

CURRICULUM VITAE

HEIDI A. DIEFES-DUX

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EDUCATION

- Ph.D.** **Purdue University, Department of Agricultural and Biological Engineering, West Lafayette, IN** 1997
Specialization: Food Process Engineering
Thesis: A steady-state food process design and analysis program with generalized unit operation models
Committee: Martin Okos, Mark Morgan, Phillip Wankat (Chemical Engineering)
- M.S.** **Cornell University, Department of Food Science, Ithaca, NY** 1992
Thesis: Rheological behavior of frozen-thawed low moisture, part-skim mozzarella cheese
Committee: Syed Rizvi, James Bartsch (Biological and Environmental Engineering)
- B.S.** **Cornell University, Department of Food Science, Ithaca, NY** 1989

PROFESSIONAL EXPERIENCE

Academic Appointments at University of Nebraska - Lincoln

Department of Biological Systems Engineering

Professor of Engineering Education, 2018 - present

Academic Appointments at Purdue University

School of Engineering Education (ENE) (Dept. of Freshman Engineering to 2004)

Visiting Assistant Professor, 1998-1999

Assistant Professor, 1999-2005

Associate Professor of Engineering Education, 2005-2013

Professor of Engineering Education, 2013-2018

Adjunct Professor of Engineering Education, 2018-2021

Department of Curriculum & Instruction, College of Education

Courtesy Appointment, 2005-2018

Department of Agricultural & Biological Engineering (ABE)

Visiting Assistant Professor, 1997-1999
Joint Appointment, 1999-2008

Industrial Positions

Kraft-General Foods International, Tarrytown, New York

Summer and Winter Intern, 1987-1989

Benchtop development of powdered soft drink and pilot plant scale-up, development of laboratory quality control methods and standards, product storage studies, manufacture troubleshooting, literature research on gum systems, executive presentations

AWARDS AND HONORS

- Anne and Frank Kosikowski Award in Food Science, 1992
- GE Foundation Faculty for the Future Incentive Grant, 1994
- Institute of Food Technologists Fellowship, 1994-1995
- Magoon Award – (Purdue) Outstanding Graduate Teaching Assistants and Instructors, 1996
- ASEE – ERM (Education Research & Methods) Apprentice Faculty Grant Award, 1996
- A.A. Potter Best Teacher Award, Freshman Engineering Nominee, 2000, 2002
- Teaching for Tomorrow Award Program, Purdue University, 2001
- Phi Sigma Rho National Sorority Best Faculty Advisor Award, 2002
- (Purdue) Freshman Engineering Best Teacher Award, 2000, 2002
- Murphy Outstanding Teacher Award, Freshman Engineering Nominee (one of Purdue's highest level teaching awards for faculty), 2001, 2003, 2004, 2006
- Murphy Outstanding Teacher Award, College of Engineering Nominee, 2004
- Purdue Research Foundation PRF International Travel Grant, 2004
- Fellow of the (Purdue) Teaching Academy, 2004
- Women & Hi Tech – Leading Light Award (Indiana-based award for contributions in education), 2006
- Seed for Success Award (Purdue recognition for a \$1 million+ research grant), 2009
- (Purdue) College of Engineering Faculty Awards of Excellence – Team Award: INSPIRE Team (for the establishment of a K-12 engineering education research center), 2011
- Purdue Research Foundation International Travel Grant, Malaysia, 2012
- (Purdue) College of Engineering Staff Awards of Excellence – Team Award: First-Year Engineering (for the development of a flipped-classroom model for First-Year Engineering courses), 2013
- (Purdue) Center for Instructional Excellence Faculty Fellowship, 2014-2018
- Fulbright Specialist Candidate, 2014-2019 [see International Experiences]
- (Purdue) School of Engineering Education Leadership Award, 2016
- ASEE Fellow, 2022

SOCIETY MEMBERSHIPS

- Gamma Sigma Delta Honor Society of Agriculture, init. 1992
- Alpha Epsilon Honor Society for Agricultural Engineering, init. 1997
- American Society for Engineering Education (ASEE)
- Research in Engineering Education Network (REEN)
- Institute of Food Technology (IFT)
- American Society of Agricultural and Biological Engineers (ASABE)

PUBLICATIONS

Refereed Journal Publications

1. Diefes, H. A., Rizvi, S. S. H., & Bartsch, J. A. (1993). Rheological behavior of frozen and thawed low-moisture, part-skim mozzarella cheese. *Journal of Food Science*, 58(4), 764-769. doi: 10.1111/j.1365-2621.1993.tb09354.x
2. Diefes, H. A., Okos, M. R., & Morgan, M. T. (2000). Computer-aided process design using food operations oriented design system block library. *Journal of Food Engineering*, 46(2), 99-108.
3. Diefes-Dux, H. A., Samant, C., Johnson, T., & O'Connor, D. (2004). Kirkpatrick's level 1 evaluation of the implementation of a computer-aided process design tool in a senior-level engineering course. *Journal of Engineering Education*, 93(4), 321-331. doi: 10.1002/j.2168-9830.2004.tb00821.x
4. Diefes-Dux, H. A., Hjalmarson, M., Zawojewski, J. S., & Bowman, K. (2006). Quantifying aluminum crystal size part 1: The Model-Eliciting Activity. *Journal of STEM Education: Innovations and Research*, 7(1&2), 51-63.
5. Hjalmarson, M., Diefes-Dux, H. A., Bowman, K., & Zawojewski, J. S. (2006). Quantifying aluminum crystal size part 2: The Model-Development Sequence. *Journal of STEM Education: Innovations and Research*, 7(1&2), 64-73.
6. Huang, D. W., Huang, R. W., Diefes-Dux, H. A., & Imbrie, P. K. (2006). A preliminary validation of Attention, Relevance, Confidence and Satisfaction model-based Instructional Material Motivational Survey in a computer-based tutorial setting. *British Journal of Educational Technology*, 37(2), 243-259. doi: 10.1111/j.1467-8535.2005.00582.x
7. Diefes-Dux, H. A., Dyehouse, M., Bennett, D., & Imbrie, P. K. (2007). Nanotechnology awareness of first-year food and agriculture students following a brief exposure. *Journal of Natural Resources and Life Sciences Education*, 36, 58-65.
8. Dyehouse, M., Diefes-Dux, H. A., Bennett, D., & Imbrie, P. K. (2008). Development of an instrument to measure undergraduates' nanotechnology awareness, exposure, motivation, and knowledge. *Journal of Science Education and Technology*, 17(5), 500-510.
9. Hjalmarson, M. A. & Diefes-Dux, H. (2008). Teacher as designer: A framework for teacher analysis of mathematical Model-Eliciting Activities. *International Journal of Problem-Based Learning*, 2(1), 57-78. <https://doi.org/10.7771/1541-5015.1051>
10. Wujczyk, L., Capobianco, B. M., & Diefes-Dux, H. (2010). Integrating the engineering design process in the kindergarten science classroom. *The Michigan Science Teacher Association Journal*, 55(1), 36-45.

11. Diefes-Dux, H. A., Zawojewski, J. S., & Hjalmarson, M. A. (2010). Using educational research in the design of evaluation tools for open-ended problems. *International Journal of Engineering Education*, 26(4), 807-819.
12. Verleger, M., Diefes-Dux, H., Ohland, M. W., Besterfield-Sacre, M., & Brophy, S. (2010). Challenges to informed peer review matching algorithms. *Journal of Engineering Education*, 99(4), 397-408. doi: 10.1002/j.2168-9830.2010.tb01070.x
13. Capobianco, B., Diefes-Dux, H. A., Mena, I., & Weller, J. (2011). What is an engineer? Implications of elementary school student conceptions for engineering education. *Journal of Engineering Education*, 100(2), 304-328. doi: 10.1002/j.2168-9830.2011.tb00015.x
14. Duncan, D., Diefes-Dux, H. A., & Gentry, M. (2011). Professional development through engineering academies: An examination of elementary teachers' recognition and understanding of engineering. *Journal of Engineering Education*, 100(3), 520 -539. doi: 10.1002/j.2168-9830.2011.tb00025.x
15. Weber, N.; Duncan, D.; Dyehouse, M.; Strobel, J.; & Diefes-Dux, H. A. (2011). The development of a systematic coding system for elementary students' drawings of engineers. *Journal of Pre-College Engineering Education Research (J-PEER)*, 1(1), 49-62. <https://doi.org/10.7771/2157-9288.1030>
16. Diefes-Dux, H. A., Zawojewski, J. S., Hjalmarson, M., & Cardella, M. (2012). A framework for analyzing feedback in a formative assessment system for mathematical modeling problems. *Journal of Engineering Education*, 101(2), 375-406. doi: 10.1002/j.2168-9830.2012.tb00054.x
17. Mena, I. B. & Diefes-Dux, H. A. (2012). First-year engineering students' portrayal of engineering in a proposed museum exhibit for middle school students. *Journal of Science Education and Technology*, 21(2), 304-316. DOI: 10.1007/s10956-011-9325-0
18. Capobianco, B. M., French, B. F., & Diefes-Dux, H. A. (2012). Engineering identity development among pre-adolescent learners. *Journal of Engineering Education*, 101(4), pp. 698–716. doi: 10.1002/j.2168-9830.2012.tb01125.x
19. Mena, I. B., Diefes-Dux, H. A., & Capobianco, B. (2013). Socialization experiences from engineering teaching assistantships. *The Journal of Higher Education*, 84(2), 189-212.
20. Diefes-Dux, H. A., Hjalmarson, M. A., & Zawojewski, J. S. (2013). Student team solutions to an open-ended mathematical modeling problem: Gaining insights for educational improvement. *Journal of Engineering Education*, 102(1), 179-216. doi: 10.1002/jee.20002
21. Yoon, S. Y., Diefes-Dux, H., & Strobel, J. (2013) First-year effects of an engineering professional development program on elementary teachers. *American Journal of Engineering Education (Special Issue: K-12 STEM Education)*, 4(1), 67-84.
22. Yoon, S. Y., Dyehouse, M., Lucietto, A. M., Diefes-Dux, H. A. & Capobianco, B. (2014). The effects of integrated science, technology, and engineering education on elementary students' knowledge and identity development. *School Science and Mathematics*, 114(8), 380-391. doi: 10.1111/ssm.12090
23. Rodgers, K. J., Horvath, A. K., Jung, H., Fry, A. S., Diefes-Dux, H., & Cardella, M. E. (2014). Students' perceptions of and responses to teaching assistant and peer feedback. *Interdisciplinary Journal of Problem-based Learning*, 9(2). <http://dx.doi.org/10.7771/1541-5015.1479>

24. Diefes-Dux, H. A. (2015). Introducing engineering in elementary education: a five-year study of teachers and students. *British Journal of Educational Technology*, 46(5), 1015-1019. doi:10.1111/bjet.12319
25. Jung, H., Horvath, A. K., Diefes-Dux, H. A., Rodgers, K. J., & Cardella, M. E. (2015). Characteristics of feedback that influence student confidence and performance during mathematical modeling. *International Journal of Engineering Education*, 31(1A), 42-57.
26. Douglas, K. A., Rynearson, A., & Diefes-Dux, H. (2016). Two elementary schools' developing potential for sustainability of engineering education. *International Journal of Technology and Design Education*, 26(3), 309-334. doi: 10.1007/s10798-015-9313-4
27. Cardella, M. E., Diefes-Dux, H. A., & Marbouti, F. (2016). Written feedback on design: a comparison of students and educators. *International Journal of Engineering Education*, 32(3B), 1481-1491. [Special Issue for Mudd Design Workshop IX]
28. Kartal, O., Dunya, B. A., Diefes-Dux, H. A., & Zawojewski, J. S. (2016). The relationship between students' performance on conventional standardized mathematics assessments and complex mathematical modeling problems. *International Journal of Research in Education and Science*, 2(1), 239-252.
29. Marbouti, F., Diefes-Dux, H. A., & Madhavan, K. (2016). Models for early prediction of at-risk students in a course using standards-based grading. *Computers & Education*, 103(December 2016), 1-15. doi: 10.1016/j.compedu.2016.09.005
30. Verleger, M. A., Rodgers, K. J., & Diefes-Dux, H. A. (2016). Selecting effective samples to train students for artifact peer review. *Journal of Engineering Education*, 105(4), 585-604. doi: 10.1002/jee.20148 [**Honorable Mention for the 2017 William Elgin Wickenden Award of ASEE**]
31. Douglas, K. A., Mihalec-Adkins, B. P., Hicks, N. M., Diefes-Dux, H. A., Bermel, P., & Madhavan, K. (2017). Learners in advanced nanotechnology MOOCs: Understanding their intention and motivation. *Computers in Education*, 8(1), 94 – 105. <https://www.asee.org/papers-and-publications/publications/division-publications/computers-in-education-journal/volume-xxvii> [Invited ASEE paper Douglas et al., 2016].
32. Kong, Y., Diefes-Dux, H. A., Douglas, K. A., & Madhavan, K. (2017). Size and scale framework and assessment for first-year engineering students. *Journal of Engineering Education*, 106(3), 431-453. doi: 10.1002/jee.20172
33. Pyrialakou, V. D., Diefes-Dux, H. A., & Gkritza, K. (2017). Use of the TRB research needs statement database in an introductory transportation course. *Transportation Research Record*, 2614, 10-17. <https://doi.org/10.3141/2614-02>
34. Lee, E., Carberry, A., Diefes-Dux, H. A., & Atwood, S. (2018). Faculty perception before, during, and after implementation of standards-based grading. *Australasian Journal of Engineering Education*, 23(2): 53-61. doi: 10.1080/22054952.2018.1544685 [Special Issue for extended REES 2017 papers]
35. Marbouti, F., Shafaat, A., Ulas, J., & Diefes-Dux, H. A. (2018). Relationship between time of class and students' grades in an active learning course. *Journal of Engineering Education*, 107(3), 468-490. <http://dx.doi.org/10.1002/jee.20221>
36. Yoon, S. Y., Kong, Y., Diefes-Dux, H. A., & Strobel, J. (2018). Broadening K-8 teachers' perspectives on professional development in engineering integration in the United States. *International Journal of Research in Education and Science (IJRES)*, 4(2), 331-348. doi: 10.21890/ijres.409263

37. Diefes-Dux, H. A. (2019). Student self-reported use of standards-based grading resources and feedback. *European Journal of Engineering Education*, 44(6), 838-849, doi: 10.1080/03043797.2018.1483896 [Special Issue for extended REES 2017 papers; First appeared online in 2018].
38. Marbouti, F., Mendoza-Garcia, J., Diefes-Dux, H. A., & Cardella, M. E. (2019). Written feedback provided by first-year engineering students, undergraduate teaching assistants, and educators on design project work. *European Journal of Engineering Education*, 44(1-2), 179-195. doi: 10.1080/03043797.2017.1340931 [Special Issue for extended REES 2015 papers; First appeared online July 2017]
39. Douglas, K. A., Zielinski, M. W., Merzdorf, H., Diefes-Dux, H. A., & Bermel, P. (2019). Meaningful learner information for MOOC instructors examined through contextualized evaluation framework. *International Review of Research in Open and Distributed Learning*, 20(1). <https://doi.org/10.19173/irrodl.v20i1.3717>
40. Zakharov, W., Strobel, J., & Diefes-Dux, H. A. (2020). Teacher level factors and student achievement in a cyber-enabled engineering education professional development program. *International Journal of Research in Education and Science (IJRES)*, 6(1), 48-60.
41. Diefes-Dux, H. A. (2021). Discipline-based education research to advance authentic learning in agricultural and biological engineering. *Transactions of the ASABE*, 64(3), 987-995. <https://doi.org/10.13031/trans.14422> [Invited Frontier Paper]
42. Diefes-Dux, H. A., & Cruz Castro, L. M. (2022). Reflection types and students' viewing of feedback in a first-year engineering course using Standards-Based Grading. *Journal of Engineering Education*, 111(2), 283-307. 10.1002/jee.20452

Shorter Communications, Letters, Notes, or Briefs in Refereed Journals

1. Berger, E. J., Diefes, H. A., Hamaker, K. H., Jones, J. D., McComb, S. A., Mulkay, E. L., & Oakes, W. C. (1998). ASEE Student Chapters: An Engineering Pipeline for Higher Education. *Journal of Engineering Education*, 87(3), 231-234. doi: 10.1002/j.2168-9830.1998.tb00348.x

Refereed Conference Proceedings

1. Diefes, H., Okos, M. R., & Morgan, M. T. (1996). The use of a computer-aided steady state food process design package for solution of closed-ended problems. *Proceedings of the ASEE (American Society for Engineering Education) Illinois/Indiana Section Meeting, Peoria, IL.*
2. Diefes, H., Okos, M. R., & Morgan, M. T. (1997). Computer-aided portfolio approach to food engineering design throughout the curriculum. *COFE '97 - New Frontiers in Food Engineering. Proceedings of the Fifth Conference on Food Engineering, Los Angeles, CA.*
3. Diefes, H. (1999). Teaching undergraduate engineering students to perform critical evaluation. *Proceedings of the ASEE Illinois/Indiana Section Meeting, DeKalb, IL.*
4. LeBold, W. K., Diefes, H., & Oakes, W. C. (1999). Helping first year students make critical decisions. *Proceedings of the 106th ASEE Annual Conference & Exposition, Charlotte, NC.*
5. Diefes, H. A. & Haghghi, K. (2000). Development and implementation of an ABET-compliant course profile & assessment model. *Proceedings of the 107th ASEE Annual Conference & Exposition, St. Louis, MO.*

6. Diefes-Dux, H. & Haghghi, K. (2001). Implementing change: A model for closing the continuous improvement loop the first time and every time. *Proceedings of the 108th ASEE Annual Conference & Exposition, Albuquerque, NM.*
7. Diefes-Dux, H. & Haghghi, K. (2001). Web-based technology for long-term program assessment. *Proceedings of the 108th ASEE Annual Conference & Exposition, Albuquerque, NM.*
8. Diefes-Dux, H., LeBold, W., Oakes, W., & Imbrie, P. K. (2001). A comprehensive beginning engineering student assessment program. *Proceedings of the 108th ASEE Annual Conference & Exposition, Albuquerque, NM.*
9. Diefes-Dux, H. (2002). Does a successful mathematics bridge program make for successful students? *Proceedings of the 109th ASEE Annual Conference & Exposition, Montreal, Canada.*
10. Daku, B. L. F. & Diefes-Dux, H. A. (2002). Implementation of a method to assess student progress/performance in an interactive, internet-based, self-learning tool. *International Conference on Engineering Education 2002, Manchester, UK.*
11. Montgomery, R., Follman, D., & Diefes-Dux, H. (2003). First year seminars in engineering excitement. *Proceedings of the 2003 ASEE IL/IN Section Meeting, Valparaiso, IN.*
12. Diefes-Dux, H., Follman, D., Montgomery, R., & Oakes, W. (2003). Tips for teaching obscenely large lectures. *Proceedings of the 110th ASEE Annual Conference & Exposition, Nashville, TN.*
13. Montgomery, R. E. & Diefes-Dux, H. A. (2003). Laptops in the lecture to promote active learning. *Proceedings of the 110th ASEE Annual Conference & Exposition, Nashville, TN.*
14. Montgomery, R., Follman, D., & Diefes-Dux, H. (2003). Relative effectiveness of different first-year engineering seminars. *Proceedings of the 33rd ASEE/IEEE Frontiers in Education Conference, Boulder, CO.*
15. Diefes-Dux, H., Follman, D., Imbrie, P. K., Zawojewski, J., Capobianco, B., & Hjalmarson, M. (2004). Model Eliciting Activities: An in-class approach to improving persistence and retention of women in engineering. *Proceedings of the 111th ASEE Annual Conference & Exposition, Salt Lake City, UT.*
16. Katehi, L. P. B., Banks, K., Diefes-Dux, H. A., Follman, D. K., Gaunt, J., Haghghi, K., Imbrie, P. K., Jamieson, L. H., Montgomery, R. E., Oakes, W. C., & Wankat, P. (2004). A new framework for academic reform in engineering education. *Proceedings of the 111th ASEE Annual Conference & Exposition, Salt Lake City, UT.*
17. Katehi, L., Banks, K., Diefes-Dux, H., Follman, D., Gaunt, J., Haghghi, K., Imbrie, P. K., Montgomery, R., Oakes, W., & Wankat, P. (2004). Development of graduate programs in engineering education. *Proceedings of the 111th ASEE Annual Conference & Exposition, Salt Lake City, UT.*
18. Katehi, L. P. B., Banks, K., Diefes-Dux, H. A., Follman, D. K., Gaunt, J., Haghghi, K., Imbrie, P. K., Jamieson, L. H., Montgomery, R. E., Oakes, W. C., & Wankat, P. (2004). Preeminence in first-year engineering programs. *Proceedings of the 111th ASEE Annual Conference & Exposition, Salt Lake City, UT.*
19. Diefes-Dux, H. A., Moore, T., Zawojewski, J., Imbrie, P. K., & Follman, D. (2004). A framework for posing open-ended engineering problems: Model Eliciting Activities. *Proceedings of the 34th ASEE/IEEE Frontiers in Education Conference, Savannah, GA.*

20. Moore, T. & Diefes-Dux, H. A. (2004). Developing Model-Eliciting Activities for undergraduate students based on advanced engineering content. *Proceedings of the 34th ASEE/IEEE Frontiers in Education Conference, Savannah, GA.*
21. Huang, D. W., Diefes-Dux, H. A., Imbrie, P. K., Daku, B., & Kallimani, J. (2004). Learning motivation evaluation of a computer-based instructional tutorial using ARCS motivational design model. *Proceedings of the 34th ASEE/IEEE Frontiers in Education Conference, Savannah, GA.*
22. Diefes-Dux, H. A., Imbrie, P. K., Haghighi, K., Lee, G., Wereley, S., & Wankat, P. (2004). Nanotechnology exposure in a first-year engineering program. *Proceedings of the iCEER 2004 International Conference on Engineering Education and Research, Olomouc, Czech Republic.*
23. Verleger, M., Diefes-Dux, H. A., Rickus, J., & Schaffer, S. (2005). An online bioengineering learning module: phylogenetic relationships. *Proceedings of the ASEE Illinois/Indiana Section Meeting, Dekalb, IL.*
24. Imbrie, P. K., Diefes-Dux, H. A., & Moore, T. (2005). First-year engineering themed seminar: A mechanism for conveying the interdisciplinary nature of engineering. *Proceedings of the 112th ASEE Annual Conference & Exposition, Portland, OR.*
25. Verleger, M., Diefes-Dux, H., Rickus, J., & Schaffer, S. (2005). Drag the green ion - An interactive online quantitative cellular biology learning module. *Proceedings of the 112th ASEE Annual Conference & Exposition, Portland, OR.*
26. Moore, T., Diefes-Dux, H. A., & Imbrie, P. K. (2005). Developing first-year students' perceptions of the engineering profession through realistic, client-driven problems. *Proceedings of the 35th ASEE/IEEE Frontiers in Education Conference, Indianapolis, IN.*
27. Verleger, M., Diefes-Dux, H. A., Rickus, J., & Schaffer, S. (2005). An online bioengineering learning module: gene regulation. *Proceedings of the 35th ASEE/IEEE Frontiers in Education Conference, Indianapolis, IN.*
28. Diefes-Dux, H., Adams, R., Cox, M., & Follman, D., (2006). Community building and identity development through graduate coursework in engineering education. *Proceedings of the 113th ASEE Annual Conference & Exposition, Chicago, IL.*
29. Moore, T., Diefes-Dux, H., & Imbrie, P. K. (2006). The quality of solutions to open-ended problem solving activities and its relation to first-year student team effectiveness. *Proceedings of the 113th ASEE Annual Conference & Exposition, Chicago, IL.*
30. Verleger, M., Diefes-Dux, H., & Rickus, J. (2006). Kevin Bacon, tactical warfare, and protein networks -An interactive online quantitative cellular biology learning module. *Proceedings of the 113th ASEE Annual Conference & Exposition, Chicago, IL.*
31. Capobianco, B., Diefes-Dux, H., & Oware, E. (2006). Engineering a professional community of practice for graduate students in engineering education. *Proceedings of the 36th ASEE/IEEE Frontiers in Education Conference, San Diego, CA.*
32. Cox, M., Diefes-Dux, H. A., & Lee, J. (2006). Student development of an undergraduate curriculum for international first-year engineering students. *Proceedings of the 36th ASEE/IEEE Frontiers in Education Conference, San Diego, CA.*
33. Moore, T., Diefes-Dux, H. A., & Imbrie, P. K. (2006). Assessment of team effectiveness during complex mathematical modeling tasks. *Proceedings of the 36th ASEE/IEEE Frontiers in Education Conference, San Diego, CA.*

34. Oware, E., Diefes-Dux, H. A., & Capobianco, B. (2006). Graduate students' evolving ideas on engineering education and engineering educators. *Proceedings of the 36th ASEE/IEEE Frontiers in Education Conference, San Diego, CA.*
35. Moore, T., Diefes-Dux, H. A., & Imbrie, P. K. (2007). How team effectiveness impacts the quality of solutions to open-ended problems. *Proceedings of the International Conference on Research in Engineering Education (ICREE), Honolulu, HI.*
36. Duncan, D., Oware, E., Cox, M., & Diefes-Dux, H. (2007). Program and curriculum assessment for the institute for P-12 engineering research and learning (INSPIRE) summer academies for P-6 teachers. *Proceedings of the 114th ASEE Annual Conference & Exposition, Honolulu, HI.*
37. Moore, T., Diefes-Dux, H., & Imbrie, P. K. (2007). Spontaneous groups versus long-term teams: An investigation using complex problem solving in a first-year engineering course. *Proceedings of the 114th ASEE Annual Conference & Exposition, Honolulu, HI.*
38. Oware, E., Capobianco, B., & Diefes-Dux, H. (2007). Gifted students' perceptions of engineers – A study of students in a summer outreach program. *Proceedings of the 114th ASEE Annual Conference & Exposition, Honolulu, HI.*
39. Oware, E., Diefes-Dux, H. A., & Adams, R. A. (2007). Photo-elicitation as a research methodology for investigating conceptions of engineering. *Proceedings of the 6th Annual ASEE Global Colloquium on Engineering Education, Istanbul, Turkey.*
40. Lambert, M., Diefes-Dux, H. A., Beck, M., Duncan, D., Oware, E., & Nemeth, R. J. (2007). What is engineering? – An exploration of P-6 grade teachers' perspectives. *Proceedings of the 37th ASEE/IEEE Frontiers in Education Conference, Milwaukee, WI.*
41. Oware, E., Capobianco, B., & Diefes-Dux, H. A. (2007). Young children's perceptions of engineering before and after a summer engineering outreach course. *Proceedings of the 37th ASEE/IEEE Frontiers in Education Conference, Milwaukee, WI.*
42. Guerra, R. C., Cox, M., & Diefes-Dux, H. (2008). Development of a pedagogically-focused course for engineering graduate teaching assistants. *Proceedings of the 115th ASEE Annual Conference & Exposition, Pittsburg, PA.*
43. McNeill, N., Cox, M., Diefes-Dux, H., Medley, T., & Hayes, J. (2008). Development of an instrument to collect pedagogical data from graduate teaching assistants within engineering laboratories. *Proceedings of the 115th ASEE Annual Conference & Exposition, Pittsburg, PA.*
44. Verleger, M. & Diefes-Dux, H. (2008). Impact of feedback and revision on student team solutions to Model-Eliciting Activities. *Proceedings of the 115th ASEE Annual Conference & Exposition, Pittsburg, PA.*
45. Capobianco, B. M., Diefes-Dux, H. A., & Habashi, M. M. (2009). Generating measures of engineering identity development among young learners. *Proceedings of the 39th ASEE/IEEE Frontiers in Education Conference, San Antonio, TX.*
46. Diefes-Dux, H. A. & Verleger, M. A. (2009). Student reflections on peer reviewing solutions to Model-Eliciting Activities. *Proceedings of the 39th ASEE/IEEE Frontiers in Education Conference, San Antonio, TX.*
47. Salim, A. & Diefes-Dux, H. A. (2009). Problem identification during Model-Eliciting Activities: Characterization of first-year students' responses. *Proceedings of the Research in Engineering Education Symposium, Palm Cove, QLD, Australia.*

48. Beck, M., Diefes-Dux, H., & Reed-Rhoads, T. (2009). K-12 school counselors: A pilot study of support needs for advising students about engineering. *Proceedings of the 116th ASEE Annual Conference & Exposition, Austin, TX.*
49. Cardella, M., Diefes-Dux, H., Oliver, A., & Verleger, M. (2009). Insights into the process of providing feedback to students on open-ended problems. *Proceedings of the 116th ASEE Annual Conference & Exposition, Austin, TX.*
50. Diefes-Dux, H., Verleger, M., Zawojewski, J., & Hjalmarson, M. (2009). Multi-dimensional tool for assessing student team solutions to Model-Eliciting Activities. *Proceedings of the 116th ASEE Annual Conference & Exposition, Austin, TX.*
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160. Panther, G., & Diefes-Dux, H. A. (2022). A case study of engineering instructor adaptability through evidence of course complexity changes. *Proceedings of the 50th SEFI (European Society for Engineering Education) Annual Conference, Barcelona, Spain*.
161. Atkinson, L., Panther, G., & Diefes-Dux, H. A. (2022). Behavioral adaptability of engineering faculty instructors engaging in emergency remote teaching during three semesters of the COVID-19 pandemic. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*.
162. Bobbett, D., Panther, G., & Diefes-Dux, H. A. (2022). Engineering faculty experience during emergency remote teaching & beyond: A case study. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*.
163. Brijmohan, Y., Panther, G., & Diefes-Dux, H. A. (2022). University engineering instructors' expressions of individual adaptability during a semester of emergency remote teaching. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*.
164. McArthur, M., Diefes-Dux, H. A., Erdogmus, E., Ryherd, E., & Armwood-Gordon, C. (2022). Impact of a VR/AR module on first-year students' understanding of Architectural Engineering: A comparison across demographics. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*.
165. Ney, K., Strattman, E., & Diefes-Dux, H. A. (2022). Low and high performing first-year engineering students' learning and metacognitive strategies. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*. **[First-year Programs Division (FPD) 2nd Place Best Paper Award]**
166. Singh, A., & Diefes-Dux, H. A. (2022). Students' metacognitive strategies revealed through reflections on their learning of process engineering concepts and skills. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*.

[Biological and Agricultural Engineering Division (BAE) 1st Place Best Paper Award]

167. Stratman, E., & Diefes-Dux, H. A. (2022). Impact of differently worded reflection prompts on engineering students' metacognitive strategies. *Proceedings of the 127th ASEE Annual Conference and Exposition, Minneapolis, MN*. **[New Engineering Educators Division (NEE) 3rd Place Best Paper Award]**

Conference Abstracts and Presentations

1. Diefes, H. A., Okos, M. R., & Morgan, M. T. (1997). A steady state food process design and analysis program with generalized unit operations. *Proceedings of the IFT Annual Meeting + Food Expo, Orlando, FL*.
2. Hjalmarson, M., Diefes-Dux, H., & Lesh, R. (2003). Data analysis in context by first-year engineering students. Presentation at the *seventh annual Conference on Research in Undergraduate Mathematics Education, Scottsdale, AZ*.
3. Capobianco, B., Zawojewski, J., & Diefes-Dux, H. A. (2004). Small group mathematical modeling in engineering: A case of collaboration. Paper presented at the *American Educational Research Association Annual Meeting, San Diego, CA*.
4. Mena, I., Diefes-Dux, H., Capobianco, B. (2010). Socialization experiences resulting from engineering teaching assistantships at Purdue University. Presentation at the *35th Annual POD (Professional and Organizational Development) Network in Higher Education Conference, St. Louis, MO*.
5. Merugureddy, R., Cardella, M. E., Diefes-Dux, H. A., & Salim, A. (2011). TAs' experiences with providing feedback on open-ended model eliciting problems. An extended abstract in the *Proceedings of the Industrial Engineering Research Conference, Reno, NV*.
6. Dyehouse, M., Yoon, S. Y., Lucietto, S., Diefes-Dux, H. A., & Capobianco, B. (2012). Measuring elementary students' science and engineering content knowledge: Development of an instrument to assess the effects of an engineering teacher professional development program. A paper presentation at the *National Association for Research in Science Teaching International Conference, Indianapolis, IN*.
7. Douglas, K. A. & Diefes-Dux, H. A. (2013). The relationship between teacher self-efficacy and student engineering identity: An HLM model. Paper presented at the *National Association for Research in Science Teaching (NARST) International Conference, Rio Grande, Puerto Rico*.
8. Jung, H., Rodgers, K. J., Diefes-Dux, H. A., & Cardella, M. E. (2013). Effect of feedback on students' performance and confidence during mathematical modeling. Paper presented at the *American Educational Research Association Annual Meeting, San Francisco, CA*.
9. Rodgers, K. J., Jung, H., Diefes-Dux, H. A., & Cardella, M. E. (2013). Comparative analysis of feedback from undergraduate and graduate teaching assistants on open-ended problems. Paper presented at the *American Educational Research Association Annual Meeting, San Francisco, CA*.
10. Yoon, S. Y., Diefes-Dux, H., Douglas, K. A., & Strobel, J. (2013). First-year effect of the engineering professional development program on teachers. Paper presented at the *American Educational Research Association Annual Meeting, San Francisco, CA*.

11. Marbouti, F., Cardella, M. F. & Diefes-Dux, H. A. (2015). A framework to analyze feedback on students' design work. Paper presented at the *American Educational Research Association Annual Meeting, Chicago, IL*.
12. Cardella, M. E., Diefes-Dux, H. A., & Marbouti, F. (2015). Written feedback on design: a comparison of students and educators. *Presentation at the Mudd Design Workshop IX, Harvey Mudd College, Claremont, CA*.
13. Faltens, T. A., Diefes-Dux, H., Douglas, K. A., Coughlan, A., Johnson, D. R., & Strachan, A. (2015). Development of a molecular dynamics simulation lab on nanoHUB to enhance student understanding of the atomic nature of plastic deformation. *Presentation at the 6th North American Materials Education Symposium, Ohio State University, Columbus, OH*. <http://www.materials-education.com/2015/na/program.htm>
14. Diefes-Dux, H. A., & Bonem, E. (2016). Adoption of a university-wide faculty teaching development program: necessary conditions. *Presentation at the 41st Conference of the Professional and Organizational Development (POD) Network in Higher Education, Louisville, KY*.
15. Marbouti, F., Diefes-Dux, H. A., & Madhavan, K. (2017). Utilizing visualization and feature selection methods to identify important learning objectives in a course. *Presentation at the 7th International Learning Analytics and Knowledge (LAK) Conference, Vancouver, British Columbia, Canada*. doi: 10.1145/3027385.3029450
16. Norton, T., Brown-Brandl, T., Panagakis, P., Cruz, V., Diefes-Dux, H., & Calvet, S. (2022). Educating for Precision Livestock Farming: The knowledge, skills and abilities to meet future industry and societal needs. *Proceedings of the 10th European Conference on Precision Livestock Farming ECPLF 2022, Vienna, Austria*.

Books

1. Zawojewski, J. S., Diefes-Dux, H. A., & Bowman, K. J. (Eds.) (2008). *Models and modeling in Engineering Education: Designing experiences for all students*. Rotterdam, the Netherlands: Sense Publishers.

Book Chapters

1. Diefes, H. A. (1999). Computer tools for engineers. In *Engineering Your Future* (pp. 317-347). Wildwood, MO: Great Lakes Press, Inc.
2. Daku, B. L. F. & Diefes-Dux, H. A. (2003). An effective system for implementing self-learning, on-line instruction for engineering students. In W. Aung et al. (Eds.), *Innovations 2003: world innovations in engineering education and research*. Arlington, VA: iNEER (International Network for Engineering Education and Research).
3. Diefes-Dux, H. A., Hjalmarson, M. A., Miller, T. K., & Lesh, R. (2008). Chapter 2: Model-Eliciting Activities for engineering education. In J. S. Zawojewski, H. A. Diefes-Dux, & K. J. Bowman (Eds.), *Models and modeling in Engineering Education: Designing experiences for all students* (pp. 17-35). Rotterdam, the Netherlands: Sense Publishers.
4. Hjalmarson, M. A., Diefes-Dux, H. A., & Moore, T. J. (2008). Chapter 3: Designing modeling activities for engineering. In J. S. Zawojewski, H. A. Diefes-Dux, & K. J. Bowman (Eds.), *Models and modeling in Engineering Education: Designing experiences for all students* (pp. 37-54). Rotterdam, the Netherlands: Sense Publishers.

5. Diefes-Dux, H. A. & Imbrie, P. K. (2008). Chapter 4: Modeling activities in a first-year engineering course. In J. S. Zawojewski, H. A. Diefes-Dux, & K. J. Bowman (Eds.), *Models and modeling in Engineering Education: Designing experiences for all students* (pp. 55-92). Rotterdam, the Netherlands: Sense Publishers.
6. Diefes-Dux, H. A., Osburn, K., Capobianco, B. M., & Wood, T. (2008). Chapter 12: On the front line – Learning from the teaching assistants. In J. S. Zawojewski, H. A. Diefes-Dux, & K. J. Bowman (Eds.), *Models and modeling in Engineering Education: Designing experiences for all students* (pp. 225-255). Rotterdam, the Netherlands: Sense Publishers.
7. Diefes-Dux, H. A. & Capobianco, B. M. (2008). Chapter 13: Learning from a faculty self-study. In J. S. Zawojewski, H. A. Diefes-Dux, & K. J. Bowman (Eds.), *Models and modeling in Engineering Education: Designing experiences for all students* (pp. 257-270). Rotterdam, the Netherlands: Sense Publishers.
8. Diefes-Dux, H. A., Whittenberg, L., & McKee, R. (2013). Mathematical modeling at the intersection of elementary mathematics, art, and engineering education. In L. D. English & J. T. Mulligan (Eds.), *Reconceptualizing Early Mathematics Learning, Advances in Mathematics Education* (pp. 309-325). Dordrecht: Springer Science+Business Media. DOI 10.1007/978-94-007-6440-8_15.
9. Diefes-Dux, H. A. (2014). In-service teacher professional development in engineering education: early years. In S. Purzer, J. Strobel, & M. E. Cardella (Eds.), *Engineering in pre-college settings: synthesizing research, policy, and practices* (pp. 233-257). West Lafayette, IN: Purdue Press.
10. Hjalmarson, M., & Diefes-Dux, H. (2017). Teacher as designer: A framework for analysis of mathematical model-eliciting activities. In T. Brush & J. W. Saye (Eds.), *Successfully implementing problem-based learning in classrooms: research in K-12 and Teacher Education*. (pp. 135-162). West Lafayette, IN: Purdue University Press.
11. Panther, G., & Diefes-Dux, H. A. (accepted). Workplace learning and adaptability frameworks for conceptualizing faculty development. In S. M. Linder, C. Lee, & K. High (Eds.), *Handbook of STEM faculty development*. (pp. X-Y). Charlotte, NC: Information Age Publishing.

Invited Publications and Presentations (see also International Experiences)

1. “Computer-Aided Process Design & Analysis Tool for Research, Industry, and Education” Cornell University – Food Science Graduate Seminar; Fall 1998.
2. “Invited Speakers Addressing EC 2000 Objectives, Outcomes, and Assessment Procedures” (co-presenter Kamyar Haghighi), *ASAE Annual International Meeting*, Sacramento, CA., July 2001.
3. “ABET Compliant Course Evaluation & Assessment Model” (co-presenter Kamyar Haghighi) *Best Assessment Processes III, A Working Symposium*, Terra-Haute, IN, March 2000.
4. “Closing the Loop 101” (co-presenter Kamyar Haghighi), *Best Assessment Processes IV, A Working Symposium*, Terra-Haute, IN, April 2001.
5. “Attaining Consistent Instruction in a Peer Led Freshman Engineering Seminar through Development of a Peer Leader Training Course” (co-presenter Jennifer Donahoe), *Annual Conference on the First-Year Experience*, Kissimmee, FL, February 2002.

6. “Transforming the Traditional First-Year Experience Course: Implementing Special Interest Programs” (co-presenter Jennifer Donahoe), *Annual Conference on the First-Year Experience*, Atlanta, GA, February 2003.
7. “Two for Purdue” (co-presenter David Dux), Purdue Graduate School, November 2004
8. “Creating New Schools of Engineering Education” (co-presenter P. K. Imbrie), *ASEE National Conference*, Salt Lake City, UT, June 2004.
9. “Adapting *Engineering is Elementary* Professional Development to Encourage Open-Ended Mathematical Modeling. Committee on K-12 Engineering Education” (co-author Daphne Duncan), National Academy of Engineering, National Research Council, *Workshop and Third Meeting, Engineering Education in Grades K-5*, Keck Center of the National Academies, Washington, DC, Oct. 22, 2007.
10. “Backward Design Lesson Plan Development” and “Learning Theories” (co-presenter Irene Mena) guest lecture for CHE 597 – Chemical Engineering Teaching Experience, Fall 2009.
11. School of Engineering Education Seminar
 - “Using the ENE Search and Screen Criteria to Debate Strengths and Weaknesses of the ENE Head Candidates.” (co-facilitator: Matthew Ohland) Spring 2010.
 - “What does a department head do? An interactive look at the search process for identifying candidates.” (co-presenter: Matthew Ohland) Spring 2010.
 - “Engineering in the Revisions to the Indiana Science Standards: What Does It All Mean?” Fall 2009.
12. “Developing and Assessing Classroom Activities for a Messy World” (co-presenter: Matthew Verleger) Conversations on Teaching: Purdue University Focus on Teaching Lecture Series, March 25, 2010.
13. “DR-K12 - R&D: Quality Cyber-Enabled, Engineering Education Professional Development to Support Teacher Change and Student Achievement (E2PD)” *Engineering is Elementary*: Invited Symposium, Museum of Science, Boston, MA, June 3-4, 2010.
14. “Student Learning Through Models-and-Modeling,” (co-presenters: Monica E. Cardella, Judith S. Zawojewski, & Margret A. Hjalmarson). *Workshop ICLS*, Chicago, IL. June 28, 2010.
15. “Authentic Engineering Experiences for First-Year Engineering Students: Intentional Design and Assessment for Learning” The University of Texas at Dallas, Nov. 9, 2010.
16. “Authentic Engineering Experiences for First-Year Engineering Students: Intentional Design and Assessment for Learning” George Mason University, January 26, 2011.
17. “Authentic assessment from a models and modeling perspective.” *Modeling and Model-based Reasoning in STEM Conference*, West Lafayette, IN, August 26-27, 2016.
18. “Data-driven instruction using standards-based grading.” *Frontiers of Engineering Education Symposium*, Irvine, CA, September 28-28, 2016.
19. “Transparent Grading: Benefits Instruction Improvement and Student Learning” Stevens Institute of Technology, Hoboken, NJ, May 4, 2017.
20. “Best practices in assessment/evaluation of effectiveness of undergraduate labs.” *University Materials Council Meeting*, Pittsburgh, PA, October 9, 2017.
21. “Standards-Based Grading: Making Grades Meaningful” Purdue University Global Assessment Advisory Committee, Webinar, March 8, 2018.

22. “How Do We Best Educate Engineers? A Complex Question for a New Field of Inquiry: Engineering Education”, Biological Systems Engineering Colloquium, Lincoln, NE, November 14, 2018.
23. “Active Learning – Lowering the Barriers, Upping the Quality,” Distinguished Speaker UC Davis Biomedical Engineering Seminar Series, Davis, CA, March 14, 2019.
24. “Reflection to Improve Student Engagement,” DBER Seminar, Lincoln, NE, September 26, 2019.
25. Raising the Bar: Engineering with the University of Nebraska-Lincoln College of Engineering. Online Panel Discussion Lead, Reinvention Collaborative - Raising the Bar (Colorado State University), July 17, 2020. <https://reinventioncollaborative.org/raising-the-bar-videos>
26. “Meaningful Teaming Instruction and Assessment Anchored by CATME SMARTER Teamwork,” Excellence in Teaching, UNL COE-ECEC, Lincoln, NE, August 14, 2020.
27. “Student Self-Reflection: Gauging Engineering Students’ Presence,” Excellence in Teaching, UNL COE-ECEC, Lincoln, NE, October 9, 2020.

GRANTS AND AWARDS

USDA – Higher Education Challenge Grant: Instructional Technology for Improving Integration of Food Safety into Food Engineering Curriculum, 2000-2002, \$99,007, PI: Heidi Diefes-Dux, Co-PIs: Tristan Johnson (Florida State University), Martin Okos (ABE); Richard Linton (Food Science)

Purdue University – MIDC (Multimedia Instructional Development Center) Grant: An Asynchronous Approach to Teaching Computer Tools in a Multimedia, 2000-2001, \$25,000, PI: Heidi Diefes-Dux; Co-PIs: P. K. Imbrie (ENE), William Oakes (ENE)

NSF HRD 0120794: Small Group Mathematical Modeling Approaches to Improved Gender Equity in Engineering (SGMM) Project, 2001-2004, \$885,260, PI: Judith Zawojewski (Illinois Institute of Technology), CoPIs: Keith Bowman, Material Science Engineering); P. K. Imbrie (ENE), Richard Lesh (Indiana University)

NSF EEC 0304579: NUE: New Learning and Discovery Experiences in Nanoscale Engineering Undergraduate Education, 2003-2004, \$100,000, PI: Kamyar Haghighi (ENE, ABE), Co-PI: P. K. Imbrie (ENE)

NSF EEC 0342028: Engineering Contexts and Concepts for Developing and Promoting Students’ Higher Level Learning, 2004-2005, \$100,000 – Cost Shared \$100,443, PI: Heidi Diefes-Dux, Co-PIs: Richard Lesh (Indiana University); Terry Wood (Math Education), Deborah Follman (ENE)

USDA – Higher Education Challenge Grant: Nanoscale Interdisciplinary Education Experiences for Undergraduate in Food and Agricultural Sciences, 2004-2005, \$100,000, PI: Heidi Diefes-Dux, Co-PIs: Kamyar Haghighi (ENE), Bruce Applegate (Food Science), Deborah Bennett (Educational Studies)

Purdue University – ItaP Digital Content Development Grant: Development of Interactive Learning Modules to Investigate the Quantitative Aspects of Cellular Biology, 2004-2005, \$10,728, PI: Jenna Rickus (ABE), Co-PIs: Scott Schaffer (Educational Technology)

NSF DUE 0512776: Assessing Student Team Effectiveness, 2005-2007, \$499,999, PI: P. K. Imbrie (ENE), Co-PIs: Heidi Diefes-Dux, Susan Maller (Educational Studies)

NSF DUE 0535678: Assessing and Evaluating Student Work on Modeling Activities Imbedded in a First-Year Engineering Problem Solving Course, 2006-2008, \$149,698, PI: Heidi Diefes-Dux

NSF DUE 0632879: Course Innovations as a Basis for Engineering Graduate Student Professional Development in Teaching, 2007-2009, \$149,961, PI: Monica Cox (ENE); CoPI: Heidi Diefes-Dux

NSF DUE 0717508: Collaborative Research: Improving Engineering Students' Learning Strategies Through Models and Modeling, 2007-2011, Purdue Award: \$264,448; Total Award: \$1,998,529, Purdue PI: Heidi Diefes-Dux, PI: Larry Schuman (Pittsburg University), Collaborators: Mary Besterfield-Sacre, Renee Clark (Pittsburg University), Ronald Miller and Barbara Olds (Colorado School of Mines), Eric Hamilton and John Christ (US Air Force Academy), Tamara Moore (Univ. of Minnesota), Brian Self (California Polytechnic State University)

NSF HRD 0734091: GSE/RES: Examining Engineering Perceptions, Aspirations and Identity among Young Girls, 2008-2011, \$449,953, PI: Brenda Capobianco (Science Education), CoPI: Heidi Diefes-Dux

NSF DRL 0822261: DR-K12 - R&D: Quality Cyber-Enabled, Engineering Education Professional Development to Support Teacher Change and Student Achievement (E2PD), 2008-2013, \$2,999,450, PI: Heidi Diefes-Dux, Co-PIs: Johannes Strobel (ENE), Monica Cardella (ENE), Sean Brophy (ENE), Senior Personnel: Brenda Capobianco (Science Education), Teri Reed-Rhoads (ENE)

NSF EEC 0835873: IEECI: Formative Feedback: Impacting the Quality of First-Year Engineering Student Work on Modeling Activities, 2008-2011, \$486,740, PI: Heidi Diefes-Dux, Co-PI: Monica Cardella (ENE)

Purdue University – ItaP Digital Content Development Grant: Model-Eliciting Activities Learning System (MEALS), 2009-2010, \$15,000, PI: Heidi Diefes-Dux

NSF EEC 1227110: Network for Computational Nanotechnology Cyber Platform, 2012-2017, \$14,500,000, PI: Gerhard Klimeck (ECE, CoPIs: Krishna Madhavan (ENE), Michael McLennan (Purdue), Lynn Zentner (Purdue), Michael Zentner (Purdue), Senior Personnel on Education Team: Heidi Diefes-Dux, William Oakes (ENE)

NSF EEC 1329304: Expert-Novice Framework to Support Student and Instructor Feedback on Design, 2013-2016, \$300,000, PI: Monica Cardella (ENE), Co-PI: Heidi Diefes-Dux

NSF DUE 1503794: Making Grades Meaningful - Standards-Based Grading for Engineering Project Courses, 2015-2017, Purdue Award: \$20,234, Total Award: \$248,893, PI: Adam Carberry (Arizona State University), Co-PIs: Sara Atwood (Elizabethtown College), Heidi Diefes-Dux, Matthew Siniawski (Loyola Marymount University)

NSF DGE 1544259: Contextualized Evaluation Framework for Advanced STEM MOOCs, 2015-2018, \$799,534, PI: Kerrie Douglas (ENE), Co-PIs: Peter Bermel (Electrical & Computer Engineering), Heidi Diefes-Dux, Krishna Madhavan (ENE)

NSF IIS 1552288: EAGER - BIGDATA: SMART Data - Academic Success Made Affordable, Rapid, and Timely through Integrated Data Analytics, 2015-2017, \$300,000, PI: Krishna Madhavan (ENE), Co-PIs: Heidi Diefes-Dux, Matthew Ohland (ENE), Mihaela Vorvoreanu (Computer Graphics Technology), Michael Zentner (Purdue)

UNL Layman New Directions Award: Prototype Augmented Reality Internship Module, 2019-2020, \$10,000, PI: Ece Erdogmus (AE), Co-PIs: Heidi Diefes-Dux, Erica Ryherd (AE).

NSF RAPID: Faculty Adaptability and Community Engagement when Teaching in a Crisis, 2020-2021, \$192,694, PI: Grace Panther (CIVE), Co-PI: Heidi Diefes-Dux

NSF RAPID: Faculty Adaptability and Community Engagement when Teaching in a Crisis - Supplement, 2020-2021, \$31,878, PI: Grace Panther (CIVE), Co-PI: Heidi Diefes-Dux

NSF EEC 2105156: Research: Evidencing Epidemic Change in Engineering Education: Shedding Light on Instructor Adaptability and Course Complexity for Sustained Change, 2021-2024, \$349,997, PI: Heidi Diefes-Dux, Co-PI: Grace Panther (CEE)

NSF DUE 2111561 Virtual/Augmented Discipline Exploration Rotations (VADERS) for Improved Engineering Student Engagement, Self-Efficacy, Diversity and Retention, 2021-2026, \$1,700,000, PI: Ece Erdogmus, Co-PIs: Kyungki Kim (Durham), Catherine Armwood-Gordon (Tennessee State University), Erica Ryherd (Durham), Heidi Diefes-Dux

TEACHING EXPERIENCE AND ACTIVITIES

Courses Taught at University of Nebraska-Lincoln

Graduate Courses in Engineering Education

BSEN 892- Special Topics: Foundations of Engineering Education Research, Spring 2019, 6 COE students

Introduction to engineering education research as a field of inquiry, the purposes and contexts of engineering education illuminated through readings and discussions of its historical roots, current expressions, and future directions. Provides a launching point for a survey of engineering educational methods and strategies and the theories of learning and thinking that shape engineering education.

BSEN 892 / CIVE 898 - Special Topics: Framing Engineering Education Research, Spring 2020, 5 COE students

Introduction to the basic types of research study designs (quantitative, qualitative, and mixed methods) through examples in STEM education. Identify an educational problem in STEM education, pose a research question, and support the need for a study through literature review. Become familiar with how theories of learning and thinking are used to predict or explain research findings. Discussion-based course that leads to the production of five artifacts: IRB certification; research paper critiques focusing on quantitative and qualitative studies, and a research proposal with an IRB project application.

ENGR 824 – Unique Concerns of Engineering Education, Fall 2020, 2021, 6 COE Students

The purposes and contexts of engineering education will be illuminated through readings and discussions of its historical roots, current expressions, and future directions. Discussions will delve into the history and trajectory of engineering education and concerns that are uniquely engineering (e.g., engineering design, diversity and inclusion, and teaming).

Undergraduate Courses in Biological Systems Engineering

AGEN/BSEN 303 – Principles of Process Engineering, Spring 2020, 20 BSE Students; Spring 2021 BSE 22 Students

Systems approach for sizing and selecting pumps for Newtonian and non-Newtonian fluids for food and agricultural applications, sizing and selecting fans for food and agricultural applications, and designing thermal processes for food and agricultural products. Application of concepts and technologies with analysis in the context of sample authentic systems.

Guest Lecture

AGEN/BSEN 100 Introduction to Biological Engineering and Agricultural Engineering, Fall 2018, 88 BSE students

Multiple mini-lectures on the topic of teaming skills and peer evaluation.

Courses Taught at Purdue

Graduate Courses in Engineering Education

ENE 595- Effective Teaching of Engineering: Linking Theory and Practice, 3 sem.

Opportunity for engineering graduate teaching assistants (GTAs) to make a connection between education theory and practice. Enables GTAs to develop knowledge about effective teaching practices and establish an engineering “community of teachers” of engineering faculty and peers. (NSF EEC 0632879)

ENE 595A – Introduction to Engineering Education, 1 sem.

Introduction to the field of engineering education. Emphasis is placed on students’ development of a personal identity within engineering & engineering practice, teaching engineering, and the scholarship of engineering education.

ENE 685 – Educational Methods in Engineering, 6 sem.

Targeted to engineering PhD students interested in pursuing academic careers. Focused on research-based and practical aspects of teaching undergraduate engineering courses.

ENE 695 - Models and Modeling Perspective in Engineering Education, 1 sem.

Targeted to STEM education PhD students interested in research around design, implementation, and assessment of student work on mathematical modeling and open-ended problems.

ENE 695C – Problem Solving and Design for Diverse Learners, 1 sem.

Introduction to three issues in STEM education: diversity, the student experience, and problem solving and design. Emphasis is placed on educational pathways, issues of attraction and retention, the impact of diversity upon the learning environment, and the ways in which students are brought into a fundamental feature of the engineering profession – design and problem solving.

First-Year Engineering and Related Courses

ENGR 132– Ideas to Innovations Part II, 8 sem., Coordinator/Curator: 2010-18

Problem solving, modeling, and engineering design (continued from Part I) and introduction to MATLAB.

ENGR 126 (Formerly ENGR 106) – Problem Solving and Computer Tools, 11 sem., Coordinator: 1999-2006

Introduction to engineering problem solving and the use of computer software, UNIX, computer communications, spreadsheets, and MATLAB. Applications in engineering.

ENGR 195 (now ENGR 131) – Ideas to Innovations Part I, 1 sem.

Introduction to problem solving, modeling, and design.

ENGR 104 – Introduction to Engineering and Purdue, 5 sem., Coordinator

Weekly small group seminars led by upper-class engineering students supplementing Freshman Engineering Lectures (ENGR 100), enabling a broader understanding of engineering disciplines at Purdue and providing skills for transition to the professional schools and academic success.

ENGR 195N – Special Topics in Nanotechnology Research Experiences, 1 sem.

First-year engineering students learn about this emerging technology through an introduction to basic research methods and nanotechnology-based manufacturing and characterization processes.

ENGR 192C/193C – Tutorial Assistance for CHM 115, 10 sem.

Assistance for first and second semester general chemistry for at-risk engineering students.

ENGR 404 – Instruction, Leadership, Mentorship, 4 sem.

Selected students enrolled in professional programs in the Schools of Engineering lead sections of ENGR 104. Common instruction on appropriate teaching methods, ENGR 104 content, mentorship, and leadership. Preparation of class outlines, development of teaching evaluation method, and formal reflection on performance and growth resulting from the teaching experience.

Undergraduate Courses in Agricultural and Biological Engineering and Related

ABE 120 – Introduction to Agricultural & Biological Engineering, 2 sem.

Introduction to engineering technologies and career opportunities involved in agricultural and biological engineering. A selection of invited lectures, participation exercises, lab tours, and field trips designed to acquaint students with the profession of agricultural and biological engineering. Topics to be covered may include biopolymers, alternate fuels, emulsions in food, extruded food products, finite element analysis, geographic information systems, site-specific resource usage, mechanical properties of biological materials, post-harvest engineering, and control systems in food process engineering.

ABE 210 – Biological Applications of Material and Energy, 2 sem.

Applications of material and energy balances to biological and engineering systems; development of a framework for the analysis of biological systems from an engineering perspective. Introduction to applications of the first and second laws of thermodynamics to biological and mechanical engineering systems. Topics include refrigeration systems, power cycles, energy conversion systems, and environmental impacts of energy production.

ABE 555 – Food Process Engineering Unit Operations, 1 sem.

Analysis and design of operations, such as sterilization, freezing, dehydration, fermentation, and separation processes. Integration of pilot plant results into the design and scale-up process systems. Emphasis on how the properties of biological materials influence the quality of the processed product.

ABE 591D – Current Topics in Food Engineering, 1 sem.

Food process engineers strengthen their technical reading and critical-thinking skills while learning about current research-based developments in food process engineering

AGR 490A – Discovery Experiences in Nanotechnology, 1 sem. (coordinator)

First-year agriculture students learn this emerging technology through an introduction to various methods and equipment for "seeing" at the nanoscale

GRADUATE STUDENT ADVISING

Committee Chair at Purdue University

1. Charuta Samant, "Project Title: Implementation of FOODS-LIB in a Senior Level Food Process Engineering Design Course," MS non-thesis, Agricultural & Biological Engineering (ABE), Fall 2002
2. Lisa Hartono, "Potential Use of Bioluminescence in the Determination of the Thermal Inactivation Rate for Low Cell Concentration," MS thesis, ABE, Summer 2005
3. Matthew Verleger, "The Design, Development, Implementation, and Assessment of Online Interactive Quantitative Cellular Biology Learning Modules," MS thesis, ABE, Summer 2005
4. Tamara J. Moore, "Student Team Functioning and the Effect on Problem Solving in a First-Year Engineering Course," PhD, Engineering Education (ENE), Spring 2005 (co-chair: R. Lesh)
5. Euridice Oware, "Examining Elementary Students' Perceptions of Engineers," PhD, ENE, Spring 2008 (co-chair: B. Capobianco)
6. Matthew Verleger, "Analysis of an Informed Peer Review Matching Algorithm and its Impact on Student Work on Model-Eliciting Activities,"
7. Irene Mena, "Socialization Experiences Resulting from Engineering Teaching Assistantships at Purdue University," PhD, ENE, Fall 2010 (co-chair: B. Capobianco)
8. Farshid Marbouti, "A Standards-based grading Model to Predict Students' Success in a First-Year Engineering Course," PhD, ENE, Spring 2016
9. Lee Rynearson, "Promoting Teaming Metacognition," PhD, ENE, Summer 2016
10. Anastasia Rynearson, "From Mechanic to Designer: Evolving Perceptions of Elementary Students over Three Years of Engineering Instruction," PhD, ENE, Summer 2016 (co-chair: B. Capobianco)
11. Kelsey Rodgers, "Development of First-Year Engineering Teams' Mathematical models through Linked Modeling and Simulation Projects," PhD, ENE, Summer 2016
12. Mark Carnes, "Conceptual Understanding of Threshold Concepts of Electrical Phenomena: Mental Models of Senior Undergraduates in Electrical Engineering," PhD, ENE, Fall 2016
13. Nathan Hicks, "A Variability Analysis of Grading Open-Ended Tasks with Rubrics Across Many Graders," PhD, ENE, Summer 2020

Committee Chair at University of Nebraska - Lincoln

1. Anu Singh, "TBD," PhD, Engineering – Specialization in Engineering Education Research (EER), Anticipated Fall 2024

UNDERGRADUATE RESEARCH

Faculty Supervisor/Mentor at University of Nebraska - Lincoln

1. Kayla Ney, "First-Year Engineering Student Reflections - Plans & Actions," Biological Systems Engineering, Summer 2020
2. Izzy Brown, "Faculty Self- and Community During a Crisis", Architectural Engineering, Summer 2020

3. Bilal Hamada, “Faculty Adaptability in a Crisis – Faculty Successes,” Computer Engineering, Fall 2020 (co-mentor: G. Panther)
4. Abdullah Hamad, Faculty Adaptability in a Crisis – Faculty Challenges,” Software Engineering, Fall 2020-Summer 2021 (co-mentor: G. Panther)
5. Victor Moreno, “Upper-Division Engineering Students’ Reflective Metacognition,” Biological Systems Engineering, Summer 2021
6. Emily Stratman, “First-Year Engineering Students’ Reflective Metacognition,” Biological Systems Engineering, Summer 2021-present
7. Morgan McArthur, “Virtual/Augmented Discipline Exploration Rotations (VADERS) Impact on Students’ Understanding of Subdisciplines,” Biological Systems Engineering, Summer 2021-2022

INTERNATIONAL EXPERIENCE

King Fahd University of Petroleum and Minerals (KFUPM), Workshop Series, June 25-27, 2012, 10 participants, Purdue University

- Diefes-Dux, H. A. & Cardella, M. E. “Authentic assessment of student work on open-ended problems.”

Universiti Teknologi Malaysia (UTM) - Visiting Professor, April 2012

- External Examiner for Ph.D. Defense. Student: Noor Hamizah Hussain. Thesis: An Inquiry-based simulation supported module to assist students’ learning of basic electric circuit
- “Authentic Engineering Experiences for First-Year Engineering Students: Intentional Design and Assessment for Learning”, workshop for engineering education graduate students on Kuala Lumpur campus

International Conference on Teaching and Learning in Higher Education, Seremban, Malaysia, Invited Pre- and Post-Conference Workshops, April 2012

- Strobel, J. & Diefes-Dux, H. A. “Integrating engineering into secondary and pre-university curricula.” Klana Resort, Seremban, Malaysia
- Strobel, J. & Diefes-Dux, H. A. “Crafting problems for engaging learning.” Kampus Akademi Kempimpinan Pengajian Tinggi (AKEPT), Negeri Sembilan, Malaysia

Universidad de Ibaqué (Ibague, Colombia), Seminar and Workshops, June 2015

Purpose was to lay groundwork for a Fulbright Specialist proposal focused on creating student-centered learning environments across five engineering disciplines

- “Authentic Experiences for Engineering Students: Intentional Design and Assessment for Learning”
- “Making Active Learning Practical in an Engineering Course”
- “Model-Eliciting Activities, Example: Nano Roughness MEA”

Universidad de Ibaqué (Ibague, Colombia), Faculty Development, July/August 2016

As part of Fulbright Specialist Program taught two 3-week faculty development courses.

- Active Learning in University Classrooms
- Assessment in University Classrooms

Host to Universidad de Ibaqué (Ibague, Colombia) Faculty Member, January/February 2017

- Hosted Jorge Montoya at Purdue University for 1 month

Universidad de Ibaqué (Ibague, Colombia), Faculty Development, July 2017

- One week faculty development course: How to Conduct and Disseminate an Engineering Education Research

LEADERSHIP

Indiana State and National Service

- *Indiana State Department of Education* Committee Member – Revision of Science Standards, 2008-2009
- *National Academy of Engineering* Committee Member - Exploring Content Standards for Engineering Education in K-12, 2008-2010