

## **A Unique, Action-Oriented, Collaborative Approach to Co-Creating a New Open-Source Sustainability Teaching Guide under a Creative Commons License**

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Cindy Anderson (she/her/hers) is a sustainability consultant with Alula Consulting, and a strategy consultant for Engineering for One Planet with The Lemelson Foundation. Cindy specializes in innovative sustainability-focused research and curriculum projects for academic institutions, non-profits, government and corporations. Cindy has taught thousands of people through courses and workshops, around the world and online, in the fields of biology, sustainability and biomimicry. She is honored to be a collaborative partner on the Engineering for One Planet initiative since its inception, co-author of the EOP Framework and framework companion teaching guides, and active EOP Network Member. Cindy holds a MS from Oregon State University, a MEd from Griffith University (Queensland, Australia), and a BSc in biology from the University of Guelph (Ontario, Canada).

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Dr. Lynn Albers is an Assistant Professor in Mechanical Engineering of the Fred DeMatteis School of Engineering and Applied Science at Hofstra University. Her previous academic contribution was as one of the founding five faculty/staff at Campbell University, helping the newly formed School of Engineering grow and establish roots in the community. A proponent of Hands-On Activities in the classroom and during out-of-school time programs, she believes that they complement any teaching style thereby reaching all learning styles. She earned her doctorate in Mechanical Engineering from North Carolina State University specializing in thermal sciences where her dissertation research spanned three colleges and focused on Engineering Education. Her passions include but are not limited to Engineering Education, Energy Engineering and Conservation, and K-20 STEM Outreach. Prior to matriculating at NCSU, she worked at the North Carolina Solar Center developing a passion for wind and solar energy research while learning renewable energy policy. She combined these passions with K-20 STEM Outreach while a National Science Foundation Fellow with the GK-12 Outreach Program at NCSU where she began Energy Clubs, an out-of-school-time program for third, fourth and fifth graders to introduce them to renewable energy.

### **Dr. John K. Estell, Ohio Northern University**

An active member of ASEE for over 30 years, Dr. John K. Estell was elected in 2016 as a Fellow of ASEE in recognition of the breadth, richness, and quality of his contributions to the betterment of engineering education. Estell currently serves as chair of ASEE's IT Committee; he previously served on the ASEE Board of Directors as the Vice President of Professional Interest Councils and as the Chair of Professional Interest Council III. He has held multiple ASEE leadership positions within the First-Year Programs (FPD) and Computers in Education (CoED) divisions, and with the Ad Hoc Committee on Interdivisional Cooperation, Interdivisional Town Hall Planning Committee, ASEE Active, and the Commission on Diversity, Equity, and Inclusion. Estell has received multiple ASEE Annual Conference Best Paper awards from the Computers in Education, First-Year Programs, and Design in Engineering Education Divisions. He has also been recognized by ASEE as the recipient of the 2005 Merl K. Miller Award and by the Kern Entrepreneurial Engineering Network (KEEN) with the 2018 ASEE Best Card Award. Estell received the First-Year Programs Division's Distinguished Service Award in 2019 and the 2022 Computers in Education Division Service Award.

Estell currently serves as an ABET Commissioner and as a subcommittee chair on ABET's Accreditation Council Training Committee. He was previously a Member-At-Large on the Computing Accreditation

Commission Executive Committee and a Program Evaluator for both computer engineering and computer science. Estell is well-known for his significant contributions on streamlining student outcomes assessment processes and has been an invited presenter at the ABET Symposium on multiple occasions. He was named an ABET Fellow in 2021. Estell is also a founding member and current Vice President of The Pledge of the Computing Professional, an organization dedicated to the promotion of ethics in the computing professions.

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## **A Unique, Action-Oriented, Collaborative Approach to Co-Creating a New Open-Source Sustainability Teaching Guide under a Creative Commons License**

The Interdivisional Town Hall (ITH) session at the ASEE Annual Conference offers the opportunity for members from different divisions and unaffiliated attendees to come together to discuss topics of interest across the society. The 2023 ASEE ITH discussion was focused on how as faculty and instructors we may make a difference stewarding students through their educational experience and how we might consider sustainability as part of the engineering canon. This builds on the planning and structure of previous iterations of an ITH. In this paper, we share the history, evolution, and mindful structure for these events. We summarize recent efforts to present several important topics related to timely engineering education subjects as well as fostering discussion among participants via intimate, roundtable conversations based on provided discussion prompts. The 2023 session included a presentation of the Engineering for One Planet (EOP) initiative and Framework and the work to be done about including sustainability. It led directly to parallel roundtable discussions to share recommendations and generate ideas for a proposed list of actionable items. At the ITH, we benefited from individuals sharing and applying their skills, knowledge, and expertise to these action items in crafting shareable deliverables for guiding future efforts. The ITH has been included in the general conference schedule and will hopefully continue for some time to come.

### 1. Background and Historical Context

#### a. Overview of Interdivisional Town Hall Evolution

The first steps at a “Town Hall” meeting were conducted by the Liberal Education Division’s Committee on Interdivisional Cooperation (2011 original committee members: Atsushi Akera, Judith Norback, Sarah Pfatteicher, Donna Riley, and Steve Vanderleest) that was held at the 2011 ASEE Annual Conference in Vancouver, British Columbia. The format called for division representatives to introduce themselves and share at least one “best practice” involving interdivisional cooperation and coordination. Open discussions then ensued, focusing on the experiences, difficulties, and challenges of working across divisions. Among other things, it was hoped that the Town Hall meeting itself would serve as a networking opportunity for meeting and working with people across the ASEE divisions. By 2014 this had morphed into two meetings, with the original format now targeted as a meeting for incoming/current program and division chairs to discuss opportunities for interdivisional cooperation and as a forum to continue to share best practices. The second meeting is what we now consider the “Town Hall”: an open gathering of conference attendees meeting on a topic of interest to the ASEE membership starting with a panel presentation followed by discussion. Additionally, both of the meetings would be organized by members of an Ad Hoc Committee on Interdivisional Cooperation (original members: Atsushi

Akera (LEES), Elliot Douglas (ERM), Susannah Howe (DEED), Joe Tranquillo (Biomedical), Margot Vigeant (Chemical Engineering), and John-David Yoder (Mechanical)). The session would begin with brief statements from several people selected beforehand as panelists or speakers who will seed the discussion, but the floor would be open to all those interested in contributing to the discussion. In 2014, the topic was, “Why is change so difficult to sustain in engineering education?” and the “open floor” approach was modified into a breakout session approach for more voices to be heard over a wider range of related topics [1].

In 2016, there was much discussion surrounding ABET’s proposed changes to the Engineering Accreditation Commission’s Criteria, making it a natural subject to address at that year’s Town Hall. To assist with preparations, the Ad Hoc Committee added an online, asynchronous Virtual Conference held for three days in March [2]. This provided a forum for ASEE members to express their views before the Annual Conference, allowing the Ad Hoc Committee to assemble a diversity of member views regarding the proposed ABET changes, summarize them, and present them for further discussion at that year’s Interdivisional Town Hall [3].

By 2018 a set of “Town Hall Guiding Principles” had been created by the Ad Hoc Committee: Atsushi Akera (LEES), Chair, Alan Cheville (ERM), John Estell (First-Year Programs), Susannah Howe (DEED), Mark Killgore (Civil), and Joe Tranquillo (Biomedical), Chair-Elect, with the understanding that not every town hall meeting would be able to focus on all of the following criteria:

A great Town Hall meeting will:

- Address a Big Question
- Build community by allowing ASEE members to mix across divisions
- Foster self-reflection among the members of the ASEE community
- Enable participation from a substantially-sized audience (200+ people)
- Disseminate information about relevant and timely engineering education topics
- Generate information/data that will be helpful to engineering educators
- Generate a high-level deliverable that will be of interest to ASEE and beyond
- Lead to a series of actionable items that may change engineering education policy
- Energize sub-groups that will take the lead on moving actions forward
- Engage ASEE administration in the planning and Town Hall event

Building on this momentum, the 2020 Town Hall co-chairs and planning committee met regularly to develop eight topics of discussion. All was going smoothly until COVID started in March 2020 forcing the conference onto a virtual platform. Due to the nature of the online platform and breakout rooms, attendance was low yielding minimal data. The co-chairs subsequently decided to forego a Town Hall in 2021 due to the planned in-person conference being switched with only a couple of month’s notice back to a virtual format, as there was not sufficient time to reframe the materials into a virtual format with a sizable time reduction [1].

John Estell subsequently led the development of Bylaws for the ITH Committee so that the Town Hall Meeting would no longer have to operate under *ad hoc* conditions. The Bylaws were subsequently circulated for review by all of the divisions, then approved by the PIC Chairs on September 16, 2021 [1].

b. Organic Evolution of the Two-Part Format

The next planning committee was formed in January of 2022 when it was determined that the Conference would be in person. The planning committee, led by co-chairs Lynn Albers (Multi), Micah Lande (ERM), and Bala Maheswaren (EPP), met regularly and decided to revisit the eight topics previously prepared for 2020. The committee combined the eight topics into four and planned a two-part ITH whereby the first half involved a roundtable discussion of the four topics and the second half was led by a team conducting an NSF-funded study on Professional Development for Faculty. The two-part format worked well and the use of a two-minute video to introduce the four topics for Part 1 was well received [4]. The same co-chairs and the 2023 planning committee decided to revisit this format, developing four relevant topics and inviting the EOP team to lead Part 2 to engage members in creating a crowdsourced document similar to the creation of the ASEE Conference Playbook in 2019 [5]. The 2023 conference also saw the addition of panel sessions to revisit the four topics from Part 1 of 2022. The panel sessions were scheduled on Monday before the 2023 ITH to help continue the conversation and promote the event which now has a permanent time slot on Mondays at 3:30 p.m. The panel sessions proved successful and the 2024 Planning Committee will be encouraged to continue the format to gain further momentum.

Year	Title
2014	Why is change so difficult to sustain in engineering education?
2015	Organizing Non-traditional Sessions on Current Topics
2016	The Proposed Changes to ABET Accreditation Criteria
2017	The Culture of Teaching
2018	Who's in the Driver's Seat in Engineering Education?
2019	Stop lecturing about active learning! Integrating Good Teaching Practices into ASEE Conference Sessions
2020	Engineers of the 2030s
2021	No Interdivisional Town Hall due to virtual platform
2022	Engineers of the 2030s
2023	Preparing Engineering Students for an Ever-Changing Planet

Table 1: ITH Titles; Descriptions in Appendix 3

c. Engineering for One Planet (EOP)

In 2023, Engineering for One Planet (EOP) representatives were invited to lead the second part of the ITH. EOP envisions a world in which all engineers are equipped to protect and improve our

planet and our lives, making it highly pertinent to the Year 2023 ITH theme, *Preparing Engineering Students for an Ever-Changing Planet*. Catalyzed in 2020 by The Lemelson Foundation and VentureWell and fueled by collaboration among educators, students, industry and nonprofit professionals with diverse engineering backgrounds and lived experiences, EOP is an effort to infuse social and environmental sustainability and related professional competencies (“student learning outcomes”) across all engineering disciplines. The goal is to prepare all engineers with fundamental social and environmental sustainability skills, knowledge, and understanding.

The EOP community represents a broad base of engineering disciplines and all EOP resources and grants are designed with input from people with a range of experiences and backgrounds, including engineers and non-engineers. The cornerstone of the EOP initiative is the open-source EOP Framework [6]. Designed as a flexible menu to help faculty introduce sustainability topics, the EOP Framework includes a total of 93 core and advanced learning outcomes across nine topic areas. Each learning outcome is mapped to ABET’s student outcomes [7] accreditation requirements and articulated using Bloom’s Taxonomy [8]. While the EOP Framework defines learning outcomes, faculty have also requested guidance on how to teach the various topics in the framework. Therefore, EOP has also co-created and published open-source companion teaching guides to provide step-by-step pedagogical instructions and links to publicly available teaching resources.

The EOP initiative not only provides free resources to help inform and accelerate the infusion of sustainability across engineering disciplines, it provides grants, supports peer learning and faculty capacity-building, and supports collaborative efforts.

Funding from The Lemelson Foundation has supported 37 EOP-related grants to 34 higher education institutions to date. The grants range in size and scope, but all serve to facilitate curricular change and integrate sustainability and related professional skills into a variety of engineering courses and programs. The first EOP grants (EOP Pilot Grants) were launched in 2020 to test the first draft of the EOP Framework in curricular change at five universities: Arizona State University, Oregon State University, the University of Central Florida, the University of Maryland, and Villanova University. To evaluate the program and foster learning and collaboration among pilot grantees, The Lemelson Foundation provided a grant to VentureWell which managed a community of practice and several public meetings. Pilotgrantees received up to \$40,000 each between 2020-2022 [9]. The program analysis showed that 80 faculty introduced EOP learning outcomes into 61 courses reaching nearly 6000 students. In 2022, The Lemelson Foundation partnered with ASEE to launch the EOP Mini-Grant Program (EOP-MGP), which has awarded 27 diverse institutions, including 11 minority-serving institutions, with seed funding to catalyze curricular changes. The EOP-MGP also supports awardees through expert mentoring and peer learning. The Lemelson Foundation has also awarded more than 10 institutionalization grants designed to support curricular changes that reach students across multiple disciplines and years.

Collectively, dozens of faculty members from these grantees have impacted hundreds of courses, many core and required, reaching well over 15,000 students. Around the world, hundreds of faculty, including many unaffiliated with grant programs, have used EOP tools to create or modify hundreds of engineering and design courses.

At the end of 2023, The Lemelson Foundation and the National Science Foundation (NSF) announced a partnership to co-support qualified engineering education projects selected by the NSF Research in the Formation of Engineers program [10]. The Lemelson Foundation will contribute up to \$3 million over three years to amplify and accelerate the integration of sustainability across engineering programs nationally through this collaboration.

## 2. The 2023 Interdivisional Town Hall

### a. Part 1

The Planning Committee, consisting of delegates from 23 divisions, began collaborating in January 2023. Initially, it was determined to continue the two-part structure allocating 45 minutes for roundtable discussion on four relevant topics in Part 1. The committee was surveyed for suggested topics. Six areas for potential discussion emerged. Four topics for discussion were developed from the list for small-group discussions at the ITH:

1. *The Changing Context of DEI in Engineering Education*
2. *Impact of Generative AI on Engineering Education*
3. *Changing the Curriculum, Course Structure, and Culture of Engineering Education*
4. *Understanding and Supporting Students Where They Are Day-to-Day*

Once the topics were finalized, the Committee asked the Student Division representative to rally members of their division to provide video reflections on the topics that piqued their interest. From approximately 12 usable video submissions, a four-minute video was created to introduce the topics of Part 1 to the ITH attendees. Appendix 4 contains more detailed descriptions used as conversation prompts for the four topics. Simultaneously, the co-chairs invited representatives from ABET and Engineering for One Planet to engage in Part 2.

### b. Part 2

In April 2023, EOP representatives were invited to explore the development of one of the ITH sessions for the 2023 ASEE Annual Conference. Because the ITH brings faculty from all ASEE divisions together, it is an ideal venue for a multidisciplinary initiative like EOP to connect with engineering faculty.

EOP representatives met with the ITH planning committee several times to develop the session goals and plan. As with Part 1, Part 2 was 45 minutes in length. Because Part 1 was focused on analytical discussion, presenters opted to take a more interactive approach for Part 2. Given the

limited amount of time available, the decision was also made to assign topics to each table rather than request that participants get up and move to the table hosting their preferred topic of interest.

The EOP Session Goals were as follows:

1. Build awareness of free EOP resources for infusing sustainability into diverse engineering courses and disciplines
2. Engage participants in collaborative, simple, and rapid activities to develop a new teaching guide using existing EOP resources
3. Demystify how to start infusing sustainability into core engineering courses
4. Create public value by publishing a new open-source EOP Framework companion teaching guide and create participant value by listing them as contributors

EOP Session Plan Overview:

Because of limited time, participants were asked to remain at their tables after Part 1. Each table became a team collaborating on the EOP activity.

The following reference resources were made available at each table. The EOP presenters (EOP) also encouraged participants to use cell phones to access teaching tools as Wi-Fi was not available. These resources are available for free download on the EOP [website](#). [11]

- *The EOP Framework: Essential Sustainability-focused Learning Outcomes for Engineering Education (2022)* [6], see Figure 1
- *EOP Framework: Comprehensive Guide to Teaching Core Learning Outcomes* [12]
- Contributors Form to collect participants' name, organization (optional), and email address (see Appendix 1)
- EOP Activity Worksheet to provide step-by-step instructions for the interactive session and to capture participant teams' outcomes (see Appendix 2)

The EOP presentations covered the following topics:

- ABET's perspective on the importance of sustainability in accreditation
- Session goals and approach, including an invitation for collaboration
- A high-level introduction to the EOP initiative vision, goals, catalysts, approach, and resources

The EOP Interactive Activity (see Methodology for more details) entailed:

- EOP guided participants through the step-by-step activity such that each team outlined how to teach a core learning outcome from their assigned EOP Framework topic area (e.g.,

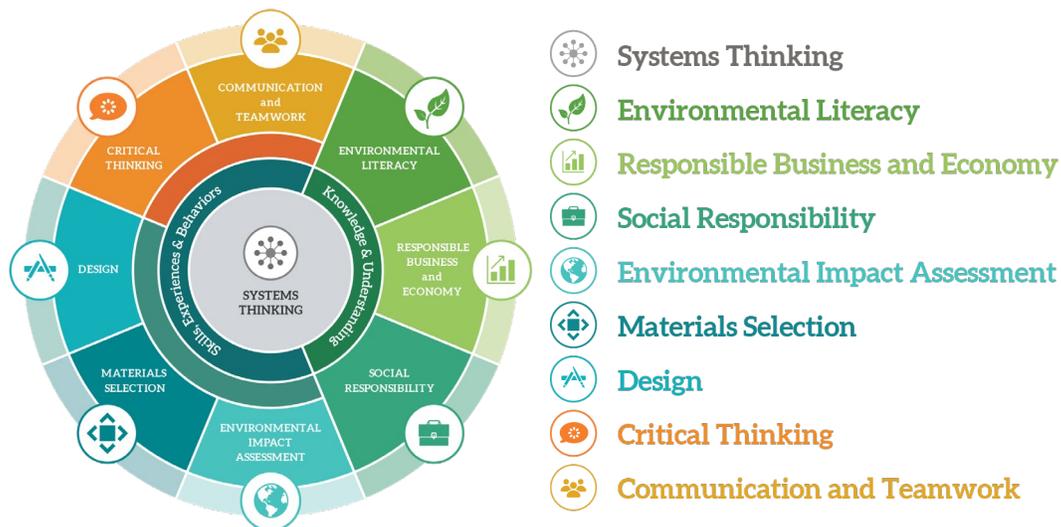
systems thinking) in one required/core engineering course. All contributions were captured by participants on their EOP Activity Worksheet (see Appendix 2).

- EOP and ITH committee leaders collected completed Contributors Forms and EOP Activity Worksheets from team tables

The following actions were taken post-conference:

- EOP found links to contributor bios from LinkedIn or institutional websites
- EOP compiled activities into a Creative Commons EOP Framework companion teaching guide, including a list of all contributors' names with links to their bios (when available)
- EOP shared a teaching guide with contributors, both on the EOP website and through social media

*Figure 1: The Nine Topics in the EOP Framework [6]*



### 3. Methodology - EOP-Focused Session (Part 2)

An ABET representative kicked off the session with an overview of the importance of sustainability. After ABET's opening comments, EOP provided a brief, 10-minute introduction to the vision, goals, catalysts, approach, and resources for the EOP initiative and then briefly explained the session goals and approach. All attendees present were invited to stay and participate in a rapid-paced 30-minute interactive activity with the intention to collaboratively co-create a new open source EOP Framework companion teaching guide. The main focus of the new guide was to provide specific examples of how the EOP Framework could be integrated into core/required engineering courses, which is a topic that EOP community members have frequently requested since the launch of the EOP Framework in 2020. EOP committed to making the new resource available for free to the public on the EOP website in 2023 alongside the two existing EOP

companion teaching guides (*EOP Framework: Comprehensive Guide to Teaching Core Learning Outcomes* [12] and *EOP Framework: Quickstart Activity Guide* [13]).

To save time, ITH participants were asked to remain seated with the same people at the 11 different tables that they were using in Part 1 of the ITH session. Each table represented a participant team and was provided physical resource materials (as listed above in the EOP Session Plan Overview) including an EOP Activity Worksheet that was specific to one of the nine topic areas (see Figure 1) from the EOP Framework. For example, if the team was seated at a “Systems Thinking” topic area table, they would have had an EOP Activity Worksheet focused on Systems Thinking, as shown in Appendix 2.

EOP guided all the teams as a whole group, providing each of the five steps of the EOP activity by using slides on large screens and a central microphone on the main stage. After providing instructions for each of the five steps in the activity, EOP facilitators paused and moved around the event space to help teams with the process and to field questions as they arose. The five-step interactive EOP activity unfolded as follows:

**Step 1:** EOP asked all participants who would like to be given attribution for their work during this activity by being listed as contributors to the open source guide to be published on the EOP website to add their full name, organization (optional) and email address to the Contributor Form available on each table (see Appendix 1). They were asked to individually complete the form by the end of the session.

**Step 2:** As table teams, participants were asked to brainstorm a variety of core/required engineering courses that they are familiar with, but that were not design courses (e.g., Heat Transfer, Dynamics, etc.) and that they were either already integrating sustainability into or were interested in doing so. Then they were prompted to select one core/required course from the courses they discussed to use as the focus of the EOP interactive session. Teams were asked to capture the course title, course level (e.g., 100-level, senior-level, etc.) and a brief description of the course that was no more than two sentences in the course form (Table 1) in the EOP Activity Worksheet (see Appendix 2). Teams were given five minutes to complete this step.

**Step 3:** Teams were then given five minutes to use the EOP Framework [6] and choose one core learning outcome (LO) from their designated framework topic area—as denoted on the top of their EOP Activity Worksheet (e.g., Systems Thinking)—to bring into their selected course. Teams were asked to use the learning outcome form (Table 2) in the EOP Activity Worksheet to document the core LO they chose, the reason they selected that LO, and which ABET student outcome(s) would be achieved with this LO, as denoted by the orange circle icon and associated numbers at the end of each LO (see Appendix 2).

**Step 4:** EOP prompted teams to utilize the physical copies of the *EOP Framework: Comprehensive Guide to Teaching Core Learning Outcomes* [12] for inspiration and ideas for

classroom activities and resources that they could bring into their selected engineering course to introduce sustainability to students or to suggest their own ideas of activities/assignments. Example activities provided by EOP included a reading and discussion question, a video that introduces a sustainability methodology, a replacement project example, or a scenario that has a sustainability focus, etc. Teams were given five minutes to brainstorm and share their ideas.

**Step 5:** During the 10 minutes allocated for this final step in this activity, EOP encouraged teams to discuss their ideas as a team and to choose one activity/assignment to bring sustainability into the core/required engineering course that they had previously selected in step two and captured in their course form table in the EOP Activity Worksheet. Using the activity form (Table 3) in their EOP Activity Worksheet to record their work, teams were asked to: 1) briefly describe the activity and/or assignment they had chosen to bring sustainability into their course and to describe if this exercise was a modification of an existing activity/assignment or if it was new, 2) Estimate approximately how much time the activity would take (e.g., how many minutes, hours, class days, etc.) and 3) Share teaching/learning resources that could be utilized to support the activity (e.g., videos, reading materials, physical equipment, etc.). Teams were given a bonus question if they had time to complete it, which was, “How will you measure the success or assess student learning from this activity?”

EOP then asked for a few teams to volunteer to share their ideas with the entire group. Individuals from two different teams joined EOP on the stage to briefly share their work including the course title and level, the core learning outcome they selected from the EOP Framework, and their sustainability-focused course activity.

All participants were thanked and a group photo of the 94 participants, the EOP and ABET representatives, and the members of the 2023 ITH Planning Committee was taken to capture the moment (see Figure 2).

*Figure 2: Photo of the participants and facilitators for Part 2 of the ITH session.*



#### 4. Data and Results - Part 2

Members of the 2023 Interdivisional Town Hall Planning Committee were surveyed about the two-part ITH format. The survey was emailed to 27 members, ten of whom responded yielding a 37% response rate. Planning committee members met every two weeks from January 2023 until approximately mid-April 2023 to plan the event. They were expected to assist at the ITH by leading a table and recording the roundtable discussions. Of the ten respondents, one was unable to attend the ITH in person but did engage in the planning for 2023 and had attended the ITH in 2022. Another respondent provided short answer responses that conflicted with the planning portion of the event and therefore their feedback has been removed. The remaining eight respondents are recorded in Table 2.

Question	Very Satisfied	Satisfied	Neither Satisfied nor Dissatisfied	Dissatisfied	Very Dissatisfied	Other (please specify)
Based on your expectations, how satisfied were you with the 2023 ASEE ITH?	5	4	0	0	0	1
	<b>A great deal</b>	<b>A lot</b>	<b>A moderate amount</b>	<b>A little</b>	<b>None at all</b>	
Did you like that the session was split into two parts (i.e., Part 1: discussion questions and Part 2: learning about Engineering for One Planet and collaborating on a teaching guide)?	3	1	4	0	0	
Did you like the interactive EOP activity in Part 2 where table teams were guided through a 5-step process to collaboratively co-create a teaching resource?	2	3	3	0	0	
Did you like that in Part 2 teams co-created content for an open source teaching guide that is now available for free on the EOP website and that gives all contributors attribution?	3	3	2	0	0	

*Table 2: 2023 Planning Committee Member Survey Response*

In general, the expectations of the respondents were for “interesting and thought-provoking discussion and to meet some new people,” “sharing ideas in teams,” “hoping that I could somehow contribute,” and “productive discourse.” The respondents felt that “it went really well” and was a “very good experience.” Other feedback included: “I felt ‘heard’;” “Well run operation, saw the attendees well engaged;” “Our table had a good discussion. It did, however, feel a bit disconnected from the larger group as time was short overall;” and “The topics for the first were, well, topical. The sustainability topic for the second half was outside of my expertise but it was fun to be speculative with learning activities.”

Overall, the respondents liked the two-part format stating, “It’s nice to split it up - the conference is very long and even if ITH is near the beginning people are already tired. Splitting it into two sessions and making them interactive was great;” and “I liked that many people could quickly come together to create something of value.” The primary dislike was time: “45 min for each (part) is not enough;” “Not enough time to reach some actionable conclusions in either topic;” and “Good event, but with limited time.” One suggestion: “There were complimentary foci on students and faculty in the 2 parts. I would have wished for a more congruent thread through the topics otherwise.”

Respondents specifically commented on Part 2 stating, “It was fun, engaging and I felt I made a useful contribution.” However, one respondent did feel “rushed.”

Feedback for future consideration: “I liked part 2, just didn’t see the connection to the purpose of it within the town hall session;” “Overall it was a very good event;” and “Keep doing what you are doing. Some of us need some help getting around DEI restrictions imposed at the state level.”

## 5. Outcomes - Part 2

The EOP activity generated 11 unique classroom activities through the completed EOP Activity Worksheets (see Appendix 2). One worksheet was collected from each of the participant teams. Seven of the EOP Framework’s nine topic areas were covered. Two submissions were collected that focused on Systems Thinking, Social Responsibility, Environmental Impact Assessment, and Communication and Teamwork Course topic areas. Classroom activities for the remaining two topic areas (Materials Selection and Design) were developed by EOP to complete the guide and ensure all nine EOP Framework topic areas were covered. EOP edited and formatted all contributions for consistency of language and style. The new open-source guide was entitled *Engineering for One Planet Framework: 13 Step-by-Step Ideas for Integrating Sustainability into Core Engineering Courses* [14] and is attributed to the 94 contributors that were participants on the 11 teams at the ITH session.

On October 5, 2023, EOP published the new guide on the EOP website, shared it with all contributors via direct email, and distributed it via social media channels. EOP also highlighted it in the EOP newsletter published on December 12, 2023. The guide was downloaded 122 times from October 5 to December 31, 2023.

## 6. Conclusions - EOP Session

This was the first time EOP attempted to co-create a new teaching guide during an event. The 30-minute time constraint was a significant challenge, and yet the result exceeded expectations.

Based on facilitators’ observations and the outcomes participants delivered, it is believed that what worked well included:

- Pre-assigning tables to topics for expediency and clarity, but also to generate a variety of examples.
- Breaking the activities down into individual, bite-sized steps and leading participants through each one.
- Providing the EOP Framework and worksheets as reference reduced complexity and made it easy to quickly complete activities, even for those who did not have prior experience.
- Active learning: Having to create a teaching plan with readily available ideas enabled participants to learn by doing.

## Lessons learned:

- To set expectations so that participants plan their participation accordingly, it would be helpful to introduce session participants to the materials in advance and provide more specificity about the agenda.
- It would be preferable to have more time for the entire experience, including a longer explanation of the resources, time to answer participant questions, and time for participants to share the course examples they created during the session.
- Wi-Fi access was not available but would be helpful for searching for materials.
- Co-creation of a teaching resource is possible during a 45-minute session.
- Co-developing a shared resource provides a meaningful opportunity for participants to actively engage with new resources and share their experiences and knowledge with the community.
- Providing attribution for the co-creation of a resource acknowledges participants' contributions during the ASEE Annual Conference.

## 7. Future Work - EOP

EOP plans to use this approach again in the future, making improvements based on lessons learned. Specifically, EOP has proposed a workshop at the 2024 ASEE Annual Conference to introduce participants to the resources and to co-create a teaching guide. If accepted, this would be the second time this approach will be deployed. Results would again be shared publicly.

## 8. Acknowledgements

The authors would like to thank the Interdivisional Town Hall Planning Committee of 2023, ASEE for a successful Annual Conference and Exposition in Baltimore, MD, ASEE President 2022-2023 Dr. Jenna Carpenter, ABET Chief Executive Officer Dr. Michael Milligan, Engineering for One Planet, and all the ASEE members attending and participating in the 2023 Interdivisional Town Hall.

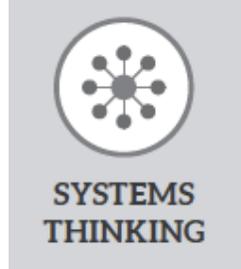
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## Appendix 2: EOP Activity Worksheet (example shown with Systems Thinking topic area)

### EOP Framework Topic Area



EOP Framework	Comprehensive Teaching Guide	Quickstart Activity Guide
		

### Activity Instructions

- **Step 1:** Add your information to the Contributors Form (separate sheet)
- **Step 2:** As a team, select a core/required engineering course\* that your team is familiar with and interested in integrating sustainability into.
  - \*Pick a course that is not a design course (e.g., Heat Transfer, Dynamics,...)
  - Enter relevant information into the Course Form below
- **Step 3:** Using the **EOP Framework** and as a team, select a core learning outcome from the **Systems Thinking** topic area to bring into your selected course.
  - Capture relevant information into the Learning Outcome Form below
- **Step 4:** Using the **Comprehensive Teaching Guide** for inspiration, come up with your own ideas of activities/assignments that you could do in your chosen course to introduce sustainability to your students. For example, an activity could be a reading and discussion question, a video that introduces a sustainability methodology, a replacement example or scenario that has a sustainability focus, etc.
- **Step 5:** Discuss ideas as a team and **select one activity/assignment** to bring sustainability into your course.
  - Capture relevant information into the Activity Form below

### Course Form

<b>Title of Core/Required Engineering Course:</b>	
<b>Level of Course:</b>	

<b>Brief description of course (no more than 2 sentences):</b>	
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**Learning Outcome Form**

EOP Core Learning Outcome (LO) from Topic Area:	
Reason this LO was selected:	
ABET student outcome(s) achieved denoted by ABET circle & number (1-7 or N/A):	

**Activity Form**

<p>Briefly describe the activity and/or assignment you will bring into your course. Is it a modification of an existing activity/assignment or is it new?</p>	
<p>Approximately how much time will this activity take (e.g., how many minutes, hours, class days, etc.)?</p>	
<p>What supporting learning resources will be utilized for this activity (e.g., videos, reading materials, physical equipment, etc.)?</p>	
<p><b>Bonus!</b> How will you measure the success or assess student learning from this activity?</p>	

**Reflection for discussion:**

<p>Was the activity harder or easier than you expected?</p>	<p>Will you change something that you are teaching?</p>
	

## **Appendix 3: Interdivisional Town Hall Discussion Topics and Format**

### **Year 2014: Why is change so difficult to sustain in engineering education?**

The session will begin with brief statements from the panel, who will seed the discussion, but the floor will be open to all those interested in contributing to the conversation. This will be an open session to which all ASEE members are invited. However, we extend a special invitation to all division chairs to either attend or send a delegation to the meeting so as many divisions as possible are represented.

The chosen topic for this year is: “Why is change so difficult to sustain in engineering education?”

Several brief, previously published papers on the subject will be distributed in advance to all division chairs. While it is intended that the session have no formal presentations, the following people have offered to open the Town Hall Meeting with very brief, opening statements:

### **Year 2015: Organizing Non-traditional Sessions on Current Topics**

We invite members from all ASEE Divisions to attend the **second annual Interdivisional** Town Hall Meeting organized by an ad hoc committee on interdivisional cooperation. This year, the session is co-sponsored by 34 ASEE Divisions. Our session last year in Indianapolis was co-sponsored by nearly as many divisions and attracted more than 70 participants.

This year’s Town Hall Meeting will be on “Organizing Non-traditional Sessions on Current Topics.” Conducted as a working meeting designed to produce technical sessions and panels for the 2016 Annual Conference, the session will utilize the following format:

- Discussing non-traditional session formats (5 speakers @ 2-3 mins. ea., Total: 30 mins.)
- Current Topics of Interest—Brainstorming Session (15 minutes)
- Breakout sessions—Developing Sessions & Panels (35 minutes)
- Reporting Out (10 minutes)

During the first phase of the meeting, all participants will be invited to contribute their knowledge about non-traditional session formats such as Pecha-Kucha, Twitter-enhanced discussions, and THAT Camp. To help seed the initial discussion, we have also lined up the following individuals for brief remarks:

### **Year 2016: The Proposed Changes to the ABET Accreditation Criteria**

In 2009, ABET’s Engineering Accreditation Commission’s (EAC) Criteria Committee convened a task force to systematically assess, evaluate, and recommend improvements to Criterion 3 of ABET’s Engineering Accreditation Criteria. The EAC has acted on their Criteria Committee’s recommendations and has advanced these proposed changes for public comment. The 2016 Interdivisional Town Hall Meeting at our annual meeting in New Orleans is organized around collecting ASEE member views regarding the proposed changes. All ASEE members are invited to attend.

### **Year 2017: The Culture of Teaching**

What is the culture of engineering instruction on our campuses and how can we change it to enhance student engagement, transform engineering mindsets, and attain the other, deeper objectives that we hold as engineering educators? For the 2017 ASEE Interdivisional Town Hall meeting, we propose to convene a multi-phase event built around this question.

- Phase I: An invitational event (online forum) held in February 2017 where appointed delegates from all interested divisions will join the Interdivisional Town Hall Planning Committee to determine the proper scope of this conversation. Our goal will be to identify six (6) to eight (8) topics of interest pertaining to the overall theme of “the culture of teaching” that can be featured in a virtual conference held during Phase II. We will ask volunteers to compose brief statements pertaining to each of the chosen topics that can be posted for the virtual conference.

- Phase II: A virtual conference open to all ASEE members held in late March 2017. Based on the same WordPress platform that we used last year to compile ASEE member views pertaining to the proposed changes in ABET engineering accreditation criteria and held for a period of 72 hours, we will provide an opportunity for all interested individuals to contribute to the dialogue surrounding the specific aspects of “the culture of teaching identified” during Phase I. These comments will be summarized and distributed to all ASEE Divisions, Sections, and Councils, and made available to all ASEE members.

- Phase III: The interdivisional town hall meeting, held during our annual meeting, will open with brief statements pertaining to the chosen topics (three or four selections, plus a summary of the rest), and proceed directly to a set of hands-on, parallel breakout sessions for developing concrete solutions and projects designed to address the specific aspects of our culture of teaching developed during Phase II. Solutions may vary from educational modules and initial work on advice manuals and guidelines to brainstorming sessions on possible grant applications, and will depend on the individual(s) identified during the virtual conference and chosen to lead each effort.

This session is part of the work of the Connecting Us Team of the ASEE Board’s Strategic Doing initiative and the Ad Hoc Committee on Interdivisional Cooperation, and has the endorsement of multiple divisions, as well as the Interdivisional Town Hall Meetings Planning Committee.

### **Year 2018: Who’s in the Driver’s Seat of Engineering Education?**

During this 90-minute interactive session, everyone will have an opportunity to participate in one of seven public conversations:

1. In what ways do the basic structure of the engineering profession and U.S. higher education impact engineering education reform initiatives?
2. How do we make change happen? What are the actual strategies and practices that we use to bring about educational improvement and transformation?
3. To what extent do our epistemic habits as engineers shape our educational programs, standards and the assessment tools we use to evaluate our programs?
4. Are we fully cognizant of the social and historical contexts within which we operate? Would greater awareness of context allow us to design more effective educational programs and curricula?
5. What are the major drivers for change? What causes us to become dissatisfied with what (and how) we teach, and how is this translated into action?
6. What are the mechanisms, both formal and informal, through which we coordinate engineering education at the national and disciplinary level, including but not limited to new accreditation standards and new visions for the profession?
7. To what extent does institutional diversity compel us to go in different directions? In what ways do institutional type, rank, and forms of support; our student demographics; and regional industrial needs force us to carve out unique solutions to the challenges of engineering education? Again, how does this vary by institution?

### **Year 2019: Stop lecturing about active learning! Integrating good teaching practices into ASEE conference sessions**

As a leading organization in the field of engineering education, ASEE and its members continue to support advances in engineering education scholarship and research. We have helped to change learning environments in many engineering classrooms to support more active and engaging experiences for our students. How might we explore incorporating a similar range of presentation modes and styles at ASEE?

Join us at the 2019 Interdivisional Town Hall to discuss strategies for changing the culture of the ASEE Annual Conference by incorporating more active and engaging sessions, such as the recent trend toward having postcard sessions. In this spirit, and in keeping with the tone of past meetings, the Town Hall Meeting will be an interactive workshop that will cross divisions. We will begin addressing the items below:

- Share suggestions for ASEE technical sessions that incorporate modern and exciting presentation techniques.
- Generate ideas for making ASEE presentations more audience-focused.
- Compile different session types that foster interactivity and engagement (lightning talks, round tables, demonstrations, live polling, postcard session, etc.)

### **Year 2020: Engineers of the 2030s**

1. Rethinking sustainability for the Engineers of the 2030s
2. Engineering a more just world
3. The ever-evolving and multifaceted engineer
4. Engineers as ethical authorities in a technological society
5. Engineering as meaningful and purposeful
6. Being stewards of the profession
7. Engineers as mentors/instructors/coaches
8. The engineers of the 2030s versus the engineers of 2020

This session will open with brief statements pertaining to the chosen topics and proceed directly to a set of hands-on, parallel breakout sessions for sharing suggestions and generating ideas designed to focus the discussions toward generating proposed lists of actionable items. Individuals identified during the Town Hall will be asked to apply their skills, knowledge, and expertise to these action items in crafting deliverables for guiding future efforts in support of the Engineers of the 2030s initiative. These deliverables will be shared with the ASEE membership and also provided to the National Academy of Engineering.

### **Year 2022: Preparing Engineers for the 2030s**

The Interdivisional Town Hall Planning Committee warmly welcomes you to revisit the topic of the Engineers of the Future with the intent to develop engineers for the 2030s and professionally develop faculty to achieve this goal. In 2004, the National Academy of Engineering published *The Engineer of 2020: Visions of Engineering in the New Century*, which urged the engineering profession to recognize what engineers can build for the future through not just technical jobs but also a wide range of leadership roles in industry, government, communities, and academia. The first half of the Town Hall will be an opportunity for participants to provide input and direction to define the #Engineersofthe2030s via roundtable discussions after a brief overview of the four topics.

Topic 1: The Engineers of the 2030s versus the Engineer of 2020.

Topic 2: Engineering a More Just World

Topic 3: Mentorship, Instruction, and Coaching in Engineering Education and Industry

Topic 4: Preparing Stewards of the Profession

The second half will start with an overview of the ASEE Faculty Teaching Excellence Program with time allotted for roundtable discussions using three prompts.

Prompt 1: Based on what you heard about new knowledge and skills students will need to become tomorrow's engineer, what new areas of faculty professional development will be most needed in the future?

Prompt 2: What benefits would an ASEE initiative that provides national recognition for faculty professional development have for engineering and engineering technology education broadly? How would recognition of such professional development benefit you personally in your current role?

Prompt 3: What are the potential barriers at your institution that might affect offering professional development opportunities, or recognizing instructors and faculty that invest their time in pursuing such opportunities? What would be needed to overcome these barriers?

#Engineersofthe2030s

## **Appendix 4: 2023 ASEE Interdivisional Town Hall Part 1 Discussion Topics**

### *The Changing Context of DEI in Engineering Education*

We all want to include DEI in our curriculum, but what is it really about and how do we implement it? Starting with some common definitions of Diversity, Equity, and Inclusion, we want to discuss how to implement it in academic settings. How do we build understanding of what DEI and its role in education is? Have people and consequently our teaching/learning style changed? The ultimate goal of the discussion is to give ASEE guidance on how we can implement DEI at our respective academic institutions in the face of changing contexts in many states. This is not an opportunity to complain (much) but provide solutions. How might we share best practices for DEI implementation and what are ways to support colleagues to help us do so?

### *Impact of Generative AI on Engineering Education*

“The recent release of ChatGPT has sparked a surge of interest in generative artificial intelligence (AI) and its potential to revolutionize education. While viewed by some as a disruptive technology with immense transformative potential, there are also concerns and challenges associated with generative AI. These include issues of academic integrity, equitable access, algorithmic bias, inaccurate information, job security, privacy, and impacts on learning. As some educators have already incorporated generative AI into their teaching, others are more cautious or apprehensive. The question now is how to address these concerns and challenges, and what is the best way to leverage this technology for engineering education and preparing students for the 21st-century workplace.” NOTE: The preceding paragraph was generated by ChatGPT based on input from the topic organizers (<https://chat.openai.com>).

### *Changing the Curriculum, Course Structure, and Culture of Engineering Education*

Preparation for engineering majors includes quite a number of pre-engineering fundamentals like math, science, programming, etc. While faculty and practicing engineers may see the connections across these topics, how might we help students experience their learning in a useful context? Are these fundamental courses needed or should they be placed later in the curriculum or removed altogether? These courses are often seen as road-blocks, negatively impacting persistence and academic success. How can we adapt curriculum and engineering culture to better showcase the utility and necessity of these courses and technical skills? How do we make the engineering course structures more inclusive in a way that can benefit all students to become future engineers?

### *Understanding and Supporting Students Where They Are Day-to-Day*

Students are aware of the broader world and context and many are concerned about how their engineering studies have implications for the greater good and making the world better. Yet, they don't know how to accomplish this. This can lead to tension between supporting students as creators of knowledge and needing to reinforce fundamentals for engineering.

How do we help bridge the gap? Add in the complexity of ever-increasing crises, rising anxieties, and negative effects on peoples' mental wellness; students must now learn in these difficult circumstances. How might we incorporate students' concerns into our existing routines in the classroom to support mutual respect and to help meet students where they are day-to-day? What are best practices that can be more widely adopted and scaled to be supportive of students' learning experiences while aligning with trauma-informed teaching which models empathy, inclusion, and multicultural awareness to students.