

BOARD # 410: NSF RED: Engineering Pathways for Access, Community, and Transfer (EPACT)

Anne Flesher

Dr. Ann-Marie Vollstedt, University of Nevada, Reno

Ann-Marie Vollstedt is a teaching associate professor for the College of Engineering at the University of Nevada, Reno (UNR). Dr. Vollstedt completed her dissertation at UNR, which focused on exploring the use of statistical process control methods to assess course changes in order to increase student learning in engineering. Dr. Vollstedt teaches courses in engineering design as well as statics and runs the Engineering Freshmen Intensive Training Program. She is the recipient of the Paul and Judy Bible Teaching Excellence Award, F. Donald Tibbitt's Distinguished Teaching Award, The Nevada Women's Fun Woman of Achievement Award, and the UNR College of Engineering Excellence Award.

Daniel Lorz, Truckee Meadows Community College

Milinda Wasala

Jaspreet Kaur Gill

Dr. Julia M. Williams, Rose-Hulman Institute of Technology

Dr. Julia M. Williams is Professor of English at Rose-Hulman Institute of Technology. She is the author of *Making Changes in STEM Education* (Routledge 2023) and a member of the ASEE Hall of Fame.

Brandon Protas

Dr. Jennifer R Amos, University of Illinois at Urbana - Champaign

Dr. Amos is a Teaching Professor of Bioengineering at the University of Illinois Urbana-Champaign. She performs research in engineering education related to how students choose their majors and what factors lead to success in first-year programs. She also has experience in leading program assessment and continuous improvement practices in engineering departments across several institutions.

Dr. Indira Chatterjee, University of Nevada, Reno

Indira Chatterjee received her M.S. in Physics from Case Western Reserve University, Cleveland, Ohio in 1977 and Ph.D. in Electrical Engineering from the University of Utah, Salt Lake City, Utah in 1981. Indira is currently Acting Dean of Engineering and Professor of Electrical and Biomedical Engineering at the University of Nevada, Reno. She has won many awards including Foundation Professor, Tibbitts University Distinguished Teacher Award, the Hoeper Award for Excellence in Teaching and Advising, Society of Women Engineers Region A Service Award, the IEEE Student Section Award for Excellence in Teaching, the Nevada Women's Fund "Women of Achievement" award and the Silver Compass Award for Extraordinary Commitment to Students. She has had over 7 million research funding in Bioelectromagnetics and engineering education. She has served as research mentor to postdoctoral fellows and many graduate students, and most recently served as mentor in the ASEE Minority Mentorship program.

NSF RED: Engineering Pathways for Access, Community, and Transfer (EPACT)

Introduction: The five-year National Science Foundation Revolutionizing Engineering Departments (RED) project, entitled “Engineering Pathways for Access, Community, and Transfer (EPACT)” utilizes a consortium model that involves collaboration among faculty from three community colleges (CCs) and a large western land-grant R1 university in the same state. The EPACT project uses a holistic approach facilitated by Complete College America’s change model [1, 2] to implement activities for teaching faculty professional development and student professional formation, resulting in a seamless transfer experience for CC engineering students into university engineering degree programs. One primary goal of the project is to foster deep collaboration and build a strong community of effective community college teaching faculty with a shared vision and purpose. This aims to ensure that students transfer to the four-year environment equipped with a well-developed engineering identity, self-efficacy, sense of belonging, and the T-shaped skills – combining breadth and depth of knowledge - needed to make the most of their new university environment. This project will thus revolutionize student-centered inclusive teaching practices and lead to cultural, structural and organizational change at all levels, ultimately impacting high-tech workforce development in the state. One major aspect of the project is to design and effectively deliver three required engineering courses at the community colleges, preventing the need for early transfer of students to the university, and helping students stay on track for graduation. By providing these courses locally, students will be able to reduce the time and costs associated with transferring to the university, ultimately improving their success rates measured by transfer and graduation with an engineering degree.

In its second year, EPACT has successfully implemented a community of practice (CoP) among community college and university engineering teaching faculty, who are collectively developing second-year online engineering courses for CC students. These courses will be delivered using a shared learning management system, adhere to ABET accreditation standards, and mirror the rigor of in-person university engineering courses, while fostering a sense of community, engineering identity, and belonging for transfer students.

Progress to date:

Community of Practice and creation of a shared vision. In the first year, the project focused on creating cohesion within the EPACT team by holding a two-day summer symposium to establish clear roles and responsibilities, and to align expectations. Symposium participants consisted of members of the CoP, the principal and co-principal investigators, a change expert, two project mentors, and the project external evaluator. The symposium enabled the members of the CoP to share knowledge, skills, and assets, ensuring that everyone understood their contributions to the project’s goals. The change expert moderated team-building sessions, and the project mentors held sessions related to RED-related topics [3]. The external evaluator observed the entire symposium and held focused sessions with CoP members. As a result of action items developed during the symposium, each of the three CCs initiated the process to list the new courses in their respective institution’s catalog, aligned course objectives and student learning outcomes, ordered textbooks, and initiated course development in close coordination with their respective university CoP teaching faculty. In addition, options for professional development for online teaching are being

researched by the PI, and an instructional designer has been hired to build out course shells including institution branding. Following the symposium, the CoP has been regularly meeting monthly to discuss CoP goals, online teaching tips [4], course format (whether all the courses need to be offered in identical format), synchronous vs asynchronous offering, etc.

The project emphasizes the importance of building community among CoP EPACT faculty and how to engage in deep collaboration with faculty across multiple institutions. CC engineering faculty often work in departments with multiple disciplines, limiting opportunities for collaboration. This project creates dedicated spaces for faculty to share curriculum, pedagogy, and a vision for student success, while also ensuring alignment with university-level engineering programs. In year two, the focus is on developing the learning platform for these courses, ensuring consistency across institutions, and meeting the unique needs of CC students, valuing the different backgrounds of our students and their experiences, creating an inclusive learning environment, and fostering a sense of belonging, and engineering identity among this population of engineering transfer students.

Mixed-methods research. As part of the project, a mixed methods engineering education study is being performed, both on the EPACT CoP faculty and CC students. The research on the students will commence in Fall 2025 when the first course will be offered. The mixed-methods research will answer the following research questions:

1. How effectively can the EPACT vision, overarching goal, objectives, and activities achieve cultural, structural, and organizational change within the Nevada System of Higher Education?
2. How strongly is the implementation of EPACT linked to the broader ecosystem that affects CC and university engineering teaching faculty development and the resulting CC engineering transfer students' educational environment, leading to academic success, and retention in their CCs, transfer to university engineering degree programs, and changes in self-efficacy, engineering identity, and belongingness?

The research study utilizes two well-tested survey instruments (quantitative), well tested rubrics, and focus group interviews (qualitative). The first set of qualitative data in the form of an in-depth semi-structured focus group interview was collected at the end of the first-year summer symposium and is currently being analyzed. Data generated will be analyzed using directed content analysis (DCA) [5], which uses an *a priori* codebook to examine themes that emerge within the analysis. This method of analysis allows data to be examined rapidly while still allowing unique participant voices to emerge. NVIVO (QSR International) software will be used to assist in the analysis. In addition to focus groups, the rubrics in the self-assessment change tool: The Partnership for Undergraduate Life Sciences Education (PULSE)" will be utilized [6 - 9]. We will utilize PULSE rubrics to study EPACT implementation success. These rubrics will assess faculty (1) participation in CoP workshops and meetings, (2) awareness/implementation of discipline-based education research, (3) sharing of information about evidence-based and effective pedagogy, (4) alignment of pedagogical approaches with evidence-based practices, (5) alignment of course goals, assessments, and learning activities, (6) faculty mentoring institutional support for teaching/learning needs in engineering, and training in emerging research areas, (7) administrative support for change initiatives, (8) alignment of administrative vision, (9) institutional support for

faculty course development, and (10) attitude of faculty toward change initiatives. The first set of data from the rubrics administered during the first summer symposium is being analyzed.

Conclusion: The project hopes to showcase organizationally, how CCs and universities within a system of higher education can collaborate and share courses effectively through the lens of student success in transfer programs. We also will emphasize the importance of faculty collaboration across institutions with a common goal, and show how that collaboration can be effective in helping engineering transfer students to complete their degrees in a timely manner and enter the workplace or graduate school.

Acknowledgements: The authors acknowledge funding received from the National Science Foundation RED program, grant number EEC-2330583. They also thank the project manager Adine Stormoen for her dedicated work on details of management of the project. The Institutional Review Board of the University of Nevada, Reno has approved all procedures.

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