



Expanding Access to and Participation in MIDFIELD (Year 2)

Dr. Matthew W. Ohland, Purdue University, West Lafayette (College of Engineering)

Matthew W. Ohland is Professor of Engineering Education at Purdue University. He has degrees from Swarthmore College, Rensselaer Polytechnic Institute, and the University of Florida. His research on the longitudinal study of engineering students, team assignment, peer evaluation, and active and collaborative teaching methods has been supported by the National Science Foundation and the Sloan Foundation and his team received Best Paper awards from the Journal of Engineering Education in 2008 and 2011 and from the IEEE Transactions on Education in 2011 and 2015. Dr. Ohland is an ABET Program Evaluator for ASEE. He was the 2002–2006 President of Tau Beta Pi and is a Fellow of the ASEE, IEEE, and AAAS.

Dr. Susan M. Lord, University of San Diego

Susan M. Lord received a B.S. from Cornell University and the M.S. and Ph.D. from Stanford University. She is currently Professor and Chair of Electrical Engineering at the University of San Diego. Her teaching and research interests include electronics, optoelectronics, materials science, first year engineering courses, feminist and liberative pedagogies, engineering student persistence, and student autonomy. Her research has been sponsored by the National Science Foundation (NSF). Dr. Lord is a fellow of the ASEE and IEEE and is active in the engineering education community including serving as General Co-Chair of the 2006 Frontiers in Education (FIE) Conference, on the FIE Steering Committee, and as President of the IEEE Education Society for 2009-2010. She is an Associate Editor of the IEEE Transactions on Education. She and her coauthors were awarded the 2011 Wickenden Award for the best paper in the Journal of Engineering Education and the 2011 Best Paper Award for the IEEE Transactions on Education. In Spring 2012, Dr. Lord spent a sabbatical at Southeast University in Nanjing, China teaching and doing research.

Dr. Marisa K. Orr, Clemson University

Marisa K. Orr is an Assistant Professor in Engineering and Science Education with a joint appointment in the Department of Mechanical Engineering at Clemson University. Her research interests include student persistence and pathways in engineering, gender equity, diversity, and academic policy. Dr. Orr is a recent recipient of the NSF CAREER Award for her research entitled, "Empowering Students to be Adaptive Decision-Makers."

Mr. Russell Andrew Long,

Russell Long, M.Ed. was the Director of Project Assessment at the Purdue University School of Engineering Education (retired) and is Managing Director of The Multiple-Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD). He has extensive experience in performance funding, large data set analysis, program review, assessment and student services in higher education. One of his greatest strengths lies in analyzing data related to student learning outcomes and, therefore, to improving institutional effectiveness. His work with MIDFIELD includes research on obstacles students face that interfere with degree completion and, as well, how institutional policies affect degree programs. His group's work on transfer students, grade inflation, and issues faced across gender and ethnicity have caused institutions to change policies so that they may improve. Awards and publications may be found at <https://engineering.purdue.edu/people/russell.a.long.1>.

Dr. Richard A. Layton P.E., Rose-Hulman Institute of Technology

Richard Layton is a Professor of Mechanical Engineering at Rose-Hulman Institute of Technology. He received a B.S. from California State University, Northridge, and an M.S. and Ph.D. from the University of Washington. His areas of scholarship include student teaming, longitudinal studies of engineering undergraduates, and data visualization. He is a founding developer of the CATME system, a free, web-based system that helps faculty assign students to teams and conduct self- and peer-evaluations. He is a



co-author of the Engineering Communication Manual, an undergraduate text published in 2016 by Oxford Univ. Press. He can occasionally be found playing guitar at a local open mic.

Dr. Catherine E. Brawner, Research Triangle Educational Consultants

Catherine E. Brawner is President of Research Triangle Educational Consultants. She received her Ph.D. in Educational Research and Policy Analysis from NC State University in 1996. She also has an MBA from Indiana University (Bloomington) and a bachelor's degree from Duke University. She specializes in evaluation and research in engineering education, computer science education, teacher education, and technology education. Dr. Brawner is a founding member and former treasurer of Research Triangle Park Evaluators, an American Evaluation Association affiliate organization and is a member of the American Educational Research Association and American Evaluation Association, in addition to ASEE. Dr. Brawner is also an Extension Services Consultant for the National Center for Women in Information Technology (NCWIT) and, in that role, advises computer science and engineering departments on diversifying their undergraduate student population. She remains an active researcher, including studying academic policies, gender and ethnicity issues, transfers, and matriculation models with MIDFIELD as well as student veterans in engineering. Her evaluation work includes evaluating teamwork models, statewide pre-college math initiatives, teacher and faculty professional development programs, and S-STEM programs.

Nichole Ramirez, Purdue University

Nichole Ramirez is a postdoctoral researcher in the School of Engineering Education at Purdue University. She received her Ph.D. in Engineering Education and M.S. in Aviation and Aerospace Management from Purdue University and her B.S. in Aerospace Engineering from The University of Alabama. She is currently the Associate Director of Policy Analysis for the Multi-Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD).

Expanding Access to and Participation in MIDFIELD (Year 2)

Executive Summary

This project is expanding the number of institutions participating in The Multiple-Institution Database for Investigating Longitudinal Development (MIDFIELD). MIDFIELD is a resource enabling the study of students that includes longitudinal, whole population data for multiple institutions. Research using MIDFIELD has already helped to change the conversation in engineering education, recognizing that the appearance of a particularly high rate of attrition is actually the result of a higher-than-typical retention rate, and a replacement rate that is much lower than other disciplines [1]. MIDFIELD results have had a significant impact on thinking about diversity in engineering education, showing that women are as likely as men to persist in engineering, that women follow similar pathways to men if they leave engineering, [2] and that student demographics and outcomes vary by engineering discipline, gender, and race [3, 4, 5, 6, 7, 8, 9, 10] This work has also shown that the way persistence is measured can result in race and gender biases [11]. This research has been recognized with four best paper awards in engineering education journals [1, 5, 6, 11]. The interdisciplinary MIDFIELD research team received the 2013 Women in Engineering Proactive Network (WEPAN) Betty Vetter Award for Research "for exceptional research committed to understanding the intersectionality of race and gender." [12]

The expansion funded by this current NSF grant enables studies using the institution as the level of analysis. This will make it possible to compare the outcomes of institutional policies while controlling for other variables such as selectivity, institutional control, endowment spending per student, and more.

As of October 4, 2017, we have secured participation agreements from 27 institutions in addition to the original 11, bringing the total number of institutions in MIDFIELD to 38. In addition to collecting student record information, we are compiling academic policy information for each partner institution. We have also held workshops at engineering education conferences to educate the broader research community, expanding the network of researchers capable of conducting this research and sharing of innovative research methods in addition to data [13, 14, 15].

In targeting institutions to join MIDFIELD, we are aiming to reflect variability in geographic region, institution size as determined by the number of engineering graduates per year, and institutional control (public or private). Institutions are also targeted that excel or fail at graduating under-represented minorities – plans include adding 5 Historically Black Colleges and Universities (HBCUs), 7 Hispanic Serving Institutions (HSIs), 5 institutions with high Native American populations, and 7 universities with high Asian/Pacific Islander populations.

Whereas the project is designed to recruit a stratified sample of US institutions with engineering programs, institutions interested in joining MIDFIELD can typically be substituted for those originally targeted for recruitment. MIDFIELD partners have the opportunity to conduct peer comparisons, carry out research to inform local policies and practice, and receive unblinded information about their institution from partner researchers.

Ongoing work on the project also includes two other significant efforts:

- Collecting and coding catalogs from each of the partner institutions to document institutional policies during the period of the data collected. A team of students has been trained and is being expanded.
- Promoting access to and research using MIDFIELD to a wider research community. Packages have been designed to facilitate analysis of MIDFIELD using the statistical software R. Sample MIDFIELD data without institutional identifiers and these packages are being shared as open-source.

The status of negotiations with partner institutions is shown in Table 1.

Table 1. Status of negotiations with proposed MIDFIELD partner institutions.

Arizona State University	Commitment letter received. Contact identified. MOU is being reviewed by institutional officials.
Baylor University	Contact identified. MOU is being reviewed by institutional officials.
California Polytechnic Institute, San Luis Obispo	Commitment letter received. Contact identified. MOU is being reviewed by institutional officials.
California State University, Los Angeles	Contact identified. MOU is being reviewed by institutional officials.
Clemson University	Data included already. Data update received, but needs to be revised to be added to MIDFIELD. MOU is being circulated for signature for formalize new partnership.
Colorado State University	MOU executed, data received and being added to MIDFIELD. ICPSR agreement signed.
East Carolina University	MOU executed. Data transmission pending. ICPSR agreement being reviewed by institutional officials.
Elizabethtown College	MOU executed, data received and added to MIDFIELD. ICPSR agreement executed.
Embry-Riddle Aeronautical University (multiple campuses)	Contact identified. MOU signed and includes a commitment to provide data from the Daytona Beach (FL) campus, the Prescott (AZ) campus, and the Online enrollment.
Florida A&M University	Earlier data included. MOU is being reviewed by institutional officials to formalize an extension of the original partnership.
Florida International University	Contact identified. MOU is being reviewed by institutional officials.
Florida State University	Earlier data included. MOU is being reviewed by institutional officials to formalize an extension of the original partnership.
Georgia Institute of Technology	Earlier data included. New contact identified. MOU is being reviewed by institutional officials to formalize an extension of the original partnership.
Grand Valley State University	MOU executed, data received and added to MIDFIELD. ICPSR agreement signed.

Harding University	Contact identified. MOU is being reviewed by institutional officials.
Iowa State University	Contact identified. MOU is being reviewed by institutional officials.
Kansas State University	Contact identified. MOU is being reviewed by institutional officials.
Kennesaw State University	Letter of commitment received from Southern Polytechnic State University before merger. Institutional contact still expresses interest in partnership, which would include Kennesaw State University data from before the merger. MOU is being reviewed by institutional officials.
Louisiana Tech University	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
Michigan State University	Contact identified. MOU is being reviewed by institutional officials.
Michigan Technological University	Contact identified. MOU is being reviewed by institutional officials.
Mississippi State University	Contact identified. MOU is being reviewed by institutional officials.
New York University	Contact identified. MOU is being reviewed by institutional officials.
North Carolina A&T State University	MOU being reviewed to extend original partnership.
North Carolina State University	Earlier data already included. Data update requested. MOU is being circulated to extend the original partnership.
Prairie View A&M University	Contact identified. MOU is being reviewed by institutional officials.
Rice University	Contact identified. MOU is being reviewed by institutional officials.
Rose-Hulman Institute of Technology	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
Rowan University	Contact identified. MOU is being reviewed by institutional officials.
Rutgers University	Letter of intent received. New contact identified. MOU is being reviewed by institutional officials.
San Jose State University	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
South Dakota School of Mines and Technology	MOU signed. Data transmission pending.
South Dakota State University	Contact identified. MOU is being reviewed by institutional officials.
Texas A&M University	Contact identified. MOU is being reviewed by institutional officials.
Texas State University at San Marcos	Contact identified. MOU is being reviewed by institutional officials.

Texas Tech University	Contact identified. MOU is being reviewed by institutional officials.
The Ohio State University	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
Tuskegee University	Contact identified. MOU is being reviewed by institutional officials.
University of Arkansas	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
University of California, Irvine	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
University of Colorado	Data update requested and being gathered. MOU signed to formalize the new partnership.
University of Florida	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials to formalize an extension of earlier partnership.
University of Houston	Contact identified. MOU is being reviewed by institutional officials.
University of Louisville	Contact identified. MOU is being reviewed by institutional officials.
University of Maryland Baltimore County	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
University of Michigan	Contact identified. MOU is being reviewed by institutional officials.
University of Nevada Reno	Contact identified. MOU is being reviewed by institutional officials.
University of North Carolina at Charlotte	MOU executed extending original partnership, ICPSR agreement executed, data received and being added to MIDFIELD.
University of Oklahoma	MOU and ICPSR agreements executed, data received and added to MIDFIELD.
University of Puerto Rico at Mayaguez	Letter of intent received. MOU is being reviewed by institutional officials. Partnership arrangements complicated by climatic, political, and economic events.
University of South Florida	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
University of Southern Maine	Contact identified. MOU is being reviewed by institutional officials.
University of Tennessee	Contact identified. MOU is being reviewed by institutional officials.
University Texas at El Paso	Contact identified. MOU is being reviewed by institutional officials.
University of Pittsburgh	Contact identified. MOU is being reviewed by institutional officials.
University of Virginia	MOU and ICPSR agreement signed. Data received and is being revised.

Utah State University	MOU and ICPSR agreement executed, data received and added to MIDFIELD.
Valparaiso University	MOU signed. Data transmission pending. ICPSR agreement being circulated for review and signature.
Virginia Commonwealth University	Contact identified. MOU is being reviewed by institutional officials.
Wichita State University	Letter of intent received. Contact identified. MOU is being reviewed by institutional officials.
Youngstown State University	Contact identified. MOU is being reviewed by institutional officials.

Acknowledgments

We are grateful for the support of the National Science Foundation through Grant 1545667.

References

- [1] M. W. Ohland, S. D. Sheppard, G. Lichtenstein, O. Eris, D. Chachra, and R. A. Layton, "Persistence, engagement, and migration in Engineering," *J. Eng. Ed.*, vol. 97, no. 3, pp. 259-278, 2008.
- [2] S. M. Lord, M. Madsen Camacho, R. A. Layton, R. A. Long, M. W. Ohland, and M. H. Wasburn. "Who's persisting in engineering? A comparative analysis of female and male Asian, Black, Hispanic, Native American and White students," *J. Women Minorities Science Eng.*, vol. 15, no. 2, pp.167-190, 2009.
- [3] M. Pilotte, M. W. Ohland, S. M. Lord, R. A. Layton, and M. K. Orr, "Student Demographics and Outcomes in Industrial Engineering," *International Journal of Engineering Education*, vol. 33, no. 2A, pp. 506-518, 2017.
- [4] M. K. Orr, S. M. Lord, R. A. Layton, and M. W. Ohland, "Student Demographics and Outcomes in Mechanical Engineering in the U.S.," *International Journal of Mechanical Engineering Education*, vol 42, no. 1, pp. 48-60, 2014.
- [5] S. M. Lord, R. A. Layton, and M. W. Ohland, "Trajectories of Electrical Engineering and Computer Engineering Students by Race and Gender," *IEEE Transactions on Education*, vol. 54, no. 4, pp. 610-618, 2011.
- [6] S. M. Lord, R. A. Layton, and M. W. Ohland, "Multi-institution Study of Student Demographics and Outcomes in Electrical and Computer Engineering in the U.S.A.," *IEEE Transactions on Education*, vol. 58, no. 3, pp. 141-150, 2015.
- [7] C. E. Brawner, S. M. Lord, R. A. Layton, M. W. Ohland, and R. A. Long, "Factors Affecting Women's Persistence in Chemical Engineering," *International Journal of Engineering Education*, vol. 31, no. 6A, pp. 1431-1447, 2015.
- [8] S. M. Lord, R. A. Layton, M. W. Ohland, C. E. Brawner, and R. A. Long, "A Multi-institution Study of Student Demographics and Outcomes in Chemical Engineering," *Chemical Engineering Education*, vol 48, no. 4, pp. 223-230, 2014.
- [9] M. K. Orr, N. M. Ramirez, S. M. Lord, R. A. Layton, and M. W. Ohland, "Student choice and persistence in Aerospace Engineering," *Journal of Aerospace Information Systems (JAIS)*, vol. 12, no. 4, pp. 365-373, 2015.
- [10] M. W. Ohland, S. M. Lord, and R. A. Layton, "Student Demographics and Outcomes in Civil Engineering in the U.S.," *Journal of Professional Issues in Engineering Education and Practice*, vol. 141, no. 4, pp. 1-7, 2015.
- [11] M. W. Ohland, C. E. Brawner, M. M. Camacho, R. A. Layton, R. A. Long, S. M. Lord, and M. H. Wasburn. "Race, gender, and measures of success in Engineering Education," *J. Eng. Educ.*, vol. 100, no. 2, pp. 225-252, 2011.
- [12] 2013 Betty Vetter Award
<http://www.wepan.org/page/WEPANAWardsForm#Betty%20Vetter%20Award%20for%20Research>
- [13] S. M. Lord, Matthew W. Ohland, R. Long, M. K. Orr, C. Brawner, and R. Layton, "Engaging with the Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD): A Special Session" *Proceedings of the 2017 Frontiers in Education Conference*, Indianapolis, IN, October 2017.
- [14] M. W. Ohland, C. Brawner, R. Layton, R. Long, S. M. Lord, and M. K. Orr, "Special Session: Making the Multiple Institution Database for Investigating Engineering

-
- Longitudinal Development (MIDFIELD) More Accessible to Researchers” *Proceedings of the 2016 Frontiers in Education Conference*, Erie, PA, October 2016.
- [15] M. Ohland, S. Lord, R. Long, and M. Orr, “Exploring and Learning from Longitudinal Student Unit-record Data, Workshop U414E,” *American Society for Engineering Education 2016 Annual Conference*, New Orleans, LA, June 2016.