



**TUEE Collaboratory**  
*Transforming Undergraduate Education  
in Engineering (TUEE)*

**Proposed Comprehensive Model Pilot for  
Transforming Undergraduate Education in Engineering (TUEE)  
at The University**

***Student-centered Professional Practice Learning (SCPPL) Initiative in  
Computer Science and Engineering for Implementation AY 2025-26***

Overview Updated April 9, 2024

The emerging national ***movement to transform undergraduate education in engineering (TUEE) requires a radical shift from passive learning***. Student-centered active project learning would feature interdisciplinary, team-based, open-ended problem solving and project learning involving real-world situations, often with real customers and real potential employers, ***throughout the undergraduate experience, especially at major, large universities***. All access, diversity and inclusion issues must be addressed systematically in the model, as well and embedded from the outset. **The Collaboratory model fosters a student-centered, professional practice learning environment for transforming undergraduate education in engineering/computer science.**

Curricular changes, including *ASEE TUEE* study findings and recommendations, dominate the many transformation initiatives currently underway nationally. However, *the proposed regional Transforming Undergraduate Engineering Education (TUEE) Collaboratory model* integrates ***Curricular (design spine based on student-centered, interdisciplinary, team-based, open-ended problem solving and project learning each of the four undergraduate years) Co-curricular professional skills development such as teamwork, a wide variety of presentations/reports, and project management with a signature design project for each of the four undergraduate years, Diversity/Inclusion and new standards for higher education/industry partnering*** into a comprehensive systemic model of student-centered active learning. Also, the model uniquely places ***emphasis on applying an entrepreneurial mindset and design thinking to intrapreneurial activity***, i.e., being entrepreneurial within the context of an existing organization. Finally, engineering and computer science majors with a minor or certificate in intrapreneurship are fully prepared to *enter a career in new product design and development* within an existing organization upon graduating.

The proposed TUEE Collaboratory model is structured to operate in an autonomous ***“Higher Education/Industry Academic Skunkworks”*** environment utilizing a unique synergistic flexible framework comprised of four Action Councils with membership representing all program participants. The *Action Councils* are the *Faculty Professional Practice Council (FPPC)*, the *Student-centered Professional Practice Council (SPPC)*, the *Student-centered Diversity Solutions Council (SDSC)* and the *Professional Practice Executive Council (PPEC)*. An *autonomous “Academic Skunkworks” synergistic operating environment* would be in the process of ***establishing the precursor for an Institute, located on or near campus, ideally in The University Technology Park, by June 2026***. The *Institute* would facilitate scaling of the comprehensive pilot and the continuing collaboration by various partners beginning with the constituencies noted below. The base synergistic, flexible framework would have been established, i.e., the four Action Councils, in preparation for the comprehensive pilot to be implemented during AY 2025-26. A diverse cohort of at least 80 high potential students, about 10 founding Strategic Corporate Partners

(SCPs) and the appropriate campus faculty and staff would have also been established by late-October 2024. *All currently scheduled courses, student programs and events throughout The University would be conducted as planned through June 2026* while the comprehensive pilot is being developed, and then implemented, in the autonomous “Academic Skunkworks” environment, ideally located in The University Research Park.

A start-up/feasibility assessment phase for proceeding with the project would be undertaken and must be completed by early fall 2024. Upon completing the start-up phase, the AY 2024-25 development phase would begin and continue throughout the entire academic year (AY 2024-25). During the development phase, all elements required for full implementation of the comprehensive pilot beginning early fall of AY 2025-26, would be identified and developed with the entire project scheduled to be completed by June 2026. Prior to beginning the Startup Phase, a full description would be provided to the Lead university(s) in both regional Collaboratories so that each university can complete the early development stage by late-October 2024 (semester campuses) or mid-November 2024 (quarter term campuses). Prior to November 2024, each lead university would have planned and then would conduct its inaugural Day on Campus with Strategic Corporate Partners event in November 2024.

**Start-Up and Assessment Phase** - All currently invited campuses are major, large universities with the capacity to serve as a Collaboratory lead, or possible co-lead, in California. They are all located in the two large California metropolitan areas in the North (Bay Area) and South (Greater Los Angeles). It is suggested that at the beginning of the Start-Up Phase, each lead university would establish about three founding Strategic Corporate Partners (SCPs.) The founding SCPs would be major companies with headquarters or large local operations with an average of at least four hundred practicing professional alums including recent retirees (These data may be sourced from alumni registered with LinkedIn.) At the inaugural Day on Campus with Strategic Corporate Partners event in November 2024, founding SCPs should scale to about 10 members, from 3 or 4 SCPs during the start-up phase.

This large alumni pool represents an immediately identifiable source of significant potential financial resources (including corporate matching) to The University for sustainable early-stage funding of this initiative (also see the Strategic Corporate Partner Investment Guidelines at [www.curg.net](http://www.curg.net)). However, most importantly, such a huge human resource pool would support campus administrators, faculty, and staff. This available cohort of practicing professionals would engage with students as coaches and mentors in a wide variety of projects and professional development activities throughout the undergraduate experience. As the number of SCPs is scaled, it will increase to many companies/organizations of various types and sizes over the years, until it comes to represent the entire ecosystem of the university. This newly added process becomes an increasingly important source of additional financial and human resources for improving and scaling existing programs and the development of new sustainable programs into the future. *The goal of such growth is that each student would be fully prepared with all required skill sets to enter their chosen career fields and excel in initial professional workplaces* as practicing engineers and computer scientists.

***When the 2025-26 academic year begins***, acting as partners, the four action Councils, with SCP practicing professionals and recent retiree alums included, would implement all elements of the comprehensive pilot: student-centered, interdisciplinary, team-based, active learning programs, projects, events, and activities while establishing new partnering standards for higher education/industry collaboration. Current students would be focused on empowering future students throughout their entire undergraduate experience to engage with practicing professionals

in proactive curricular and co-curricular student-centered, active learning. The new partnering relationships would include the extensive involvement of alums and recent retirees (industry and professional societies) in a variety of roles to supplement and complement current faculty, who are typically operating with a full load teaching theory and conducting research. Faculty and staff simply lack the numbers to come close to advising, coaching, and mentoring *each student* throughout the undergraduate experience.

The short-term objective of the initiative through June 2026 is to design, develop and implement the comprehensive pilot for a scalable, replicable, and sustainable exemplar model of engineering education practice consistent with the *ASEE TUEE findings and recommendations* of the multi-phase, five-year, NSF-funded study released in 2018. The implementation would include:

1. **Faculty Professional Practice Council (FPPC)** – this action council would have oversight for establishing then maintaining continuing improvement of the exemplar curricular professional practice program featuring student-centered team-based problem solving and project learning each year *throughout* the undergraduate experience. Included would be a *design spine* with at least one signature team-based design project each of the four years, including industry sponsored third-year (one semester) and fourth-year (full-year) best practice senior design projects. Design thinking and entrepreneurial/intrapreneurial mindset would be integrated *throughout* the undergraduate experience. During AY 2025-26, the best practice *sponsored senior design (capstone) program would be implemented featuring real problems that would be solved by small student teams of 4-5 students for at least ten, up to 15 sponsors/customers. Best practice industry sponsored one-semester third-year design projects would be introduced in spring semester 2025 during the development phase of the initiative, with sponsored second-year projects being introduced spring semester 2026 and at three partner community colleges.* Various presentations and reports would be embedded with each project to help assure that each student acquires the oral and written communication skills required in the professional workplace upon graduation.

The FPPC would be established during the start-up phase. Depending on offerings by the university, students participating in the pilot would be majoring in one of the following majors: BME, CpE, CS, EE, or ME. Each department chair representing each major, would select a lead for the faculty team and two additional faculty members to represent the major. One would lead program development for first and second-year design projects and the other would lead program development for third and fourth-year sponsored projects including a best practice capstone program. Project sponsors would plan on using results produced by their student team and would get the IP. Student names would be on any resulting patent. The FPPC has a lead point of contact for communication to and from PPEC, SPPC, SDSC and each of the SCPs.

2. **Student Professional Practice Scholars (SPPS)** – a diverse cohort of current (spring 2024) second and third-year *honors students majoring in BME, CpE, CS, EE, or ME with 3.0+ GPAs* would be fully established by late October 2024 *with an initial cohort of about 80 honors students attending the inaugural Day on Campus with Strategic Corporate Partners.* SPPS would be the student cohort participating in all student-centered projects, programs activities and events throughout the entire two-year project. The size of the SPPS cohort would be scaled accordingly throughout the project to be completed by June 2026 but eligible student majors would remain the same. When full Implementation of the comprehensive pilot begins in AY 2025-26, planning for scaling of the pilot would also begin, e.g., additional majors in the College of Engineering, including other colleges like business and science, graduate level programs and projects, establishing better and more research collaborations with companies and establishing other regional Collaboratories will be in process, along with several other considerations to be created and determined in the development phase. Again, the SPPS cohort provides the student teams for the team-based, project learning experience throughout the entire two-year project.

3. **Student-centered Professional Practice Council (SPPC)** – established during the start

up phase of this project, in collaboration with the founding SCPs, the SPPC would further establish and engage student teams and work groups in co-curricular student-managed personal and professional development activities and events. These projects, activities and events would be undertaken in collaboration with SCP practicing professionals/alums and recent retirees. along with members of local professional chapters of *ACM, ASME, BMES and IEEE* that complement the academic professional practice projects and programs. Initial SPPC membership, established during the start-up phase, would include one lead student nominated by each major student chapter of ACM, ASME, BMES and IEEE, as well as one third-year and one second-year student selected by each lead student. SPPC would have a lead point of contact for communication to and from the PPEC, SDSC, FPPC, each SCP and each national professional society.

4. **Student-centered Diversity Solutions Council (SDSC)** – established during the start-up phase of this project at The University in collaboration with SPCs, SPPS member leaders representing national diversity student organizations (*AISES, NSBE, SHPE, SWE*) would establish the SDSC. Local professional chapter member representation of their respective national diversity organizations would be established. SDSC would have a lead point of contact for communication to and from the PPEC, SPPC, SDSC, FPPC, each SCP and each national diversity organization. SDSC is an exemplar model that would *embed the addressing of diversity and inclusion issues at the core of the comprehensive pilot model* and when it is scaled. A strong diverse student leadership group led by SDSC is essential to collaborate effectively with SCPs to address various diversity, equity, inclusion, pathway, and pipeline issues.

5. **Professional Practice Executive Council (PPEC)** – provides general direction and oversight for the initiative. Typically, the Dean of the College of Engineering, and/or a designated report, would lead the Professional Practice Executive Council (PPEC) and the Dean’s Leadership Team (DLP). The DLP would typically consist of the Head, or a designated report, in the following areas: Academic Affairs, including the Dean of Faculty, a faculty member lead representing each participating major in engineering/computer science: BME, CpE, CS, EE, ME. Student Affairs including Student Success and Career Service; Development including Corporate Relations, Alumni Affairs and Gifts & Grants. For SCPs, the membership would include the Chief Technical Officer or direct report, a Vice President of Engineering, and the Vice President of Research/new product development and the Campus Manager who will oversee all the activity by their SCP representatives at the campus. Also, a lead point of contact for communication to and from the PPEC and each Council (FPPC), (SPPC) and (SDSC) will be identified. The Council should meet one or two times prior to the Day on Campus with Strategic Corporate Partners in November 2024 to discuss plans for what it can contribute and the benefits it expects to see and its plan for creating the best program in optimizing the projects and project learning throughout the undergraduate experience. Each council member would serve on an interim basis until the Day on Campus with Strategic Corporate Partners event, at which point some will rotate out while others may become permanent members. Each SCP would be a non-voting member of The University’s PPEC.

6. **Transfer Scholars Program (TSP)** – Due to community college enrollment characteristics in most communities, it is anticipated that most transfer students would continue to be low-income underrepresented minorities and women from local community colleges. It is suggested that about three local community colleges would be established as strategic partners by November 2024 and would participate in the inaugural Day on Campus with Strategic Corporate Partners. The community colleges would first participate in developing the Transfer Scholars Program. *Potential transfer students would be awarded full-tuition scholarships, and each finalist would have the opportunity to interview for an internship with Strategic Corporate Partners for the summer prior to AY 2025-26 as an incoming student.* During the spring of 2026, two-year capstone design projects would be introduced at two or three local partner community colleges concurrent with second-year design projects being introduced at the host university.

7. **Strategic Corporate Partners (SCPs)**– a world class initiative that *engages* SCP executives in the PPEC, with university leadership along with practicing professionals and recent retiree alums *with students, faculty, and staff in a variety of experiences throughout the undergraduate experience*. The goal is to leverage the curricular Professional Practice Program and co-curricular Student-centered Professional Practice Scholars (SPPS) initiatives to ***create new higher education/industry partnering standards in collaboration with FPPC, SPPC, SDSC and PPEC***. This would provide an alternative to traditional university Corporate Partner/Affiliate Programs that tend to treat corporate partners as donors or sponsors of university-developed programs that typically provide various levels of *access* to faculty and students. By *engaging corporate investor/partners in creating sustainable innovations and programs that foster and support student-centered active learning*, The University would immediately enhance existing corporate relationships and develop new ones, for example, an alumni chapter would be established within each SCP.

**Concluding Comments** -The distinguishing element in the implementation of the model is an integrated approach to replace current piecemeal approaches to student-centered, team based, problem-solving and project learning throughout the undergraduate experience. It creates a new relationship for partnering with industry alums and recent retirees and all other participants. It is one in which the companies are viewed *not as* donors but as investor/partners expecting a strong return on investment while providing new major sources of human and financial support for students and student programs. Company employees, especially alums and recent retirees, represent primary immediate critical human and financial resources to supplement and complement university faculty and staff, especially at major, large universities who are already working at capacity teaching theory and conducting research. ***Faculty simply lack the numbers and bandwidth*** to serve as advisors, coaches, and mentors throughout the experience ***for each student***. ***Unless this issue is addressed with an innovative approach to significantly enhance human and financial resource development, there will be no transformation and the problem will remain insoluble***. **It seems that the TUEE Collaboratory model pilot may be the only comprehensive model for transforming undergraduate education in engineering/computer science (TUEE) that would be implemented by June 2026 and into the foreseeable future.**