2023 Faculty, Staff, and Students Research Poster Session

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Book of Abstracts

2023 Minot State University Research Poster Session
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ELUCIDATING THE INFLUENCE OF CLIMATE CHANGE ON BUR OAK GROWTH IN NORTH DAKOTA

Monica J. Anderson
Division of Science

The goal of this research project is to determine climate sensitivity in the species *Quercus macrocarpa* via sampling a stand at Bison Plant Trail Park. The genus, *Quercus*, has been established as a reliable proxy for climate reconstruction in multiple previous studies. The currently understood convention is that *Quercus* is most sensitive to variation in temperature and precipitation during the growing season. Limited research has been performed on the species Quercus macrocarpa in North Dakota. Samples were taken from the stand and visually cross dated using the Yamaguchi method. Cores were individually scanned with an Epson Expression 10000XL photo scanner and subsequently measured with computer programs Cdendro and Coorecorder. Errors in the measuring process were flagged with computer program COFECHA. Samples were detrended for noise using computer software ARSTAN. The finished master chronology was compared with meteorological data to perform a climate response analysis study. Climate information was retrieved from NOAA and USGS. Performing a seasonal correlation plot using R, multiple climate factors \were compared with the master chronology. To determine direct climate drivers, we used a twostep regression process where we examined climate factors as either primary or secondary growth response variables. The results from our research indicate that species *Quercus macrocarpa* growing in the Bison Park Trail positively correlates the highest to Souris River streamflow. Bur oaks positive correlation to river discharge during the growing season may be valuable to evaluate future performance of *Quercus* in response to a changing climate for North Dakota plains area.

RAPID SYNTHESIS OF N-[1-(2,4-DIFLUOROPHENYL)ETHYL]-N-METHYLFORMAMIDE

Monica J. Anderson, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-phenylethyl)formamides. Specifically, the reaction between 2,4-dichloroacetophenone and N-methylformamide was completed in 50 minutes and produced N-[1-(2,4-dichorophenyl)ethyl]-N-methylformamide with an isolated yield of 98%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours.

Hypothesis: Chlorine is an electron-withdrawing group. It decreases the electron density on the carbonyl and makes it more reactive towards formamide in the Leuckart reaction. Fluorine acts a less electron-withdrawing substituent in an aromatic ring. Replacing chlorine with fluorine will increase the electron density on the carbonyl, make it less reactive, and thus slow down the reaction. In this work, the hypothesis was tested in the reaction between 2,4-difluoroacetophenone and N-methylformamide.

Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 184ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.

Result: The reaction was completed in 120 minutes. The isolated yield of N-[1-(2,4-difluorophenyl)ethyl]-N-methylformamide was 80%.

Conclusion: The results of the reaction support the initial hypothesis that replacing chlorine with fluorine in acetophenone will slow down the Leuckart reaction. The reaction provides a new method for the synthesis of N-[1-(2,4-difluorophenyl)ethyl]-N-methylformamide. N-[1-(2,4-difluorophenyl)ethyl]-N-methylformamide is a new compound.

NORTH DAKOTA CHILDCARE PROVIDER'S PERSPECTIVES ON OPPORTUNITIES AND MODE OF DELIVERY FOR QUALITY OF TRAINING IN EARLY CHILDHOOD DEVELOPMENT FOR IMPROVING PRACTICES

Nichol L. Anderson and Yung-Ju 'Ruth' Chen
Department of Teacher Education and Kinesiology

Purpose. The purpose of the study was to explore North Dakota early childhood education providers and educators' perceptions of current training and professional development opportunities and needs in the state for to stay up to date on best practices.
Methods. A total of 265 daycare providers, preschool teachers, and kindergarten teachers in the state were surveyed on their perspectives on the existing trainings and professional development opportunities available to them along with areas of child development and best practices they would like to have more training and professional development in and preferences for the mode of delivery.
Results. Preschool and kindergarten educators had a higher percentage of satisfaction in their professional development opportunities provided by their employees then daycare providers, and a slightly lower percentage of satisfaction of professional development opportunities they attended on their own at their own costs. Furthermore, their satisfaction was linked to whether or not they felt their professional development improved their career development. Most preschool and kindergarten educators preferred instruction to take place either all online or all face-to-face throughout regular intervals during the school year and during designated, paid planning times.
Conclusions. The findings of the study will inform future professional development for early childhood education providers and educators in North Dakota.

THE EFFECTS OF A COMMUNITY-BASED SHORT-TERM FUNDAMENTAL MOVEMENT PROGRAM ON PRESCHOOL-AGED CHILDREN'S FUNDAMENTAL MOVEMENT COMPETENCE

Yung-Ju 'Ruth' Chen
Department of Teacher Education and Kinesiology

Purpose. The project aimed to examine the effects of a community-based short-term fundamental movement program on preschool-aged children's ball skill competence.

Methods. Eighteen preschool-aged children (8 males, 10 females; age 3 to 5, age M = 4.24, SD = 0.67 years) from a community daycare were recruited and participated in the study. A 4-week intervention that consisted of eight 30-minute lessons of developmentally appropriate activities that foster locomotor and manipulative skill development in young children was implemented. Pre-and post-tests were conducted to assess participants' fundamental movement competence using the Test of Gross Motor Development (3rd Edition; TGMD-3). Descriptives were reported. A Wilcoxon Signed Rank Test was conducted to examine the differences in participants' ball skill competence between pre-and post-tests. A multi-liner regression analysis was conducted to determine the sex and age differences in participants' ball skill competence.

Results & Conclusions. Four participants (22%) were ranked below the 25th percentile in their ball skills at pretest. The participants showed significant improvement in their ball skill competence after the 4-week intervention ($p < .001$). There were no sex or age differences in their ball skill competence at pretest ($p > .05$) or between pre-and post-tests ($p > .05$); however, girls and younger children demonstrated significantly better ball skill competence at post-test ($p < .05$). While the literature suggests 6-week intervention is need for observing changes in children's fundamental movement competence, the findings showed that the 4-week intervention could be effective on the improvement of preschool-aged children' ball skill competence.

A NORTH DAKOTA CENTER FOR PERSONS WITH DISABILITIES (NDCPD) SCHOLARS PROJECT TITLED 'COLLEGE PREPARATION FOR NATIVE AMERICAN STUDENTS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES'

Rebecca Daigneault, Heather Travnicek, and Angi Barczik
Department of Addiction Studies, Psychology, and Social Work; in collaboration with the NDCPD Scholars Program

The purpose of this project was to gather transition-to-college information and resources for Native American students with Intellectual and Developmental Disabilities (IDD). This was accomplished through discussions with ASTEP (Advancing Students toward Education & Employment) personnel, a 2 to 3-year post-secondary education program for students with IDD at Minot State University. Additionally, information was obtained from a transition specialist at a North Dakota tribal high school who supported the transition of a student to the ASTEP program. Web searches for literature, journal articles, and state transition resources was also conducted.

Methods included a review of the literature, application to and approval from the Minot State Institutional Review Board for exempt research, and development and dissemination of a resource sheet/handout that was developed to disseminate the identified resources, services, and supports (state and national).

Findings included funding issues as the biggest barrier to attending a post-secondary education program such as ASTEP. One student who graduated from the ASTEP program now has steady employment, his own apartment, and drives a vehicle. High school transition services, in partnership with each tribe's vocational rehabilitation services, tribal colleges, family support, and post-secondary institution support, is essential for making the transition to college a success.

UTILIZING CLASSROOM ASSIGNMENTS FOR ACTIVE LEARNING

Ashley DeMakis
Department of Nursing

Twenty-three senior Nursing students at Minot State University (MSU) created a Leadership and Management Escape Room using classroom assignments that aligned with the Department of Nursing (DON) Student Learning Outcomes (SLO). The students met the SLOs by researching a leadership topic, educating on that topic, and creating, implementing, and evaluating an escape room for their peers. The students were divided into six groups and researched six leadership topics including Disaster Preparedness, Prioritization, Delegation, Conflict Resolution, Communication, and Infection Control. The students evaluated the process and outcomes through a research paper and dissemination of their research at Scholarship Day, where all the nursing students, instructors, and clinical and community leaders came to listen to the nursing students' research projects created that semester. The research that was disseminated included information such as the average length of time to escape each room, the number of clues that needed to be given to those participating, and how the group resolved issues that were encountered during the trial run. Overall, the students enjoyed this activity and retained the leadership and management content. The students enjoyed this active learning assignment as an alternative to lecture. This was a positive change for both the instructor and the nursing students.

RAPID SYNTHESIS OF N-METHYL-N-[1-(4-TRIFLUOROMETHYLPHENYL)ETHYL]FORMAMIDE

Hassan S. Elshanbary, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-phenylethyl)formamides. Specifically, the reaction between 4-isopropylacetophenone and unsubstituted formamide was completed in 20 minutes and produced N-[1-(4-isopropylphenyl)ethyl]formamide with an isolated yield of 88%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours.

Hypothesis: Isopropyl is an electron-donating group. It increases the electron density on the carbonyl and makes it less reactive towards formamide in the Leuckart reaction. Replacing isopropyl with an electron-withdrawing group will decrease the electron density on the carbonyl, make it more reactive, and accelerate the Leuckart reaction. In this work, the hypothesis was tested in the reaction between 4-trifluoromethylacetophenone and formamide.

Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 193ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products. Result: The reaction was completed in 10 minutes. The isolated yield of N-[1-(4-trifluoromethylphenyl)ethyl]formamide was 76%.

Conclusion: The results of the reaction support the initial hypothesis that the presence of electron-withdrawing groups in acetophenone will accelerate the Leuckart reaction. The reaction provides a new method for the synthesis of N-[1-(4-trifluoromethylphenyl)ethyl]-formamide. N-[1-(4-trifluoromethylphenyl)ethyl]formamide is a new compound.

KEEPING THE IOM'S 80% BSN GOAL ALIVE: SUPPORTING ASSOCIATE DEGREE RNS TO ACHIEVE THEIR BSN

Melissa Fettig
Department of Nursing

Extensive academic research confirms the baccalaureate of science in nursing (BSN) program of study prepares nurses more sufficiently to rival today's increasingly complex healthcare system, its association with superior patient care and outcomes, when compared to associate degree (AD) nursing programs. Healthcare employers overwhelmingly prefer BSN prepared nurses because they are academically prepared for critical thinking, leadership, case management, community health, health promotion, and application of evidence-based practices. In response to the multiple pathways to the nursing profession and mounting evidence that BSN nurses are better prepared to practice in our complex healthcare system, in 2010, the Institute of Medicine (IOM) recommended to increase the proportion of RNs with a baccalaureate degree to 80% by 2020. This goal fell short, with only 56% achieved by 2019. Advances in technology and the higher acuity of hospitalized patients continues to support the IOM recommendation and continues to be predominant in the current literature today. This literature review is a synthesis of information extracted from the research to better understand the barriers for AD RNs to achieve a BSN and provide recommendations for key stakeholders to support the IOM's goal of 80%. Recurrent themes for barriers to pursue a BSN include: cost, lack of perceived benefit, time, insufficient advisement, insufficient support, and self-doubt. The research also revealed key stakeholders and evidence-based practices to support AD RNs to achieve their BSN. Supportive practices include: providing resources for financial support, explaining the benefits, solutions to the time crunch, quality advisement, increasing the circle of support, and helping students overcome self-doubt. The research has revealed several important practices which can enhance the healthcare system and provide the means to achieve the IOM's goal and maintain success over the long term.

PARENTS WITH INTELLECTUAL/DEVELOPMENTAL DISABILITIES: NORTH DAKOTA NEEDS ASSESSMENT

Lori Garnes, Peggy Bowers, Hope Coble, and Rachel Martinson
ND Center for Persons with Disabilities, Special Education, and Department of Nursing

The purpose of this research project was to conduct a survey about the needs of parents that have intellectual and/or developmental disabilities (I/DD) in North Dakota. We used TASP needs assessment survey to put together a series of questions for agencies that offer services to parents with I/DD. We will use the information provided by each agency to further understand how we can identify parents with I/DD and connect them to services. A total of eight agencies are located in North Dakota, four agencies responded to our survey. The following results found that only two out of four agencies have a process to find and/or identify parents with an I/DD. Three out of four agencies surveyed parents with I/DD to find out what support services they needed. Only two out of four agencies identified specific criteria for adequate services for parents with I/DD. Only two out of four agencies obtain and report data on the number of parents with I/DD. And only two out of four agencies track parenting outcomes for parents with I/DD (at any age level). The survey data was collected and analyzed, the overall census was found that individuals within this population need additional services and resources in the state of North Dakota. The completed data can be found in our results section.

NAVIGATING THE RAPIDS: DOES A RESILIENCE TOOLKIT KEEP NURSING STUDENTS AFLOAT?

Lisa Krogman and Christina Nadeau
Department of Nursing

Nursing students experience significant levels of stress/anxiety, sometimes starting in the first semester of the nursing program. Students sometimes leave the nursing program after the first semester related to the challenges of coping with robust academic curricula and first-time clinical experiences. The AACN recognizes the need for resilience building in the nursing curriculum. In "A Call to Action for Academic Nurse Leaders to Promote Practices to Enhance Optimal Well-Being, Resilience, and Suicide Prevention in Schools of Nursing across the U.S." (AACN, 2020), the AACN has stressed the need to add resilience building to the nursing curriculum. The project leaders reviewed the literature and determined that a toolkit for first-semester nursing students could be an evidence-based project to impact CD-RISC score comparisons and influence the first-semester nursing student retention rate at Minot State University. The toolkit was implemented in the Fall '22 semester. 100% of the 23 students in the fall cohort participated in the project. In a paired t-test, student the mean ($\pm$ SD) % change on the CD-RISC scores was an improvement of 17.43% with a $\pm$ 13.02, with a p-value of <0.001 and a confidence interval of 0.05 indicating statistical significance. There was a 100% retention rate for the Fall '22 first semester cohort. The nursing students reflected that they "greatly benefited" from using the toolkit in their end-of-semester evaluations. The small cohort data indicates a possible connection between higher resilience scores and lower attrition. In conclusion, using a resilience-building toolkit impacted attrition.

USE OF CATECHOLAMINE REUPTAKE INHIBITORS TO ENHANCE EPINEPHRINE DETECTION AFTER METHAMPHETAMINE STIMULATION OF ADRENAL CELLS

Clay Mantz, Kaitie Hanson, Spencer Gordon, Paolo Panales, Noah Keller, and Bryan Schmidt
Division of Science

Methamphetamine has become a growing issue around the world with overdose and usage numbers increasing in recent years. While the effect of methamphetamine usage on the central nervous system is well documented, there has been minimal research on the effects of methamphetamine outside of the central nervous system. The side effects of methamphetamine use resemble those of epinephrine stimulation of the periphery, indicating the importance of investigating the effects of methamphetamine on the peripheral system, particularly the adrenal gland. Prior studies have indicated that methamphetamine stimulation increases epinephrine secretion from adrenal cells. However, the low amounts of epinephrine produced made clear analysis of the results difficult. To increase detectable epinephrine, norepinephrine transporter inhibitors that prevent reuptake of secreted epinephrine and norepinephrine were added to the assay alongside treatments of acetylcholine and methamphetamine. These inhibitors allowed for sufficient epinephrine detection by ELISA to clearly demonstrate an increase in epinephrine secretion upon methamphetamine stimulation. These tests show that all three reuptake inhibitors increase observed levels of epinephrine though two of them seem to be cytotoxic. Addition of methamphetamine also drives up the levels of epinephrine even further.

EFFECTS OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION ON RANGE OF MOTION AND MOVEMENT PATTERNS

Beth Marschner, Kelsey Higginson, and Heather Golly
Department of Teacher Education & Kinesiology

Limited tissue mobility and loss of range of motion (ROM) contribute to changes in movement patterns. The purpose of the study was to determine the effect of instrument assisted soft tissue mobilization (IASTM) on tissue mobility and functional movement patterns. This study utilized a convenience sample (N=70) from an accredited regional university consisting of students, faculty, and staff. Each participant served as their own control using a test, re-test study design. Individual's ROM was pretested using a goniometer. Gait and center of pressure (COP) analysis was administered using Noraxon MyoMuscle insoles. Individuals either received IASTM treatment with HawkGrips or walked during the testing session. Post-tests were completed after each treatment. MANOVA results showed significance for bilateral knee flexion and ankle ROM between pre-and-posttest IASTM treatment. There was a statistically significant effect in ankle dorsiflexion and seven gait and COP components between pre-test IASTM and post-test walk. Statistically significant interaction effects were seen between post-test IASTM and post-test walk ankle in plantarflexion and seven gait and COP components. The findings of this study indicate that IASTM improves ROM and movement patterns. Those changes seem to support evidence finding that IASTM is more effective when combined with a stretching or mobility program (Thompson, et al, 2018). The effects on gait and center of pressure need further examination; this study shows support for further research using IASTM to treat other conditions with limited ROM and movement pattern dysfunction.

EFFECTS OF VESTIBULAR REHABILITATION IN THE TREATMENT OF DIZZINESS AND BALANCE DISTURBANCES AFTER CONCUSSION

Beth Marschner, Kelsey Higginson, and Heather Golly
Department of Teacher Education & Kinesiology

The purpose of this study was to examine the effect of vestibular rehabilitation (VR) versus traditional graduated return to play (TGRTP) concussion treatment protocols on time to return to play, dizziness and balance in athletes. The study utilized a convenience sample consisting of ten athletes from an NCAA Division II University. Participants were randomly assigned to the treatment groups within three days of concussion diagnosis. Pre and post-test consisted of completing the Sport Concussion Assessment Tool (SCAT5), the Dynamic Gait Index (DGI), and visual and vestibular dysfunction evaluation. Data was analyzed using the Mann-Whitney U test to evaluate whether dizziness and balance symptom recovery differed by concussion treatment protocol. The results indicated that there was no significant difference in either treatment group in the time to return to play, however, the 2-tailed test showed initial visual motion sensitivity testing and initial right side Hallpike Dix testing (components of the SCAT5 and vestibular dysfunction evaluation) were significant, $p<0.046$. Four of the six participants in the VR group reported motion sensitivity symptoms compared to none of the four in the TGRTP group. These two symptoms are associated with dizziness and balance disturbances.

INVESTIGATING THE RELATIONSHIP BETWEEN PERSONALITY TRAITS AND JOB SATISFACTION IN DIRECT SUPPORT PROFESSIONALS

Lisa Michels and Evan D. Borisinkoff
Department of Special Education

Direct Support Professionals (DSPs) play a vital role in the quality of life for people with intellectual and developmental disabilities, but organizations are struggling to hire and retain enough DSPs to meet their needs. Understanding factors that influence turnover and retention is a priority for organizations serving people with disabilities. A DSP's job can be difficult and stressful, but many report feeling satisfied with their work despite the challenges. It is often said that it takes a certain "type" of person to work as a DSP, and this study explored whether that particular "type" could be described by a common model of personality. The exploratory quantitative study employed the Five-Factor Model of personality and the General Job Satisfaction Scale to measure whether personality traits related to the degree of job satisfaction in DSPs at Intermediate Care Facilities for Individuals with Intellectual Disabilities. Forty-seven participants completed the online questionnaire, and data were analyzed to look for correlations between the five personality factors and job satisfaction. Analysis did not find any significant correlations, suggesting that personality may not be a prominent factor in job satisfaction. Limitations are discussed, including the possible effect of the COVID-19 pandemic and workplace shortages. Although no significant results were found, the study contributed to the literature on DSP recruitment and retention issues, and it employed a methodology that could be easily replicated by researchers seeking to expand upon these findings.

BUT IS HE A REAL MUSICIAN?: A SINGLE CASE STUDY OF A COUNTRY MUSIC SINGER

Kateri Miller
Division of Performing Arts

The definition of musician is similar to the definitions of musicality, musical talent, and music ability (Boyle, 1992; Hallam & Prince, 2003; Lamont, 2002; McPherson, 1996; Simpson, 2004). The term *musician* includes anyone who makes music, regardless of whether the person has learned music formally or informally, including reading or writing music using standard notation (Green, 2005). The purpose of this single case study was to examine the musical journey and the processes of learning music of a professional singer, guitarist, and songwriter who has had no formal guitar lessons or lessons on reading/writing music using standard notation. Data was collected through interviews, observations and documents from the participant. The examined literature and the results indicate that not being able to read music using staff notation does not make one any less of a musician, nor does it prevent one from achieving a performance. Implications and future research for music education include broadening perspectives of the way children learn music, the role of music literacy in elementary general music and exploring the function and difference between music education and music instruction.

SYNTHESIS OF N-[1-(6-METHOXY-2-NAPHTHYL)ETHYL]-N-METHYLFORMAMIDE

Daniela Nardelli, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-arylethyl)formamides. Specifically, the reaction between 2-acetyl-6-methoxynaphtalene and formamide was completed in 15 minutes and produced N-[1-(6-methoxy-2-naphthyl)ethyl]formamide with an isolated yield of 82%. It was interesting to investigate if the same procedure will work in the reaction between 2-acetyl-6-methoxynaphtalene and N-methylformamide to produce N-[1-(6-methoxy-2-naphthyl)ethyl]-N-methylformamide.
Hypothesis: Replacing unsubstituted formamide with N-methylformamide will affect the rate of the reaction with 2-acetyl-6-methoxynaphtalene. If the steric factor determines the rate of the reaction, then adding the methyl group will make the reaction slower. If the electron-donating properties of the methyl group are more important, then adding the methyl group will accelerate the reaction.
Methods: The reaction was conducted on a 10 mmol scale at 180-186ºC. Extraction and column chromatography were used for the isolation of the product. NMR-spectroscopy and elemental analysis were used to determine the structure of the product.
Result: The reaction was completed in 120 minutes. The isolated yield of N-[1-(6-methoxy-2-naphthyl)ethyl]-N-methylformamide was 96%.
Conclusion: The results of the reaction show that the steric factor plays the major role in determining the rate of the reaction. The reaction provides a new method for the synthesis of N-[1-(6-methoxy-2-naphthyl)ethyl]-N-methylformamide. N-[1-(6-methoxy-2-naphthyl)ethyl]-N-methylformamide is a new compound.

RAPID SYNTHESIS OF N-[1-(2,5-DICHLOROPHENYL)-4,4-DIMETHYLPENT-1-EN-3-YL]FORMAMIDE

Amanda J. Neumiller, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-aryl-4,4-dimethylpent-1-en-3-yl)formamides. Specifically, the reaction between 1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one and formamide was completed in 15 minutes and produced N-[1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide with an isolated yield of 83%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. In addition, it was the first example of the Leuckart reaction successfully completed on an alpha,beta-unsaturated ketone. The earlier attempts to apply the Leuckart reaction to alpha,beta-unsaturated ketones produced mixtures of multiple products resulting from the retro-aldol condensation of the starting material. It was interesting to investigate, if the rapid procedure will succeed on other 1-(dichlorophenyl)-4,4-dimethylpent-1-en-3-ones. In this work the procedure was tested on 1-(2,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-one.
Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 202ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.
Result: The reaction was completed in 15 minutes. The isolated yield of N-[1-(2,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide was 90%.
Conclusion: The results of the reaction confirm that the rapid procedure for the Leuckart reaction can be successfully conducted on 1-(2,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-one. The reaction provides a new method for the synthesis of N-[1-(2,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide. N-[1-(2,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide is a new compound.

ASTEP ELEVATED: A GROW YOUR OWN LEADERSHIP DEVELOPMENT PILOT PROJECT FOR COLLEGE STUDENTS WITH AND WITHOUT ID/DD

Tracey Olson
North Dakota Center for Persons with Disabilities
(NDCPD)/Advancing Students Toward Education and Employment Program (ASTEP)

The ASTEP Elevated Project had two purposes. The first was to address gaps in self-advocacy and leadership development opportunities for college students with and without disabilities through training, mentoring/case management, and service-learning. The second was to develop, pilot, and evaluate a model for advanced leadership development that can be replicated in other college programs for students with and without ID/DD. The project used a "grow your own" approach to build leadership capacity among college-age students through leadership development activities, evaluation, and replication.

An ASTEP mentor and third-year ASTEP student were recruited for project participation. Assessment tools of the Purdue University Leadership Self-Assessment and the National Consortium on Leadership and Disability for Youth-NCLD/Y Leadership Self-Assessment were used, and individualized leadership development plans were created for each participant. Training, co-mentoring/case management, and service-learning activities were implemented under the supervision of the Principal Investigator. Data collected from the self-assessments indicated that participants gained leadership skills in the areas of: understanding leadership, enhances communication, commits to serving others, thriving, working, and leading skills.

The leader and co-leader planned and led/co-led weekly classes with other students on healthy relationships. They promoted disability awareness on campus by giving interviews to MSU newspaper, creating awareness videos, and participating in an interview for the MSU TV station. They attended the Looyenga Leadership Center and earned leadership badges. ASTEP Elevated Co-leader was a guest speaker at the MSU Leadership Summit, provided mentoring to ASTEP students, and conducted a poster session at the AUCD conference in Washington DC.

PRIMARY CULTURE OF BOVINE ADRENAL CELLS FOR METHAMPHETAMINE STUDIES

Paolo Panales, Kaitie Hanson, Spencer Gordon, Clay Mantz, Noah Keller, and Bryan Schmidt
Division of Science

Methamphetamine has been shown to amplify the effect of acetylcholine on epinephrine secretion by adrenal medullary cells. It is important to note that limited data can be obtained in established adrenal cell lines such as PC-12 or CCL-79 due to the downregulation of PNMT in these immortalized cells. PNMT is the gene that codes for the enzyme phenylethanolamine N-methyltransferase, which methylates norepinephrine into epinephrine, the final step of the epinephrine synthesis pathway. To address this obstacle, our lab conducted a literature review on the methods of preparing a primary culture of adrenal chromaffin cells, and we successfully developed our own modified procedure that yields on average 3.52 x 10^7 cells/mL at 89% viability per adrenal gland. Along with other experimental treatments, the viability of these primary adrenal cells was also monitored. Before and after treatment, trypan blue exclusion was performed on each sample, with viability and cell counts measured by Invitrogen Countess 3 automated cell counter. Our results show that chromaffin cells are more sensitive to environmental changes relative to cortex cells. There is no statistically significant difference in cell viability across treatments in the same cell population, suggesting that our modified treatment procedure has shown promise in future experiments to demonstrate the effect of methamphetamine on epinephrine secretion by chromaffin cells.

RAPID SYNTHESIS OF N-[1-(2,3-DICHLOROPHENYL)-4,4-DIMETHYLPENT-1-EN-3-YL]FORMAMIDE

Alejandra D. Paredes Villasante, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-aryl-4,4-dimethylpent-1-en-3-yl)formamides. Specifically, the reaction between 1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one and formamide was completed in 15 minutes and produced N-[1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide with an isolated yield of 83%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. In addition, it was the first example of the Leuckart reaction successfully completed on an alpha,beta-unsaturated ketone. The earlier attempts to apply the Leuckart reaction to alpha,beta-unsaturated ketones produced mixtures of multiple products resulting from the retro-aldol condensation of the starting material. It was interesting to investigate, if the rapid procedure will succeed on other 1-(dichlorophenyl)-4,4-dimethylpent-1-en-3-ones. In this work the procedure was tested on 1-(2,3-dichlorophenyl)-4,4-dimethylpent-1-en-3-one.
Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 194ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.
Result: The reaction was completed in 15 minutes. The isolated yield of N-[1-(2,3-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide was 81%.
Conclusion: The results of the reaction confirm that the rapid procedure for the Leuckart reaction can be successfully conducted on 1-(2,3-dichlorophenyl)-4,4-dimethylpent-1-en-3-one. The reaction provides a new method for the synthesis of N-[1-(2,3-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide. N-[1-(2,3-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide is a new compound.

THE IMPACT OF TWO COMPONENTS OF STRATEGIC INTERACTIVE WRITING INTERVENTION (SIWI) ON THE WRITING SKILLS OF AN ELEMENTARY STUDENT WITH HEARING LOSS

Holly F. Pedersen and Christina Aboudi
Department of Special Education

Literacy, specifically reading and writing, is a primary goal in today's schools and is linked to successful post-secondary outcomes for all students. The writing performance of students who are deaf/hard of hearing (DHH) often lags behind that of their hearing peers due to challenges with establishing solid language foundations. Despite the significant gap in writing performance for DHH students, the research base is limited on evidence-based practices for this population, leaving teachers of the deaf/hard of hearing without a toolkit of effective strategies to use with their students. One evidence-based strategy for improving writing of students who are DHH is the Strategic Interactive Writing Instruction (SIWI) model. The purpose of this single subject, multiple base-line study was to determine the impact of two components of the SIWI model on the narrative writing abilities of an elementary-aged student with hearing loss. Results indicated a trend of steady increase in the student's writing skills over 15 instructional sessions. Implications of this study for the student and their teacher as well as for the field are discussed.

LEARNING TO COLLABORATE: AN INTERDISCIPLINARY PROJECT-BASED ACTIVITY TO PREPARE PRE-SERVICE PERSONNEL FOR INCLUSION OF STUDENTS WITH DISABILITIES

Holly F. Pedersen and Timothy E. Godfrey
Department of Special Education

The Individualized Educational Program (IEP) is the foundation of special education for students with disabilities; therefore, learning to write these documents is critical for preservice personnel. The proposed project aimed to determine the efficacy of using a project-based learning (PBL) approach in evaluating student mastery of the elements involved in the IEP process. PBL is an evidence-based teaching strategy that uses complex real-world problems as a method to promote student learning and application of facts and concepts (Duch, 2011). The research question posed was, *What is the impact of an interdisciplinary PBL IEP activity on the knowledge, skills and self-efficacy of preservice candidates related to the IEP process?* The intervention included an interdisciplinary role-play seminar among pre-service professionals from several CEHS disciplines. A mixed-methods design was used and data were collected through pre/post administration of the Sentiments, Attitudes, and Concerns about Inclusive Education Revised Scale for Measuring Pre-Service Teachers' Perceptions about Inclusion (SACIE-R) and the Readiness for Interprofessional Learning Scale Questionnaire (RIPLS). Candidate written reflections and exit focus group discussions were analyzed using qualitative methods to enhance the quantitative data. Results indicate an increase in pre/post student scores and that students viewed the intervention favorably and perceived that it increased their confidence and abilities in specific aspects of the IEP process. These results and their implications for pre-service preparation programs are highlighted.

PERSPECTIVES OF SEXUALITY EDUCATION AMONG TEACHERS OF THE D/DEAF AND HARD OF HEARING

Holly F. Pedersen and Robert Richards-Keyes
Department of Special Education

This study is an exploratory survey of Teachers of the Deaf and Hard of Hearing (TODHH) in the United States. This survey is intended to create a baseline for future research into the field of sexuality education among the d/Deaf and Hard of Hearing (DHH) school-aged population in the United States for which there is little current research. With the high prevalence of sexual violence perpetrated against the DHH population, a first step to curtailing the problem is understanding the perspectives of educators. Following the work of Suter et al. (2009) and Howard-Barr et al. (2005) this study ascertained that TODHHs do not feel adequately prepared to teach topics of sexuality education. This leaves students who are DHH at an increased risk for sexual exploitation and abuse. This study illuminates the need for further research on topics related to sexuality education of the DHH, ways to better prepare TODHHs to deliver content, and the development of curriculum that meets the unique needs of students who are DHH.

RAPID SYNTHESIS OF N-METHYL-N-[1-(4-TRIFLUOROMETHYLPHENYL)ETHYL]FORMAMIDE

Branden Z. Pelzer, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-phenylethyl)formamides. Specifically, the reaction between 4-isopropylacetophenone and unsubstituted formamide was completed in 20 minutes and produced N-[1-(4-isopropylphenyl)ethyl]formamide with an isolated yield of 88%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. Interestingly, we also conducted the same reaction with N-methylformamide and discovered that it was completed only after 1.5 hours, which was much closer to the usual Leuckart reaction time.

Hypothesis: Isopropyl is an electron-donating group. It increases the electron density on the carbonyl and makes it less reactive towards formamide in the Leuckart reaction. Replacing isopropyl with an electron-withdrawing group will decrease the electron density on the carbonyl, make it more reactive, and accelerate the reaction. In this work, the hypothesis was tested in the reaction between 4-trifluoromethylacetophenone and N-methylformamide.

Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 200ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.

Result: The reaction was completed in 40 minutes. The isolated yield of N-methyl-N-[1-(4-trifluoromethylphenyl)ethyl]formamide was 93%.

Conclusion: The results of the reaction support the initial hypothesis that the presence of electron-withdrawing groups in acetophenone will accelerate the Leuckart reaction. The reaction provides a new method for the synthesis of N-methyl-N-[1-(4-trifluoromethylphenyl)ethyl]-formamide. N-methyl-N-[1-(4-trifluoromethylphenyl)ethyl]formamide is a new compound.

ANNUAL BAT ACTIVITY IN NORTH DAKOTA VERSUS CLIMATE

Joseph L. Pettit, Sarah Upton, and Sawyer Goodwin
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Most studies of bats focus on the summer months when bats are most active. However, this approach ignores the presence of bats during early spring and late fall. Here, we wanted to expand the knowledge of North Dakota bats by recording which bats are present through one calendar year. Thus, we deployed one to three bat detectors (ultrasonic audio recording units) to record the echolocation calls of bats at Upper Souris National Wildlife Refuge. Detectors were deployed from 31 January to 23 October 2022. Each species of bat has a unique echolocation call which we used to identify the species of bat and document activity levels. Activity levels were compared to local climate to determine any driving influence of weather or climate. During 2022, we recorded 227,355 individual bat passes (a recording of one bat echolocating) of which 31,258 could be identified to species. The most recorded species, in order of activity level, were the silver-haired bat (18,829 calls), and the IUCN endangered little brown bat (7,024 calls). Interestingly, we did record calls from Townsend's big-eared bats, and the fringed myotis bat which would indicate a large range expansion for these species. We first observed bats on 28 March and the last bat observed was recorded on 3 October with a peak activity level occurring from 15 May through 15 July. Of the climate variables we analyzed, the only significant driver of bat activity was temperature. Bats seemed to have a minimum temperature required for activity, 34 degrees Fahrenheit.

SPOKEN LANGUAGE COMPREHENSION AND NEUROCOGNITION IN SPANISH LEARNERS ABROAD

Charlotte Sophia Rammell
Division of World Languages and Cultural Studies

Many students choose to study abroad while learning a new language. Living in another country and culture offers challenges, one of which is understanding what people say to you. Understanding a second language when it is spoken is a difficult task, one that is even harder in real-world conditions that involve background noise. In our first language, we navigate this task fairly well. In a second language, this task is harder due to lowered language proficiency and vocabulary knowledge. Previous research has shown that linguistic and cognitive factors affect how well we can understand spoken language. Currently, their contribution to speech comprehension in learners abroad is unknown. Learners who live in the target culture learn language differently, so the role of these factors may change in this context also.
This project has two goals: (1) to determine the factors affecting spoken language comprehension in learners abroad, and (2) to describe changes in cognition, language comprehension, and proficiency over time. To complete these two goals, data was collected from Spanish language learners living in Nicaragua. These participants (N=11) completed a series of linguistic, cognitive, and speech perception tasks. A subset of the participants completed a second series of tasks approximately eight months later. Preliminary analyses show that (1) second language proficiency and English vocabulary knowledge affect Spanish speech perception in noise, and (2) one cognitive measure (dimensional change card sort test) improved over time.

LITTLE TUBA ON THE PRAIRIE: AN INVESTIGATION INTO THE INFLUENCES AFFECTING NORTH DAKOTA BAND STUDENTS' MUSIC INSTRUMENT SELECTION AND ATTITUDES TOWARD THE TUBA

David Rolandson and Dianna Anderson
Division of Performing Arts

Within North Dakota schools, there is an observable lack of students playing tuba in school band programs. The purpose of this study was to investigate the influences that affected band students' music instrument selection in K-12 schools and to determine whether a live solo performance by a professional tubist could influence their attitudes toward and perceptions of the tuba. We visited eight school locations throughout North Dakota and administered a self-designed questionnaire to $N = 444$ middle and high school band students. At each research site, students were subjected to a short intervention [solo tuba recital performed by the researchers]. Principal components analysis (PCA) and subsequent MANOVA testing revealed which factors most strongly influenced students' instrument selection in band. Additionally, because half of the participants completed our questionnaire prior to our intervention, we will discuss whether a live tuba performance had any influence over students' attitudes towards the tuba. Further analysis of written responses was used to determine how students perceived the tuba and identify why band students most often avoided the tuba when choosing a musical instrument to learn.

SIGNS OF MEANING: EXAMINING LITTERAE PASSIONIS IN LITURGICAL CONTEXT

Mark Singer
Division of Social Science

Litterae passionis, the letters and symbols added to the Gospel accounts of Christ's arrest, trial, and crucifixion, are common paratextual elements in medieval liturgical manuscripts. While most scholars acknowledge that these marks guided the cantillation of the Passion narrative by a single cleric and not a dramatized reading by multiple liturgists, they otherwise offer little explanation for *litterae* beyond suggesting a possible but unproven relationship with musical notation. No one has examined closely *which* words in medieval Passion manuscripts were marked and what that may reveal about how this liturgy was performed.

This study, based on the transcription and examination of *litterae passionis* from forty-five pre-thirteenth century Latin Gospel manuscripts, provides evidence that the Passion text was cantillated in an affective manner reflecting its centrality to Christian belief. It also reveals a group of five manuscripts that employ *litterae* far more frequently than do others. These include a ninth-century Gospel book and four eleventh- and twelfth-century lectionaries, one of which was modified further by erasure of its *litterae* and the addition of musical notation. These manuscripts appear to have been marked more extensively to ensure that the liturgist remained grounded in the fundamental "gospel tone" or liturgical mode while performing a more-elaborate, heightened cantillation directed by the manuscripts' *litterae* and other paratextual elements.

While no instructional text for medieval liturgical cantillation survives, closely examining *litterae passionis* gives us a better understanding of how this core text was performed in a manner that affectively communicated its meaning.

RAPID SYNTHESIS OF N-[1-(3,4-DICHLOROPHENYL)-4,4-DIMETHYLPENT-1-EN-3-YL]FORMAMIDE

Ryan M. Swartwout, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-aryl-4,4-dimethylpent-1-en-3-yl)formamides. Specifically, the reaction between 1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one and formamide was completed in 15 minutes and produced N-[1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide with an isolated yield of 83%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. In addition, it was the first example of the Leuckart reaction successfully completed on an alpha,beta-unsaturated ketone. The earlier attempts to apply the Leuckart reaction to alpha,beta-unsaturated ketones produced mixtures of multiple products resulting from the retro-aldol condensation of the starting material. It was interesting to investigate, if the rapid procedure will succeed on other 1-(dichlorophenyl)-4,4-dimethylpent-1-en-3-ones. In this work the procedure was tested on 1-(3,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one.
Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 196ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.
Result: The reaction was completed in 15 minutes. The isolated yield of N-[1-(3,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide was 81%.
Conclusion: The results of the reaction confirm that the rapid procedure for the Leuckart reaction can be successfully conducted on 1-(3,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one. The reaction provides a new method for the synthesis of N-[1-(3,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide. N-[1-(3,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide is a new compound.

RAPID SYNTHESIS OF N-[1-(3,5-DICHLOROPHENYL)-4,4-DIMETHYLPENT-1-EN-3-YL]FORMAMIDE

Tambraye L. Trottier, Lioudmila I. Bobyleva, and Mikhail M. Bobylev
Division of Science

Background: Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-aryl-4,4-dimethylpent-1-en-3-yl)formamides. Specifically, the reaction between 1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one and formamide was completed in 15 minutes and produced N-[1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide with an isolated yield of 83%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. In addition, it was the first example of the Leuckart reaction successfully completed on an alpha,beta-unsaturated ketone. The earlier attempts to apply the Leuckart reaction to alpha,beta-unsaturated ketones produced mixtures of multiple products resulting from the retro-aldol condensation of the starting material. It was interesting to investigate, if the rapid procedure will succeed on other 1-(dichlorophenyl)-4,4-dimethylpent-1-en-3-ones. In this work the procedure was tested on 1-(2,4-dichlorophenyl)-4,4-dimethylpent-1-en-3-one.
Methods: The reaction was conducted on a 10 mmol scale at 180ºC - 202ºC. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products.
Result: The reaction was completed in 15 minutes. The isolated yield of N-[1-(3,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide was 87%.
Conclusion: The results of the reaction confirm that the rapid procedure for the Leuckart reaction can be successfully conducted on 1-(3,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-one. The reaction provides a new method for the synthesis of N-[1-(3,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide. N-[1-(3,5-dichlorophenyl)-4,4-dimethylpent-1-en-3-yl]formamide is a new compound.

AN ANALYSIS OF RED PANDA ARBOREAL HABITS IN CAPTIVITY

Daniela Nardelli, Sarah Upton, and Chad Williamson
Division of Science

Red pandas (*Ailurus fulgens*) are arboreal mammals that are known to spend 90% of their time off the ground in the high-elevation forests of the Himalayan mountains. Since arboreal mammals have been shown to alter space use in captivity, we sought to determine if captivity played a role in the arboreal habits of red pandas at the Roosevelt Park Zoo in Minot, North Dakota from March-April, 2023. We observed two red pandas during 10-minute trials, using 30-second intervals to determine proportional time spent on the ground versus arboreal. An ethogram was also created to document typical red panda behavioral patterns during the trials. Preliminary results suggest that captive red pandas at the Roosevelt Park Zoo may spend less time off the ground than wild red pandas. However, data collection is ongoing and data analysis will be completed in mid-April.

PHYSICAL PLACES, DIGITAL SPACES: DESIGN-BASED RESEARCH AND THE DEVELOPMENT OF LOCATION-BASED AUGMENTED REALITY

Ethan P. Valentine and Somtochukwu Ozeh
Department of Addiction Studies, Psychology, & Social Work
Department of Math & Computer Science

Augmented reality (AR) applications have seen a surge in interest in recent years, driven by the commercial success of such titles as *Pokémon GO* and *Jurassic World: Alive*. Though not a new technology, the extent to which users are able to simultaneously interact with both *physical* and *digital* spaces has grown in recent years. Recent research has begun to point to the value of *location-based* AR in particular, which leverages location data from a mobile device to allow the user to explore and interact with digital tools based on their movement around physical space. Much of this research has focused on the use of AR tools to aid learners' exploration of historical or cultural sites, with an emphasis on learning about events that took place there. Despite recent interest in location-based AR in both commercial and academic spaces, very little research has examined the use of location-based AR for developing mental models of physical spaces themselves. The present research seeks to address that gap through the development and evaluation of location-based AR tour applications representing the Minot State campus and other local and regional landmarks. Design-based research is underway to develop the initial campus application, with this poster's focus on exploratory qualitative inquiry with campus stakeholders. Findings include a need for improved accessibility tools on campus, concerns about information overload in existing campus tours, loss of personalization in digital spaces, and varied needs across the campus community. The implications of these findings and plans for future research will be discussed.

BUGGING OUT: PHYSIOLOGY AND BEHAVIOR OF LARVAL ANTLIONS (*VELLA AMERICANA*)

Rebecca A. Valentine,[,] Carlie Richardson,[,] and Chad Williamson
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Department of Biology, Ball State University

Vella americana is a species of antlion that is found in southeastern United States and Mexico. Although some studies have compared specific behaviors or anatomical features between antlion species, there is a substantial gap in scientific literature with regard to *Vella americana*. Since this species spends much of its time in its larval stage before maturing into a flying insect, our research focused on providing an overview of larval anatomy, physiology, metabolism, and behavior. We collected 64 specimens of larval *Vella americana* from Sapelo Island, GA during 3-10 March, 2023. Responses to various auditory stimuli were recorded, and specimens were dissected prior to metamorphosis for examination of morphological characteristics. This poster will highlight findings from this investigation, alongside implications for the conservation of the species. Limitations of the research and directions for future research into *Vella americana* will also be discussed.

AQUATIC AND TERRESTRIAL SPACE USE IN CAPTIVE NORTH AMERICAN RIVER OTTERS (LONTRA CANADENSIS)

Mark Vernon, Janessa Brown, Yuden Zongtenpa, and Chad Williamson
Department of Biology

The North American River Otter (*Lontra canadensis*) is a semi-aquatic mammal featured in many zoological institutions that requires access to water and land within their enclosure. Wild river otters have been estimated to spend two-thirds of their life on land, however – given the limited scope of available space for otters in zoo enclosures compared to their wild counterparts – there remains an opportunity to examine if the proportional use of terrestrial versus aquatic space differs in captivity. To assess captive river otter space use (aquatic versus terrestrial) and associated behaviors, we performed an ethological survey of two individual river otters at the Roosevelt Park Zoo in Minot, North Dakota during March-April, 2023.Garnering an understanding of this behavior and any disparity between wild and captive animals will help refine and optimize exhibit design for these and similar organisms to better facilitate captive animal welfare. Data collection is in progress and will be completed by mid-April 2023.

WEASEL BAIT EFFICACY IN WESTERN NORTH DAKOTA

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Weasels are small mesocarnivores that may provide an effective barometer for the health of the ecosystems in which they are found. However, weasels are difficult to reliably detect due to their elusive and primarily nocturnal behavior. As such, there exists a need to improve the methods of detection to more definitively determine the presence and prevalence of weasels in areas of interest. The purpose of this study was to evaluate the efficacy of different bait-lure combinations in detecting 3 species of weasel (short-tailed weasel (*Mustela erminea*), long-tailed weasel (*Neogale frenata*), least weasel (*Mustela nivalis*) in Ward County, North Dakota. Monitoring sites were chosen based on known weasel habitat preferences (e.g., downed woody debris, riparian areas, edges) and digital trail cameras were used to detect weasel presence beginning in January, 2023. We compared the efficacy of 3 bait types (chicken legs, chunked beaver meat, cat food containing fish) with and without a supplemental salmon oil scent lure. Each site consisted of 4 digital trail cameras placed at least 4 m apart and no farther than 20m apart, with each camera pointed at a bait/lure combination consisting of a bait type placed with or without salmon oil. Bait types and salmon oil lure presence was randomly determined. Cameras were programmed to collect 20 s video files and sites were checked every 2 weeks. Preliminary data suggest a preference towards chicken and beaver meat, especially with the presence of salmon oil. Data collection is ongoing and data analysis will be completed in mid-April.

RAPID SYNTHESIS OF N-ETHYL-N-[1-(4-TRIFLUOROMETHYLPHENYL)ETHYL]FORMAMIDE

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Recently, we developed a rapid procedure for the Leuckart reaction and successfully applied it for the synthesis of substituted N-(1-phenylethyl)formamides. Specifically, the reaction between 4- isopropylacetophenone and unsubstituted formamide was completed in 20 minutes, producing N-[1-(4- isopropylphenyl)ethyl]formamide with an isolated yield of 88%. The new procedure appeared to be much faster than the traditional Leuckart reaction that is usually completed within 3 to 6 hours. Later, we conducted the same reaction with N-ethylformamide and discovered that it was completed only after 2.5 hours, much closer to the usual Leuckart reaction time. Isopropyl is an electron-donating group. It increases the electron density on the carbonyl and makes it less reactive towards formamide in the Leuckart reaction. Replacing isopropyl with an electron withdrawing group will decrease the electron density on the carbonyl, make it more reactive, and accelerate the reaction. In this work, the hypothesis was tested in the reaction between 4-trifluoromethylacetophenone and N-ethylformamide.
The reaction was conducted on a 5 mmol scale at 180 C - 210 C. Extraction and column chromatography were used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structures of the products. Result: The reaction was completed in 60 minutes. The isolated yield of N-ethyl-N-[1-(4-trifluoromethylphenyl)ethyl]formamide was 86%.
The results of the reaction support the initial hypothesis that the presence of electron-withdrawing groups in acetophenone will accelerate the Leuckart reaction. The reaction provides a new method for the synthesis of N-ethyl-N-[1-(4-trifluoromethylphenyl)ethyl]-formamide. N-ethyl-N-[1-(4- trifluoromethylphenyl)ethyl]formamide is a new compound.

AN ANALYSIS OF CAPTIVE TRUMPETER HORNBILL WATER DISH HEIGHT PREFERENCE

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Physical complexity is a convenient way to introduce enrichment to captive animals' enclosures. Benefits of enrichment can include decreased aggression, increased activity levels, improved reproduction, improved general health, and more. This study evaluated optimal height (i.e., maximum use) of water dish placement as an enrichment activity for a bonded pair of trumpeter hornbills (*Bycanistes bucinator*) at Roosevelt Park Zoo in Minot, North Dakota during March-April, 2023. We hypothesized that captive trumpeter hornbills will exhibit increased interaction with an existing shallow water dish if it is placed at a height of 1.5 meters or higher, based on management and husbandry guidelines for the species as provided by the European Association of Zoos and Aquariums (EAZA). We placed the water dish at three distinct height levels (i.e., 0 m (on the ground), 1.5 m, and 2.5 m) for a duration of 1 week each, and observed interaction frequencies at each height. Based on our hypothesis, we predicted to observe the most interactions with the water dish at the highest level (2.5 m) and the fewest interactions at ground level. Data collection is ongoing and data analysis will be completed in mid-April.

COMPARISONS BETWEEN NOCTURNAL AND DIURNAL FORAGING BEHAVIOR OF SHREWS IN NORTH DAKOTA

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Shrews (*Sorex sp.*) play a vital role in a variety of ecosystems as an important prey source for small predators and voracious consumers of insects and other invertebrates. Having one of the highest metabolic rates among mammals, shrews must consume food sources every 2-3 hours to avoid starvation. However, shrews are known to be most active during nocturnal periods. During a bait efficacy study intended to focus on the presence of weasel species in North Dakota, we observed consistent shrew foraging events at our bait sites with apparent behavioral differences (i.e., number of visits, time spent feeding) in diurnal versus nocturnal feeding activity. Thus, we hypothesized that shrews may visit bait sites more often and spend more time feeding during nocturnal hours. To evaluate shrew foraging behavior, we analyzed video footage from 4 digital trail cameras used in our weasel bait efficacy study. Video data is currently being analyzed to compare how much time shrews spend feeding during diurnal and nocturnal periods. The means of diurnal and nocturnal feeding activity times will be compared using Student's t-test for two independent samples. Data collection is ongoing and data analyses will be completed in mid-April.

FTX – THE PLAUSBILITY OF AN UNMODIFIED AUDIT OPINION ON AN ORGANIZATION THAT LACKS INTERNAL CONTROL; A DEEP DIVE INTO THE STANDARDS

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FTX Group was plagued with material related party transactions as well as an "unprecedented" lack of internal control. Yet, despite these issues, two of the four FTX "Silos" were give unmodified audit opinions. The purpose of this paper is not to rehash what went wrong, how and where. Rather, this paper calls into question the ability for a public accounting firm to issue an unmodified opinion on the financial statements of FTX. I will explore the relevant auditing standards and guidance provided to auditors to determine the appropriateness of issuing an unmodified opinion. Ultimately, I determine that a Disclaimer of Opinion on the Financial Statements is the only appropriate report to issue when an entity has pervasive and material related party transactions and lacks internal control.

COMPARING EFFECTS OF REPRESENTATIONAL FORMATS ON PROBABILITY WORD PROBLEM SOLVING

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Visual representations have been widely used in math learning activities. However, depending on visual formats, their effects on math problem solving may differ. Pictorial representations, which depict real-world images described in problem stories, have been argued to be irrelevant and helpless to problem solving. Diagrams, which outline the underlying problem structures, tend to improve problem solving success. Recent evidence suggested that some math textbook design may not be consistent with the visual design principles above mentioned, showing a tendency of heavily choosing pictures for visualizing probability problems. The current investigation is warranted to evaluate whether and how pictures and diagrams may affect probability problem solving differently with the purpose of informing future math instructional design.

In an ongoing preregistered experimental study, undergraduate research volunteers have been randomly assigned to two problem visualization conditions: pictorial vs. diagrammatic. Each participant solves a pretest and a posttest of basic probability word problems. Pretest problems are presented in text only and posttest problems are each presented with either a concrete picture of the problem story or a diagram in addition to the problem text.

Preliminary analyses on data collected so far have revealed significant differences in how different visual representations affect problem solving. While time spent on problem solving from the pretest to the posttest reduced similarly across the conditions, participants in the diagrammatic condition improved significantly more on problem solving success than those given pictorial images. The findings underscore the importance of careful choices of visual tools for probability education.

GENERALIZED EPIDEMIOLOGICAL MATHEMATICAL MODEL OF INFECTIOUS DISEASES

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We present a generalized epidemiological mathematical model that can be used to model the spread of infectious diseases. Our model expands upon the simple SIR model of infectious diseases, which measures the rate in which individuals move between the susceptible, infectious, and recovered compartments, respectively. Since infectious diseases are multi-faceted in nature, we compartmentalize the infectious class of individuals into exposed, asymptomatic infectious, symptomatic infectious, hospitalized, and hospitalized with intensive care. Using our model, we calculate the reproduction number, R_0, using the Next-Generation matrix method, which represents the number of secondary cases produced by a single infectious person with the disease. Furthermore, we propose two additional models which consider vaccination and vaccination with waning (i.e., the rate at which the vaccine loses efficacy). Using each model, we calculate a revised reproduction number in terms of R_0, which gives us information on how the vaccination (with and without waning) affects the spread of the disease. Compared to current literature, we provide a more accurate representation of the spread of infectious diseases, since we also include the waning rate of the vaccine. From the development of our models, we simulate the effects of a vaccination program on the spread of infectious diseases.

ADAPTING MSU STUDENT HANDBOOK FOR STRUGGLING READERS

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This study aimed to use different techniques to adapt MSU Student Handbook for struggling readings. The Student Handbook is the official statement of rules and regulations. However, research suggests that only 32% of first-year students read at a 12th-grade level. MSU offers inclusive education programs to students with disabilities, including intellectual disabilities. It is important to provide an alternative and adapted version of the Student Handbook for struggling readers on campus, prospective students with disabilities, and their families. In this project, we used readability measures to determine the reading level and contributing factors that led to reading challenges. We used different techniques to adapt the materials to a lower grade level by simplifying the language and the information structure. Interviews with students who self-identified as struggling readers showed that they felt that the adapted version contained the same information, was easier to read, and was easier to understand. Comments from struggling readers indicated that they preferred short paragraphs, small words, concise content, and printed copies of the materials. Results showed that the adapted materials met the struggling readers' needs for better comprehension and information retrieval. This project is of great significance to support MSU's vision and goal of creating an inclusive campus.