NSF RED: Engineering Pathways for Access, Community, and Transfer (EPACT) – Progress to Date

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Introduction:

The five-year National Science Foundation Revolutionizing Engineering Departments (RED) project, entitled "Engineering Pathways for Access, Community, and Transfer (EPACT)," brings together faculty from three Northern Nevada community colleges (CCs) and the University of Nevada, Reno, a large western land-grant R1 university to implement coordinated faculty professional development and student professional formation activities, resulting in a seamless transfer experience for CC engineering students entering university engineering degree programs.

Cultural, structural, and organizational barriers that limit access, continuity, and successful transfer remain a persistent challenge for students pursuing engineering degrees, particularly those who begin at community colleges. To address these challenges, the National Science Foundation funded a five-year RED project titled Engineering Pathways for Access, Community, and Transfer (EPACT) [1]. This paper describes the progress and emerging outcomes of the EPACT project in its third year of implementation.

EPACT brings together faculty from the three community colleges and the university within the same state through a structured Community of Practice (CoP). Members of a CoP engage in group activities to share resources and solve problems [2-4]. They learn from their interactions, help each other develop ideas, give constructive feedback, and encourage the transfer of knowledge [5]. The EPACT CoP called the Nevada Engineering Educators Team (NEET) is designed to foster sustained collaboration between community college (CC) and university engineering teaching faculty as they collectively redesign core elements of the engineering transfer pathway. Central to this effort is the co-development of three required, foundational second-year engineering courses taught online by CC faculty and available to CC students enrolled at participating community colleges, along with aligned assessment tools tailored to CC engineering students. In parallel, faculty participating in NEET engage in professional development activities that support shared pedagogical approaches, curricular alignment, and continuous improvement.

Beyond structural alignment, EPACT is grounded in research demonstrating that academic, social, and experiential capital support significantly contribute to CC engineering transfer student success [6–23]. Students' sense of belonging, engineering identity, and self-efficacy are strongly associated with persistence in engineering. This focus on inclusive design and identity-supporting practices is especially important for CC engineering students, who are often first-generation, low-income, and from historically underrepresented groups [24-25], and who often face structural and cultural barriers during transfer. Accordingly, EPACT integrates coordinated academic and mentoring support alongside course redesign to intentionally cultivate a sense of

belonging, reinforce engineering identity, and strengthen self-efficacy before CC students transition to the university environment.

By offering these foundational engineering courses online with localized community college support, the EPACT model reduces the need for early transfer to the university, which often disrupts student progress and increases financial and logistical burdens. This approach allows students to remain enrolled at their home CCs while completing critical coursework that is directly transferable and aligned with university degree requirements. As a result, students benefit from reduced time to degree, lower overall costs, and increased continuity in their academic experience.

This paper situates the EPACT project within broader efforts to strengthen engineering transfer pathways and presents insights from the project's third year, highlighting the role of cross-institutional collaboration, shared course development, and community-centered design for improving student persistence, transfer, and graduation outcomes in engineering.

Progress to date:

Community of Practice and creation of a shared vision

The project places a strong emphasis on building a CoP (NEET) among EPACT faculty to foster deep, sustained collaboration across the participating institutions. Developing a CoP for the EPACT project is particularly important given that CC engineering faculty often work within multidisciplinary departments that offer limited opportunities for discipline-specific collaboration. EPACT intentionally creates structured spaces for faculty to share curriculum, pedagogy, and a collective vision for student success, while maintaining alignment with university-level engineering programs.

In the first two years of the project, efforts centered on building cohesion within the EPACT team through a two-day summer symposium designed to establish shared roles, responsibilities, and expectations. Symposium participants included members of NEET, the principal and co-principal investigators, a change expert, two project mentors, the project's external evaluator, the project manager, the university Director of Academic Success, the Director of Career Services, and two graduate students. The symposium provided the first structured opportunity for NEET members to share expertise and develop a common understanding of how individual contributions aligned with overall project goals. Team-building activities were facilitated by the change expert, while project mentors led sessions focused on RED-related topics including assessment [26-28]. The external evaluator observed the full symposium and conducted separate focused sessions with NEET members, the PI and Co-PIs, and graduate students.

Action items that emerged from the first two symposia guided early project implementation, after which NEET began meeting monthly to sustain collaboration among the participating CCs and university faculty. These meetings centered on aligning shared goals, advancing inclusive online teaching practices [29], and refining course structures and delivery formats designed to strengthen engineering identity, self-efficacy, and CC students' sense of belonging. NEET also evaluated synchronous versus asynchronous delivery models and engaged in coordinated

discussions regarding instructional technologies, including microphones, lighting, tablets, and collaborative digital tools, to enhance the effectiveness of online instruction. Each of the three participating CCs initiated the process of listing the new courses in their institutional catalogs, aligning course objectives and student learning outcomes, ordering textbooks, and beginning course development in close coordination with university NEET engineering teaching faculty. In parallel, the principal investigator explored professional development options related to online teaching, and an instructional designer was hired to develop institutionally branded course shells. Overall, NEET was able to build a shared learning platform that aligned instructional experiences across institutions while remaining responsive to the diverse backgrounds and needs of CC students, with a particular emphasis on inclusive design, sense of belonging, self-efficacy, and engineering identity.

In the third year of the project, NEET has continued to meet monthly to sustain momentum and deepen collaboration across institutions. Meeting topics during this period have included support of the first course being offered during the 2025 fall semester, course development status updates for the remaining courses, course scheduling and marketing, refinement of Canvas course shells and common homepage elements, as well as alignment of student resource pages (e.g., tutoring, disability resource centers, and institutional support services). Additional meetings focused on assessment-related topics, including survey implementation, use of rubrics, development of shared exam question banks, and review of exam questions across courses. Professional development activities embedded within NEET meetings addressed online student engagement, community building, engineering identity, leadership and mentoring, and best practices for supporting students in virtual learning environments.

In addition to regular monthly meetings and annual summer symposia, the project convened a winter symposium during Year 3. The winter meeting included sessions on best practices for online exams and project-based assessments, as well as an Anchors and Engines activity [30] that identified priority tasks for the remainder of year 3 including increasing collaboration among faculty participating in the CoP and strengthening student motivation to complete EPACT-related activities, including proactive advising for CC students by the university College of Engineering Director of Academic Success and career advising by the Director of Career Services.

During this past year, NEET experienced unplanned membership changes, with two CC faculty members exiting the project and two new CC members joining. One new member began participation in May 2025 and taught the first EPACT course, bringing prior experience teaching at a public university and expertise in engineering education research, while an additional faculty member joined NEET in January 2026. Together, the team changes and NEET activities reflect a shift in Year 3 towards professional development, course refinement, assessment alignment, and sustained implementation of EPACT courses.

Research

To examine early implementation of EPACT and participant experiences, quantitative and qualitative data were collected from NEET faculty and CC student participants. The study addresses 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. To what extent is the EPACT CoP influencing faculty development, collaboration, and course redesign?
3. How are the experiences reported by participating CC engineering transfer students related to changes in sense of belonging, self-efficacy, and engineering identity during EPACT course implementation?

To date, the project has made progress in both quantitative and qualitative data collection and analysis. The research study integrates two established quantitative survey instruments administered to student participants, including the Intersectionality of Non-normative Identities in the Cultures of Engineering (INICE) [31] and the Laanan Transfer Students' Questionnaire (L-TSQ) [32]. One complete set of student survey responses administered at the start and end of the Fall 2025 semester was obtained from the first course (Statics) offered during the Fall 2025 semester. Additional data collection from the Statics and Dynamics courses offered in Spring 2026 is underway. Analysis of the quantitative data collected to date is being conducted with a focus on research question 3 and will be reported in future work.

To examine faculty collaboration and professional development within NEET, the study utilizes the *Partnership for Undergraduate Life Sciences Education (PULSE)* self-assessment change rubrics [33-36]. The PULSE rubrics are administered to NEET faculty yearly to assess faculty outcomes across multiple dimensions, including: (1) participation in NEET workshops and meetings; (2) awareness and implementation of discipline-based education research; (3) sharing of evidence-based pedagogical practices; (4) alignment of instructional approaches with evidence-based methods; (5) alignment among course goals, assessments, and learning activities; (6) faculty mentoring, institutional support for teaching and learning, 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) faculty attitudes toward change initiatives. To date, two sets of PULSE rubric data have been collected from NEET participants and are currently being analyzed.

In addition to surveys, this project collects qualitative data, consisting of in-depth NEET faculty focus group interviews. Focus group interviews were conducted at the conclusion of both the first- and second-year summer symposia. Qualitative data are being examined using directed content analysis (DCA) [37], which applies an *a priori* codebook to identify and explore emergent themes across data sets. This approach enables efficient analysis while preserving the depth and distinct perspectives of participant voices. NVivo (QSR International) software is being used to support the qualitative analysis process. Using the first set of data, the EPACT research group has developed the first version of a qualitative codebook which is being used to guide further analysis. Relevant themes related to the effect of NEET on EPACT faculty professional development (research question 2) will be identified. The EPACT research group also mapped all survey and focus group questions to the research questions to ease the evaluation process.

As EPACT is currently in early implementation, this paper emphasizes project design, implementation processes, faculty collaboration processes, and theoretical grounding. Analysis of data collected to date is ongoing and will be reported in future work.

Conclusion:

This project aims to demonstrate, at an organizational level, how CCs and a university within the same system of higher education can effectively collaborate and share courses in ways that center on student success in engineering transfer pathways. In doing so, the project highlights the critical role of cross-institutional faculty collaboration around a shared vision and illustrates how sustained coordination can support engineering transfer students in completing their degrees in a timely manner and successfully transitioning into the workforce or graduate study.

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