

Board 251: Electricity Access and Sustainable Business Models Educators' Workshop

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Electricity Access and Sustainable Business Models Educators Workshop

Abstract

Over 700 million people worldwide do not have access to electricity. Yet, there is very little coverage of this topic in US universities. This important topic can motivate students to pursue engineering studies and inspire engineering students to engage in a variety of activities related to electricity access, making it a pivotal area for educational focus with potential to help diversify the field of electrical engineering.

An initial gathering of about 25 engineering educators, field practitioners, and non-profit organization representatives participated in an initial NSF-sponsored workshop in June 2022. A goal of this workshop was to survey the community as to what already existed in this field and to consider how to expand electricity access education in the United States.

Following the success of 2022 workshop, an expanded workshop on this topic was held in October 2023. About 40 attendees, including engineering faculty members, students, and field practitioners participated. The two-day program of sessions included keynote speakers, moderated panels, and themed discussions. This paper presents details of the second workshop along with feedback from the attendees about the workshop and how they found it beneficial.

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Key words: Electricity access, sustainable business models, educators, curricular activities

Motivation

Over 700 million people worldwide do not have access to electricity. Yet, there is very little coverage of this topic in US universities. This important topic can motivate students to pursue engineering studies and inspire engineering students to engage in a variety of activities related to electricity access, making it a pivotal area for educational focus. This topic has the potential to attract a broader representation of students including women and students of color who are eager to make a difference in the world. This could be helpful for diversifying the field of electrical engineering which lags behind other engineering disciplines in participation of women, African American, and Latinx students in the USA [1].

In June 2022, 24 engineering educators, field practitioners, and non-profit organization representatives participated in an NSF-sponsored workshop held right before the *2022 ASEE Annual Conference and Exposition* [2]. A goal of that workshop was to survey the community as to what already existed in this field and to consider how to expand electricity access education in the United States. Following the success of the 2022 workshop, an expanded workshop on this topic was held in October 2023. About 40 attendees, including engineering faculty members, students, and field practitioners participated. The two-day program of sessions included keynote speakers, moderated

panels, and themed discussions. This paper presents details of the second workshop along with feedback from the attendees. More details are provided in [3].

Workshop Participants

The 40 participants came from 36 different entities including educational, profit, and non-profit sectors. The diverse group included professors, graduate students, undergraduates, company presidents, directors, program coordinators, non-profit representatives, and researchers. Table 1 lists the participating organizations. Note that there were 25 educational institutions and eleven companies. Twenty-four of the participants were professors, program directors, and coordinators from various universities. Nine participants were CEOs, presidents, and directors from profit and non-profit organizations. There were six graduate students and one undergraduate student.

Table 1: List of Participating Organizations

Participant Organizations		
Universities		For-Profit/Non-Profit
Penn State University - Harrisburg	The University of Texas at Dallas	SunGate Solar LTD
The University of Washington	Ohio State University	World Bank
Rochester Institute of Technology	Syracuse University	KIT Hub (Knowledge and Impact Trade Hub)
Arizona State University	Seattle University	To Catch the Sun
The George Washington University	University of New Haven	PowerSwitch
Bucknell University	Villanova University	IEEE Entrepreneurship
Lahore University of Management Sciences	University of San Diego	Novation Tech LLC
Lipscomb University	University of Illinois Urbana-Champaign	ASME and Engineering for Change
Northeastern University	Lafayette College	Appropedia
Penn State HESE	Navajo Technical University	Hewlett-Packard Labs
Colorado School of Mines	Lehigh University	KiloWatts for Humanity
Baylor University	Cal Poly Humboldt	
The Cooper Union		

Workshop Agenda

The workshop was held over two days at the Villanova Inn near the Villanova University campus on Tuesday October 10 and Wednesday October 11, 2023. The workshop was designed to provide opportunities for sharing information among participants and interaction. Activities included keynote speakers, themed discussions with short presentations and then small group discussions, Mentimeter online surveys to collect immediate feedback from the whole group, and networking breaks. Lunch was provided on both days and dinner was provided on Day 1.

Day 1 was dedicated to understanding perspectives from stakeholders regarding electricity access and sustainable business. Keynote speakers Mou Riiny, CEO of SunGate Solar in South Sudan and Dr. June Lukuyu, Assistant Professor of Electrical and Computer Engineering at the University of Washington shared insights on the challenges of working in South Sudan and Uganda. Themed discussions focused on enhancing the classroom experience and sustainable, ethical, and beneficial projects as well as a student panel. Table 2 shows the schedule for Day 1:

Table 2: Day 1 Schedule

Day 1: October 10th	
7:30-8:30	Breakfast
8:30-8:45	Welcome Remarks
8:45-9:15	Workshop Orientation
9:15-9:45	Introductions, Motivations, Aspirations
9:45-10:15	Morning Refreshment Break
10:15-11:30	Keynote: Integrating Electricity Access and Sustainable Business
11:30-11:45	Themed Discussion Overview
11:45-12:30	Themed Discussion #1a: Enhancing the Classroom Experience
12:30-13:30	Networking Lunch Break
13:30-14:30	Themed Discussion #1b: Enhancing the Classroom Experience
14:30-15:00	Student Panel
15:00-15:45	Themed Discussion #2a: Implementing Sustainable, Ethical, and Beneficial Projects
15:45-16:15	Afternoon Refreshment Break
16:15-17:00	Themed Discussion #2b: Implementing Sustainable, Ethical, and Beneficial Projects
17:00-17:15	Day 1 De-Brief
18:30-20:30	Dinner

Day 2 focused on engineering education perspectives in energy access. Sessions covered practical experiences, challenges, and collaborative efforts to enhance engineering education. Panel discussions featured projects from Guinea, international summer programs, and initiatives in Africa. Themed discussions explored breaking barriers, building opportunities, and sustaining the community. The day concluded with discussions on priorities, recommendations, and changing faculty perspectives in integrating energy access into engineering education. Table 3 shows the schedule for Day 2:

Table 3: Day 2 Schedule

Day 2: October 11th	
7:30-8:30	Breakfast
8:30-9:30	Panel: Engineering Education Perspectives on Energy Access
9:30-10:15	Themed Discussion #3a: Breaking Barriers and Building Opportunities
10:15-10:45	Morning Refreshment Break
10:45-11:15	Themed Discussion #3b: Breaking Barriers and Building Opportunities
11:15-12:15	Practitioner Panel
12:15-13:15	Lunch

13:15-14:45	Discussion: Priorities and Recommendations
14:45-15:15	Afternoon Refreshment Break
15:15-16:45	Discussion: Sustaining Our Community
16:45-17:00	Closing Remarks

Workshop Evaluation

At the end of the workshop, participants were invited to complete an electronic survey to evaluate the workshop. Twenty-eight participants responded to at least one question. Overall, the feedback was very positive for the overall organization, sessions, networking, the diverse perspectives of the participants, and logistics.

Table 4 shows the overall evaluation of the workshop by participants. All but two participants who responded to the survey rated it as excellent or very good.

Table 4 Overall Evaluation of the Workshop by Participants

	Excellent	Very Good	Good	Fair	Poor	Neutral/No Opinion
Overall, how would you rate the workshop?	19	8				1
Please rate the organization of the workshop.	24	4				
Please rate the overall quality of the sessions at the workshop.	21	4	1			
Please rate the networking (informal and formal) opportunities at the workshop.	21	5				

When asked to rank the representation of different academic institutions (e.g. different geographic regions, teaching-focused, research-focused, public/private, Tribal Colleges and Universities, Historically Black Colleges and Universities, etc.) at the workshop, 21 participants said “broad representation,” 3 said “neutral,” and one said “narrow representation.”

The results in Table 5 show that participants found the workshop relevant with practical strategies for expanding/enhancing electricity and sustainable business education. In the first offering of this workshop, participants had asked for more opportunities for interaction. Thus, we are pleased that in this offering, all participants agreed or strongly agreed that they were given such opportunities. Most participants said that the workshop improved their understanding of skills and experiences that students need to pursue careers in electricity access although the results show that there is room for improvement in this area since 8 participants were neutral or disagreed.

Table 5 Participant Responses about Workshop

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I was given the opportunity to express my viewpoints and opinions at the workshop	23	3			
The workshop’s sessions concerned relevant topics that I was interested in.	15	11			
The workshop identified and discussed gaps and barriers to expanding/enhancing electricity access or related sustainable business education.	18	6	1	1	
I learned practical strategies to expand/enhance undergraduate electricity access or related sustainable business education at the workshop	11	9	5	1	
The workshop improved my understanding of what skills and experiences students need to be competitive in pursuing a career in electricity access.	11	7	5	2	1

Participants were enthusiastic in praise of the workshop when asked what they liked best. Interaction and networking were mentioned by most respondents. Since this was an important goal, we were pleased to see that participants thought this was achieved in this version of the workshop. People mentioned the collaborative environment, the menti system, the mixture of presentations and discussion, and the impressive participants with diverse perspectives.

Three participants thought the logistics, food, venue, organization and sharing of documents were well done. Several participants commented on the quality of the presentations, learning about energy access, and the importance of identifying barriers to such work and action items to address them.

When asked what they disliked about the workshop, the most common response (11) was “nothing” or “no complaints” or “it was great” with another 7 participants leaving the question blank. Five participants suggested that the workshop could be shorter as they were tired by the end of the second day. Two participants thought that the small group sessions were repetitive or inefficient. One person felt that “too many people spoke about experiences at THEIR institutions but did not think about a global experience.” One person was disappointed that nothing concrete was resolved. Three participants suggested improvements for the future such as a publication from this workshop, more time to think of actionable items for participants’ curricula and sharing the specifics of themes with presenters beforehand.

Participants were enthusiastic about continuing to participate in efforts such as this. All participants who responded to the survey indicated that they were interested in participating in a

similar workshop in the future with 18 participants saying “very interested” and 7 “somewhat interested.” Building on the comments from the participants, the organizers are working on next steps. More details are available in [3].

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References

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- [1] Lord, S. M., R. A. Layton, and M. W. Ohland, “A Multi-institution Study of Student Demographics and Outcomes for Electrical and Computer Engineering Students in the U.S.A.,” *IEEE Transactions on Education*, vol. 58, no. 3, pp. 141-150, 2015.
[10.1109/TE.2014.2344622](https://doi.org/10.1109/TE.2014.2344622)
 - [2] Louie, H., P. Singh, J. Urquizo, and M.-L. Tran, “A Workshop for Energy Access Educators,” *Proceedings of the 2023 ASEE American Society for Engineering Education Conference*, Baltimore, MD, June 2023.
 - [3] Louie, H., P. Singh, S. Lord, and S. Vasconcelos, “Workshop on Electricity Access to Broaden Participation in Electrical Engineering,” in the *Proceedings of the 2024 ASEE American Society for Engineering Education Conference*, Portland, OR, June 2024.