



TUEE Collaboratory

Transforming Undergraduate Education in Engineering (TUEE) Proposed Pacific Northwest TUEE Collaboratory – Last Call

August 25, 2017

The purpose of Phase 1 of the TUEE Collaboratory, as described below, was to produce a flexible framework to facilitate collaboration and encourage lead universities and industry partners to establish practicing models, including multi-institution regional Collaboratories. The regional Collaboratories would be prepared to facilitate the widespread implementation of the ASEE TUEE initiative findings and recommendations scheduled to be released in 2018. While the flexible framework has been created, the second goal of establishing a multi-institution regional TUEE Collaboratory remains. In order to accomplish this important but very aggressive goal within the one academic year remaining before the release of the findings and recommendations, Corporate & University Relations Group (CURG) has initiated the development of a comprehensive regional TUEE Collaboratory pilot in the Pacific Northwest.

Last fall in the Pacific Northwest, two universities were selected as candidates to be leads for development of the Collaboratory – the University of Washington Seattle and the University of Washington Tacoma. The University of Washington Tacoma is a relatively new campus with considerable flexibility as it develops and would be a good fit for the transformative nature of a Collaboratory. Unfortunately, we were unable to move with UW Tacoma because, at that time, they were searching for an inaugural Dean for the Institute of Technology and thus were not in a position to assume a lead role. We invited UW Seattle, a nationally recognized major research university, along with Seattle Central and Highline Community Colleges and Washington MESA and proceeded with them in their respective lead roles. However, in the spring of 2017 we were informed by UW Seattle that due to the redesign of their enrollment process that was underway, they would not be able to proceed as the lead university. Subsequently we pursued other Pacific Northwest universities without success due to the short timeline. At the 2017 ASEE Annual Conference on June 27, Paul Jones, founding Executive Director of the TUEE Collaboratory, had to inform Norman Fortenberry, the Executive Director of ASEE, and several other “interested parties” that it was very unlikely we would have a lead university for the Pacific Northwest TUEE Collaboratory, the first regional TUEE Collaboratory (Seattle Central College and Highline College remained poised to be lead community colleges).

However, upon learning on July 16 that, effective July 1, Dr. Rajendra Katti was appointed inaugural Dean of the Institute of Technology at the University of Washington Tacoma (UW Tacoma), Paul Jones extended a “last call” invitation to Dean Katti for UW Tacoma to be the lead university for the proposed Pacific Northwest TUEE Collaboratory. Dean Katti has agreed to consider being the lead university contingent upon three local community colleges and at least four major companies (HQ or strong Pacific Northwest presence) would commit to full participation as founding Strategic Partners by September 22, 2017 (fall 2017 classes begin September 27). Also, the decision to move forward to implementation would be contingent upon all stakeholders agreeing to collaborate in creating all aspects of the comprehensive pilot program prior the inaugural Day with Corporate Partners event in November 2017. The scheduled launch of the 501(c)3 non-profit corporation that would be the permanent “home” for the TUEE Collaboratory would be announced at the event.



Background

Transforming Undergraduate Education in Engineering (TUEE) “aims to produce a clear understanding of the qualities engineering graduates should possess and to promote changes in curricula, pedagogy, and academic culture needed to instill these qualities in the coming generation of engineers.” TUEE is a five-year, four-phase initiative being developed by the American Society of Engineering Education (ASEE) with support from the National Science Foundation (NSF). Phase 1: *Synthesizing and Integrating Industry Perspectives* <http://tuee.asee.org> released in May 2013, involved 34 invited representatives of companies with an important stake in training the future engineering workforce (participants are listed in Appendix D).

Preparing Engineering Students for Professional Practice

During the ASEE Annual Conference in June 2013, a small group of ASEE Corporate Member Council (CMC) members informally discussed the recently released ASEE TUEE Phase 1 report. They noted that findings and recommendations would be issued in 2018 that would ultimately “produce a flexible framework for transforming the undergraduate engineering experience”.

During the conference, the ASEE CMC special interest group (SIG), Preparing Students for Professional Practice (PSPP) was established and ASEE CMC member Paul Jones was selected to chair the new SIG. The primary purpose for the new SIG was to “produce a flexible framework” to facilitate corporate and university member collaboration in accelerating implementation of the 2018 TUEE findings and recommendations. Subsequently, several best practices panels and workshops were sponsored by ASEE CMC PSPP, primarily in conjunction with the ASEE Annual Conferences in June and the ASEE Conference for Industry & Education Collaboration (CIEC) in February of each year. At the 2015 ASEE CIEC in February, an informal all-day preconference workshop was held with about 30 corporate and university CMC members and guests participating. The outcome was to issue the challenge to create a “TUEE Collaboratory” that would initially be sponsored by the ASEE CMC Preparing Students for Professional Practice special interest group (SIG).

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The aggressive end goal for the TUEE Collaboratory was to have several exemplar engineering education transformative industry/higher education models operating for widespread implementation of the ASEE TUEE findings and recommendations **when** issued in 2018. In addition, the TUEE Collaboratory supports the Engineering Deans Council Diversity Pledge signed by over 100 engineering deans and presented at the White House on August 27, 2015. This support is in the development of strong K-16+ Transfer Scholar/Diversity Pipeline initiatives involving universities, community colleges, K-12 and local company employees and retirees when establishing regional TUEE Collaboratories, especially in urban and rural areas.

Collaboratory university members are expected to represent all types and sizes of colleges and universities, along with their corporate partners representing the various industries that hire their



graduates. Community colleges, especially feeder schools serving high enrollments of low-income and underrepresented minorities and women students, are encouraged to be included in the Collaboratory model developed. The Collaboratory will emphasize student-centered, interdisciplinary, team-based problem solving and experiential learning. Corporate members will partner with selected member universities to systemically engage in student-managed team-based activities, projects and events with students and faculty at each of their partner universities. Graduating students will possess the attributes and skill sets needed to enter and succeed in the professional workplace.

Curricular Professional Practice Experiential Learning – students will participate in student managed project teams to solve real problems for real customers throughout their undergraduate experience. Various types of reports and presentations embedded with all projects will help foster strong communications skills for each student. Faculty representing each major will establish the Faculty Professional Practice Council (FPPC). Senior design (capstone) projects will involve real open-ended problems provided by industrial sponsors. Although a faculty coach(s) will be provided for each team, the student team is empowered to solve the problem for their customer. The team must interact with their sponsor liaison(s) weekly throughout the academic year. The skills of negotiating project plans and schedules, making presentations, preparing reports, adjusting to changing conditions and presenting critical design reviews to senior management are all needed in the professional workplace and will be learned in this program. Sponsors pay a capstone program fee, determined by the university (typically \$15K-\$50K per project), plan to use the results produced by their student teams and retain all intellectual property rights. The TUEE Collaboratory encourages student centered team based curricular and co-curricular problem solving throughout the undergraduate experience. A strong senior design (capstone) experience is critical and should serve as each student’s “last course **and** first job”, engineering practice prior to graduating – using team-based problem solving skill sets, solve a real open-ended problem for a real customer, on time and within budget – each team member is prepared to enter and succeed in the professional workplace.

Co-curricular Professional Practice Experiential Learning – will involve extensive collaboration by corporate partners and professional societies with student-managed teams and work groups in developing a world class co-curricular experiential program that complements the *Curricular Professional Practice Program*. Students exceeding requirements to maintain a merit scholarship (typically a 3.0 GPA) apply to be members of Student Professional Practice Scholars (SPPS). Student leaders representing campus chapters of national engineering student organizations will establish the Student Professional Practice Council (SPPC). Student members will be empowered to manage experiential and professional development activities and events in collaboration with their corporate sponsors/partners. With the coaching and support of university faculty and staff plus recent retirees and alums with corporate partners and members of local professional society chapters (ACM, ASME, IEEE, etc.), students will manage and participate in teams and work groups developed by the students in collaboration with their corporate partners. Activities and events will include career/professional development, tech talks/workshops, boutique career events, corporate partner site visits, a day on campus with each corporate partner and mentoring. A student ambassador or ambassador team will be designated as the point of contact for each corporate partner to facilitate their engagements with students and faculty.



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Diversity – a strong diverse student leadership group, representing the diversity student organizations on campus, is essential to effectively collaborate with corporate partners to address various diversity issues, activities, events and recruiting throughout the academic year. National diversity student organizations at member universities, such as NSBE, SHPE, SWE and AISES, are encouraged to form Diversity Solutions Councils linked to their respective local professional chapters and alumni of major local companies for developing and managing mentoring and various engagement programs and projects.

K-16+ Diversity Pipeline and Transfer Scholars programs are encouraged, especially in forming regional Collaboratories in urban areas (multiple universities, community colleges, K-12 districts/charter schools, local major companies, recent retirees and university alumni of strategic corporate partners and local professional society members.) Lower division (first and second year) STEM students, whether enrolled at a university or at a community college, need opportunities to participate in interdisciplinary, team-based experiential learning and problem solving. With a highly diverse population of students, community colleges should be integrated into the emerging industry/higher education collaborations. An effective transfer scholars/diversity pipeline program will include at least three key elements: small-scale real world problem solving experiences, participation of corporate partners in community college co-curricular activities, and clear pathways to transfer scholarship support. The program should focus on underrepresented minorities and women, full scholarships for highest potential students, internships for incoming transfer students with corporate partners and mentoring by student leaders upon enrollment in the university.

Strategic Corporate Partner Initiatives – Each university member of the Collaboratory is encouraged to invite a select group of Strategic Corporate Partners to develop a unique world-class comprehensive and systemic corporate partnering program. A broad range of programs defined and developed in collaboration with founding corporate partners to include sponsored graduate and undergraduate research, senior design (capstone) projects, internships (including summer team internships), various student professional and career development activities and events along with other areas of mutual benefit to each corporate partner, the university and its faculty and students. Developing specifics of this initiative would be defined and implemented in collaboration with Strategic Corporate Partners throughout the 2017-2018 academic year. The goal is to help establish new standards for university-industry partnering.

Summary and Next Steps

At the 2016 ASEE Annual Conference in June, it was determined that the Preparing Students for Professional Practice SIG of the ASEE Corporate Member Council had fulfilled its mission by establishing the flexible framework for the TUEE Collaboratory (Curricular, Co-curricular, Diversity, Transfer Scholars and Strategic Corporate Partner sections in this document outline the Collaboratory's "flexible framework"). Since members of the ASEE CMC PSPP SIG were volunteers and had no resources for developing regional Collaboratories, it was decided to sunset the SIG effective immediately. Paul Jones, chair of the SIG from its inception in 2013, agreed to lead the effort to establish an independent 501c3 non-profit corporation that would host the TUEE Collaboratory. Paul and CURG senior associates would assist universities and companies in achieving the goal of developing at least one model regional TUEE Collaboratory by mid-2018.



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As noted in the opening paragraphs, if all stakeholders agree to proceed by Sept 22, 2017, the PNWTC would be the first comprehensive regional TUEE Collaboratory model to be established with the University of Washington Tacoma as the lead university for a full comprehensive model. The PNWTC would also serve as the model for future regional TUEE Collaboratories. As of August 25, 2014, UW Tacoma would be the lead university, and Highline College and Seattle Central College have agreed to be lead community colleges with Tacoma Community College in the process of being invited. Amazon, Boeing, Google, Intel, Microsoft are in the process of being invited to be the founding Strategic Corporate Partners (with five other companies “in reserve”.) All stakeholders must agree to collaborate in creating all elements of the Collaboratory by the November 2017 Day with Corporate Partners event. (Guidelines and a draft for all elements will be provided by September 8, 2017.) Executives from at least two Pacific Northwest universities, three community colleges and five Strategic Corporate Partner candidates would be invited to participate fully as guests in November 2017 Day with Corporate Partners event. It is anticipated that by June 2018, at least three universities, six community colleges and twelve major companies would be founding Strategic Partners of the PNWTC (projected numbers of students, internships, transfer scholars, projects etc. by Fall 2018 will be added to this draft by September 8, 2017.)

By November 2017, the 501c3 non-profit corporation is scheduled be established. It would assume the oversight of the TUEE Collaboratory and host the Day with Corporate Partners event. Immediately upon launch at the event, the new 501c3 non-profit will begin reaching out to open discussions with ASEE and numerous other professional societies and organizations regarding various types of endorsements, affiliations and collaborations. Until that time, this is an independent effort by Paul Jones, CURG and its senior associates that will keep the project on schedule.

Establishing the Pacific Northwest TUEE Collaboratory model by mid-2018, within one academic year, would be an unprecedented achievement in higher education/industry collaboration. However, without the operating model, it is unlikely the notion of Transforming Undergraduate Education in Engineering will occur in a timely and meaningful scale, especially in the areas that affect the underserved today.

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