

AAAS and Center for Biology and Society

2022 Student E-Posters



Carly Busch

Coming Out to the Class: Students Benefit When Instructor Reveals Her LGBTQ+ Identity

E-Poster Graduate Winner in Social Sciences

Sharing personal information has been recognized as an effective way for instructors to build relationships with their students and foster a sense of community in their courses. Revealing personal identities may be particularly impactful for students with concealable stigmatized identities (CSIs), defined as identities that can be kept hidden and that carry negative stereotypes, such as lesbian, gay, bisexual, transgender, and queer (LGBTQ+) identities. Students with CSIs often struggle to find similar others in science, which can negatively affect their sense of belonging. Previous studies have assessed the factors leading to LGBTQ+ identity instructors or students revealing their identity in the classroom, but we know of no studies that have looked at the impact of an instructor revealing their LGBTQ+ identity on students. This study is the first to demonstrate an impact of instructor LGBTQ+ identity on students, which supports the assertion that a brief intervention could have far reaching potential effects on students.



Baylee Edwards

Students' Perceptions of Bioethics Topics and Their Comfort When Learning About Them

Bioethics is an important aspect of understanding the relationship between science and society, but studies rarely examine student experiences and comfort learning bioethics. In this study, we investigated undergraduate bioethics students' support of and comfort learning three common and controversial bioethics topics: gene editing, abortion, and physician assisted suicide (PAS). Further, student identity has been shown to be an important aspect of how students perceive and learn about controversial topics at the intersection of science and society. So, we explored how students, religious affiliation, gender and political affiliation were associated with their support and comfort. In fall 2020, we surveyed students, at the beginning and end of 5 bioethics courses at an R1 university. At the beginning of the courses, students indicated whether they support each bioethics topic in all, some, or no situations. At the end of the course, we asked students to rank their comfort levels when learning each topic and to explain why they felt that comfort level. We used ordinal regressions to analyze our quantitative data and inductive coding to analyze our qualitative data. Analyses of pre-course data showed that most students enter bioethics supporting gene editing and PAS in only some situations, while a large portion of students enter supporting abortion in either all or some situations. We also found that at the beginning of bioethics, women support abortion more than men. Religious students were less likely than non-religious students to support all three topics, and non-liberal students were less likely than liberal students to support both abortion and PAS. At the end of the courses, women reported less comfort than men when learning about gene editing, religious students were less comfortable than non-religious students when learning about abortion and PAS, and non-liberal students were less comfortable than liberal students when learning about abortion. Overall, students often cited that well-rounded unbiased materials made them comfortable, whereas the controversial nature of the topics as well as their lack of support for a specific topic caused them to be uncomfortable. This is the first study we know of exploring experiences of undergraduate biology students in bioethics courses. Based on our findings, it may be important for bioethics instructors to be cognizant of students' varying viewpoints and comfort levels to facilitate an engaged class in which students are comfortable sharing their perspectives and exchanging ideas about bioethics.



Samantha Maas

Navigating Academic Biology as an LGBTQ+ PH.D. Student

AAAS E-Poster Undergraduate Winner in Science in Society

The LGBTQ+ identity is considered a concealable stigmatized identity (CSI) because it is often an identity that be kept hidden and is also socially devalued in some or all contexts. Prior studies have shown that holding a CSI increases the likelihood that a person will experience anxiety, depression, and lack of feelings of belonging in settings that devalue that specific identity. Biology graduate programs are unique settings where students often encounter situations where revealing their LGBTQ+ identities is relevant, and biology topics are related to sexuality and gender. Because of the intersection of these factors and the underrepresentation of LGBTQ+ identities in science, this research aims to examine the experiences of LGBTQ+ students in the context of biology graduate programs. In this study, we used the CSI framework to develop a semi-structured interview script asking about LGBTQ+ students perceived and experienced stigma, decisions to reveal or conceal and how they navigated teaching considering their identity. In total, we interviewed 22 biology Ph.D. students from 13 universities across the U.S. and used both inductive and deductive coding to find themes that emerged across the interviews. The interviews indicated that students often felt anxiety around revealing their LGBTQ+ identity in context of graduate school; students worried about it being sexualized, perceived as irrelevant or inappropriate, or making other students feel uncomfortable. They also experienced stigma related to their identities; students described being misgendered, hearing derogatory slurs directed toward the LGBTQ+ community, and being treated differently than their peers because of their LGBTQ+ identity. We also found that students reported some field sites and job positions are in regions that are not friendly to LGBTQ+ people, and this can severely diminish the academic positions they are willing to take. Lastly, we found that most students were out to their PI and other graduate students, but not to their undergraduates in fear of removing a professional barrier. These findings provide some insight into how we can create more inclusive graduate programs for LGBTQ+ biology students



Erika Nadile

The Impacts of Using Personalized Emails in an Online Course

Instructors can use student names as a way to connect with their students and to build relationships since students may perceive this as their instructor caring about them and their academic success. However, few studies have examined the impact of using student first names in personalized emails in a large-enrollment upper-level biology course that is primarily asynchronous. In this study, 300 students were randomly assigned to a control or treatment group to test the impact of personalized emails with first names. Students in the control group received weekly emails addressed to Hi all whereas student in the treatment group received personalized emails with their preferred first names that were sent using mail merge. At the end of the study, both groups of students answered questions regarding their perceptions of the instructor who sent the emails. Students were asked about their perceptions of instructor caring, instructor connectedness, and sense of belonging in the course. Students in the treatment group were also asked to what extent the personalized emails had an impact on their experiences in the course. Finally, we tracked student behaviors and engagement patterns over the course of the semester, including office hour attendance, final course grades, and who opens emails sent by the instructor. We used a variety of statistical methods to examine if there were any differences between control and treatment groups. We found that students in the treatment group were more likely to open the emails that were personalized to them than students in the control group. Further, we found that students in the treatment group were more likely to respond back after receiving a personalized email. We did not find any statistical differences between the two groups in any of the affective perceptions. We also did not observe any differences in office hour attendance, overall number of emails sent, or final course grades. Despite no differences in those factors, we found that over 95% of students in the treatment group reported a positive impact from the personalized emails. Students reported that they perceived they were more than a number in the course and that the instructor cares. This work adds to the growing body of literature on small and easy instructor decisions and choices that can impact students in asynchronous biology courses. Personalized emails had a small, but positive impact on students yet took up very little instructor time.



Lauryn Remmers

Social Determinants of Health and Total Joint Arthroplasty Complications

Social determinants of health (SDOH) are the conditions in one's living environment that affect health, functioning and quality of life. Total joint arthroplasty (TJA) is a surgical procedure to replace a damaged joint with an artificial joint. TJA complications include acute myocardial infarction, pneumonia, sepsis, surgical site bleeding, pulmonary embolism, or periprosthetic joint infection. Previous research demonstrates that Black race, Hispanic ethnicity and poverty were negatively associated with TJA outcomes in veterans. The goal of this mixed methods quality improvement study is to determine if SDOH affect TJA complications at a health system in the Phoenix metropolitan area. For this study, records from patients who underwent hip or knee TJAs at any of the four system facilities between 2/2019 and 2/2020 were included. Demographics and clinical data were extracted from the electronic health record (HER) via Midas+ Care Management with SDOH variables from case manager notes corresponding to food, utilities, housing and transportation insecurities, and interpersonal safety. Complications were identified using ICD-10 codes, SDOH for individuals with and without complications were compared. A multinomial logistic regression was performed in SPSS to identify significant variables. Semi-structured interviews with case managers (n=2), orthopedic surgeons (n=5), and primary care physicians (n=4) were performed to explore care team interactions with SDOH. Interview notes were coded and analyzed based on response frequency and themes. Of 2,520 patients who underwent TJA, 50 (1.98%) experienced a TJA complication. Of those, 38% screened positive for an SDOH. For those without TJA complication, 27% screened positive for an SDOH (p=0.093). Results from multinomial logistic regression showed that complication significantly differed between facilities (p=0.047). Most interview participants identified a correlation between socioeconomic status and surgical outcomes. They also recognized that language barriers for Spanish speaking individuals and family involvement post-discharge are significant factors in TJA outcomes. This single system mixed methods retrospective quality improvement study demonstrates that patients who screen positive for an SDOH are more likely to experience a TJA complication. We recommend that SDOH assessments be obtained for all patients undergoing TJA, be available to care teams, and be incorporated into care plans to improve outcomes.



Sarika Sawant

Bite Force Estimates for Greenland Sharks Using Anatomy and Modeling

Bite force is a measure of feeding performance, linking the anatomical form to a function. Using jaw muscle fiber angles and mass, bite force can be calculated using assumptions from basic Newtonian physics. This method of predicting organismal performance has been validated in multiple taxa to include crocodylians, fishes, elasmobranchs, and more. Therefore, this is a useful and reliable way to study performance in species that are not amenable to capture or captivity. The goal of this study is to estimate maximum bite force generated by the Greenland shark, *Somniosus microcephalus*, and to compare these estimates with both close relatives and other large sharks. Three Greenland sharks were obtained and had an average length of 85.7cm (52-109cm). The jaw adductors were exposed, photographed, excised and weighed. Muscle fiber angles, and lengths of the in-and out-levers (formed by the insertion of these muscles onto the lower jaw) were compared with estimates from Mako, Spiny dogfish, and Sandbar sharks, for whom bite force was estimated using the same protocols, in previous studies. The average maximum bite force for *Somniosus microcephalus* was 22.18 N (SD = 3.92), which was most similar to the spiny dogfish sharks selected for comparison: perhaps predictable given similarities in morphology and close phylogenetic relationship. Generally speaking, the bite force estimates for Greenland sharks were as expected (bite force increasing with size), or slightly on the low side, when comparing bite force with body size among these species of sharks.



Risa Schnebly

Reviving The Dead, Ignoring The Living: Emotion, Ethics, & The Dream Of De-Extinction

Selected as an e-poster competition finalist.

Scientific reports documenting accelerating global biodiversity decline and urging environmental action have become commonplace in this century. As we move deeper into what many observers call the sixth mass extinction in the planet's history, we are left with a simple but unsettling question. Why has the public largely failed to respond to scientists' calls to action? Conservation psychologists have suggested one answer to this question, focusing on how environmental issues are communicated to the public. Conservation messaging, we are sometimes told, is far too negative in tone and affect to motivate people to care for the environment and subsequently change their behaviors. Yet, others see such negativity as a necessary appeal to ecological realism. The goal of this research project was to examine how different messaging techniques, and especially expressions of emotionality surrounding the loss and recovery of biodiversity, can differently influence public attitudes about conservation and the environment. This question was explored using the case of de-extinction, an emerging and controversial conservation technology. De-extinction claims to "resurrect" extinct species, challenging widely held notions of extinction as permanent. Yet seeing extinction as reversible may shift how people feel about biodiversity loss and our moral responsibility to stop it. I conducted an interdisciplinary literature review spanning the fields of ecology, environmental ethics, and social and conservation psychology to examine how language framing de-extinction as a form of species revival might sway public attitudes. Specifically, I juxtaposed the emotions evoked by the resurrectionist framing to the emotions evoked by understandings of extinction as permanent to understand each framing's capacity to motivate support for conservation efforts. I found that overly negative conservation discourse could indeed discourage people rather than motivate them to care about biodiversity loss. Although the language of de-extinction is more hopeful and positive, I argued that it is misleadingly so. De-extinction in fact inspires a false optimism about our ability to fight biodiversity loss relying on our technology alone. Of more concern is that it ultimately fails to motivate people to support necessary and wider societal change. Rather than positivity or negativity, I concluded that the most important element of communicating environmental issues was including a sense of efficacy that empowers individuals to feel like their own actions could have a significant impact in the world.



Sarah Van Dijk

P2Rx7 Promotes CD8+ T Cell Memory Through Zeb2 Negative Regulation

AAAS E-Poster Undergraduate Winner in Developmental Biology, Genetics, and Immunology

Selected as an e-poster competition finalist.

Memory CD8+ T cells protect against secondary viral infections. They develop and maintain exclusively in circulation (e.g. central memory - T_{cm}) or are excluded from re-circulation (resident memory - T_{rm}). The extracellular ATP receptor P2RX7 promotes both T_{cm} and T_{rm} generation. High (P2RX7^{hi}) P2RX7-expressing early effector cells show survival, memory and pluripotency genes. Conversely, many terminal effector (TE) and apoptosis genes are upregulated in low (P2RX7^{lo}) P2RX7-expressing cells. Among these genes is the zinc-finger transcriptional repressor *Zeb2*, which promotes TE differentiation at the expense of the memory CD8+ T cell pool. Given that *Zeb2* was higher in P2RX7^{lo} early effector cells, we postulated that *Zeb2* ablation would allow P2RX7-deficient CD8+ T cells to skew towards memory subsets. To test this, we used RNP-based CRISPR-Cas9 to knockout *Zeb2* in wild type or P2RX7-deficient P14 cells. At the memory timepoint, *Zeb2* ablation led to a rescue of the ability of P2RX7-deficient cells to differentiate into the CD62L+ T_{cm} and CD69^{hi}CD103^{hi} T_{rm} subsets, as well as increase the population of each. Our data suggest that P2RX7 imprints a pro-memory signature that is, to some extent, dependent on the negative regulation of *Zeb2*.



Cindy Vargas

Factors that Influence Life Sciences Student Persistence in Research

Undergraduate research is one of the most valuable activities an undergraduate can participate in due to the number of benefits it can deliver. However, research has been shown that undergraduates often encounter challenges when engaging in research, such as problematic mentoring and unwelcome lab environments, which may result in leaving their research experience prematurely. These studies have been almost exclusively conducted at research-intensive (R1) institutions, and it is unclear how generalizable undergraduate experience experiences can be at other institution types. Specifically, we were interested in (1) to what extent institution type predicts students' decisions to persist in undergraduate research experiences and (2) what factors affect students' decisions to either stay in or consider leaving their undergraduate research experience at different institution types. We extended a study we had previously conducted across public R1 institutions to include private R1 institutions, Master s-granting institutions, and 20 PUIs to access our research questions. Using logistic regression, we found that students at public, R1 institutions are more likely to leave their research experiences compared to students at Master s-granting institutions and PUIs. However, there are few differences in why students enrolled at different institution types consider leaving or choose to stay in their undergraduate research experiences. We found that students primarily leave research because they do not enjoy their everyday research tasks and because they do not have enough time to do research. Conversely, students stay in their research experiences because they perceive their experiences to be important for their future careers and because they feel they are gaining important skills or knowledge. This work highlights the importance of investigating undergraduate research across institution types and highlights the need to consider institutional context when conducting biology education research. The implications of this work show that students can have different experiences in undergraduate research depending on where they participate.



Shaun Victor

The SmartPad: A Novel Internet of Things Diagnostic Device for Obesity Treatment

Obesity is a disease affecting many individuals in the U.S. as 40% of adults and 18% of children are obese. Obesity occurs when an individual's intake energy exceeds their energy expenditure (EE) for an extended period of time, which leads to weight gain. The objective of this project was to develop a non-invasive medical device, named the SmartPad, to monitor an individual's EE under free-living conditions through ambient measurements of CO₂ concentration accumulation rate in a room. To validate whether the SmartPad could accurately measure the resting and exercising (biking) EE of subjects with respect to a gold standard reference instrument (MGC Ultima CPX™), a longitudinal study consisting of 20 subjects was performed and subjects EE was measured four times (twice while resting and twice while biking). The data confirmed that the SmartPad's VCO₂ (volume of CO₂ exhaled) and EE measurements aligned with the MGC's measurement as the correlation plot for VCO₂ from the SmartPad and MGC had a slope of 1.00 and a regression coefficient of 0.99, and the corresponding VCO₂ Bland-Altman plot had a mean bias close to zero (-2.4%). The correlation plot for the EE from the SmartPad the MGC had a slope of 1.03 and a regression coefficient of 0.99 and the corresponding EE Bland-Altman plot also had a mean bias close to zero (-2.4%). In a follow-up study, a single subject performed N=113 resting EE and N=46 exercising EE measurements to evaluate the influence of time per measurement on the device's accuracy. Specifically, this experiment focused on understanding how the operating CO₂ threshold range for a given EE assessment (determines the CO₂ concentrations for when an EE measurement should begin and end) affects the SmartPad's time per measurement, accuracy, and precision. Five operating threshold ranges were tested for the resting EE measurements: 500-600, 500-625, 500-650, 500-700 ppm, and six operating threshold ranges were tested for the EE measurements: 500-600, 500-625, 500-650, 500-675, 500-700 and 500-900 ppm. The experimental results indicated that the 500-650 ppm range reduced the measurement time to 14-19 minutes for resting EE assessments with an accuracy and precision of 0.99%±10.50% (SD), and the 500-675 ppm range reduced the measurement time to 4-7 minutes for exercising EE assessments with an accuracy and precision of 0.79%±9.3% (SD). Another aim of this study was to determine how SmartPad accuracy would be affected when assessing a wide range of BMIs and EE values. Five subjects with BMIs ranging from 18.8 (nearly underweight) to 31.1 (classified as clinically obese) were assessed using the SmartPad at the 500-650 ppm CO₂ threshold range. The results indicated that neither subject BMI (p=0.267) nor subject resting EE (p=0.088) had statistically significant effects on SmartPad accuracy. Overall, the experimental results validated the accuracy of the SmartPad's VCO₂ and EE measurements and provided a specific operating threshold range for resting and exercising EE assessments.



Nicholas Wiesenthal

Examining How Research and Teaching Affect Depression in Life Sciences Ph.D. Student

Graduate students are significantly more likely to experience depression compared with the general population. However, few students have examined how graduate school specifically affects depression. In this qualitative interview study of 50 life sciences Ph.D. students from 28 institutions, we examined how research and teaching affect depression in Ph.D. students and how depression in turn affects students' experiences teaching and researching. Two researchers used inductive coding to analyze the interviews and established an appropriate inter-rater reliability score ($\kappa = 0.94$) before one researcher coded the remainder of the interviews. The study found that graduate students more commonly mentioned factors related to research that negatively affected their depression and factors related to teaching that positively affected their depression. The most common research-related factors exacerbating depression were failure (48%) and unstructured research experiences (38%), and the most common teaching-related factors alleviating depression were positive reinforcement from undergraduates (58%) and teaching as a structured task (33%). Graduate students reported that depression had an exclusively negative effect on their research, primarily hindering their motivation (64%) and self-confidence (58%), but that it helped them to be more compassionate teachers (23%). This work pinpoints specific aspects of graduate school that Ph.D. programs can target to improve mental health among life science graduate students.