as they mature. Therefore, it is an important for children to increase their physical activity. Kuwait as a country has not investigated the amount of physical activity children undergo in physical education classes. The purpose of this study was to measure students' physical activity in Al-Jahra City, Kuwait during the academic year 2011–2012. Data were collected from two elementary schools (one for boys and one for girls). The guiding research question was: what differences (if any) exist by grade or gender in the amount of physical activity available in physical education classes in Al-Jahra City, Kuwait? Eight intact classes (two for third-grade boys; two for fifth-grade boys; two for third-grade girls, and two for fifth-grade girls) were videotaped during instructional physical education periods. How class time was utilized was analyzed using Basic Academic Learning Time (BALT-PE) instrument. The active amount of physical activity was assessed by having all students (n=177; 92 boys, 85 girls) wear pedometers. Descriptive statistics and a two-way ANOVA (grade/gender) were used to analyze differences.

A QUERY INTO POSSIBLE SHARED NEURAL SUBSTRATES FOR MELODIC PITCH PROCESSING AND VISUO-SPATIAL PROCESSING

Mark Himmelreich (Graduate)
Psychology

Cyrille Magne (Faculty)
Psychology

Cyrille Magne (Faculty Sponsor)
Psychology

The purpose of this study is to investigate the relationship between music aptitude and visuo-spatial abilities. To this end, participants performed a visual mental rotation task and a melody transposition task while their electroencephalogram (EEG) was recorded. In addition, participants' music aptitude was measured using the Advanced Measure of Music Audiation. Results revealed some similarities and differences between the brain reponses during the execution of the two tasks. In particular, significant modulation of EEG activity in the alpha (8-12 Hz) and the beta (13-25 Hz) frequency ranges was observed in both the visual and musical tasks. The similar increase in alpha activity was interpreted as reflecting similar working memory processes at play during the execution of both tasks. In contrast, the direction of the Beta modulation was different between the visual task (increased activity) and the music task (decreased activity). This later finding may reflect different strategies at play for manipulating the stimuli in each task. Finally, significant positive correlations were found between music aptitude scores and Beta activity in the mental rotation task, suggesting the existence of a positive transfer between the musical and visual domains. Overall, the present findings are in line with previous literature showing a link between music and visuo-spatial abilities as well as studies suggesting a positive influence of music aptitude on cognition.

RESPONSE TO INTERVENTION AND ITS RELATIONSHIP TO SCHOOL PSYCHOLOGISTS' JOB SATISFACTION

Whitney Wrenn (Graduate)
School Psychology

James Rust (Faculty)
School Psychology

Seth Marshall (Faculty)
School Psychology

Monica Wallace (Faculty Sponsor)
School Psychology

Job satisfaction research has found to be positively correlated with expanded role (Huebner, 1993 and Levinson, 1990). Canter (2006) described how the implementation of Response to Intervention (RtI) would expand the role of school psychologists and create more expansion opportunities. Previous studies that have looked at job satisfaction ratings found overall positive ratings but have repeatedly found Dissatisfied ratings in two areas: School Policies and Practices and Opportunities for Advancement. Concurrent with Canter's (2006) view, the researcher believed that RtI reflects new school policy and allows for role expansion of the school psychologist. The purpose of the current study was to survey ratings of job satisfaction and level of RtI involvement among Tennessee school psychologists. It was the belief of the researcher that school psychologists who are more satisfied with their job will be more involved with RtI than school psychologists who are neutral or less satisfied with their job. The survey consisted of a Job Satisfaction Scale (Reschly & Wilson, 1995) and an RtI Scale that was created by the researcher based on a NASP document regarding role expansion and RtI (National Association of School Psychologists, 2006). The survey was completed by 126 Tennessee school psychologists. Analysis revealed Cronbach's alphas of .88 and .85 for the RtI and Job Satisfaction Scales, respectively. Principal components analysis will be performed on the RtI scale.

ACHIEVING PROPORTIONAL EDUCATION FOR THE ACADEMICALLY-ADVANCED IN THE MATHEMATICS CLASSROOM

Larry Griffin (Graduate)
Mathematics/Educational Leadership

Dorothy Craig (Faculty Sponsor)
Educational Leadership

With today's educational reform movement driven by high-stakes assessment testing, common educational practices, such as differentiating instruction within mixed-ability settings, has shifted a large portion of its focus away from advancing the student and more towards remediating the student (Manning, Stanford, & Reeves, 2010). As a result, America's best and brightest students are showing the smallest gains on state assessment tests (Taylor, 2008). Thus, this action research study employed a quasi-experimental design to examine the academic growth of academically-advanced students in an 8th grade mathematics course when placed in an ability-grouped setting. The focus of the research (a) examined the extent to which a grouped environment helped or hindered learning for the academically-advanced student, (b) determined the factors that influence students' perspectives on their learning of mathematics and the impact on student growth, and (c) discovered critical information necessary in improving the current math curriculum for the advanced student. The population for this study was twenty-five 8th grade middle school students identified as academically-advanced in mathematics based on the previous year's TCAP math scores. The data collected was from standardized student achievement data (TCAP, EXPLORE, and ThinkLink) as well as from teacher observations and student surveys. Findings indicate statistically significant differences exist in the academic growth levels using ability-grouping. Initial student surveys show 75% of the students think the current mathematics is "somewhat challenging", and 25% indicate math is "not challenging."

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SOCIAL NETWORKING ABILITY AND LABOR MARKET OUTCOMES

Joshua Hill (Graduate)
Economics and Finance

Mark Owens (Faculty Sponsor)
Economics and Finance

Economists are becoming more interested in how social networks affect markets. Anecdotally, most people know someone who has found employment through friends or who does business with others simply because they have a pre-existing friendship. The current study attempts to empirically investigate the relationship between the underlying skills used to construct social connections and how these skills affect labor market success. Utilizing data from the National Longitudinal Study of Adolescent Health, I investigate the potential link between an individual's networking abilities and labor market outcomes. I illustrate that past social networking experiences proxy for unobservable social networking ability. The proxies can be incorporated into an econometric model of economic outcomes. I also consider the possibility that interpretation of social networking skills is not constant across the entire sample. Individuals may have the ability to network with individuals that are not beneficial to labor market success. To investigate this possibility, I allow the social networking ability proxies to vary based on friends' mean GPA. I find that social networking abilities do affect labor market outcomes and that the abilities' estimated effects vary based on past friend characteristics.

PREFERRED AND EFFECTIVE READING COMPREHENSION STRATEGIES AND THE USE OF GRAPHIC NOVELS AMONGST PRACTICING ENGLISH AS A SECOND LANGUAGE TEACHERS

Cristina Hudgins (Graduate)
Curriculum and Instruction

Dorothy Craig (Faculty Sponsor)
Educational Leadership

This study focuses on identifying the most widely used and most effective reading comprehension strategies for English Language Learners, as well as the frequency with which graphic novels are used in the English as a Second Language classroom. The following questions were the basis for this research: (1) What are the most widely used and most effective reading comprehension strategies among ESL teachers? (2) How often, if at all, are graphic novels used to assist in reading instruction with English Language Learners? (3) How available are graphic novels in the school setting? (4) Are the use of graphic novels and accompanying reading comprehension strategies discussed in teacher preparation courses? The study employed a non-experimental quantitative approach in the data collection phase. The data was gathered by administering a survey in Likert Scale format to practicing English as Second Language teachers attending Middle Tennessee State University. Descriptive statistics are used to analyze the data set. Along with the use of statistics, coding was emplyed with regards to the optional comments section of the survey to allow for further inquiries into possible themes and patterns that may arise.

MILITARY SERVICE AND CIVILIAN LABOR OUTCOMES

Philip Routon (Graduate)
Economics

Joachim Zietz (Faculty Sponsor)
Economics

Using the National Longitudinal Survey of Youth (both the NLSY79 and NLSY97), I estimate the impact of military service and various types of military training on several labor market outcomes. These include employment, earnings, and length of the job search. Current literature is lacking a good comparison of voluntary-enlisted veterans with non-veterans in terms of the civilian usefulness and economic returns of their training. Since military occupations and training have drastically changed in the last few decades, I also further the literature by using more recent data as well as more advanced statistical techniques (matching) than those used in previous studies. These effects are compared across military branches and occupations. Lastly, since no research has been done in this area, I also examine the economic returns to joining the National Guard and Army Reserve.

EXPLORATION OF THE DISPOSITIONS OF ELEMENTARY AND SECONDARY MUSIC EDUCATORS REGARDING RHYTHM METHODS

Michael Catalano (Graduate)
School of Music

Jamila McWhirter (Faculty Sponsor)
School of Music

Educators realize that young children (K-4) lack the mathematical knowledge to understand the fractional relationships represented in rhythmic notation. However, research suggests that young students can learn rhythms through different types of speech cue and rhythm syllable methods such as Orff, Kodaly, and Gordon. At some point, most students will gain the mathematical knowledge to understand how basic durations can be subdivided using fractional relationships. At this point, students should be able to comprehend a more traditional approach to reading rhythms, an approach most utilized by instrumentalists when reading and teaching rhythmic notation. The purpose of this pilot study is to investigate the dispositions of elementary and secondary music educators regarding the teaching of rhythm. Some research questions to be explored: Are there challenges with teaching rhythm reading? Are the rhythm methods used at the elementary level sufficient for students advancing to larger musical ensembles at the secondary level to make the transfer over to a more traditional method of reading rhythms? Should elementary or secondary teachers be responsible for making that transition? Why do certain school systems or teachers use the methods that they do?

EFFECTS OF CAFFEINE ON SESSION RATINGS OF PERCEIVED EXERTION (RPE)

Lauren Killen (Graduate)
Health and Human Performance

Richard Farley (Faculty Sponsor)
Health and Human Performance

This study examined effects of caffeine on session RPE (SRPE) following 30 minute constant load cycling. Individuals (n=15) of varying aerobic fitness completed a VO2 max trial and two 30 minute cycling bouts (double-blind, counterbalanced) following ingestion of 6 ml/kg of caffeine or matched placebo. RPE overall, legs and breathing were estimated every 5 min, and SRPE was estimated 30 minute post-exercise using the OMNI pictorial scale. SRPE (caffeine versus placebo) were compared using paired t-test, separate 2 (trial) X 7 (time point) repeated measures. ANOVA's were used for between-trial comparisons of HR, RPE-O, RPE-L and RPE-B. Caffeine resulted in a significantly lower SRPE ($p < 0.05$) for CAF (6.1 ± 2.2) vs. PLA (6.8 ± 2.1). Acute perceptual responses were significantly lower for CAF for RPE-O (15, 20, 25 30 min), RPE-B (15, 20, 25 30 min) and RPE-L (20 and 30 min). Survey responses post-exercise revealed greater feelings of nervousness, tremors, restlessness and stomach distress following CAF vs. PLA. Blunted acute RPE and survey responses suggest participants responded to caffeine ingestion. Caffeine decreased acute RPE during exercise, which could partially account for lower SRPE responses. However, decreased SRPE could also reveal a latent analgesic affect of caffeine extending into recovery. Extending the understanding of SRPE could benefit coaches in avoiding overtraining when adjusting training programs. Further research is warranted regarding factors potentially mediating SRPE.

MESHFREE METHODS FOR THE BLACK-SCHOLES PARTIAL DIFFERENTIAL EQUATION

Nana Boateng (Graduate)
Mathematics

Abdul Khaliq (Faculty Sponsor)
Mathematics

Computations with high dimensional data are a very important area of study in computational finance, but traditional methods such as finite difference, finite volumes and finite elements cannot handle such problems because of the presence of mixed derivatives. Therefore the need for a meshfree approach such as Radial Basis Functions (RBF's) is very important. We consider the efficiency, computational cost and accuracy of a meshfree radial basis functions approach in solving the American option problem in computational finance. We model the price of the option with the Black-Scholes equation. Empirical evidence suggests that the Black-Scholes model gives a fairly accurate prediction of the option price. The difficulty in solving the American option lies in the free boundary condition. This arises because of the ability to exercise the American option at any time before expiry. We introduce a penalty term to make up for the free boundary condition in the American option. Three commonly used radial basis functions (RBFs) are compared in terms of their accuracy and efficiency. The application of RBFs leads to a system of differential equations that are solved by a time integration scheme known as the Theta-method. Finally, a comparison is made between the Finite Difference method solutions and RBFs.

CLASSROOM TEACHERS' DISPOSITIONS REGARDING MUSIC INTEGRATION

Luke Hill (Graduate)
Music

Jamila McWhirter (Faculty Sponsor)
School of Music

The inclusion of music integration in general classroom instruction is a significant indicator of academic and artistic success. According to a recent study by the Tennessee Arts Commission, integration of the arts into the core classroom curriculum resulted in at least 20% gains in math, English, and social studies, while there were 10% gains in Science, based on a comparative school's achievement. Additionally, it has been shown that when implemented with authenticity, arts integration has proved to help students' academic and artistic understanding and achievement (Levitt 2010). Music integration can be greatly effective in developing both content knowledge application and authentic music experiences. However, teachers have received varying amounts of training and practice in the field of music integration, have varying levels of music integration support, and have different levels of enthusiasm for music integration. Therefore, the teachers experience various levels of success. The purpose of this pilot study is to investigate teachers' dispositions regarding methods for the successful and practical implementation of music integration into the K-6 classrooms. This will be analyzed through the use of a online survey. Classroom teachers in a middle Tennessee elementary school that are directly involved in an arts integration program will be asked to participate. Through the respondents' replies and comments, recommendations are made to help guide teachers around the state who are attempting to integrate the arts successfully and with fidelity. This pilot study will also be used as a foundation for a larger study that will be carried out across the state of Tennessee. Such expansive responses would be even more effective in providing information regarding successful methods for music integration in the general education classroom. Additionally, such discussion may assist teachers in facing challenging problems in integrating the arts in their classrooms.

AN AGENT-BASED SIMULATION OF A HEAVY EQUIPMENT RENTAL PROCESS

Harold Lay (Graduate)
Computational Science

Zachariah Sinkala (Faculty Sponsor)
Mathematics

Heavy equipment rental houses must carefully balance the size, mix, and age of a fleet in order to maximize the profit, internal rate of return, and dollar utilization (defined as the actual income divided by the maximum potential income). Since the stochastic variables for rental length and time between rentals do not follow any standard random distributions, a custom distribution is generated by linear interpolation over the actual data. By modeling individual machines as agents and aggregating the detail results, a highly parallel, asynchronous simulation was built. This simulation was executed using an NVIDIA Graphical Processing Unit (GPU) by assigning each machine to a processor core. This allowed the agent-based simulation to be run across multiple GPU's on a multi-core system without the overhead of time synchronization. This provided a tool to explore the relationship between fleet parameters and financial results. Future enhancements will allow management to perform "what-if" analysis as well as adjust parameters to simulate the impact of different economic conditions.

GAMES OF STRATEGY AND CULTURAL COMPLEXITY

John Kennedy (Graduate)

Anthon Eff (Faculty Sponsor)
 Economics

I examine the previously hypothesized positive cross-cultural correlation between the presence of games of strategy and level of cultural complexity. I implore three techniques in order to contribute to the current literature and maximize the effectiveness of the Standard Cross-Cultural Sample (Murdock and White1969). Missing data is a problem found throughout the SCCS and, as suggested by Eff and Dow (2009), is corrected with multiple imputations. Spatial autocorrelation is inevitable throughout cross-cultural research as cultural transmission is ever-present. I utilize specially weighted language phylogeny and weighted distance matrices to create fitted values to take the cultural transmission into consideration. I also utilize regression techniques to analyze the relationships explaining the prevalence of strategic games throughout cultures. I begin by modeling with ordinary least squares regression and later utilize a two-stage least squares regression model.

MULTI-RESOLUTION ANALYSIS METHOD FOR IMS DATA - BIOMARKER SELECTION AND CLASSIFICATION

Lu Xiong (Graduate)
College of Basic and Applied Sciences

Don Hong (Faculty)
Mathematical Sciences

Don Hong (Faculty Sponsor)
Mathematical Sciences

Imaging Mass Spectrometry (IMS) has shown great potential and is very promising in proteomics. The main task for IMS data processing is biomarker selection and classification. However, challenges remain in data processing due to the high dimensionality and complexity of the data sets. In this post presentation, we introduce effective and efficient ways for IMS data biomarker selection and classification by using multi-resolution analysis methods. First, we give a brief introduction to IMS data and the popular statistical methods for IMS data analysis. Second, the motivation of proposing multi-resolution methods for IMS data analysis is introduced. Then, we apply wavelet transform for IMS data de-noising and the wavelet pyramid method used in image matching to do biomarker selection on wavelet coefficients space. Finally, the naïve Bayes classifier is used to do classification on wavelet coefficient space. Performance of other popular algorithms and the multi-resolution method is also compared and discussed. The experiment results show that the multi-resolution method has higher classification accuracy.

STEROL COMPOSITION AND BIOSYNTHETIC GENES OF THE RECENTLY DISCOVERED PHOTOSYNTHETIC ALVEOLATE, *CHROMERA VELIA (CHROMERIDA)*, A CLOSE RELATIVE OF APICOMPLEXANS

Manoj Khadka (Graduate)
Biology

Josh Dodson (Graduate)
Biology

Rebecca Seipelt (Faculty)
Biology

Sabrina Holder (Undergraduate)
Biology

Jeff Leblond (Faculty Sponsor)
Biology

Chromera velia is a recently discovered, photosynthetic, marine alveolate closely related to apicomplexan parasites, and more distantly to perkinsids and dinoflagellates. To date, there are no published studies on the sterols of *C. velia*. Because apicomplexans and perkinsids are not known to synthesize sterols de novo, but rather obtain them from their host organisms, our objective was to examine the composition of the sterols of *C. velia* to assess whether or not there is any commonality with dinoflagellates as the closest taxonomic group capable of synthesizing sterols *de novo*. Furthermore, knowledge of the sterols of *C. velia* may provide insight into the sterol biosynthetic capabilities of apicomplexans prior to loss of sterol biosynthesis. We have found that *C. velia* possesses two primary sterols, 24-ethylcholesta-5,22E-dien-3b-ol, and 24-ethylcholest-5-en-3b-ol, not common to dinoflagellates but rather commonly found in other classes of algae and plants. In addition, we have identified computationally three genes, SMT1 (sterol-24C-methyltransferase), FDFT1 (farnesyl diphosphate farnesyl transferase, squalene synthase), and IDI1 (isopentenyl diphosphate D-isomerase), predicted to be involved in sterol biosynthesis by their similarity to analogous genes in other sterol-producing eukaryotes, including a number of algae.

AN ANALYSIS OF AIRPORT-PUBLIC RELATIONSHIPS ON SOCIAL MEDIA

Camille Breland (Graduate)

Tricia Farwell (Faculty Sponsor)
Journalism

Airports are turning to social media sites and tools, such as Facebook and Twitter, to develop relationships with their publics. Using Hallahan's (2008) five concepts to measure the strength of organizational-public relationships, the researcher conducted a content analysis of ten U.S. airports' presence on Facebook and Twitter, including seven large- and three mid-sized airports. Elite interviews with airport public relations professionals supplemented the qualitative data. The findings suggest that by using social media outlets for communication, airports are creating stronger relationships with their publics, according to Hallahan's five measures: commitment, communality, control mutuality, trust, and satisfaction. Data suggest airport social media posts on the two websites are focused on relationship-building content, and the sentiment of public response to posts was overwhelmingly positive.

VERIFICATION OF LOS ALAMOS NATIONAL LAB PRODUCTION HYDRODYNAMICS CODE XRAGE

Raymond Hendon (Graduate)
Computational Science

John Wallin (Faculty Sponsor)
Computational Science

Two projects are presented as verification procedures for the Los Alamos National Laboratory's hydrodynamics production code xRAGE. The first project uses the Method of Manufactured Solutions to calculate the spatial convergence rates of xRAGE based on the method of successive grid refinement, showing unexpected results. To find the source of the error, a new manufactured solution is created to pinpoint the location of the error. The second project investigates the adaptive mesh refinement capability of xRAGE by simulating the one-dimensional Guderley problem. An optimal error metric for comparing AMR data sets to fixed cell data sets in one dimension is defined and proven to be an exact comparison. Results are promising, showing that error tends to decrease as the maximum number of refinements increases and as the tolerance for refinement decreases.

THE EFFECTS OF SYLLABLE SEGMENTATION ON ARTICULATION

Mina Brown (Graduate)
Special Education

Dorothy Valcarcel Craig (Faculty Sponsor)
Education

Phonological awareness is the understanding that oral language can be broken and divided into smaller components. For example sentences can be broken down into words, and words can be broken down into syllables, and syllables can be broken down into phonemes. Consequently, children can manipulate many sounds or syllables by deleting sounds in a word, adding sounds, or substituting one sound for another sound. Therefore, children struggle in the area of articulation as they learn to produce new words. The participants of this study are 3-5 years of age and are students enrolled in a special education program. This study examines the effects on a child's articulation when learning new words by breaking them down into syllables. Therefore, this quasi-experimental design focuses on the question, what improvements-if any- are made in the area of articulation when using the strategy of syllable segmentation when presented with picture cards? Data is collected through a pre and post norm-referenced assessment focused on articulation.

ESTABLISHING VALIDITY OF A ONE-DIMENSIONAL WEIGHT STIGMA SCALE USING RASCH MODEL

Rose Carter (Graduate)
Health and Human Performance

Craig Carter
Sociology and Anthropology

Minsoo Kang (Faculty)
Health and Human Performance

Youngdeok Kim, Joshua Haley, Peter Hart (Graduates)
Health and Human Performance

Minsoo Kang (Faculty Sponsor)
Health and Human Performance

The purpose of this study was to validate the weight stigma scale (WSS) using the Rasch model. The WSS was designed to measure self-perceived amounts of stigma due to self-reported body weight. Methods: The 8-item WSS was based on a 7-point Likert Scale (i.e. "Strongly Disagree" to "Strongly Agree") and was administered to students enrolled in undergraduate general education classes at a south eastern U.S. university (N = 569). Students' age ranged from 17 to 49 years old. Students whose Body Mass Index (BMI) was greater than 25 kg/m2 were classified as overweight to obese and were used in the data analysis (n =212). Item difficulty and person's ability (i.e. level of perceived stigma) were estimated in Logits. Model-data fit was acceptable based on Infit and Outfit Statistics (>= 0.5 and <= 1.5). Results: With the exception of one WSS item, the model fit the data. The Rasch Model supports the unidimensionality of the items (e.g. stigma based on body weight). The most difficult item to endorse was "People think that I am not particularly intelligent because I am overweight" (Logit = 1.08), and the least difficult item to endorse was "I am self-conscious about being overweight" (Logit = -1.34). The person separation reliability (including, extremes) was .77, and when extreme cases (n = 25) were excluded, the person separation reliability increased to .86. Discussion: These results support the validity of the WSS in measuring self-perception of stigma due to body weight.

THE USE OF TIO$_2$ THIN FILMS FOR THE DETECTION AND DEPLETION OF CHEMICAL WEAPONS MODELS

Peter Cothron (Graduate)
Chemistry

Andrienne Friedli (Faculty Sponsor)
Chemistry

Titania (TiO$_2$) powder catalyzes oxidization of organic compounds in the presence of light and is used in decomposition of environmental contaminants. In this project, mesoporous TiO2 thin films were investigated as sensors for chemical warfare agent (CWA) models, with the intent that the CWAs could be decomposed after detection and the sensors reused. Mesoporous TiO2 was synthesized according to a literature procedure using P123, a polyether block copolymer, as a pore-generator. After forming a titania sol-gel and spin-coating onto an appropriate substrate, the P123 was removed via calcification at 300 °C then 500 °C. Variations in experimental conditions for film formation included number of layers, spin-coating rate, heating rate, and decomposition temperature. Film morphology was characterized through thickness measurements (profilometry), water contact angle (goniometry), and transmission electron microscopy (TEM). Initial sensor investigations were performed with mustard gas simulant chloromethyl phenyl sulfide (CMPS) or nerve agent model dimethyl methyl phosphonate (DMMP) to find systems that could be monitored with available spectroscopic methods. After exposure to CWA model vapor, the films were examined with IR and Raman spectroscopies to determine whether binding or entrapment within the film occurred. Films with evidence of binding to CMPS/DMMP were exposed to a medium pressure UV lamp for up to 30 minutes to photochemically decompose the compound. After the decomposition was complete, the film was re-exposed to CMPS/DMMP and the process was repeated to determine efficiency.

THE RECENT SOLAR MINIMUM AND IRI MODEL PREDICTIONS AND IMPROVEMENTS

Matthew Wang (Graduate)
Computational Science

Dieter Bilitza (Faculty Sponsor)
Computational and Data Sciences/George Mason University

The sun is currently in its solar minimum of its cycle, but this cycle is unique in that it has lasted almost two years longer than previous cycles, disagreeing with the IRI model and other predictions. These discrepancies are observed from the IRI model and data from the Ionosphere. The ionosphere is the upper part of the Earth's atmosphere and mainly affects radio propagation between satellite and Earth-based communications. It is important to observe the inaccuracies, not only for radio communication but also to better understand the sun. Emphasis on the importance of using the updated IRI indices for the IRI model is discussed. Ionosonde data, predominant from the SPIDR database, is used from stations in different latitudes to investigate how well the previous model performed and how the updated parameters of the model perform. The results of this analysis may yield new insights into the sun's solar cycles and improve the model for future cycles.

DESIGN OF A WIRELESS HEART MONITORING SYSTEM

Rafet Al-Tobasei (Graduate student)
Computational Science

Raymond Avornyo (Undergraduate)
Mathematical Sciences

Scott Handy (Faculty Sponsor)
Chemistry

Coronary heart diseases are the leading cause of death in the US. In 2001, one out of every five reported deaths was due to heart diseases. Of the number of deaths due to heart diseases, 163,221 deaths were due to sudden cardiac arrests. Patients suffering from or recovering from heart complications have to be confined to the hospital for constant heart monitoring or have to pay regular visits to the physician to get their heart checked. The bulk of the costs of treatment of heart diseases come from such hospital visits or confinement. This design is a simulation of a wireless heart monitoring system. The design is composed of a pulse generator that creates and transmits pulses wirelessly to a computer. Readings on the computer are then transferred over the internet to a physician. The pulse generator simulates the heart rate of a person. An alert mechanism incorporated in the design sends out text messages when pulse readings are outside a set target range. An actual working device of the wireless heart monitor would help reduce the mortality rate due to sudden cardiac arrests attacks. Such a system would also reduce the cost of treatment significantly.

TEACHERS' PERCEPTIONS ABOUT HOMEWORK

Sirci Stinson (Graduate)
Educational Leadership

Dorothy Valcarcel-Craig (Faculty Sponsor)
Educational Leadership

Homework is a widely used educational tool across content areas and grade levels and can have an impact, either positive or negative, on students' academic achievement. This study examined teachers' and prospective teachers' perceptions about homework by asking the following four questions: 1. What do teachers see as the purpose of homework? 2. What value does homework have for students? 3. What are the best homework practices, including type of homework assignment, time spent on homework and amount of homework? 4. How prepared by their undergraduate programs are teachers on the subject of homework? The study used a qualitative approach through surveys and interviews. Teachers are better able to design homework for the purpose of benefitting their students academically when teachers have an understanding of their own perspectives on homework and how that affects their homework implementation. The results will be used to improve practice in the classroom.

FORENSIC ANTHROPOLOGY IN THE CLASSROOM: A BARE BONES METHOD FOR MENTORING

Tiffany Saul (Graduate)
Biology

Anthony Farone, Mary Farone, Kim Sadler (Faculty)
Biology

Hugh Berryman (Faculty Sponsor)
Forensic Institute for Research and Education

Forensic anthropologists use skeletal remains to determine biological profiles that may assist law enforcement in the identification of individuals. These biological profiles include estimates of age, sex, and ancestry. Through the NSF TRIAD GK-12 Fellowship, the science of Forensic Anthropology was easily incorporated into high school biology classrooms over the last two years. The popularity of forensic science in television and movies promotes curiosity and interest from the students, which provides an exceptional opportunity to use this type of scenario to introduce inquiry-based lab activities. In the classroom, students were instructed on basic techniques used to determine age, sex, and ancestry, and used casts of human bones to practice these techniques. Other forensic science lessons have been used to encourage participation, such as finger-printing and DNA processing. These forensic science lessons have been presented to students in the classroom and in weekend STEM workshops designed to increase interest in various scientific fields. CSI: MTSU, a unique summer camp for high school students, has also been instrumental in introducing forensic science applications to future scientists. Support from Forensic Institute for Research and Education (FIRE) has given students insight into real-world applications of STEM science. High school student projects mentored by the Graduate Fellow have been designed with forensic application in mind and are intended for entry in the upcoming Middle Tennessee State University Forensic Science Symposium for middle and high school students. The authors have worked closely with the university and community to create and host this first annual one-of-a-kind event to showcase original student research projects. This presentation will highlight the benefits of mentoring middle and high school students and encouraging scientific research, both for the students and the mentors.

CURRENT SEXUAL BEHAVIORS OF TENNESSEE ADOLESCENTS: FINDINGS FROM THE 2011 YOUTH RISK BEHAVIOR SURVEILLANCE SYSTEM.

Poliala Dickson (Graduate)
Health and Human Performance

Amanda Cole, Brittney Oliver, Samuel Sowah (Graduate)
Health and Human Performance

Andrew Owusu (Faculty Sponsor)
Health and Human Performance

Youth who initiate sex early face serious consequences such as unwanted pregnancy and exposure to sexually transmitted infections (STIs). Teens who are sexually active before the age of 13 are more likely to have multiple sex partners and less likely to use condoms, further increasing these risks. While only representing 25% of the overall sexually active population, individuals between the ages of 15-24 make up nearly half of all new cases of STIs. The purpose of this study is to provide descriptive statistics on sexual behaviors of Tennessee adolescents with special attention given to the effect of early initiation of sex on current sexual behaviors. Methods: Data from the 2011 Tennessee Youth Risk Behavior Survey (TNYRBS) was utilized. Frequency distri-butions and cross-tabulations were run using SPSS version 16.0. Results: A total of 2635 adolescents participated in the survey. More than half of all participants (52.4%) reported having had sexual intercourse at least once. The mean age of initiation of sex is 14.3 years of age, and 17.2% of participants reported having had four or more sexual partners in their lifetime. Of the students who reported current sexual activity 58.7%, reported using a condom, and another 23.5% used either the birth control pill or the contraceptive shot (depo-provera) to prevent pregnancy the last time they had sex. However, only 9.3% reported using both a condom and the contraceptive pill or shot the last time they had sex. Conclusion: Although, majority of teens reported using a condom the last time they had sex there is still a large subset that are not taking adequate steps to prevent the spread of sexually transmitted infections. These findings need to be addressed due to the extremely high incidence of STI's in this population.

HEDONIC PRICE ANALYSIS OF MULES IN TENNESSEE

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Agribusiness and Agriscience

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Mules are the offspring of a male donkey and horse mare. Mules are strong, durable animals with a reputation for sure-footedness, willingness to learn, good work ethic, and stubbornness. However, little data appears to exist on the numbers of mules in the state. It is known that many Anabaptist groups use mules for their main source of farm power. They are also highly important in logging applications here they represent a more eco-friendly approach to forestry than heavy machinery. Additionally there is a thriving subculture of mule trainers, mule skinners (people who drive teams), and trail riders. All of these activities culminate in the annual Columbia Mule Day Celebration, held each spring in Columbia, Tennessee. Since mules are not a primary agriculture product, there is a dearth of research on mule markets. In this study we present a hedonic price analysis of mules in Tennessee. Data on prices and mule attributes were collected at public outcry auctions held throughout the state. Mules are typically sold in lots ranging from single animals up eight-mule teams. We estimate the impact of size (measured in hands), age, number of mules in each lot, gender, and color on the auction price of mules.

COMPUTATIONAL MODELING OF SILICA-BASED BODY ARMOR

Zachary Spears (Graduate)
Computational Science

Abdul Khaliq (Faculty Sponsor)
Computational Science

Modern body armor is a combination of years of hi-tech research, but it is basically still made of the same components as when bulletproof vests first came out. In an attempt to create stronger, more flexible body armor, people have developed the idea of using a non-Newtonian fluid made of silica and polyethylene glycol to strengthen the standard body armor while also lightening it. This will allow for lighter body armor that is flexible and becomes rigid only for the very short period of time to deflect the bullet, then becomes flexible again. I will use computational modeling techniques to show the effectiveness of silica-based body armor, and using chemistry models; I will work on developing a better form of body armor through functionalization of the silica in the armor. To verify my simulations, I will use tests run by independent testers as well as some I will run on my novel set-ups.

THE FORMATION OF MELAMINE-CYANURATE AND MELAMINE-URATE COMPLEX IN AQUEOUS AND PHYSIOLOGICAL MATRICES

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Chemistry

Beng Ooi (Faculty Sponsor)
Chemistry

Melamine and cyanuric acid have been implicated in the kidney-related disease in infants and in the death of a large number of cats and dogs that ingested tainted food containing melamine. Melamine and cyanuric acid can form extremely insoluble crystals that precipitate in the renal tubules, leading to progressive tubular blockage, degeneration, and acute renal failure. Melamine can also interact with uric acid to form insoluble urinary tract calculi composed of melamine and uric acid at 1:2 mole ratios. Infants are susceptible due to higher uric acid levels compared to adults. Melamine is used for making food packaging materials, and plastic tableware and for coating of food tins, but only residual amounts leach into food. The U.S. Food and Drug Administration (FDA) reported that food and beverages have been found to contain melamine in the parts-per-million levels as a result of leaching from melamine-containing resins. Trace levels of cyanuric acid can be present in food and water from the use of dichloroisocyanurate in swimming pools, and water used in food manufacturing. The goal of this study is to investigate the histomorphologic characteristics of the crystals observed at various concentrations, pH, and temperatures using scanning electron microscopy (SEM). The morphology, size, and distribution of the crystals formed at temperature of 4, 25, and 37 degrees Celsius at final melamine and cyanuric acid concentrations ranging from 5 mg/L to 500 mg/L were compared. Crystals prepared at different pH conditions ranging from pH 3.3 to 8.8 were also analyzed. Melamine-cyanurate formed in bovine blood plasma and in the kidney tissue of a catfish that had been fed for 3 days with 200 milligram per day of melamine and cyanuric acid per kilogram body-weight was analyzed by SEM and Raman microscopy. Melamine-urate crystals formed in water and in blood plasma were also analyzed via SEM and Raman microscopy.

MODELING NOISE IN THE NERVOUS SYSTEM

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Mathematics/Computational Science

Noise in the nervous system may be modeled by taking existing PDE models and adding stochastic terms. Presented here are preliminary findings and information regarding noise in the nervous system and the methods of modeling it. "Noise — random disturbances of signals — pose a fundamental problem for information processing and affect all aspects of nervous-system function. However, the nature, amount and impact of noise in the nervous system have only recently been addressed in a quantitative manner. Experimental and computational methods have shown that multiple noise sources contribute to cellular and behavioral trial-to-trial variability." – A. Aldo Faisal - University of Cambridge

DAYTIME PATTERNS OF TIME SPENT IN SEDENTARY BEHAVIORS AMONG US MIDDLE-AGED ADULTS

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Saori Ishikawa, Joel Reece (Graduates)
Health and Human Performance

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Health and Human Performance

Purpose: Despite of the increasing importance of Sedentary Behaviors (SBs) for maintaining healthy life in later years, few studies have explored the trajectory of time spent in SBs throughout a day. The purpose of this study, therefore, was to examine the patterns and changes in time spent in SBs during the day among US middle-aged adults. Method: Data from the 2003 to 2006 National Health and Nutrition Examination Survey (NHANES) were analyzed for this study. A total of 1,038 middle-aged adults (40-60 years of age) who provided valid data of accelerometer activity counts for at least three days of weekdays and a day of weekend days were included. The average minutes of SBs (<100counts/min) for each time block of the 11-hour daytime period was calculated for a weekday and a weekend. The exploratory factor analyses (EFA) and the piecewise latent growth models (LGM) were employed using Mplus v6.11 to examine the patterns and changes in minutes of SBs during the daytime. Results: For both weekday and weekend day, four latent factors (i.e., time periods) were extracted by EFAs. The four-piecewise LGMs for both weekday and weekend day were all well fitted. For weekday, the initial minute of SBs at 8:00am was 33.13. Decreasing trends were found with slope estimates of -0.78 and -0.14 in the first two time periods, while increasing trends were found in the third and fourth time periods with slope estimates of 0.28 and 0.93, respectively. For weekend day, the initial minute of SBs at 8:00am was 36.44. The minutes of SBs was decreased in the first time period with the slope estimates of -1.80 and increased throughout the last three time periods with the slope estimates of 0.27, 0.45, and 1.88, respectively. Conclusion: This study investigates the patterns of SBs during daytime among US middle-aged adults. Those transition points where the minutes of SBs increase should be targeted in future research in order to reduce the total amount of SBs among middle-aged adults.

CAN WE FIGHT CANCER BY ATTACKING ITS BLOOD SUPPLY? AN ANALYSIS OF THE EFFECT OF ANGIOSTATIN ON TUMOR ANGIOGENESIS

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Mathematics & Molecular Biosciences

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Mathematics & Molecular Biosciences

Cells that are no longer able to control their rate of division and growth are said to be cancerous cells. A population of such cells that keep dividing and growing rapidly out of the norm is known as a tumor. During this process of uncontrolled cell replication (mutations), the genetic structure of the cells is altered and can thus become resistant to drugs, thereby escaping the effects of therapy. However, tumors fail to grow when there is a lack of oxygenation and other nutrients to it. Usually they cannot grow beyond 1 - 2mm (proposed by Dr. Judah Folkman).In our study, we use a mathematical model to analyze the effect of angiostatin on tumor angiogenesis.

THE RELATIONSHIP BETWEEN CHILDHOOD OBESITY AND SEDENTARY ACTIVITIES AMONG TENNESSEE HIGH SCHOOL STUDENTS

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Brittney Oliver (Graduate)
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Andrew Owusu (Faculty Sponsor)
Health and Human Performance

Purpose: Existing studies indicate that sedentary behaviors lead to obesity. Sedentary behaviors include watching television or playing video games. Prior research indicates that children ages 9-12 are more likely to be obese as a result of playing computer/video games. This study examined data from high school students in Tennessee to determine the relationship between obesity and the amount of time spent playing computer/video games as well as between obesity and the amount of time spent watching television. Methods: Using data from the self-administered 2011 Tennessee Youth Risk Behavior Survey the selected independent variables were: time spent watching television on an average school day and time spent playing video or computer games or using a computer for something that was not school-related. The dependent variable was body mass index (BMI). Results: Confidence intervals were calculated for cross-tabulation between sedentary behavior variables and BMI. Students who reported playing more than 3 hours of computer/video games (17.1%, C.I. 14.9 – 19.4) each day are significantly more likely to be obese compared to those who play 3 or less hours of computer/video games each day (11.5%, C.I. 8.9 – 14.1). There was no significant difference between the number of hours spent watching television and BMI. Conclusions: Contrary to previous studies, our results indicate there is no significant difference between the amount of hours watching television and weight status. Since experts agree that sedentary behaviors are related to weight status, we suggest a need for a more in-depth analysis of the data to better understand the amount of time spent partaking in sedentary activities that would result in weight gain.

DETERMINATION OF BARBITURATES IN SOIL BY LIQUID CHROMATOGRAPHY/MASS SPECTROMETRY

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Chemistry

Sheeba Siddiqi (Undergraduate)
Chemistry

Paul Kline (Faculty Sponsor)
Chemistry

A method for detecting pentobarbital in soil previously developed by this laboratory was utilized to determine its application to a broader range of barbiturates. The method was developed to quantify the rate of decay of pentobarbital in contaminated soil. Barbiturates are highly stable organic compounds that are released into the environment via multiple pathways. Euthanized animals are a growing contamination source in addition to the contribution of barbiturates from a wide array of pharmaceutical use. Barbital and its derivatives were extracted from separate soil samples each separately spiked with the respective barbital derivative. Clean up procedures involved centrifugation, reverse-phase solid phase extraction (SPE), microfiltration, and lastly analysis by liquid chromatography/mass spectrometry. Concentration determination and recovery was determined utilizing a deuterated isotope method and internal standard method. Satisfactory recoveries of the barbital derivatives indicate this is an effective method for analysis and detection. Further, pre-concentration via SPE allowed for .001 mg of barbital per 5 g of soil (200 ppb) to be detectable at limits of quantification using LC-MS.

DEPRESSION AND EATING DISORDERS...HOW ARE THEY RELATED?: AN EXAMINATION OF BOTH AMONG TENNESSEE'S ADOLESCENTS

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Introduction: Eating disorders have the highest mortality rate of any mental illness. More than half of teenage girls and nearly one-third of teenage boys report using unhealthy weight control behaviors, such as skipping meals, fasting, smoking cigarettes, vomiting, and taking laxatives. Consistent with previous research, we hypothesize that students who vomit or take laxatives to lose weight are more likely to exhibit symptoms related to depression than students who do not report these eating disorder behaviors. Methods: Using the data from the 2011 Youth Risk Behavior Survey, we examined questions related to the signs of depression and behaviors related to eating disorders as reported by students in the state of Tennessee. The selected independent variable was vomiting/ laxative use to lose weight. The selected dependent variable was depression. Results: 4.1% of students who reported vomiting or taking laxatives to lose weight (65.975, CI 54.561-77.389) those students are significantly more likely to report signs and symp-toms of depression when compared to students who did not vomit or take laxatives to lose weight (24.252, CI 22.265-26.238). Odds ratios were calculated for this relation-ship. Tennessee adolescents who reported vomiting or taking laxatives to lose weight were approximately six times more likely to also report signs and symptoms of depression than students who did not report vomiting or taking laxatives to lose weight. Conclusion: There are significant associations between high school students' vomiting/ laxative use behaviors and depression. Students who had engaged in vomiting and laxatives are more likely to report signs and/or symptoms of depression than students who did not take laxatives and experiencing vomiting.

GARDNERELLA VAGINALIS RECRUITS THE NLRP3 INFLAMMASOME IN DIFFERENTIATED MONOCYTES

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Biology

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Biology

Gardnerella vaginalis is a gram variable rod associated with bacterial vaginosis, pelvic inflammatory disease, bacteremia, and preterm birth. It produces a toxin known as vaginolysin, which binds to CD59, as a cholesterol dependent cytolysin (CDC). Similar CDCs have been shown to have intracellular activity capable of up regulation of the innate immune system and activation of the NLRP3 (cryopyrin) inflammasome. Notably, *G. vaginalis* bacterial vaginosis is characterized as a condition lacking any obvious signs of inflammatory activity. Inflammation within the uterus during pregnancy can cause prenatal brain injury and has been associated with preterm birth. The involvement of phagocytes in regulating innate immunity in the vaginal epithelium and endometrium is well documented. Though clinical samples are capable of producing activity in Toll-like Receptors (TLRs) 2 and 4, it has not been clearly demonstrated that isolated *G. vaginalis* specimens are capable of the characteristic inflammatory downstream effectors. We set out to determine if *G. vaginalis* causes inflammation relative to lipopolysaccharide when exposed to phorbol-12-myristate-13-acetate (PMA) differentiated human monocytes (THP-1) and if so, what inflammasome components were recruited. A significant increase in IL-1β, IL-18, and TNFα activity were detected over an LPS baseline after 12 hours. Immunofluorescence for apoptosis associated speck like protein containing a CARD (ASC) showed aggregations in both LPS- and *G. vaginalis* treated samples.

LACK OF ACCESS TO AFFORDABLE AND HEALTHY FOODS COULD BE LINKED TO OBESE ADULTS AND CHILDREN

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Psychology

Thomas Brinthaupt (Faculty Sponsor)
Psychology

The purpose of this paper is to explore how obesity rates correspond to the percentage of a county's population living in food deserts. Obesity is defined as having a body mass index (BMI) of 30 kg/m² ((lbs. /in²)*703) or more for adults (CDC, 2010). A child is considered obese when the percentile is 95th or higher based on the CDC BMI chart for age and sex (CDC, 2011). This condition refers to having an excess amount of body fat that endangers one's health and puts a person at risk for many diseases. Environment plays a large role for many who become obese. An environment where there is low access to healthy and affordable food is called a food desert. In these communities, people opt for unhealthy foods high in fat, sugar, and calorie content that contribute to the obesity epidemic. It is hypothesized the rates of adult and childhood obesity increase as the percentage of the county's population living in food deserts increases. This study utilized online data from the Food Desert Locator of the U.S. Department of Agriculture's Economic Research Service U.S. Census Bureau 2010 population data, and Tennessee Coordinated School Health Childhood Obesity Rates by County Data of 2008-2009.

EFFECTS OF ACCUMULATED SHORT AND VERY SHORT BOUTS OF EXERCISE ON BLOOD PRESSURE: A META-ANALYSIS

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The American College of Sports Medicine recommends 30 minutes of moderate exercise most days of the week for adults, which can be accumulated in short bouts (at least 10 minutes). Recent interest has begun to investigate the effects of very short bouts (<10 minutes) on health variables. PURPOSE: To determine the effect of accumulated short and very short bouts of exercise on systolic blood pressure (SBP) and diastolic blood pressure (DBP). METHODS: Multiple online databases (i.e. Medline, Web of Science, EBSCO Host, Science Direct, Pubmed, Google Scholar, and Oregon PDF in Health and Performance) were used to identify applicable articles. Search terms included the following words: accumulate, exercise, physical activity, short bouts, intermittent, and health benefits. In addition, extensive cross-referencing from review and original articles was conducted. Only articles that were randomized, trained for at least 4 weeks (not sport specific), measured blood pressure, and included an experimental group with well-defined or well-estimated short or very short bouts of exercise (2-10 minutes) were included. Meta-Analysis software was used for the analysis. RESULTS: A total of 51 articles were collected in the initial searches. After further review, 21 effect size (ES) values from 9 articles were calculated. This included 11 ES values for SBP and 10 ES values for DBP. Overall, all accumulated bouts of exercise yielded a small to moderate ES of -0.34 (95% CI=-0.56, -0.13) and -0.37 (95% CI=-0.59, -0.14) for SBP and DBP, respectively. Employing the fixed effects model, homogeneity was found in the mean ES for both SBP, $Q(10)=9.45$, $p=.49$, and DBP, $Q(9)=6.27$, $p=.71$. CONCLUSION: The accumulation of short and very short bouts of moderate-to-vigorous exercise has a small to moderate negative effect on both SBP and DBP.

MITOCHONDRIAL INVOLVEMENT IN UV-LIGHT INDUCED CELL DEATH IN NEURO-2A

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Molecular Biosciences

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Cells constantly undergo apoptosis, a type of programmed cell death, throughout the embryonic development and life span of an organism. When a cell looses the ability to undergo apoptosis, it may become cancerous. Therefore, we have studied the mechanism of cell death in a mouse model (N2a cells) of human neuroblastoma, a common form of childhood cancer. UV-light induces apoptosis through a pathway that requires functional acid sphingomyelinase, which induces activation of the extrinsic apoptotic pathway. N2a cells have low acid sphingomyelinase activity and therefore should be resistant to UV-induced apoptosis. However, studies from our laboratory demonstrated that UV-light induces a form of programmed cell death in N2a cells that is associated with translocation of phosphatidylserine to the exoplasmic leaflet of the plasma membrane, a characteristic feature of apoptosis, but lack many other features of the extrinsic pathway. When exposed to staurosporine, a protein kinase inhibitor, the N2a cells display the expected phenotypic changes, which indicate that they possess the molecular machinery necessary for execution of the extrinsic pathway. Therefore, we hypothesize that N2a cells exposed to UV-light bypass activation of the extrinsic pathway and, instead, activate the intrinsic pathway, which does not require functional acid sphingomyelinase. To test this hypothesis, N2a cells exposed to UV light were monitored for changes in mitochondrial outer membrane permeability (MOMP), translocation of Bax from the cytosol to the mitochondrial membrane, and release of cytochrome C into the cytosol. In addition, we monitored the cleavage of caspase 9 and caspase 3, which are activated as part of the extrinsic and intrinsic pathways, respectively. The results of these experiments suggest that exposure of N2a cells to UV light results in the activation of a potentially novel, caspase-3-independent pathway that involves changes in mitochondrial membrane permeability and resembles the intrinsic pathway of apoptotic cell death.

THE ASSOCIATION BETWEEN PERSONAL HEALTH STATUS AND THE USE OF THE INTERNET FOR HEALTH INFORMATION

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Andrew Owusu (Faculty)
Heatlh and Human Performance

Poliala Mahoney-Dickson, Brittney Oliver, Samuel Sowah (Graduates)
Health and Human Performance

Norman Weatherby (Faculty Sponsor)
Health and Human Performance

Background: Evidence shows that many people use the Internet for researching health issues. However, we do not have a large amount of information on the perceived health status or demographics of this population. This study investigated the relationship between personal health status and the use of the Internet to research health information when controlling for age, sex, race, and Internet use. Methods: This study utilized data from the 2007 Health Tracking Household Survey (HTHS). Complex samples Logistic Regression was used to determine if a relationship exists between personal health and the use of the Internet to research health information when controlling for age, sex, race, and Internet use. Personal health status was evaluated using a dichotomized variable of those who responded their general health as good, very good or excellent versus those who responded it was fair or poor. Internet use was evaluated by a Yes or No response to whether the Internet had been used within the last 12 months to obtain personal health information. Results: From a sample size of 12,401 unweighted, valid cases, 67.9% reported that they obtained personal health information from the Internet within the last year. When controlling for age, sex, race, and overall Internet use, those who reported a personal health status of fair or poor are significantly more likely to have used the Internet to get personal health information than those who reported a general health status of Good, Very Good, or Excellent (OR: 1.60; CI: 1.35-1.90). Females are significantly more likely than males to use the Internet for health information (OR: 1.55; CI (1.40-1.70). No significant findings were observed for age or race. Conclusion: Significant associations exist between personal health status and the use of the Internet to obtain health information. More research is needed in this area to strengthen existing methods of health communication via the Internet by further understanding the population being served.

BIFURCATION ANALYSIS OF TUMOR GROWTH INTERACTING WITH IMMUNE SYSTEM

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Mathematical Sciences

Scott Handy (Faculty Sponsor)
Chemistry

Study of cancer tumor growth as well as its interaction with other cells in the organism is an open topic in modern science. A number of methods are used to predict the behavior of this process. Among them are experimental research, statistical approach, and mathematical modeling. To describe the biological process mathematically, scientists make up a system of differential equations. This approach is beneficial, because you may not just solve the system but also study its response to variation of different parameters it contains. In this work the bifurcation of the system of ordinary differential equations modeling the effect of a simple immune system and immunodeficiency on the dynamics of conjointly growing tumor and normal cells is considered. The amount and strength of medicine the patient takes was chosen as a parameter to be varied. The behavior of tumor, normal and effector cells as the result of parameter's variation was studied. MATLAB'10 was used to obtain and visualize the results.

SYNTHESIS AND CHARACTERIZATION OF DONOR-ACCEPTOR POLYENES WITH INDOLINE AND TRIHYDROQUINOLINE DONORS

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Chemistry

Nathan Rau (Graduate)
Chemistry

Andrienne Friedli (Faculty)
Chemistry

Andrienne Friedli (Faculty Sponsor)
Chemistry

To study the effect of donor group on stability and conjugation in donor-acceptor polyene dyes, we synthesized three donor molecules: 5-(N-methylindolin-5-yl)-2,4-pentadienal (**1a**), 5-(N-butylindolin-5-yl)-2,4-pentadienal (**1b**), and 5-(N-methyl-2,3,4-trihydroquinolin-6-yl)-2,4-pentadienal (2). A three-step procedure, based on modification of literature procedures for individual steps, was used for each target. Indoline and tetrahydroquinoline were first alkylated using potassium hydride and the appropriate haloalkane. Next, a selective electrophilic aromatic bromination method using N-bromosuccinimide was performed to give primarily para-bromination, with the percentage of dibrominated side product depending upon reaction conditions. Finally, lithium-halogen exchange, followed by nucleophilic addition to N, N-diethylaminopentadienal resulted in the dark orange solids **1** and **2**. The completion of each step was confirmed by NMR spectroscopy, and the intermediate and final products were purified using column chromatography. The solvatochromic final products were purified by repeated recrystallization and characterized with NMR and UV. Results were supported with calculations of solvent-dependent electronic transition energies and hyperpolarizabilities using the ZINDO//DFT method.

DO COLLEGE STUDENTS UNDERSTAND THAT CARDIOVASCULAR RISK FACTORS APPLY TO THEM?

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Psychology

Gloria Hamilton (Faculty)
Psychology

Gloria Hamilton (Faculty Sponsor)
Psychology

Cardiovascular disease is a significant health problem in the United States. Healthy lifestyle practices play a key role in preventing and treating cardiovascular disease (CVD). Central to such strategy is a nutritious, heart-healthy diet. The purpose of this study was to determine the relationships between college students' nutrition knowledge and their perceptions of risk pertaining to CVD. This study utilized a self-report data collection instrument designed to measure students' perceptions of CVD risk, reported risk factors, accuracy of students' nutrition knowledge, and evaluation of their individual diets. Statistical analyses revealed no relationship between CVD nutrition knowledge and perceived risk or reported number of risk factors. Statistical findings did reveal a significant relationship between personal diet rating (healthy vs. unhealthy) and accuracy of CVD nutrition knowledge, as well as between perceived and self-reported risk. This research suggests that, despite the finding of a slight optimism bias, college-aged men and women recognize their current health risk and dietary disparities but are not taking steps to change their diet to prevent CVD. Results of this study suggest that students would benefit from CVD-related nutrition information that includes behavior-change strategies found effective in prevention of CVD.

AN EMPIRICAL ASSESSMENT OF ASSORTATIVE MATCHING FOR VENTURE CAPITAL AND PRIVATE EQUITY MARKETS IN AFRICA

Jonathan Adongo (Graduate)
Economics

Bichaka Fayissa (Faculty Sponsor)
Economics

Using a hand collected dataset, I investigate the matching patterns between investors and entrepreneurs who obtain venture capital or private equity financing across 42 African countries, except South Africa, from 2004 to 2009. The analysis focuses on the direction and degree of the equilibrium sorting pattern by team-level education and work experience. The empirical results suggest that positive assortative matching by venture capital or private equity work experience occurs between investors and entrepreneurs at the seed, startup or early venture capital and private equity stages. This finding holds regardless of whether or not risk is taken into account. In addition, the degree of sorting on this human capital trait is relatively higher than for other traits that capture the education and work experience of investors and entrepreneurs. For these two stages, it supports the sentiment of investors without exposure to Africa that experience in screening, structuring, and executing deals is important.

HIDING BEHIND THE CONCEPT OF JUSTICE: ARE WE AWARE OF THE DISCRIMINATION IN THE U.S. CRIMINAL JUSTICE SYSTEM?

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Psychology

Gloria Hamilton (Faculty)
Psychology

Gloria Hamilton (Faculty Sponsor)
Psychology

Ethnic discrimination has been documented at all levels of the U.S. criminal justice system, with Euro-Americans more likely than minorities to experience better treatment from police officers, fairer tactics by prosecutors, lighter sentencing from judges, and more favorable news portrayals. This study was designed to examine college students' perceptions of police treatment of Euro-Americans and African-Americans and whether treatment differed by race of suspect. Participants were recruited from two universities in a southern state: one was an historically black university, the other, a state university. A total of 304 participants completed a survey constructed to elicit their perceptions of police treatment of both Euro-American and African-American suspects.

AN INTEGRATED APPROACH IN THE USE OF SURFACE-ENHANCED RAMAN AND INFRARED SPECTRAL LIBRARIES FOR THE IDENTIFICATION OF CARCINOGENIC AROMATIC AMINES

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Chemistry

Ngee Sing Chong (Faculty)
Chemistry

Beng Guat Ooi (Faculty)
Chemistry

Ngee Sing Chong (Faculty Sponsor)
Chemistry

Surface-enhanced Raman spectroscopy (SERS) has been studied to a much greater extent than surface-enhanced infrared analysis (SEIRA) because of the significantly greater signal enhancement factor and its wide variety of substrate choices. In this study, we investigate the feasibility of preparing a versatile substrate amenable to both techniques to optimize the synergistic powers of SERS and SEIRA for identifying trace levels of structurally similar aromatic amines. The analytes studied include known or suspected carcinogens such as 4-aminobiphenyl, 2-naphthylamine, o-toluidine, melamine derivatives and their respective isomers. The substrate preparation procedures rely of the use of colloidal synthesis or electro less deposition techniques involving gold, silver and copper. The accuracy of identifying the carcinogenic aromatic amine via spectral matching of SERS and SEIRA is evaluated by the Euclidian distance search algorithm and compared to the corresponding match indices based on NIST mass spectral library. Preliminary results indicate that the integrated approach of using both SERS and SEIRA spectral libraries is able to improve the accuracy of identifying analytes over the mass spectral method.

EXAMINING THE RELATIONSHIP BETWEEN SLEEP DIFFICULTIES AND ACADEMIC PERFORMANCE AMONG MTSU STUDENTS

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Health and Human Performance

Amanda Cole, Brittney Oliver, Poliala Mahoney-Dickson, Youngdeok Kim (Graduates)
Health and Human Performance

Lisa Thomason Schrader (Staff/administrator)
Health Promotion

Norman Weatherby (Faculty)
Health and Human Performance

Andrew Owusu (Faculty Sponsor)
Health and Human Performance

Introduction: Among college students, sleep problems can impact academic performance, health, and mood. As a group, college students do not get as much sleep as the general adult population. The consequences of inadequate sleep include difficulty in concentrating and a lower overall academic performance. The purpose of this study was to examine the relationship between sleep difficulties and academic performance among students at Middle Tennessee State University. Methods: Data on MTSU students who participated in spring 2010 National College Health Assessment (NCHA) was analyzed to examine the relationship between selected variables. Principle component analysis was performed to obtain a composite variable that represented sleep difficulty. Multinomial logistic regression was then conducted to predict the extent to which the composite variable and other covariates (i.e., gender, grade, housing status, and working hours) affected overall letter grade average. Results: When controlling for covariates, a significant association was observed between the composite sleep difficulty variable and overall grade average (Wald $x2$=6.14, p=.046). When controlling for gender, year in college, full-time or part-time status, and type of housing, the more trouble students have sleeping, the less likely it is that they will have an overall letter grade average of "A"(OR = 0.787, CI= 0.637, 0.971) or "B" (OR = 0.807, CI = 0.666, 0.979). Conclusions: Students with sleep-related problems are significantly less likely to earn good grades in school. This important relationship between sleep quality and academic performance suggests that interventions to improve academic performance should take sleeping problems into account.

THE EFFECTS OF INTER-TRAIT CORRELATION ON MODEL RECOVERY IN MULTIDIMENSIONAL ITEM RESPONSE THEORY (MIRT)

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Literacy studies program

Jwa K. Kim (Faculty Sponsor)
Literacy studies program/ Psychology

The purpose of the current study was to investigate the effects of inter-trait correlation on model recovery in Multidimensional Item Response Theory (MIRT). Many educational and psychological tests are constructed with multidimensional traits, although a common assumption of the IRT models is that only one trait is measured by a set of items in a test. The correlation among group dimensions can be an issue when items measure multiple traits. Researchers have addressed that if group factors are correlated, then multi-unidimensional models may provide a better fit for the model than the traditional unidimensional models. If group factors are correlated perfectly (r =1.0), then there is no difference on model fit indices between the unidimensional and multi-unidimensional estimates. If group factors are independent (r =.00), then unidimensional models should be utilized. Not much research has been done to investigate the effects of inter-trait correlation on parameter estimation in MIRT. A computer simulation study was conducted to evaluate effects of the correlation between group dimensions. A two-factor, 18-item, between-item design was implemented with n = 1,000 for each test situation. Correlation between two factors was manipulated with 11 different values: 1.0, .9, .8, .7, .6, .5, .4, .3, .2, .1, and 0. The slope parameter for each factor was set to 1.0 and intercept parameter was fixed to .5. The Matlab program was used to generate data and to analyze three different models: traditional unidimnesional, separate unidimensional, and multi-unidimensional models. The modified IRTmu2no module was utilized (Sheng, 2008). In order to compare the model fit, the Bayesian deviance information criterion (DIC; Spiegelhalter et al. 1998) was also used.The results showed that when correlation between two factors was greater than 0, the DIC was smaller in separate unidimensional and multi-unidimensional models than in the traditional unidimensional model. However, when correlation between two factors was close to 1.0, then the DIC indicated that the traditional unidimensional model and multi-unidimensional model produced better model fit indices than the separate unidimensional model. The results indicate that correlation levels between group factors affect the model recovery accuracy.

PERSONALIZED ARTICLE RETRIEVAL SYSTEM – A PRELIMINARY STUDY

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Traditional key word-based information retrieval techniques are not adequate for large databases such as PubMed. They often return too many citations that are not directly relevant to the user's interest. What would be desirable is a personalized article retrieval system with enhanced capabilities that returns a more selected set of highly relevant articles for an individual's research interests. The ultimate goal of this study is to develop such a system using text classification techniques. In this study, an initial system was built using the text classification approach. In this prototype system, the user enters a query in the search interface, and the system returns a set of relevant documents to the user. In the second step, the user can select one or more documents which are highly related to their information needs and submits those to the system. Then, the 20 most similar documents to the user inputs are selected from the background dataset and labeled as relevant documents. The background set contains a representative sample of the main dataset. Similarly, the 20 least similar documents are selected from the background set and labeled as irrelevant documents. In the next step, the Naïve Bayes classifier is learned based on above relevant and irrelevant documents. Then, the main dataset is classified into relevant and irrelevant set using the Naïve Bayes classifier. Finally, the most similar 50 documents from the relevant set are returned to the user. Initial conclusions based on this system are: (1) Individual seed choice is directly linked to significantly different classification accuracy. (2) Training set size for the Naïve Bayes classifier should be increased according to the number of user seeds. (3) Small and local dictionary based on user seeds leads to better quality and reduced the run time dramatically.

INHIBITION OF ACID SPHINGOMYELINASE ACTIVITY BY INTRACELLULAR CHOLESTEROL

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Biology

Acid sphingomyelinase (ASM) is a glycoprotein capable of hydrolyzing sphingomyelin into ceramide and phosphocholine. ASM must undergo a C-terminus cleavage event in the lysosome to become an active enzyme. Niemann-Pick disease type A and B is a result of ASM deficiency due to a deleterious mutation in the sphingomyeline phosphodiesterase-I (SMPD1) gene. Previous findings in our lab suggest cells with constitutively high levels of ASM activity undergo a drastic reduction in ASM activity when loaded with intracellular cholesterol. The goal of our research is to determine the mechanism by which cholesterol inhibits acid sphingomyelinase activity. The Chinese hamster ovary cell line (CHO-K1) and a mutant CHO-K1 cell line (CT-60) are the model cell lines being studied. The CHO-K1 cell line is a common mammalian monolayer cell culture with constitutively active ASM. The CT-60 cell line is a result of a defective Niemann-Pick type-C1 (NPC1) protein and a gain of function mutation in the sterol regulatory element-binding protein cleavage activating protein (SCAP). The two mutations induce retention of free cholesterol in the lysosomal compartment and constitutive endogenous sterol synthesis, respectively. We believe cholesterol is either blocking the trafficking of ASM to the lysosome or cholesterol is inhibiting the protease responsible for cleaving and activating ASM. To address this, a plasmid construct was developed with the ASM coding sequence attached to the green fluorescent protein (GFP) coding sequence. Cells transformed with the plasmid construct express ASM with a C-terminus GFP tag. Fluorescence microscopy and western blot analysis of the GFP tag in CHO-K1 and CT-60 cells transformed with the ASM-GFP plasmid will be used to elucidate how cholesterol is inhibiting ASM activation by observing the cleavage of GFP from the ASM C-terminus and the intracellular localization of ASM-GFP.

ELECTRONIC BULLYING AND MENTAL HEALTH AMONG TENNESSEE ADOLESCENTS

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Introduction: Bullying remains a challenge within adolescent health. Prior research has provided insight into the health consequences of physical and psychological bullying. The current study investigates relationships between electronic bullying, mental health, and suicide.

Methods: 2011 Tennessee Youth Risk Behavior Surveillance Survey data were utilized for the current study. The selected independent variable was having been bullied electronically. Selected dependent variables were signs and symptoms of depression, suicide ideation, having a suicide plan, suicide attempt, and injuries as a result of a suicide attempt. Results: Approximately 14 percent of Tennessee adolescents reported being electronically bullied. Initially, complex samples cross-tabulations were conducted. Adolescents who were electronically bullied were significantly more likely to report considering suicide (28.36%; 95% CI: 22.05 – 34.67) than students who were not electronically bullied. Among students who had attempted suicide, those who had been electronically bullied were significantly more likely to report experiencing an injury related to a suicide attempt (6.25%; 95% CI: 3.34 – 9.16) than students who were not electronically bullied. Logistic regression analysis was performed to examine relationships between having been bullied and each of the mental health and suicidal behavior variables. Female students were significantly more likely to report having been electronically bullied than male students. When controlling for gender, students who were electronically bullied were 4.40 times (95% CI: 3.44 – 5.62) more likely to report experiencing signs and symptoms of depression, 3.54 times (95% CI: 2.58 – 4.87) more likely to report suicide ideation, and 5.01 times more likely to attempt suicide than students who were not electronically bullied. Conclusion: Various forms of bullying are related to several negative mental health conditions and behaviors. Bullying prevention programs should address depression and suicidal thoughts and behaviors. Furthermore, research is needed to investigate the mental health and negative health behaviors of bullies and bully-victims.

MATHEMATICS AND CANCER: A STUDY ON HOW MAMMALIAN CELL CYCLE ENTRY THOUGH A BISTABLE MECHANISM CAN BE EXPLAINED MATHEMATICALLY

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Computational Science

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Mathematics

Cancer, by definition, is a group of diseases characterized by uncontrolled cell growth and spread of abnormal cells. A total of 1,59,670 new cancer cases and 571,950 deaths from cancer were projected to occur in 2011 just in the United States. Over the past decade, much work has been done by teams of mathematicians, physicians, biologists and others to tackle the second leading cause of death in the United States. In this study, we attempt to turn to mathematics and use it as a microscope to study the Rb-E2F network, which has been verified as a critical component in regulating the initiation of DNA replication. It is also well known that the control of this pathway is disrupted in virtually all human cancers. Animal cells commit to the cell cycle at the restriction point (R-point), and this point of commitment has been well identified by scientists as being regulated by the Rb-E2F network through a bistable switch mechanism. Using a combination of ordinary differential equations, computer science, and a basic understanding of biological network topology, we attempt to target the individual activities of these proteins in the Rb-E2F network to gain insight on their significance in driving the bistable cell cycle entry to commitment through the R-point.

HIGH SCHOOL EMPLOYMENT AND THE ECONOMIC ASSIMILATION OF THE CHILDREN OF IMMIGRANTS

Giuseppe Rionero (Graduate)
Economics

Joachim Zietz (Faculty Sponsor)
Economics

High school employment has been shown to impact favorably labor market outcomes in early adulthood. I test whether this same pattern is observable in the case of children of immigrants living in cities with a high immigration density. Results indicate that high school employment has a small effect only on wages, and it is very heterogeneous. In particular, the wage benefit is restricted to male students and American children of immigrants.

DENDRONIC SURFACES FOR VAPOR SENSORS

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Chemistry

Yue Chang (Faculty)
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Chemistry

Andrienne Friedli (Faculty Sponsor)
Chemistry

Dendrimers are highly branched and functionalized tree-like polymers that have well-defined structures, uniform sizes, and monodisperse molecular weights. When built in a stepwise manner on surfaces, stable, dense, well-organized, and close-packed arrays of hemispherical dendrons are produced. Dendrimers and surface-bound dendrons are reported to entrap guest molecules including dyes, organic solvents, and gases. Three generations of triazine-methylaminopiperidine (TMAP) dendrons were synthesized on mesoporous SiO2 solids and films according to literature procedures. The materials were characterized using thermogravimetric analysis and IR (solids), and UV and IR (thin films). Next, the dendron periphery was modified to selectively bind guest molecules. The first modification was the reaction of outer aminomethyl groups in first generation (G1) TMAP with 3-hydroxybenzaldehyde followed by reduction with $NaBH_3CN$. The resulting phenols are designed to allow hydrogen bonding with 2, 4-dinitrotoluene (DNT), a model for explosive 2, 4, 6-trinitrotoluene. These films and solids will be used as sensors for vapors and gases and for changes detected using infrared, fluorescence, and UV spectroscopic methods.

HERPETOLOGICAL SURVEYING IN MIDDLE TENNESSEE

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Biology

Alison Carey (Graduate)
Biology

Daniel Estabrooks (Graduate)
Biology

Ryan Johnston (Graduate)
Biology

Brian Miller (Faculty Sponsor)
Biology

The geographic range of many amphibian and reptile species in Tennessee is disrupted. Although possibly a result of geographic isolation, the dearth of county records likely reflects a lack of general herpetological surveying. We are currently surveying counties in middle Tennessee in order to document the presence of various amphibian and reptile species. Various methodologies are utilized, including rock flipping, log rolling, visual surveying, dip-netting, and road cruising. Although surveying is performed year-round, efforts are concentrated in late-Winter and Spring, as this time period coincides with the breeding season of many species in middle Tennessee. To date we have documented (either in press or in preparation) 15 new records of species in Bedford, Maury, Marshall, Moore, Smith, and Williamson counties. All documented individuals were amphibians and comprise 8 distinct species. Geographic distribution records were documented in the journal *Herpetological Review*. Voucher specimens were deposited in the Herpetology Collection at MTSU. Animals were collected under authorization of the Tennessee Wildlife Resource Agency (permit no. 3618).

HEALTHY SENIORS

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Health and Human Performance

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Health and Human Performance

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Health and Human Performance

Older adults (≥ 65 years) account for approximately 12% of the US population but utilize almost one-third of total health care dollars. Inpatient hospitalizations make up the largest single area of expenditures for Medicare beneficiaries, accounting for 26% of Medicare dollars in 2011. Many of these hospitalizations are for conditions such as asthma, pneumonia, diabetes, chronic respiratory conditions, chronic cardiac conditions, and acute conditions that may be potentially avoidable. In Tennessee, the rate of preventable hospitalization is approximately 90 per 1,000 Medicare enrollees. Interventions that help effectively manage chronic conditions can reduce hospitalizations. Medication management can reduce the need for hospitalizations for acute exacerbations of chronic disease, for example compliance with beta-blocker medication regimens has been shown to reduce hospitalizations for congestive heart failure by 38%. Immunizations for influenza and pneumonia can limit acute illnesses in this vulnerable population. Focusing efforts on interventions that manage chronic conditions and reduce the incidence of acute conditions can reduce hospitalizations in the elderly and, as a result, lower health care costs. MTSU is collaborating with National Healthcare Corporation (NHC) to develop the Healthy Seniors program. Our mission is to implement a case management model to promote improved health and quality of life and to reduce health care costs for community-dwelling older adults in four Tennessee counties. Goals also are to reduce emergency room visits and hospitalization, comparing results in the four intervention counties with four control counties. Using evidence-based interventions in the four counties, a reduction in health care costs is anticipated from an average annual expenditure of $25,132 for at-risk older adults with five or more chronic conditions to an average annual expenditure of $12,500. Over the course of the three-year cooperative agreement, the anticipated savings of Medicare funds are $15,158,400.

RECORDED HISTORY: STUDIO TECHNIQUES AND THEIR EFFECTS ON MUSIC

Andrew Huether (Graduate)
Recording Industry

Dan Pfeifer (Faculty Sponsor)
Recording Industry

Description: This project comprises a study of evolving techniques and technologies in the history of recorded music. Several significant recording techniques have been included in this study: single microphone, live ensemble; multiple microphone, close placement, live ensemble; multiple microphone, close placement, isolated live ensemble; and overdubbed, non-live individual performances. The project explores the differences in sonic quality, artist performance, and comfort levels in these various situations. The effects of headphones on performance are also under study. Jazz, as a traditionally live-ensemble genre, was chosen for the performers; this was the most comfortable fit because of Jazz's presence throughout the history of recorded music. Learning goals: This project aims to come to conclusions about the effects of recording and music performance techniques on both the sonic quality and performance of recorded music. The project attempts to discover any validity in the use of "outdated" recording techniques and how modern performers adapt to these methods.

EXPERIMENTAL VEHICLES: INNOVATION AND CREATIVITY IN ENGINEERING

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Engineering Technology / College of Basic and Applied Sciences

Saeed Foroudastan (Faculty Sponsor)
Engineering Technology / College of Basic and Applied Sciences

MTSU's 2012 Experimental Vehicles Program (EVP) is comprised of four student-run projects in the Engineering Technology Department. The four projects consist of SAE Baja, SAE Formula, Moonbuggy, and Solar Boat. Since 2004 EVP has allowed all MTSU students from different majors to work on these assigned projects for the academic year. In addition, these projects are tailored to provide students an opportunity to demonstrate what they have been learning from textbook theories as well as to exhibit their skills and talents. Each year students who participate in the EVP and the university have won awards for their achievements in safety in building and operating the vehicles as well as recognition for design and performance. Participants of each team apply concepts based on lessons learned from previous competitions as well as new ideas, to manufacture and construct different types of materials by using various tools and machines. The EVP not only deals with engineering concepts, but also provides knowledge and experience in business, such as setting management plans, completing milestones, writing reports, complying with safety rules and procedures, applying lean concepts, and cost estimating. By having both hands-on experience and a business mind set, EVP team members become well-rounded individuals who can succeed in the global economy.

METEORLOGICAL IMPACTS ON UNIVERSAL E-LINES OPERATIONS

Joseph Cooper (Graduate)
Aerospace

Paul Craig (Faculty Sponsor)
Aerospace

Middle Tennessee State University's Department of Aerospace operates a simulated airline flight dispatch center for Universal E Lines, a virtual airline. This facility is named the NASA FOCUS (Flight Operations Center Unified Simulation) Lab. The airline serves sixteen communities in seven states in the southeastern United States and is based in Nashville, TN, with hubs in Nashville and Jacksonville, FL. The flight operations center is a one-of-a-kind academic facility and is modeled after similar facilities used by commercial airlines. Weather is a leading cause for delays and cancellations in commercial aviation. Although meteorological factors cannot be controlled, their impact on airline operations must be carefully considered and their potential effects mitigated. In the NASA FOCUS Lab, real-time current weather data from the NWS is used, enhancing the realism and fidelity of airline operations in this simulation. The Universal E- Lines meteorologist is responsible for accessing and interpreting weather data for the safe and efficient operation of the airline and for providing timely information and recommendations to flight crews and center personnel about conditions that would require alterations in flights. The use of real-time weather necessitates the use of a metric to standardize variability in weather. A recently developed four-part, seven-point weather rubric attempts to grade weather severity, its impact on airline operations and the effectiveness of the airline's meteorologist. In the preliminary phase of this study, the weather rubric is being tested and refined. FOCUS Lab staff and aerospace faculty complete this tool at the end of each session, and a numeric score is determined and assigned to the training session. This study evaluates the correlation between weather severity and airline operations in terms of time delays and financial losses.

PREDICTORS OF AEROSPACE TEAM PERFORMANCE

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Industrial/Organizational Psychology

Artyom Ivakh (Graduate)
Industrial/Organizational Psychology

Emily Sanders (Graduate)
Industrial/Organizational Psychology

Michael Hein (Faculty Sponsor)
Industrial/Organizational Psychology

Within the NASA Flight Operation Center-Unified Simulation (FOCUS) Lab, aerospace and industrial/organizational psychology students observe and rate the performance of undergraduate aerospace students from various disciplines engaging in an airline simulation. Participants included pilots, flight dispatchers, controllers, maintenance technicians, weather forecasters, and managers. One goal of this experience is to provide students with better preparation for entering the workforce. Performance is currently measured in several ways, including financial outcomes and communication. Several other measures are currently in development that will quantify individual knowledge and skills, individual performance, and team performance. The measures of individuals are important because they will allow researchers to look at correlations between individual factors and team factors. Team performance is also important to quantify, because it will allow for better understanding of the connection between team communication and team performance.   Another factor that affects performance is After Action Reviews, which are conducted one week after the simulation. Each After Action Review allows teams to communicate and process what they did well and what they can improve on in future simulations. Each of these factors is reflected in a model of performance antecedents and processes.