Abstract 1409

Quantification of Learning Advances in a Science CURE: Providing Learning Objectives to Corroborate and Validate the Advantages of Experiential Education

Arthur Sikora, *Nova southeastern University*

Course-based Undergraduate Research Experiences (CURE) seek to supply college students with hands-on experiences to develop research skills and complex thinking. As students progress through their education and enter their professional careers, improvement of these critical skills is imperative. CUREs make it possible for students to experience the enchantment of science in its authentic form by engaging in research. Regardless of race, socioeconomic status or family obligations, CUREs have been gaining popularity as an essential model to expose every student to the process of science firsthand. This study aims to gauge student learning objective mastery quantitatively using Anticipated Learning Outcomes (ALOs) designed specifically for the Biochemistry Authentic Student Inquiry Laboratory (BASIL) CURE curriculum. Likert scale-based analysis is employed to evaluate the level of content mastery student responses demonstrate. Assignment questions were designed to correspond to the most critical learning objectives. Learning gains were evaluated across several semesters and represent fully in person, hybrid and online teaching modalities. Analysis shows greater mastery of bio-informatic ALOs during remote learning. The data show that quality education can be enhanced and improved by technology. The student's mastery of wet-lab ALOs coincided with our findings that lab courses need enhanced strategies to teach critical STEM lab-research skills in an online setting. This work will allow for wider CURE adoption through quantitative assessment and instruction strategies targeted to identifying learning mastery gaps. Ultimately, research based curricula can serve as a platform to expose every undergraduate student to vital STEM research experiences.

103496, https://doi.org/10.1016/j.jbc.2023.103496

Abstract 1451

Comparing effectiveness of two antibodies (Aducanumab and Gantenerumab) on reducing amyloid-beta plaques

Nikhila Paleati, *Nova Southeastern University*

Akhil Godbole, Pranav Neravetla, Emily Schmitt Lavin, Arthur Sikora

Alzheimer's disease (AD) is a degenerative neurological disorder that destroys memory and other important cognitive functions. As time progresses, brain cell connections, as well as the brain cells themselves, atrophy and die. AD is caused by a missense mutation in the amyloid-beta peptide within the amyloid precursor protein (APP). The mutation results in glutamine being replaced with glutamic acid. Previously conducted studies showed that mutated forms of the amyloid-beta peptide fragment have a greater tendency to stick together and form protein clumps or aggregates. The abnormal build-up of aggregates in and around the brain cells has been found to be strongly associated with the development of Alzheimer's disease, therefore, it appeared crucial to study the methods that reduce these build-ups. Attempts to treat this disease have produced antibodies that bind to the mutated amyloid-beta peptide and clear the aggregated amyloid precursor protein out of the brain. The overall goal of this project is to use 3D printed protein models to show interactions leading to a clearer explanation of the efficacy variations between antibodies. One antibody, Aducanumab, is currently in Phase 3 clinical trials and has been fast-tracked by the U.S. Food and Drug Administration. Aducanumab functions by specifically binding to the mutated amyloid-beta peptide and clearing aggregates out of the brain. This antibody binds to a smaller linear epitope formed by amino acids 3–7 of the amyloid-beta peptide. Using Jmol, protein visualization software, the Aducanumab (6CO3) PDB was manipulated to highlight multiple hydrophobic interactions, shown in a dark salmon color, and 2 hydrogen bonds, shown in white. The small binding location, flexibility provided by fewer strong interactions, and high affinity for aggregates at a high density make the antibody ideal for clearing out large aggregates. Another antibody, Gantenerumab, is still undergoing testing in order to ensure safety and efficacy. This antibody functions by binding to a longer linear epitope formed by amino acids 3–11 of the amyloid-beta peptide. Unlike Aducanumab, Gantenerumab interacts with peptides through 2 salt bridges in addition to 3 hydrogen bonds and multiple hydrophobic interactions. Along with hydrogen bonds in white and hydrophobic interactions in dark salmon, the Gantenerumab (5CSZ) PDB was manipulated to show negative side chains of the salt bridge, labeled in red, while the positive side chains were labeled in blue. The increased number and strength of interactions reduces the flexibility of this antibody, thus making it difficult to easily bind and clear aggregated peptides. While both antibodies bind to a similar region of the amyloid-beta peptide and function to

remove aggregates, they vary in the amount and type of interactions made with the amyloid-beta peptide.

This work was made possible by funding through the National Science Foundation, Division of Undergraduate Education (NSF-DUE) grant number 1725940 for the CREST Project. Nova Southeastern University's Farquhar Honors College and Dept. of Biological Sciences also provided support. Protein model printing was made possible by 3D Molecular Designs.

103497, https://doi.org/10.1016/j.jbc.2023.103497

Abstract 1457

The Impact of STEM Bridge on Belonging and Academic Confidence in Underrepresented Groups

Tabetha Johnson, *La Sierra University*

Marvin Payne

La Sierra University's STEM Bridge introduced academic and social opportunities to a cohort of fifteen incoming first-year students and three transfer students from underrepresented groups. Incoming first-year and transfer STEM students, especially students of color and women, experience various social and emotional challenges as they enter STEM disciplines in college. STEM Bridge aims to increase incoming students' sense of belonging as they begin college careers. Coordinators devised a meaningful two-week schedule to foster a sense of belonging for underrepresented groups. Additional objectives included giving students VIP access to campus, setting foundations for peer and faculty networking, career and internship development, and project-based learning in plant experimentation. The ultimate goal of these efforts was to help students develop a firm footing and academic confidence in STEM. Coordinators involved twenty-eight University departments in providing a rigorous two-week schedule of academic activities around sustainability. Mental health awareness activities offered a basis of emotional stability and Social engagement opportunities and allowed students to develop social bonds. Enrolled STEM students were recruited to join at no-cost two weeks prior to the fall quarter. Students were given IRB-approved pre-and post-assessments to measure impacts on growth in programming's academic, social, and emotional areas. Participants were 39% male, 61% female, and identified with the following ethnicities; 15% Hispanic, 62% Asian, 23% African American, and 23% Caucasian. Results indicated that 25% of assessed students started STEM Bridge uncertain about implementing foundational concepts in upcoming sciences courses, and 39% began STEM Bridge wondering whether their previous math classes had prepared them for upcoming courses at La Sierra University. After STEM Bridge, 93% of assessed participants felt more aware of academic and social resources on campus to support them. Assessments also indicated that STEM Bridge students gained more confidence in their ability to do research and find solutions to real-world problems. 85% of assessed students felt more confident about starting college because of the friends they made at STEM Bridge. 92% of assessed students planned to join STEM clubs after attending STEM Bridge. Assessed students also increased their awareness of mental health resources on campus by 40%. Finally, 100 percent of assessed STEM Bridge students indicated feeling more confident in their ability to be successful at La Sierra University because of attending the program. Assessment results underscore the importance of access and inclusive representation for belonging and developing academic