Applying Organizational Citizenship Behavior (OCB) to Engineering Education: Collaborate, Elevate, and Engineer Together (CEET) Program Design

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Introduction

Engineering education increasingly demands collaboration, empathy, and community-minded professionalism. Although engineering curricula have traditionally emphasized cognitive and core competencies such as communication, problem-solving, teamwork, and procedural knowledge, comparatively less emphasis has been given to the social and behavioral dimensions of learning that help students work effectively with others, navigate interpersonal dynamics, and contribute meaningfully to shared goals.

Existing approaches to teamwork often emphasize task-oriented collaboration, including role coordination, communication strategies, and project outcomes. Yet, these approaches frequently underemphasize the voluntary, informal, and prosocial behaviors that build trust, sustain a constructive learning climate, and strengthen team cohesion. Developing such behaviors requires learning environments that intentionally nurture cooperation, mutual respect, and collective responsibility.

Funded by the National Science Foundation (NSF), this three-year Implementation and Evaluation Project is situated in undergraduate mechanical engineering (ME) courses at the University of New Mexico (UNM). A persistent concern across many engineering programs is the high rate of attrition during the first two years of the introductory coursework. Early courses often function as key barriers to progression, presenting substantial academic and social challenges for students. Evidence suggests that students who struggle in early engineering courses face elevated risk of course failure and departure from engineering degree pathways. Accordingly, the structure, pedagogy, and support resources embedded in introductory courses can be consequential for students' academic trajectories, underscoring the need for well-targeted interventions that reduce early barriers and strengthen learning outcomes.

To address this need, the project advances Collaborate, Elevate, and Engineer Together (CEET), a three-year initiative designed to strengthen pedagogical strategies that support successful engineering education outcomes. CEET is grounded in Organizational Citizenship Behavior (OCB), with the aim of enhancing engineering students' learning experiences and strengthening a supportive learning culture in undergraduate engineering programs.

OCB refers to voluntary and discretionary behaviors that are not formally part of role requirements but contribute positively to the overall functioning of the community [1]. OCB is particularly valued in educational institutions, where collaborative and community-oriented behaviors among faculty, staff, and students can significantly impact the learning culture and effectiveness. While OCB has not yet been widely introduced in engineering education, it is a well-validated concept in the fields of organization studies and industrial/organizational psychology [2]. Research on OCB is now beginning to explore its applications in education, showing immense potential [3][4]. This concept specifically involves contributing to a supportive social learning environment, and making a commitment and effort toward achieving shared goals.

In this project, we adopt Podsakoff et al.'s [2] conceptualization to define OCB in engineering education defined as voluntary, prosocial actions that support the social, psychological, and collaborative environment of engineering teams and communities. In this framing, OCB extends beyond formal role expectations and contributes to the collective success of engineering students, teams, and learning environments. Unlike traditional OCB, which focuses on productivity, OCB in engineering education emphasizes collaborative problem-solving, professional identity, and belongingness in engineering practice.

Situating Literature in the Project

Organizational Citizenship Behavior (OCB) emerged from research in management to describe discretionary contributions that support collective functioning. Organ observed that some individuals voluntarily help colleagues, take initiative, and exert effort beyond formal job requirements, so called in-role behaviors, to advance team and organizational goals, even when such actions are neither required nor explicitly rewarded [5]. A defining feature of OCB is that it reflects personal choice rather than enforceable role expectations; therefore, its absence is not typically treated as a punishable omission.

This concept has been elaborated with differentiated dimensions. Evidence across studies indicates that OCB is associated with positive outcomes at multiple levels. In a meta-analysis of 168 workplace studies, Podsakoff and colleagues reported that OCB relates positively to individual outcomes such as performance evaluations, job satisfaction, and organizational commitment, and to collective outcomes such as team cohesion, group performance, and overall organizational effectiveness [6]. Although OCB was initially developed in business settings, its core logic transfers well to education, where learning and performance are also shaped by voluntary, relational, and community-sustaining behaviors. Accordingly, researchers have adapted OCB to schools by examining teachers' citizenship behaviors and their effects on school functioning [7], and to higher education by using OCB to explain faculty development processes and outcomes [8][9].

From the perspective of student learning, OCB likewise offers a useful framework for understanding behavior in collaborative learning environments, where group success often depends on discretionary actions that support peers, sustain productive interaction, and strengthen the team's learning climate. For example, in the context of collaborative learning, OCB among students can enhance emergent leadership, group cohesion, and learning engagement [10]. Furthermore, an OCB measurement scale for collaborative learning in higher education has been validated, providing a foundation for empirical research on students' OCB in collaborative learning [11]. Together, these developments underscore both the relevance of OCB in educational settings and the readiness of the field to investigate OCB-informed instructional interventions.

Project Setting

This project is rooted in UNM's ME courses focusing on design: ME 160 Mechanical Engineering Design I and ME 260 Mechanical Engineering Design II. Students in ME tend to take these courses during their freshman and sophomore years (Table 1).

Table 1. Course Information

Course Number and Title	Size	Course Offering	Course Delivery (per week)
ME 160 Mechanical Engineering Design I	100	Twice per year	2.5 hrs Lecture | 2.5 hrs Lab
ME 260 Mechanical Engineering Design II	80	Twice per year	2.5 hrs Lecture | 2.5 hrs Lab

These courses use a wide range of assignments and assessments that students should complete individually and with their team members. The courses also encourage students to work with their peers in studying learning materials and preparing for quizzes and exams.

These two courses follow a similar structure, with hands on labs (3 hours/week), lectures twice a week, and a team project which applies what they learned within a team environment. ME160 focuses on introducing engineering design fundamentals, including CAD and the design process, while ME260 builds on this foundation by focusing on manufacturing processes and hands-on fabrication. ME160 consists of CAD design labs and design fundamentals used in engineering. ME260 includes hands-on machining labs and lectures that consist of manufacturing topics. Students also learn and apply additive manufacturing (3D) and utilize CAD design in their projects. Both courses start forming their teams for the project in Week 8.

Within these course contexts, ME 160 introduces structured supports for collaboration, such as study-mate partnerships and cross-group knowledge-sharing activities, to help students establish collaborative learning practices. ME 260 provides continued opportunities for students to apply and reinforce these behaviors in team-based project settings.

These ME courses emphasize collaboration and teamwork, incorporating design labs, capstone projects, and group-based problem-solving assignments. These course characteristics align seamlessly with interventions aimed at fostering OCB, such as helping behaviors, altruism, and knowledge sharing, belongingness, and engineering identity.

Collaborate, Elevate, and Engineer Together (CEET) Program

The Collaborate, Elevate, and Engineer Together (CEET) program is a set of course-level interventions grounded in OCB that are designed to nurture both individual development and collaborative growth among students in engineering courses. CEET provides purposeful pedagogical structure for cognitive, social, and emotional support to students, more authentic engineering learning experiences, and facilitating a more collaborative and supportive classroom community. CEET empowers students to grow into community-minded individuals and skilled engineers.

The tasks of mechanical engineers are inherently complex and ill-structured, requiring a broad range of knowledge and skills, including problem identification, analysis, design thinking, application of technical knowledge, collaboration and communication and project management. Accordingly, the formation of engineers demands learning how to navigate ambiguity effectively and efficiently with peers to achieve shared goals. This process emphasizes knowledge sharing, reflective thinking, interpersonal skills, and reciprocal helping behaviors, which are essential for success in the collaborative and dynamic environment of the engineering profession. Figure 1 illustrates the configuration of OCB in engineering education as adapted in this project [11]. It

highlights key dimensions of OCB and their application in fostering collaboration and effective teamwork among students in engineering settings.

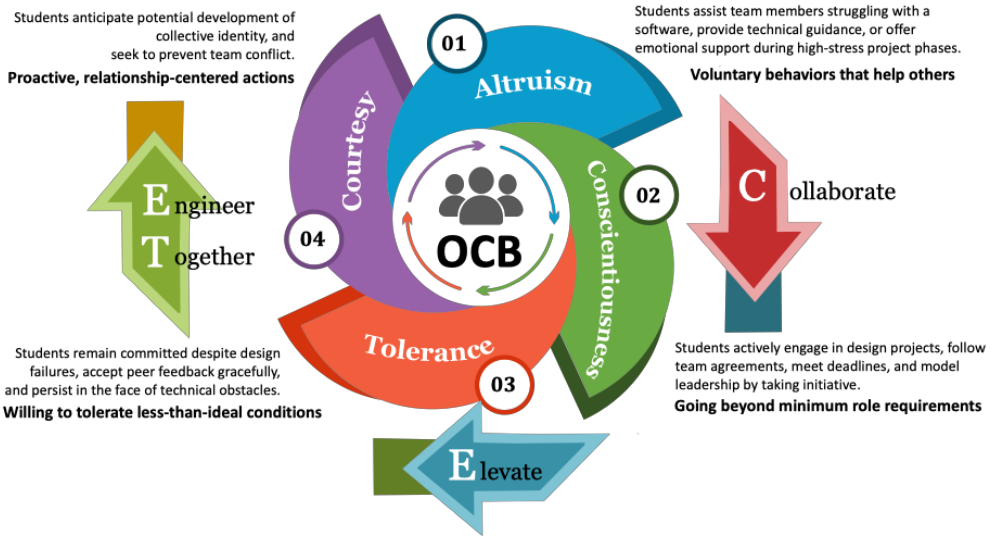

Figure 1. *CEET: Configuration of OCB in engineering education*

The underlying value of the CEET program is that the classroom should be an authentic and supportive learning environment where students with varying academic and personal backgrounds can become engineers together through an optimized collaborative learning process. In achieving shared learning goals defined in the courses, students will experience incremental phases of collaborate, elevate, and engineer together (See figure 2).

At the beginning of the course, students are given learning tasks, and course expectations through guidelines. Students define and identify their collaboration with team members, and work together to solve complex problems as a team.

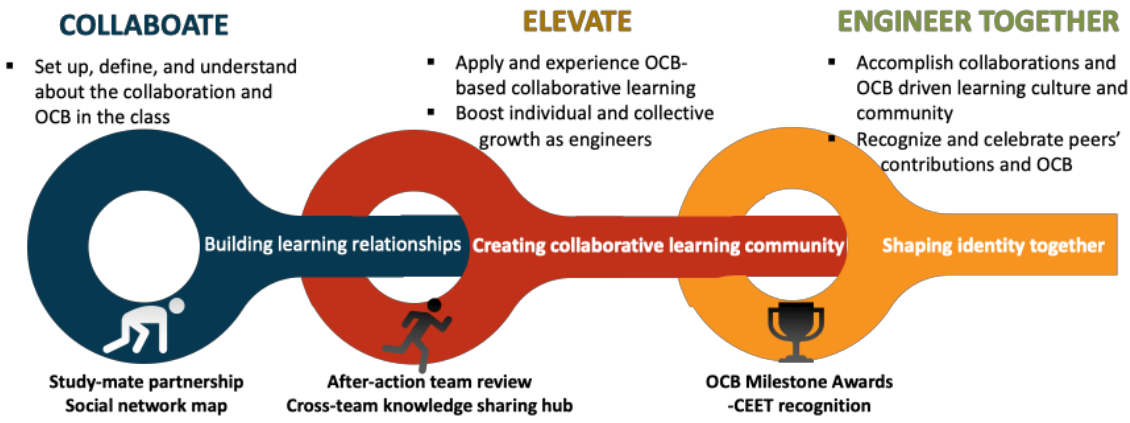

Figure 2. *Comprehensive Plan of the CEET Program in the undergraduate ME courses at UNM*

To elevate individual and collective growth during the learning process, students are asked to engage in learning activities fostering their application and experience of OCB. With the

scaffoldings to elevate their learning, students collaborate within and across the groups, building partnerships, and engaging in meaningful knowledge sharing, deep reflective learning, and reciprocal helping behaviors. In the last stage—engineer together, based on the prior stages—students accomplish team missions and produce tangible learning outcomes. This is also where they will experience a collaborative learning community and recognize their peers' contribution and OCB.

This CEET program will achieve three objectives. CEET Core concepts, applications and outcomes can be found in Table 2. **Objective 1** is to enhance collaborative learning among engineering students in the undergraduate mechanical engineering courses at UNM, focusing on defining and identifying the concept of collaboration. Since OCB will be significantly associated with students' collaborative learning, this project examines a structured learning guideline that supports peer interaction and knowledge sharing.

This effort will integrate innovative analytic (i.e., collaborative network maps) and collaborative tools (i.e., study-mate partnerships) to foster a dynamic learning environment where students can engage in problem-solving tasks and projects that mirror real-world engineering challenges. Analyzing students' collaboration involves the examination of the informal learning and knowledge sharing among students based on interconnectivity and interactions during the course. Students may indicate the extent to which they think the role of collaboration provides others with the necessary information for learning tasks given in the course.

By facilitating effective teamwork and collaboration, the project aims to develop not only students' technical competencies but also interpersonal skills, thereby preparing them for successful careers in the engineering field. This initiative will also seek to identify and address the barriers to effective collaboration and propose solutions to improve educational outcomes in the mechanical engineering education at UNM. Expected outcomes of this phase are a sociogram of network structure and ties to help build study-mate partnerships and collaboration networks.

Objective 2 is to improve individual and collective growth by collaborating within and across the groups through learning activities based on targeted OCB interventions within the curriculum and pedagogical strategies. Students' collaborative learning experiences and growth as mechanical engineers will be further elevated through structured interactions and discussions with their peers in the class.

Such efforts will integrate both team-level (i.e., After-action team review) and across the teams (i.e., Cross-team knowledge sharing hub). First, the team-level after-action review is to facilitate proactive engagement in collaborative problem-solving, iterative design activities, and effective management of technical setbacks. Once a project test run is finished, students reflect on their goals, evaluate their achievements, identify unmet objectives, and discuss areas for improvement during the After-action review. Students' discussions aim to foster knowledge sharing and promote OCB among students during collaborative problem-solving efforts. Students share their analysis and reflections and navigate ambiguity to improve their shared project goals.

Second, students' learning experience and growth can be further enriched using the Cross-team knowledge sharing hub. This centralized knowledge sharing hub can be used to foster knowledge

sharing, collaboration, problem-solving, and innovation by exploring diverse perspectives and identifying common challenges and successes. Through the interventions during the Elevate phase, expected outcomes include individual students' learning performance, the development of belongingness, and a collaborative and supportive learning community at the course level.

Table 2. CEET Core Concepts and Applications

Phase	Description	Interventions	Outcomes
Collaborate (From week 1) Driven by OCB **A**ltruism; **C**onscientiousness	Students define and identify what they collaborate on, who they collaborate with, and how they collaborate. They build learning relationships, working together to complete learning tasks in pursuit of study-mate partnership.	Study-mate partnership based on SNA; Microlearning Video Orientation about OCB	Study-mate partnership; Collaboration network map
Elevate (From week 7) **A**ltruism; **C**onscientiousness **T**olerance	Students boost individual and collective growth and collaborate within and across the groups through learning activities that foster the experience and application of OCB.	After-action team reviews; Cross-team knowledge-sharing hub	Learning performance; Belongingness; Collaborative and supportive learning community
Engineer Together (From week 12) **A**ltruism; **C**onscientiousness **T**olerance; **C**ourtesy	Students accomplish their team missions, experience a collaborative learning community, and recognize their peers' contributions and OCB.	OCB Milestone Awards: CEET recognition	Learning performance; Belongingness; Engineering identity

Objective 3 is shaping the collective identity of engineers during the course, accomplishing their team missions, experiencing a collaborative learning community, and recognizing their peers' contributions. For Objective 3, a robust peer recognition badge will be designed to enhance collaboration, reward outstanding contributions, and promote a culture of sustainable systems in UNM. The OCB Milestone Awards is a CEET recognition activity that encourages and rewards students who consistently exhibit OCB during key project milestones.

The OCB Milestone Awards designed in a course that emphasize team projects will be implemented to acknowledge not only the final deliverable but also the processes and interactions that bring the project to fruition. Based on the input from the instructional team and students, rewards will be given as a physical badge and digital recognition board at the end of the course. Expected outcomes are learning performance, belongingness, and engineering identity.

Considering the current course structure and 16 weeks of course duration, CEET interventions will be implemented in three different phases: Collaborate (from week 1), Elevate (from week 7), and Engineer Together (from week 12). During the Collaborate phase, in addition to the

instructor's introduction and guidelines for learning tasks, the research team will support the development of optimal study-mate partnerships based on a social network analysis and will provide a microlearning video orientation about OCB to guide students' collaborative learning and set the expectations. During the Elevate phase, the instructor will incorporate structured learning activities—After-action team reviews and Cross-team knowledge-sharing hub—to facilitate students' collaborative learning and OCB. During the last phase, the instructor will facilitate the CEET recognition of students.

Moving forward

The CEET project was launched in Fall 2025, with its first pilot implementation underway in Spring 2026. Three additional iterative implementations are planned from Fall 2026 through Fall 2027. Across these semester-long cycles, CEET will be refined and strengthened through systematic data collection, theory-driven analysis, and continuous improvement. Through the intentional integration of prosocial behaviors and reflective collaboration grounded in OCB, CEET is designed to enhance students' engineering identity, belongingness, and learning performance while fostering teamwork and social connectedness essential for professional practice.

During each iteration, the project team will examine how CEET interventions influence undergraduate engineering students' cognitive and affective learning outcomes using multiple complementary data sources, including surveys, network data, interviews and observations. Students will be followed across ME 160 and ME 260 to examine longitudinal development in OCB, engineering identity, belongingness, and learning performance. Pre- and post-course survey data will be analyzed to examine changes over time, and additional analyses (e.g., group comparisons and regression) will be used to estimate the effects of CEET interventions. Qualitative data from interviews and observations will be analyzed to better understand students' experiences and perceptions of CEET. Findings from each cycle will be used to refine both in instructional design of CEET and the underlying theoretical framework linking OCB, identity development, belongingness, and collaborative learning.

Over time, these iterative cycles will produce a validated, transferable intervention framework that can be scaled across engineering courses and institutions. This framework will contribute both practical tools for instructors and empirical evidence to advance theory and research on prosocial learning, engineering identity, and supportive engineering professional formation.

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