

Pre-Conference Workshop: Decolonizing what? Limits and opportunities for developing equitable syllabi in computer science and engineering education

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Abstract—This research-to-practice pre-conference workshop brings insights and approaches to equitable syllabus development to college-level instructors. The organizers synthesize their experiences and research on the structures, culture, and equity initiatives of US engineering education. The first half of the workshop presents participants with frameworks for thinking about equitable engineering syllabi and a technique for actualizing those values (i.e., the organizers' syllabus toolkit). In the second half, participants apply and reflect upon their insights and techniques with a sample syllabus and then participants' own instructional materials. Participants will leave the two-and-a-half-hour workshop with skills and methods for evaluating their syllabi in addition to concrete revisions of their own materials.

Index Terms—syllabus, equity, undergraduate engineering education, faculty development, broadening participation

I. GOALS

There are four goals for this pre-conference workshop. Respectively, each goal is focused on research and dissemination, networking, the conference theme (bridging the gap between theory and practice), and broadening participation and equity.

- 1) This workshop will introduce participants to a selection of contemporary research on equity in college-level courses in engineering education.
- 2) This workshop will provide an opportunity for engineering educators to interact and collaborate with colleagues

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who share an interest in equitable course design in engineering education, especially engineering educators and researchers.

- 3) This workshop will actively bridge the gap between theory and practice. The organizers will synthesize research on the content and context of engineering education, presenting their significance to fellow engineering educators. Also, the workshop will include dedicated opportunities for participants to apply these principles themselves: to example materials and to participants' own materials.
- 4) This workshop will provide participants with a method of evaluating engineering syllabi with respect to equity for disproportionately underrepresented students.

II. TOPICS & SUBJECTS

Many engineering and computing instructors are unsure how to oppose the discriminatory, assimilationist politics of engineering education, which continues the oppressive legacies of engineering practice and US education. Although these inequalities are structural—distributed, recursive, and reinforcing—instructors continue to have a strong influence over the classroom and its syllabus, especially as an informational and rhetorical device for orienting students to their classes [1]. But how does the discourse of “decolonizing your syllabus” fit into engineering and computing education, let alone general equity-minded practices [2]? This workshop brings research on equity in engineering education to inform the design of syllabi in undergraduate engineering courses.

The workshop begins by introducing research on equity initiatives in STEM education and the role of the syllabi.

This includes research that pertains to US education broadly, such as the influences of the industrial model of education [3] and the legacy of cultural assimilation [4]. This also includes research specific to engineering education, such as its culture of political disengagement [5] and the construction of a social/technical divide [6], [7]. The theoretical introduction concludes by discussing the opportunities and limitations [8], [9] to decolonization in engineering education, especially through pushes to “decolonize your syllabus” [10].

Next, the workshop introduces the organizers’ Breaking the Binary Syllabi Toolkit, a resource for instructors to evaluate how existing syllabi support equity for students from minoritized groups. The Toolkit bridges research and practice in two ways. First, the Toolkit synthesizes principles from the existing literature. Second, the Toolkit’s development is informed by findings from our own qualitative analysis of undergraduate computer engineering syllabi. Participants will engage insights from asset-based, learner-centered, culturally relevant, and universal design pedagogy [11] by evaluating an example syllabus and, then, evaluating their own syllabus.

In summary, this workshop provides participants with a forum to explore frameworks and considerations of equitable syllabus development in engineering education. This includes discussions about both the “context” and “content” of engineering education. Due to the time limitations of this workshop, the organizers will not introduce why diversity, equity, inclusion, or broadening participation initiatives in engineering education are imperative for students, faculty, and the public. Instead, workshop participants are encouraged to bring their own knowledge—studied or experiential—as a background to exploring workshop topics.

III. QUALIFICATIONS

Each workshop leader brings a mixture of formal and informal training in engineering education and systemic change. The faculty workshop leaders bring experience in conducting professional development workshops and implementing equitable policies in engineering education.

A. Gabriel Medina-Kim

Medina-Kim is an NSF GRFP awardee and PhD candidate in Science and Technology Studies at Rensselaer Polytechnic Institute. They draw on the social studies of technology to analyze the dynamics of critical technical practice and equity initiatives in computer science & engineering education. Medina-Kim’s dissertation explores the discourses, dynamics, and experiences of cultural change in a university computer engineering department. Medina-Kim teaches undergraduate courses in both computer science and women’s, gender & queer studies

B. Lynne Slivovsky

Dr. Slivovsky is Professor and Chair of Computer Engineering at California Polytechnic State University, San Luis Obispo, California, USA. Her work navigates the interplay between technology and society through community and

equity. She was recognized as a visionary STEM leader by being selected to the 2020 NSF IAspire Leadership Academy cohort. She is PI of the NSF RED grant Breaking the Binary.

C. Jane Lehr

Dr. Lehr (she/they) is the Director of the campus-wide Office of Student Research, Director of Research Engagement in the College of Liberal Arts, and Professor in Ethnic Studies and Women’s, Gender & Queer Studies at California Polytechnic State University, San Luis Obispo. She is also Director of the CSU Louis Stokes Alliance for Minority Student Participation (LSAMP) in STEM Program at Cal Poly and affiliated faculty in the Center for Engineering, Science & Mathematics Education (CESAME); the department of Computer Science & Software Engineering; and the Science, Technology & Society Program. Her research, teaching and practice focus on STEM education, social justice, and institutional change.

D. Elizabeth Thompson

Dr. Thompson is the Director of General Engineering and a professor in Industrial and Manufacturing Engineering. She has been at Cal Poly for over 30 years and has held various positions on campus including Co-Director of Liberal Arts and Engineering Studies, Director of Women’s Engineering Programs, and CENG Interim Associate Dean. Although she has taught over 25 different courses, she currently teaches Financial Decision Making, First Year Engineering, Senior Project, and Change Management. Her research is in Engineering Education where she has received \$11.8 million of funding from NSF as either PI or Co-PI. She researches equitable classroom practices, integrated learning, and institutional change. She spent the 2019-2020 academic year at Cal State LA where she taught and collaborated on research related to equity and social justice. She is a co-advisor to Engineers without Borders and oSTEM at Cal Poly.

IV. AGENDA

This workshop is planned to take two and a half hours: 150 minutes. The workshop activities are listed in detail in Table I. The remainder of the section describes the organization of the workshop into roughly three projects with a series of breaks.

Breaks are either structured or unstructured. The one-minute breaks are structured breaks, hereafter referred to as Be In Your Body breaks. During these breaks, organizers and participants are encouraged to hold silence for 60 seconds. They give participants for whom English is not their first language and who are continually interpreting the speech around them or for participants who are not auditory-learners time to process. They also provide participants an opportunity to change their posture and/or move about to counteract the effects of sitting/being sedentary. In contrast, participants are encouraged to spend their time as needed during the five-minute unstructured breaks.

The first section (30 minutes) is an introduction. This is an introduction in the classic sense, where participants

TABLE I
WORKSHOP AGENDA OUTLINE

Duration	Activity	
	Short Description	Format
10 min	Introductions: facilitators and participants	Interactive
10 min	"You can do this!" Participants and their role in this asset-based workshop	Presentation
10 min	Why is a syllabus important?	Interactive
1 min	Be In Your Body Break	Break
15 min	Reviewing research on equity initiatives and engineering syllabi	Presentation
15 min	Introducing our syllabus toolkit	Presentation
5 min	Break	Break
20+10 min	Applying the syllabus toolkit to facilitator-provided instructional materials	Small groups + discussion
1 min	Be In Your Body Break	Break
30+10 min	Applying the syllabus toolkit to participant instructional materials	Small groups + discussion
15 min	Closing Remarks	Presentation
Total: 2 hours 30 minutes		

and organizers become familiar with each other. In addition, this section functions as an introduction to the asset-based approach of the workshop. Through discussing the objectives and features of a "good syllabus," the organizers will demonstrate protocols of an asset-based approach to learning. Rather than having a determined set of takeaways about "good syllabi," participants (and organizers) will be encouraged to draw on their strengths and previous experiences as a legitimate source of knowledge. This contrasts deficit-based approaches, where participants are assumed to be ignorant and, thus, in need of patriarchal wisdom.

The second section (30 minutes) presents participants with frameworks for thinking about equitable engineering syllabi and a technique for actualizing those values. (This workshop will not introduce why initiatives of diversity, equity, inclusion, or broadening participation in STEM are imperative for students, faculty, and the public. This will be the starting point). The first half overviews salient cross-disciplinary research on the structures of engineering education: the industrial model of education, the construction of a social/technical divide in engineering education, and the affordances of a syllabus. The second half introduces the organizers' own syllabus toolkit. After discussing the the organizers' previous research on engineering syllabi, the organizers will discuss how those findings informed the development of their own syllabus toolkit. Although these frameworks are not prerequisites for operationalizing equity in engineering syllabi, the organizers find them to be conceptually potent and empirically practical.

Participants should bring a developing understanding of how the engineering classroom (broadly) remains a venue

for discrimination. This developing understanding may come from previous professional development, academic training, or lived experiences. This workshop will not introduce why initiatives of diversity, equity, and inclusion (e.g., broadening participation) in STEM are imperative for students, faculty, and the public; this will be the starting point.

The final section (90 minutes) provides opportunities for participants to apply the syllabus toolkit themselves. First, participants will work together in small groups, applying the syllabus toolkit to instructor-provided instructional materials. Second, participants will apply the syllabus toolkit to their own instructional materials: in small groups or individually. Each of these explorations conclude with group discussions, where participants can identify promising strategies for revising existing course materials.

V. TAKEAWAY

The workshop is designed so that each participants will achieve each of the following.

- 1) A method for evaluating syllabi for equity
- 2) Knowledge of equity-based movements regarding syllabus and course design, such as decolonization.
- 3) Skill in identifying instructor-centered syllabi and developing learner-centered syllabi.
- 4) Equity-based revisions of participants' own syllabus.

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