

## *California Education Learning Lab*

# Background Information and Academic Research

The following are resources on improving learning outcomes and closing equity and achievement gaps in undergraduate STEM education. This resource list features academic, government and institutional publications as well as links to educational initiatives that align with the goals of the Learning Lab.

Where possible we provide links that connect to open-access versions of publications or to sites featuring accessible versions of publications. An asterisk indicates publications for which an open-access version is unavailable (\*).

### **STEM Participation and Equity Gaps in California and the United States**

Chen, X. and Soldner, M. (2013). [STEM Attrition: College Student's Paths Into and Out of STEM Fields: Statistical Analysis Report](#). Washington, DC: National Center for Education Statistics.

Johnson, H. (2018, June 21). [Gender Imbalances in STEM Majors](#), Public Policy Institute of California (Blog Entry).

National Science Board, (2018). [Higher Education in Science and Engineering: Undergraduate Education, Enrollment, and Degrees in the United States](#). In *Science & Engineering Indicators 2018*. Alexandria, VA: National Science Foundation.

### **Understanding and Addressing Equity Gaps**

Blackburn, H. (2017). [The Status of Women in STEM in Higher Education: A Review of the Literature 2007-2017](#). *Science & Technology Libraries*, 36, 235-273.

Estrada, M. et al. (2016). [Improving Underrepresented Minority Student Persistence in STEM](#). *CBE—Life Sciences Education*, 15:3.

\* Hurtado, S., and Carter, D. (1997). [Effects of College Transition and Perceptions of the Campus Racial Climate on Latino College Students' Sense of Belonging](#). *Sociology of Education*, 70:4, 324-345.

Toven-Lindsey, B., Levis-Fitzgerald, M., Barber, P.H., and Hasson, T. (2015). [Increasing Persistence in Undergraduate Science Majors: A Model for Institutional Support of Underrepresented Students](#). *CBE—Life Sciences Education*, 14:2.

Kezar, A., and Holcombe, E. (2017). *Creating a Unified Community of Support: Increasing Success for Underrepresented Students in STEM*. Available from [USC Pullias Center for Higher Education, CSU STEM Collaboratives](#).

Wang, MT, and Degol, J.L. (2017). [Gender Gap in Science, Technology, Engineering, and Mathematics \(STEM\): Current Knowledge, Implications for Practice, Policy, and Future Directions](#). *Educational Psychology Review*, 29:1, 119-140.

## **Learning Science and STEM**

Ballen, C.J., Wieman, C., Salehi, S., Searle, J.B., and Zamudio, K.R. (2017). [Enhancing Diversity in Undergraduate Science: Self Efficacy Drives Performance Gains with Active Learning](#). *CBE—Life Sciences Education*, 16:4.

Carlone, H. and Johnson, A. (2007). [Understanding the Science Experience of Successful Women of Color: Science Identity as an Analytic Lens](#). *Journal of Research in Science Teaching*, 44:8, 1187-1218.

Casasola, T., Nguyen, T., Warschauer, M., and Schenke, K. (2017). [Can Flipping the Classroom Work? Evidence from Undergraduate Chemistry](#). *International Journal of Teaching and Learning in Higher Education*, 29: 3, 421-435

Eagen, K. (2016). *Becoming More Student-Centered? An Examination of Faculty Teaching Practices across STEM and non-STEM Disciplines between 2004 and 2014*. Alfred P. Sloane Foundation. Available from Alfred P. Sloan Foundation, [Science of Learning STEM](#).

Eddy, S.L., and Hogan K.A. (2014). [Getting Under the Hood: How and for Whom Does Increasing Course Structure Work?](#) *CBE—Life Sciences Education*, 13:3, 453-468.

Freeman, S., et al. (2014). [Active Learning Increases Student Performance in Science, Engineering, and Mathematics](#). *Proceedings of the National Academy of Sciences*, 111:23, 8410-8415.

\* Haack, D.C., Hille Ris Lambers, J., Pitre, E., and Freeman, S. (2011). [Increased Structure and Active Learning Reduce the Achievement Gap in Introductory Biology](#). *Science*, June 3, 2011, 1213-1216.

Huber, E. and Werner, A. (2016). [A Review of the Literature on Flipping the STEM Classroom: Preliminary Findings](#). In Barker, S., Dawson S., Pardo, A., and Colvin, C. (Eds.), *Show Me the Learning. Proceedings ASCILITE 2016 Adelaide*, 267-274.

Means, B., Peters, V., and Zheng Y. (2014). *Lessons from Five Years of Funding Digital Courseware: Postsecondary Success Portfolio Review, Executive Summary*. Menlo Park, CA: SRI Education.

Thille, C. (2013). *How Technology is Transforming Higher Education*. In *Proceedings of the Aspen Institute Congressional Program—Challenges Facing America’s Higher Education System (October 4-7, 2013)*. Palo Alto, CA.

Thille, C. (2016). *What the Science of Learning Indicates We Should Do Differently*. In Otte, G. and Goldstein M. (Eds.), *Change We Must: Deciding the Future of Higher Education*. New York, NY: Rosetta Books. [Link to chapter in Google Books](#)

### **Additional Works and Perspectives on Institutional Change**

Arum, R. and Roksa, J. (2011). *Academically Adrift: Limited Learning on College Campuses*. Chicago: University of Chicago Press.

Dolan, E.L., Lepage, G.P., Peacock, S.M., Simmons, E.H., Sweeder, R., and Wieman, C. (2016). *Improving Undergraduate STEM Education at Research Universities: A Collection of Case Studies*. Tucson, AZ: Research Corporation for Science Advancement. Available from [Association of American Universities, Undergraduate STEM Education Initiative, Initiative Publications](#).

Fairweather, J. (2008). *Linking Evidence in Promising Practices in Science, Technology, Engineering, and Mathematics (STEM) Undergraduate Education*. Washington DC: Board of Science Education, National Research Council, The National Academies.

Singer, S.R., Nielsen, N.R., and Schweingruber, H.A., (Eds.). (2012). *Discipline-Based Education Research: Understanding and Improving Learning in Undergraduate Science and Engineering*. Washington, DC: National Academies Press.

Smith, J. and Herckis, L. (2018). *Understanding and Overcoming Institutional Roadblocks to the Adoption and Use of Technology-Enhanced Learning Resources in Higher Education*. [Available from: The Simon Initiative, Carnegie Mellon University](#).

### **Institutional Initiatives**

#### **California Acceleration Project**

[Growth-Oriented Grading Practices](#) (June 2018)

[Summary Affective Practice](#) (June 2018)

Other California Acceleration Project [Publications](#)

California State University, [Course Redesign with Technology](#)

University of California, [Innovative Learning Technology Initiative](#)

University of California. (2016, December 30). [Adaptive Learning Technology Pilot Report](#)

Association of American Universities, [Undergraduate STEM Education Initiative](#)

Association of American Universities. (2017). *Progress Toward Achieving Systemic Change: A Five-Year Status Report on the AAU Undergraduate STEM Education Initiative*. Washington, DC.

Available from: Association of American Universities, [Progress Toward Achieving Systemic Change](#).

[Carl Wieman Science Education Initiative at the University of British Columbia/ Science Education Initiative](#) at the University of Colorado, Boulder

[Open Learning Initiative](#), Carnegie Mellon University