Report on a Student Community of Practice Program's Impact on Career Preparedness and Sense of Belonging Among Underserved Undergraduate Students in the Electrical & Computer Engineering Major

Dr. Rachael E Cate, Oregon State University

Rachael Cate received her M.A.in rhetoric and composition from Oregon State University in 2011 and her Ph.D. in higher education leadership and research from Oregon State University in 2016. She joined the School of Electrical Engineering and Computer Science at Oregon State University as a member of the professional faculty in 2016. In this role, she provides engineering communication instruction to students as they progress through the senior capstone project and develop relationships with project stakeholders in industry. She also supports engineering communication program development, research, and implementation. Her Ph.D. research interests include social justice pedagogies; promoting diversity, equity and inclusion in higher education; service learning; program design and leadership; and qualitative research.

Jacob Field, Oregon State University
Sierra Kai Sverdrup, Oregon State University

Report on a Student Community of Practice Program's Impact on Career Preparedness and Sense of Belonging Among Underserved Undergraduate Students in the Electrical & Computer Engineering Major

Abstract: *The EECS Design Student Community of Practice in the School of Electrical Engineering and Computer Science at Oregon State University is a program in its 6th year of development. Educational researchers and engineering education faculty have conducted best practice research and program evaluations to drive program development, and several papers have been published in the past to present the results of these studies and implementation efforts. In the most recent program year (2022-2023), more than one hundred students opted to participate in the program's 9 events and online resources. This report details the implementation of the program in AY 2022-2023, including application of best practice research, events hosted, and resources developed to serve the student community. In addition, results of a participant survey being conducted in the current program year (2023-2024) will allow the author to explore impacts of the participation in the community on career preparedness and sense of belonging, particularly among students who identify with underserved populations in the electrical and computer engineer major on the basis of race, ethnicity, gender, sexual orientation, disability, or first-generation status. The survey results (still in progress) will allow the researcher and program developer to determine what the most important impacts of the program are among these students and to make recommendations for future program development.*

Keywords: communities of practice, transformative learning, sense of belonging, career preparedness, undergraduate education, capstone design, URM students, women in engineering, first-generation, underrepresented racial minority students, underserved student communities, marginalized students, case study, program development research, developer narratives, longitudinal study, educational action research

1. Introduction

This report describes the most recent full year (2022-2023) of the Oregon State University School of Electrical Engineering and Computer Science Design Student Community of Practice Program. The program development details and the research process, data collection, and implementation methodology that has guided it are potentially useful for other engineering educators who seek to create transformative educational opportunities that promote inclusivity, equity, and social justice within the discipline of engineering. The following report first presents the developmental context and key foundations upon which the current version of the program has been structured. Subsequently, a descriptive narrative is offered that includes organization & coordination of the community, opportunities & resources provided to participants, and perceived key benefits of the program based on the developer's perspective. A plan in progress for additional data collection to steer another stage of research and change implementation is discussed. Finally, takeaways for future development of this and other comparable communities of practice for student participants in engineering education are considered.

1.1 Background

The EECS Design Student Community of Practice Program at Oregon State University in the School of Electrical Engineering and Computer Science was originally developed and piloted in 2017 as a means to interweave aspects of academic, extracurricular, career preparation, and professional identity-building in the engineering discipline based upon the model presented by Wenger [1]. Over the 6 years since the pilot, program leaders have conducted development research that has guided advancements in basic organization, educational practice, resource focus and overall implementation methodology [2-4]. The arc of these changes, based on literature review and data gathered from program participants, (also depicted in Fig. 1) has moved toward:

A. *Creating a transformative learning environment through interest-based communities in which participants have opportunities to interact with key program factors for transformative learning. Specifically and primarily, ensuring an inclusive environment where diverse participants collaborate with each other. [2]*
B. *Identifying and increasing program elements that are particularly impactful for our underserved participant groups in order to support the transformative, inclusive, and critically-aware learning environment. [3]*
C. *Reorganizing and re-focusing the program as a single community that supports social justice advocacy, inclusive professional practice, and career skills development through exposure to professional opportunities and career guidance [4]*.

Fig. 1 depicts the overall flow of the program annually. The program began in 2017 with the goals listed above, but, through research from student surveys, interviews with students, and literature review, it has pivoted to focus on the three key areas outlined above and in the figure. The program continues to dynamically evolve via feedback and research to better serve students with a focus on these goals.

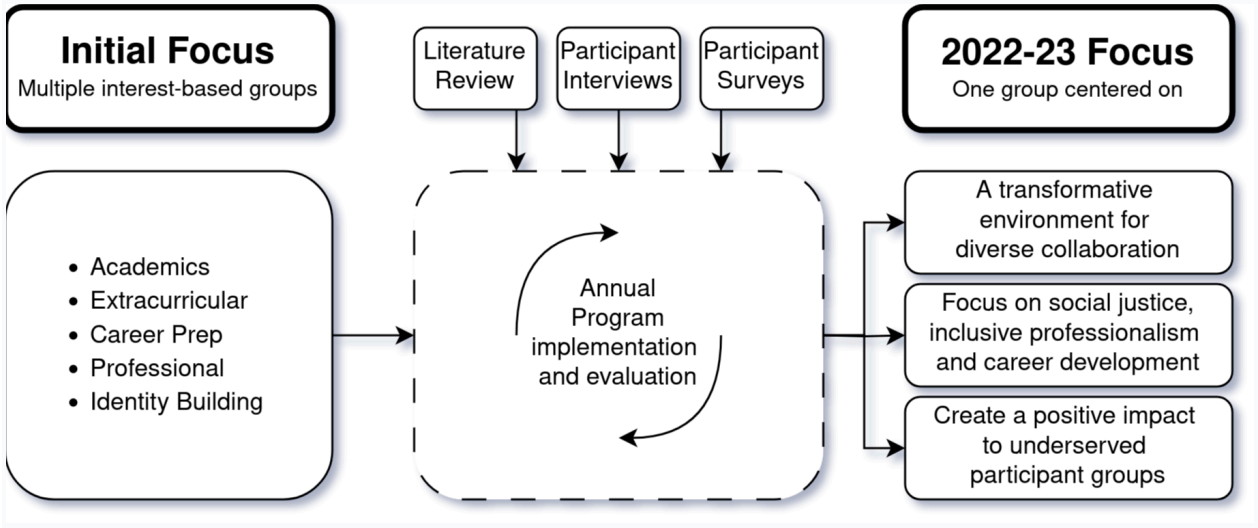

Figure 1. Arc of EECS Design Student Community of Practice Program Development

The following were key takeaways resulting from each of these developmental research & implementation phases:

Influencers for Transformative Education [5, 2]:

1. Critical awareness of culture
2. Professional identity development
3. Participation in communities of mentoring and learning
4. Holistic skill integration through reflection
5. The development of professional integrity through affective awareness

Fig. 2 [3] is a visual representation of the process of these five influencers' impacts on student experiences in an electrical and computer engineering program. This model of the five influencing factors was then used in the development of the subsequent study's interventions.

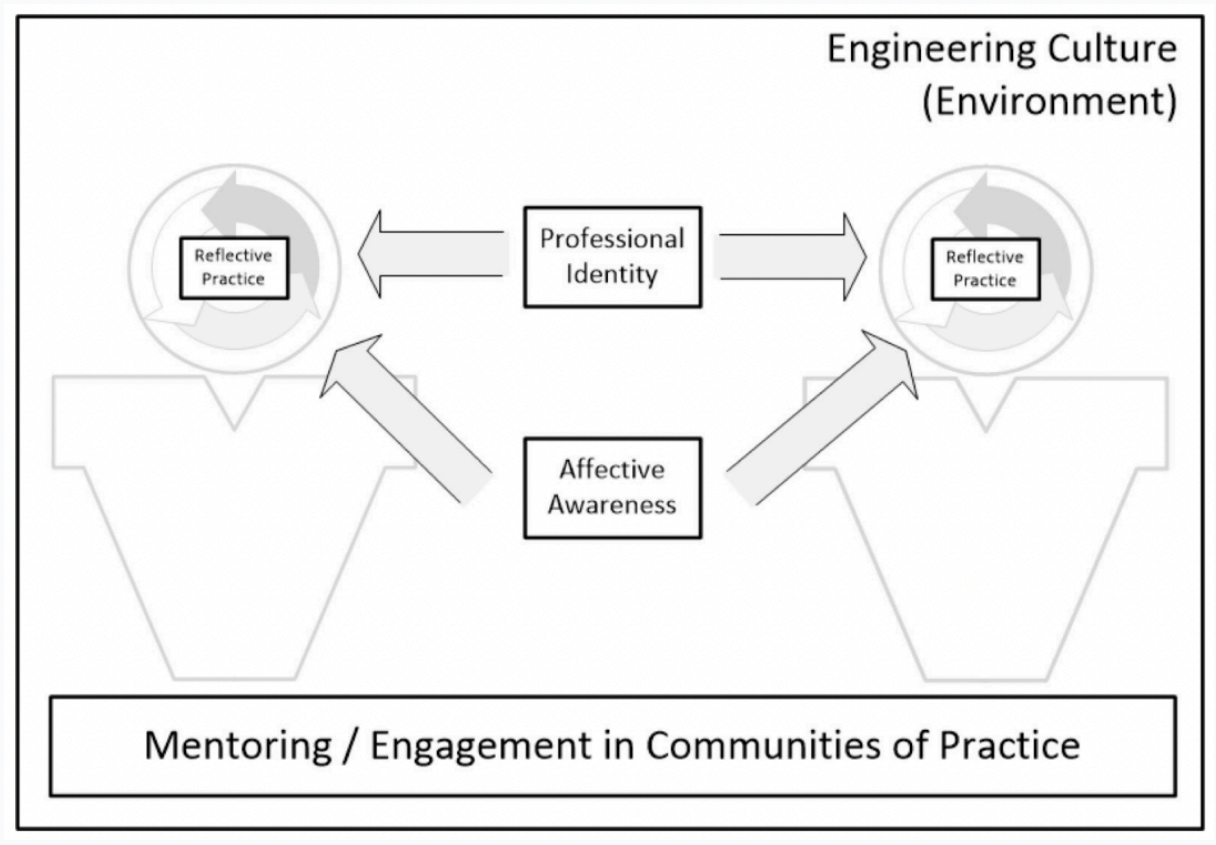

Figure 2. Process of Transformative Learning as Affected by the 5 Influencers: Culture, Participating in Communities, Reflection, Professional Identity, and Affective Awareness

After this model was applied to program development, program developers completed a mixed-methods study including a survey to collect qualitative and quantitative data to evaluate program effectiveness at creating a transformative educational experience for participants [3]. The findings of this study included key impacts of the program and recommendations for future development:

Key Impacts of the EECS Design Student Communities of Practice Program [3]:

1. *Instructors of engineering education seeking to facilitate transformative learning experiences for their students should create their own auto-ethnographic teaching narratives and engage in interdisciplinary dialogues to share values and understanding. Not only do these practices help to support a strong foundation for educational action research studies, they also serve as a foundation for an educational culture within which transformative learning can occur.*
2. *Experiential design courses should be used to teach integrated skills, and also these courses should be extended throughout the curriculum in a way that allows for maximum scaffolding, possibly beginning as early as the freshman year in some form.*
3. *More broadly, experiential opportunities should be developed that complement engineering programs and empower students to build integrated practical and*

professional/interpersonal skills, to participate in an inclusive, supportive engineering community, and to reflect on professional engineering identity across multiple school terms. The more extended the amount of time devoted to this, the more likely it is that students will progress further in their transformative processes.

4. *Finally, we can recommend the establishment of discipline-based communities where students can come together to discuss engineering practice for course credit to be used as an inclusive transformational instructional practice.*

Recommendations to Increase Inclusive & Equitable Impacts of the EECS Design Student Community of Practice, Focused on Serving URM and Women Students [4]:

1. *Ensuring the CoP environment is inclusive, accessible, safe, vibrant, and relaxed with participants present who genuinely have interest in being there in order to support social connections and meaningful professional development exchanges within the communities. This may take additional resources spent on providing for environmental conditions, and it may also mean changing the assignment system within which students are awarded credit in our courses for professional development so that it is clear that CoP engagement is not required.*
2. *Providing more engaging activities such as interest-area based presentations, service learning, and structured discussions or project opportunities.*
3. *Focusing more on professional development workshops that target the specific needs and experiences of underrepresented students.*
4. *Demonstrating the values of diversity, equity, inclusion, social responsibility and ethical engineering practice more meaningfully in CoP activities, processes and documentation. This may include efforts to hold more social justice-focused events and activities of all students to participate in and to bring more diverse URM and women in as presenters as well as broader institutional efforts to change the culture of our engineering program at all levels so that dominant faculty and students are more aware.*
5. *Facilitating better mentorship connection opportunities with faculty, industry partners, and/or peers that include ways for underrepresented students to connect with diverse mentors who reflect their identities. This may take the shape of a mentor matching system, and some extensive reimagining of how mentorship is integrated into Communities of Practice in general may need to take place.*

Subsequent to the identification of these recommendations, the program developers made some change efforts corresponding to each of them, within limits of the resources available. First, a focus on **accessibility** of events included offering both remote and hybrid as well as in-person event options and efforts to create a **more genuine, sincere environment** resulted in a decision to change course assignments related to professional development (which could be satisfied by participating in the CoP) from mandatory to extra credit assignments. Next, an interest survey was administered at the beginning of the next year to ensure responsiveness to authentic interest and the provision of **engaging opportunities** specific to the participating cohort for that year. To support professional development and also participants from underrepresented communities, opportunities offered were also intentionally centered around

two key areas: **career preparation/exploration and advocacy of diversity, equity, inclusion & social justice**. All events had primary goals of offering participants to engage in one (or, often, both) of these. Finally, development of a mentor matching program was begun. This program, including a website and an algorithm for matching those who register, is currently in its second year of development and is scheduled to be unrolled in the 2024-2025 academic year. The following section provides a more detailed description of the implementation of these recommendations in the 2022-2023 academic year.

2. Program Report for the 2022-2023 Academic Year

The following section documents program implementation during the most recent academic year, during which all of the recommendations and next practices from previous years' research results were put into place. Overall, this has been the most robust and focused year of the program, with more events and resources than ever before offered to target specific needs based on the development research.

2.1 Coordination and Setup

At the beginning of the 2022-2023 academic year, the primary faculty program developer first conducted an interest survey to determine which topics or events might be particularly useful or engaging to the students enrolled in the ECE Senior Design course series for the 3-term academic year-long sequence. As in previous years, this population was the most accessible to program faculty and so remained the focus population for development. As a departure from past years, however, the "Professional Development Assignment" associated with course credit for engagement with the Community of Practice or other self-chosen extracurricular career development opportunities (see Appendix A) was discontinued.

This assignment was transitioned to a set of extra credit opportunities (event attendance, correspondence with a mentor, professional portfolio submission, or community leadership) to be added on top of students' final grade at the end of each term. This change was based on the past feedback that students who did not choose to be involved in the community were disrupting the culture of the community and diminishing the overall authenticity of sincere engagement with the community. The trade-off of this change, in theory, was that students who have reduced access to career development opportunities because of circumstances such as lack of time to engage in activities not directly related to coursework because of home or life responsibilities (a population that often overlaps with underserved communities) might miss out on participation in the community for this reason. However, the extra credit option seemed a good compromise between forcing students who do not want to participate and offering credit to those who are interested but otherwise would not be able to take advantage of events and resources. The extra credit assignments also maintained the relationship between the course objectives and content and the presentation of opportunities to engage with the community or practice. This relationship has supported a level of awareness among students regarding what the community offers and how they might benefit from participating.

In addition to students in the ECE Senior Design 3-term course sequence, the faculty developer also had access to ECE Junior Design students in the winter and spring terms and was able to offer extra credit to them as well as incorporate periodic announcements about community activities and resources within the frameworks of the course. While this effort resulted in a majority of ECE junior and senior students making up the community participant group, students in the computer science program as well as other engineering majors also received invitations to community events through college newsletter and calendars. While the event focus was primarily based on the interest of ECE students, the inclusive mission of the community meant that all students were welcomed, and some non-ECE students (especially CS majors) did attend (and expressed that they found value in) some of the community's offerings.

Throughout the course in the fall, winter and spring terms, students registered for a variety of events related to the topics of advocacy for social justice in the engineering progression, the awareness of the experiences of diverse engineers in the workplace, strategies for how to pursue careers in engineering or computer science, creating community and sharing about engineering projects, and awareness of the broad impacts of engineering designs in society (see also Table 1 below). Most of these events were in person or hybrid events, and some of them were conducted exclusively over Zoom (online e-campus students and others who could not make it in person expressed appreciation for these hybrid and online events). When students registered, they also entered whether they would be joining in person or online and their food preferences if attending in person. For in-person or hybrid events, these were held between 11am-1pm during class lecture time for ECE Senior Design or during the ECE Junior Design afternoon class time, and pizza was provided to increase the accessibility of the event and also encourage participation among students for whom an included meal might be a significant motivating factor. The low-stakes, social environment of most of the events was also intended to increase accessibility and appeal, especially among students from underserved populations who may have had less prior opportunities to take part in career development events and may be more likely to feel intimidated by higher stakes professional environments.

2.2 Events & Attendance

The EECS Design Student Community of Practice program reached 126 students in the 2022-2023 academic year, including primarily ECE Junior and Senior and CS online students.

A grant from OSU STEM Research Center's Inclusive Excellence Fellowship was used to fund two student assistants to develop program resources, and these students contributed to event organization. In addition, a CS capstone project team also took on development of a "Mentor Matching System" including a website, survey, and algorithmic matching program intended to facilitate students with mentors who share their interests and/or identities. Development of this system will hopefully be taken up by another team to finish and unroll in the next academic year.

Key project focus areas for 2022-2023 were:

- Website development with embedded opportunities to connect
- The "Mentor Matching System" (CS capstone project)

- Creating and administering a community interest survey
- Career development and DEI advocacy-focused events and engagement opportunities, several each term (shown in Table 1 below)
- Mailing list announcements and event promotion

Table 1. 2022-2023 Events and Participation Numbers

Event Title	Date	Attendees
Pizza Social Kick-off with Career Development Center's Erich White to raise awareness of the community	10/21/22	35
Advocating for Equity and Inclusion in the Profession: engineer panelist pizza luncheon with BPA and Sahid Rosado-Lausell	11/18/23	20
Lattice Semiconductor Guest Talk: Inclusive Teamwork and Career Prep	2/3/23	29
Resume-Builder and Engagement Info Session with Resume Specialist Dr. Akash Kannegulla and ESC President David Celano (online)	2/25/23	18
Uncovering “Hidden Keys to Success” for Getting a Job with BPA and CDC's Erich White	3/3/23	37
Design Project Share-Out and Awards Pizza Social	3/27/23	24
Grad School Info Panel	4/28/23	40
Design Project Impact Forum to Promote Ethical and Socially-Just Design Practices with Special Guest Sahid Rosado-Lausell (online)	5/10/23	37
End-of-Year Awards Celebration with Voting in Chintimini Park	6/7/23	43

2.3 Program Benefits

The program developers have noted several important benefits of the program in its current form. More data about participant experiences and impacts would be a valuable addition to these findings (see collection plan-in-progress in the next section). First and foremost, student participants may have an increased sense of belonging, and in particular, those who identify as members of historically underserved communities on the basis of race, ethnicity, gender, sexual orientation or first-generation status [6-9]. In addition, the opportunities provided for exposure of these students to explore career options and make connections decreases the impact of the "hidden curriculum" in higher education for these students and empowers them to prepare for careers in ways they may not have been aware of prior to participation [11,12].

In turn, this culture and inclusivity and equity contributes to a more transformational educational experience for all students, based the conditions needed in Mezirow's [5] theory of transformational learning and scholars who have suggested that truly transformational

education programs must engage diverse learners to work together in a process that pushes them to change their perspectives [13-18]. As such, the program has the potential to contribute to the transformation of not just educational culture but the engineering discipline, as participants who graduate and enter the workforce are more diverse and better-prepared to advocate for socially just engineering cultures and practices [19, 20].

3. Conducting and Learning from EECS Underserved Student *Testimonios*

In spring 2023, students finishing the ECE capstone program responded to a survey developed in the initial developmental research phase using a mixed-methods approach and Education Action Research (EAR) methodology [21]. These students responded to demographic questions as well as indicated whether or not they had participated in a community of practice. In addition, they responded to Likert Scale questions to measure transformative educational experiences, satisfaction, career awareness, and social justice advocacy. They also responded to qualitative text response questions about sense of belonging and most meaningful aspects of their education from their perspectives. The results of this survey for the 2022-2022 year can be compared with results from previous years to determine changes in impacts of the program over time.

Concurrent with the implementation of the EECS Design Student Community of Practice Program and the longitudinal data collection into the survey tool in spring 2023, the program developers also began undertaking an archive project in the style of the auto-ethnographic personal narrative or *testimonio* form that has been established as an educational research method by qualitative researchers focusing on decolonizing methodologies [22-32]. This EECS Student Experience Storycorps Archive Project (SESAP) was originally conceived as a way to gather data to steer the community of practice program, similar to the interviews that were conducted in spring 2022. However, the scope and significance of the SESAP data grew beyond that original intention, and the SESAP research team is now exploring implications of the results that extend to recommended changes in the School of EECS and engineering education on the whole. Its development has resulted in an archive site hosted by the Oregon State University library featuring 9 testimonial narrative interviews or *testimonios* from students who identify themselves as being members of historically underserved communities in engineering education on the basis of race, ethnicity, gender, sexual orientation, disability status, nationality or religion. The results of the analysis of these interviews are currently being formulated as recommendations from the SESAP student co-authorship community. Currently the following recommendations are being considered:

Recommendations for EECS Program Development from SESAP:

1. A more extensive plan, spanning before arrival at OSU through graduation, for support of students' access to educational opportunities along with career development and mentorship is needed, including relationships with others who have shared interests and can provide caring support for holistic information, resource, and community connection needs.

2. Additional trainings should be conducted at all faculty and students levels to increase awareness of social justice, equity, and inclusion issues, including harms such as microaggressions, that are present in diverse communities and to increase capacity to listen, understand, and support diverse needs as well as appreciate the strengths and perspectives of diverse individuals.
3. Diversity should be celebrated and valued as a part of the culture of the community, including opportunities to learn about and celebrate diverse perspectives and share ways of thinking about school, society, and engineering that are not included within the dominant tradition. Specific spaces, grassroots efforts, events, and resources should be devoted to this.
4. More explicit emphasis on equity, inclusion, engineering for change social justice is needed in the EECS curriculum to better reflect and support students from underserved communities.
5. Programs should be devoted to making connections between underserved communities and EECS programming and opportunities. These should include service learning, or engagement of students in community-centered projects that enable students to leverage concern for community well-being as well as faculty service research that bridges the gap between engineering research and underserved communities. The ability to engage in this research and service should be values in processes for admissions and hiring.
6. Specific efforts should be made to raise awareness about and to counter a culture of competitiveness, business, and prioritizing individual or program prestige above mutual support, caring, and collaboration.Cultural transformation efforts should include clear articulation of values and resources devoted to encouraging and rewarding positive practices in this area.
7. Ongoing spaces and forums should be maintained for students from underserved communities to contribute to leadership of change efforts within EECS, including conveying their perspectives, concerns, and ideas for development to EECS leaders.

EECS Design Student Community of Practice program developers plan to incorporate these recommendations into the 2023-2024 and future program years. In particular, the community can:

- ❖ Find more ways to celebrate and advocate for the valuing of diversity by offering spaces and events devoted to diverse perspectives and identities;
- ❖ Continue to offer events and resources that explicitly focus on social justice advocacy;
- ❖ Reach out to local communities and/or student cultural communities to engages student participants in ways that connect engineering work with underserved communities; and
- ❖ Focus some events and resources on raising awareness about harmful aspects of dominant engineering culture and strategies to counter these.

By implementing these recommendations into program development for the EECS Design Student Communities of practice, the developers hope to increase the effectiveness of the program to meet program goals of ***increasing sense of belonging and career preparedness***

for underserved students as well as overall transformative educational culture and engagement with social justice advocacy among participants.

4. Future Development & Conclusion

It is the intention of the program developers in current and future program years to implement recommendations from the SESAP *testimonios,* analyze new data as it is collected from surveys and use those results to produce additional recommendations to guide the program. This ongoing cycle of data collection, analysis, and implementation (see Fig. 1) aligns with established educational program evaluation methods and also the EAR methodology. As improvements are made, key program objectives can hopefully be achieved with continually improving effectiveness. Additional data can be analyzed to discover any significant relationships between student identities and their experiences of the program, and qualitative narratives can be used to further illuminate what steps program developers might take.

Ultimately, it is the *research* goal of this program development process to not only investigate *to what extent* the program achieves its goals, but also to create and demonstrate a usable model for other engineering educators and program developers who seek to create ***more inclusive and equitable opportunities for historically underserved students as a programmatic means to promote social justice in engineering education***.

References

[1] Wenger, E., McDermott, R., & Snyder, W. Cultivating Communities of Practice, Harvard Business Review Press, 2002.

[2] R. E. Cate and D. Heer, “Literature Review and Methods Paper: Identifying Influencers That Contribute to Transformative Learning in an Electrical and Computer Engineering Undergraduate Capstone Design Project and Selecting Action Research Methods to Frame a Study,” presented at the 2018 ASEE Annual Conference & Exposition, Jun. 2018. Accessed: Aug. 16, 2018. [Online]. Available: https://peer.asee.org/literature-review-and-methods-paper-identifying-influencers-that-contribute-to-transformative-learning-in-an-electrical-and-computer-engineering-undergraduate-capstone-design-project-and-selecting-action-research-methods-to-frame-a-study

[3] R. Cate and D. Heer, “Longitudinal Study to Develop and Evaluate the Impacts of a ‘Transformational’ Undergraduate ECE Design Program: Study Results and Best Practices Report,” *Journal of Higher Education Theory and Practice*, vol. 20, no. 13, Art. no. 13, Dec. 2020, doi: 10.33423/jhetp.v20i13.3837.

[4] R. Cate and A. Nelson, “Communities of Practice: Developing, Evaluating, and Improving a Program Aimed at Supporting Transformative Learning Among

Underrepresented Undergraduate Students in Engineering," in *2022 ASEE Annual Conference & Exposition*, 2022.

[5] J. Mezirow, Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education. San Francisco, Calif.: Jossey-Bass, 2009.

[6] E. E. Liptow, K. C. Chen, R. Parent, J. Duerr, and D. Henson, "A Sense of Belonging: Creating a Community for First-generation, Underrepresented groups and Minorities through an Engineering Student Success Course," presented at the 2016 ASEE Annual Conference & Exposition, Jun. 2016. Accessed: Aug. 26, 2021. [Online]. Acced at: https://peer.asee.org/a-sense-of-belonging-creating-a-community-for-first-generation-underrepresented-groups-and-minorities-through-an-engineering-student-success-course

[7] J. A. Leydens, J. C. Lucena, and T. K. K. B. Morgan, "Mechanisms by Which Indigenous Students Achieved a Sense of Belonging and Identity in Engineering Education," presented at the 2017 ASEE Annual Conference & Exposition, Jun. 2017. Accessed: Aug. 26, 2021. [Online]. Available: https://peer.asee.org/mechanisms-by-which-indigenous-students-achieved-a-sense-of-belonging-and-identity-in-engineering-education

[8] M. D. Johnson, A. E. Sprowles, K. R. Goldenberg, S. T. Margell, and L. Castellino, "Effect of a Place-Based Learning Community on Belonging, Persistence, and Equity Gaps for First-Year STEM Students," Innov High Educ, vol. 45, no. 6, pp. 509–531, Dec. 2020, doi: 10.1007/s10755-020-09519-5.

[9] T. L. Strayhorn, College students' sense of belonging: A key to educational success for all students. Routledge, 2018.

[10] K. Rainey, M. Dancy, R. Mickelson, E. Stearns, and S. Moller, "Race and gender differences in how sense of belonging influences decisions to major in STEM," International journal of STEM education, vol. 5, no. 1, pp. 1–14, 2018. Accessed at https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-018-0115-6

[11] L. Long and J. Mejia, "Conversations about Diversity: Institutional Barriers for Underrepresented Engineering Students," Journal of Engineering, vol. 105, no. 2, pp. 211–218, Mar. 2016, doi: https://doi.org/10.1002/jee.20114.

[12] D. R. Simmons and S. M. Lord, "Removing Invisible Barriers and Changing Mindsets to Improve and Diversify Pathways in Engineering," Advances in Engineering Education, 2019, Accessed: Aug. 26, 2021. [Online]. Available: https://eric.ed.gov/?id=EJ1220293

[13] K. Illeris, "Transformative learning and identity," Journal of Transformative Education, vol. 12, no. 2, pp. 148–163, 2014. Available:

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1020.1382&rep=rep1&type=pdf

[14] K. A. Goodman, The Transformative Experience in Engineering Education, Dissertation, University of Colorado Atlas Institute, Boulder, CO, 2015. Available: http://atlas.colorado.edu/wp-content/uploads/2016/01/KGoodmanDissertationv4.pdf

[15] P. Freire, Education for Critical Consciousness. London, UK ; New York, NY: Continuum, 2005.

[16] R. Stevens, K. O'Connor, L. Garrison, A. Jocuns, and D. M. Amos, "Becoming an Engineer: Toward a Three Dimensional View of Engineering Learning," Journal of Engineering Education, vol. 97, no. 3, pp. 355–368, Jul. 2008.

[17] J. A. Leydens and J. C. Lucena, Engineering Justice: Transforming Engineering Education and Practice. John Wiley & Sons, 2017.

[18] P. Cranton, Understanding and Promoting Transformative Learning: A Guide for Educators of Adults. Jossey-Bass Higher and Adult Education Series. Jossey-Bass, 350 Sansome Street, San Francisco, CA 94104-1310 ($32.95)., 1994.

[19] A. K. Agrawal and S. Harrington-Hurd, "Preparing Next Generation Graduates for a Global Engineering Workforce: Insights from Tomorrow's Engineers," Journal of Engineering Education Transformations, vol. 29, no. 4, pp. 5–12, Apr. 2016. Available: http://www.journaleet.org/index.php/jeet/article/view/90659

[20] J. Chiki and G. Sallar, "Teaching Social Justice Through Project-Based Learning in Engineering," in Teaching and Learning for Social Justice and Equity in Higher Education: Content Areas, C. C. Ozaki and L. Parson, Eds. Cham: Springer International Publishing, 2021, pp. 97–124. doi: 10.1007/978-3-030-69947-5_6.

[21] B. Somekh, Action Research: A Methodology for Change and Development. Open University Press, 2005.

[22] D. Delgado Bernal, R. Burciaga, and J. Flores Carmona, "Chicana/Latina testimonios : Mapping the methodological, pedagogical, and political," *Equity & Excellence in Education*, vol. 45, no. 3, pp. 363–372, Jul. 2012.

[23] L. P. Huber, "Disrupting apartheid of knowledge: testimonio as methodology in Latina/o critical race research in education," *International Journal of Qualitative Studies in Education (QSE)*, vol. 22, no. 6, pp. 639–654, Nov. 2009.

[24] R. M. Mueller, “Testimonio: Oral histories woman to woman,” *Revista Espaço Acadêmico*, vol. 11, no. 130, pp. 45–50, 2012.

[25] W. Alarcón, C. Cruz, L. G. Jackson, L. Prieto, and S. Rodriguez-Arroyo, “Compartiendo Nuestras Historias : Five Testimonios of Schooling and Survival,” *Journal of Latinos & Education*, vol. 10, no. 4, pp. 369–381, Oct. 2011, doi: 10.1080/15348431.2011.605690.

[26] C. M. Saavedra and M. S. Pérez, “Chicana and Black feminisms: Testimonios of theory, identity, and multiculturalism.,” *Equity & Excellence in Education*, vol. 45, no. 3, pp. 430–443, Jul. 2012.

[27] R. Avant-Mier and M. A. Hasian, “Communicating ‘truth’: Testimonio, vernacular voices, and the Rigoberta Menchu controversy,” *Communication Review*, vol. 11, no. 4, pp. 323–345, Dec. 2008.

[28] J. Beverley, *Testimonio: On the politics of truth*. Minneapolis, MN: U of Minnesota Press, 2004.

[29] M. M. Espino, I. I. Vega, L. I. Rendón, J. J. Ranero, and M. M. Muñiz, “The Process of Reflexión in Bridging Testimonios Across Lived Experience.,” *Equity & Excellence in Education*, vol. 45, no. 3, pp. 444–459, Jul. 2012.

[30] R. Cate and D. Russ-Eft, “Expanding circles of solidarity: A comparative analysis of Latin American community social justice project narratives,” *Power and Education*, p. 1757743819871320, Aug. 2019, doi: 10.1177/1757743819871320.

Appendix A

Professional Development Extra Credit

To maintain long-term success as an engineer, ongoing effort must be spent on professional development. Keeping your technical and professional edge sharp and modern will enable better opportunities. This professional development can be done is a variety of ways including:

- Being a member of a professional community
- Contributing to group knowledge

- Training in new methods and technology
- Learning in related but tangential topics
- Attending conferences or webinars
- Participating in professional societies

For this extra credit submission opportunity, you can engage in professional development during the term and summarize what you have done at the end of the term. There is significant extra credit available for each submission, and the final due date for submission will be near the end of the term. However, you may submit at any point during the term, and note that some submissions require steps to be completed throughout the term (you won't be able to do it all in the last week and receive the credit). The overall goal of encouraging you to engage in these activities is to improve your professional readiness, to build opportunities into the course for you to do this (e.g. Community of Practice workshops, mentors, events) and also to make sure you get academic credit for doing it. Try to **begin as soon as possible to get the most out of this opportunity.**

View the EECS Design Student Community of Practice Webpage here.

Specifics

- Late Submissions: No Extra Credit (please do not ask for opportunity to complete this extra credit if you have already missed the submission deadline)
- Grading: Individual, up to 4 percentage points on final grade.
- Submission Method: Canvas Submission
- Primary Audience: Self, Instructors, any connections you make professionally may view some materials you create related to the assignment
- Other Audiences: Your participation in professional communities is collaborative and everything you do will be in relationship with others. Also, if you choose to complete the portfolio submission when offered (including your resume and any other materials you save there), you will have that to show to interviewers, mentors, and/or hiring managers if you choose.

Process for Identifying Opportunities and Submitting Evidence for Credit:

1. First, participate in some outside activities that you think will improve your skills both technically and professionally during the current term. Refer to the rubrics in Canvas for what will be accepted for each term. Note that any of these activities can be virtual, on campus, in EECS (or not), but they must be things you are not already doing for a course (this or or any other course). Participation in Communities of Practice to fulfill these are encouraged, but not required, as many clubs/internship experiences could be applied.

2. Submit evidence throughout the term via PDFs to each Canvas extra credit submission assignment.

3. If you are fulfilling the professional portfolio option, double check that your profile and projects are updated on the professional portfolio site of your choosing. The options for this are:
    - The Project Showcase tool on the EECS web page--be sure to create a personal portfolio page with your resume included, not just the project page
    - A LinkedIn profile page
    - OR a Google Drive Portfolio containing your resume, a table of contents, and artifacts that highlight your skills

    Whether you choose the Project Showcase site or LinkedIn, ensure your current skills are highlighted (there should be some evidence of recent work done). You will need to supply the direct link to this profile as a comment on your Canvas submission to the Portfolio submission assignment.

Below, see a full list of the opportunities for submission that may be included in your course (also included in the Canvas rubric for each individual submission). Check your specific course assignments list in Canvas to see which are being offered each term.

Table 1. Professional Development Submission Opportunities, Evidence, and Resources

Opportunity	**Evidence to Be Submitted on Canvas**	**Suggested Resources**
Participating in at least two planned events (such as a webinar, workshop, or project collaboration session)	A PDF with information about the event, organization, topic, any notes you collected and a screenshot if possible.	-Community of Practice -Events offered through EECS on the EECS Student Portal (link) -Webinars you find on professional association or resource sites (ASEE, Trello) -College of Engineering-sponsored associations and groups (here is the link to the list). -All OSU Club Meetings (Here is a list of 300+ student clubs and organizations) (link) -Student Leadership and Involvement (SLI) coordinates a diversity of involvement and leadership opportunities -Any other organization/professional

		event that interests you
Corresponding with (or interviewing) a mentor to discuss engineering skills or professional development	A PDF with a sentence explanation of who you correspond with and about what as well either screenshot of an online thread or email and your personal notes from the interaction.	• EECS faculty or grad students • Internship supervisors or senior colleagues • EECS Career Center advisor meeting
Completing Professional Portfolio and including link to EECS Student Showcase, LinkedIn or Google Drive (see further explanation below)	A link to your portfolio site	-EECS faculty or grad students who are willing to answer your question or have a meeting with you -Internship supervisors or senior colleagues -EECS Career Center advisor meeting
EECS Design CoP Community Leadership	First, sign up by contacting Rachael to be a community leader. Throughout the term, you'll help to organize 1-3 events during class time with funds for food available. At the end of the term, a PDF with a page explanation of your contributions to coordinating specific events will be submitted..	

Professional Portfolio

Developing a portfolio of work can be a benefit when searching for a job and help in reflecting on your career and experience. For EECS design courses, you are expected to use the Project Showcase website to present your work, so you may already have a profile page established. This website allows for you to represent yourself to the public in a clear and unified way. You do have the option of keeping your profile private to OSU only if you would like. If you already have your own portfolio you would rather submit, you may do that as well but please be sure that it covers the same information as the Project Showcase. A fully populated LinkedIn profile (with projects) can satisfy this requirement as well.

When you have your profile on the screen, you will need to copy and paste the address bar (including your unique profile ID) into the comment field of this assignment when submitting to allow for evaluators to view your profile.

* Note that if submitting via LinkedIn, no resume is required.

Grading Details

This is the rubric for the entire set of Professional Development Extra Credit opportunities. It has been broken down for Canvas submission, where each rubric item is represented in a separate Canvas assignment submission point.

Rubric

Participating in at least two planned events (such as a club meeting, webinar, workshop, or project collaboration session): A PDF with information about the event, organization, topic, any notes you collected and a screenshot if possible.	**3 possible pts**
Corresponding with (or interviewing) a mentor to discuss engineering skills or professional development: A PDF with a sentence explaining who you correspond with and about what as well. Include either a screenshot of an online thread or email and your personal notes from the interaction.	**3 possible pts**
Leadership: Throughout the term, you'll help to organize 1-3 events during class time with funds for food available. At the end of the term, a PDF with a page explanation of your contributions to coordinating specific events will be submitted.	**9 possible pts**
Professional Portfolio page: Link to either an EECS Student Showcase, LinkedIn or Google Drive, well-organized and including artifacts from activities engaged in this term.	**3 possible pts**
Total	**Up to 4 percentage points added to final grade possible per term**