

Title: Increasing Hispanic Student Success and STEM Completion Through Active Learning Within General Chemistry Course Sequence

Presenter: Christian Burke, Richard Luu, Valerie Hsiao, and Andy Lai, Pasadena City College

Mentor: Jared Ashcroft

Active learning is the educational approach of enabling student success by (1) assigning preparatory work to be completed outside of the classroom in advance of each class and (2) engaging with the students through group-based activities in the classroom. A meta-analysis of current research has shown that active learning strategies have been far more successful than traditional pedagogical methods in STEM education (Freeman et al, 2014). Our research focuses on student success, progression and progression success through the two general Chemistry courses at Pasadena City College, 1A and 1B, with a special focus on traditionally underrepresented students. The data was taken from classes taught using variants of active learning and those taught by the traditional pedagogical method of lecturing. In both Chemistry 1A and 1B, underrepresented students, as in Hispanic and Latino students, had a higher success and retention rate in the active learning classrooms than traditional classrooms. Progression rates were much higher in active-learning classrooms, 55.1% as compared to 28.5% using traditional methods. Conversely, overrepresented students saw a drop in success, retention, and progression rates when active learning was employed. A student survey of enjoyment and helpfulness ratings assigned to class activities supported this trend, with underrepresented minority and non-underrepresented minority students choosing a complementary mixture of active learning activities as most helpful and most enjoyable. These findings suggest that an active learning approach taking into account both student groups' preferred learning styles may be most beneficial to all.

References

- Freeman, S., Eddy, S. L., McDonough, M., Smith, M. K., Okoroafor, N., Joesr, H., & Wenderoth, M. P. (2014). Active learning increases student performance in science, engineering, and mathematics. *Proceedings of the National Academy of Sciences of the United States of America*, 111, 8410-8415
- Greco, J. B. (2018). Studio Format General Chemistry: A Method for Increasing Chemistry Success for Students of Underrepresented Backgrounds. *ACS Symposium Series*, 1301(8), 131-143.
- Herrera, F. A., & Hurtado, S. (2011). Maintaining initial interests: Developing science, technology, engineering, and mathematics (STEM) career aspirations among underrepresented racial minority students. Los Angeles: University of California, Los Angeles, Retrieved November 15, 2019, from Higher Education Research Institute website: <http://www.heri.ucla.edu/publications-main.php>
- Hyun, J., Ediger, R., & Lee, D. (2017). Students' Satisfaction on Their Learning Process in Active Learning and Traditional Classrooms. *International Journal of Teaching and Learning in Higher Education*, 29(1), 108-118.
- Rainey, K., Dancy, M., Mickelson, R., Stearns, E., & Moller, S. (2019). A descriptive study of race and gender differences in how instructional style and perceived professor care influence decisions to major in STEM. *International Journal of Stem Education*, 6(6), Retrieved November 15, 2019 from <https://doi.org/10.1186/s40594-019-0159-2>.