Scholarship of Teaching and Learning (SoTL) Accelerator Program: Overview, Results, and Lessons Learned

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Lessons Learned: Scholarship of Teaching and Learning (SoTL) Accelerator Program: Overview, Results, and Lessons Learned

Introduction

Motivation

According to the 2021 Engineering by the Numbers Report: ASEE Retention and Time-to-Graduation Benchmarks for Undergraduate Engineering Schools, Departments and Programs [1], the overall average retention rate for obtaining an engineering degree within 6 years was 55.9%. According to the 2021 NSF National Survey of College Graduates [2], only 65% of science and engineering college graduates had an occupation related to their highest degree. Putting this into perspective, if 100 students enrolled in an engineering program, about 55.9% (~56 students) will complete the degree within six years. Of those ~56 students, 65% (~36 graduates) will enter the engineering workforce. In summary about one-third (1/3) of students who enroll in engineering programs will complete the degree within six years AND enter the engineering workforce.

What about the other two-thirds (2/3)? Why are they leaving engineering education and/or not entering the engineering workforce? The literature suggests teaching and learning plays a large role in these extreme attrition rates [3-5]. Effective teaching enhances retention and completion rates by promoting engagement, understanding, motivation, relevance, support, feedback, and inclusivity in the learning process. When students are actively engaged, supported, and motivated to learn, they are more likely to persist and complete their educational goals.

Background

Developing effective scholarship of teaching and learning (SoTL) practices can help support the adoption of active learning practices, which continues to be a challenge in engineering education [6]. Moreover, adopting effective SoTL practices allows a gateway to improved learning and broadening participation as engaging in SoTL requires faculty to think more critically as they adopt and disseminate research-based practices. However, the vast majority of disciplinary engineering PhD programs (e.g., non-Engineering Education programs) do not prepare graduates for teaching and/or disseminating best teaching practices through the scholarship of teaching and learning (SoTL) [7]. As a result, the limited teaching preparedness of new college and university engineering educators has the potential to turn students off from engineering [8], which directly impacts retention and completion rates [9].

Several factors potentially contribute to this problem. First, most disciplinary engineering PhD programs focus more on technical research and development of the dissertation, with little regard for teaching [10]. Second, most disciplinary engineering research does not involve human subjects; thus, most disciplinary engineering PhD graduates and faculty members have a limited understanding of IRBs' role in protecting human subjects [11]. Third, most promotion and tenure (P&T) policies fail to prioritize teaching efforts; for those that do, focus is placed on student satisfaction (e.g., end-of-semester course evaluations) rather than student learning [12]. As a result, the limited teaching preparedness of new college and university engineering educators has the

potential to turn students off from engineering [8], which directly impacts retention, completion, and placement rates [9].

Study Purpose

In response, the Scholarship of Teaching and Learning (SoTL) Accelerator program (a new engineering faculty professional development program) was created, implemented, and assessed; funding was provided by the Kern Family Foundation and Arizona State University Mentorship 360 Program. The SoTL Accelerator program had two core parts (Figure 1): (1) New Curriculum Development, Implementation, and Assessment, and (2) Reflection and Dissemination of Findings. The SoTL Accelerator program was delivered in a virtual, structured, cohort manner to promote accessibility, accountability, and a sense of belonging. The purpose of this paper is to provide an overview, results, and lessons learned from 30 engineering faculty participants who completed the SoTL Accelerator program. Program details can be found here: https://www.sotlaccelerator.com/

Methods

Intervention: SoTL Accelerator - Professional Development Overview

To receive the full program stipend ($1,750) engineering faculty participants were expected to:

(1) Complete eight hours of asynchronous preparatory work using an online learning management system,
(2) Attend all required virtual meeting sessions (see Figure 1),
(3) Design and implement their new curriculum within an engineering class with at least four students,
(4) Upload their newly developed curriculum and implementation notes as a card on EngineeringUnleashed.com,
(5) Upload a minimum of four un-identified student metacognitive reflection submissions to the learning management system,
(6) Disseminate findings with a SoTL manuscript, and
(7) Complete evaluations.

Requirements for the SoTL manuscript were as follows: (1) fill in the manuscript template using the headings provided, (2) write a paper that includes a minimum of 4000 words and a minimum of 20 citations, and (3) include the phrase “entrepreneurial mindset” in the title, abstract, introduction, and literature review. Additional details can be found here: https://www.sotlaccelerator.com/

Legend: Part 1: Curriculum Development + Part 2: SOTL Dissemination

Week	Meeting Days	Meeting Time	Activity / Deliverable
0	Jan 3-5, 2023	2-5pm ET	Initial Workshop (daily homework ~ 30 min)
1	Jan 9-20, 2023	Book 30 min Meeting via Calendly	Curriculum Development: One-on-One Meeting to Obtain Feedback/Approval for Curriculum Intervention
2			
3	Jan 27, 2023	No Meeting - Asynchronous Individual Work Time	
4	Feb 3, 2023	3:30-5pm ET	Curriculum Development: Feedback Protocol
5	Feb 10, 2023	3:30-5pm ET	Curriculum Development: Feedback Protocol
6	Feb 17, 2023	3:30-5pm ET	Curriculum Development: Feedback Protocol
7	Feb 24, 2023	3:30-5pm ET	Curriculum Development: Feedback Protocol
8	Mar 3, 2023	3:30-5pm ET	Curriculum Development: Evaluation, Introduction to SOTL VWG
9	Mar 10, 2023	3:30-5pm ET	SOTL Dissemination: Paper Outline + Potential Problems to Solve
10	Mar 17, 2023	No Meeting - Asynchronous Individual Work Time	
11	Mar 20-24, 2023	Book 30 min Meeting via Calendly	SOTL Dissemination: One-on-One Meeting #1
12	Mar 27-31, 2023	Book 30 min Meeting via Calendly	SOTL Dissemination: One-on-One Meeting #2
13	Apr 7, 2023	No Meeting - Asynchronous Individual Work Time	
14	Apr 14, 2023	3:30-5pm ET	SOTL Dissemination Small Group Session #1
15	Apr 21, 2023	No Meeting - Asynchronous Individual Work Time	
16	Apr 28, 2023	3:30-5pm ET	SOTL Dissemination: Small Group Session #2
17	May 5, 2023	No Meeting - Asynchronous Individual Work Time	
18	May 12, 2023	3:30-5pm ET	SOTL Dissemination: Small Group Session #3
19	May 19, 2023	No Meeting - Asynchronous Individual Work Time	
20	May 26, 2023	11:59pm ET	Final Paper Submission Deadline

Figure 1. Example Schedule (Spring 2023)

Participants

The SoTL Accelerator professional development program was delivered virtually. As such, the participants included 30 engineering instructors from various universities throughout the United States (Figure 2). The gender breakdown was 9 females and 21 males. Various engineering disciplines and courses were represented. Upon completion of the professional development intervention, all participants completed an IRB-approved assessment.

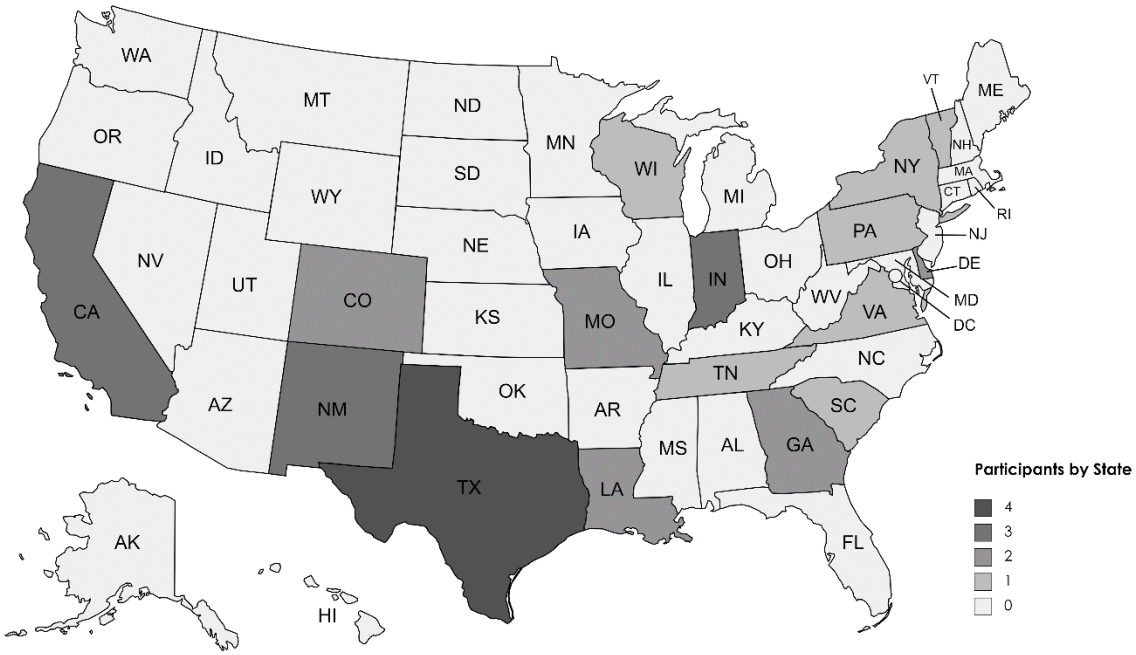

Figure 2. Participants by State

Data Collection

The SoTL Accelerator professional development program is comprised of two main parts (see Figure 1): (1) New Curriculum Development, Implementation, and Assessment, and (2) Reflection and Dissemination of Findings. The goal of the data collection was to better understand participant perceptions of completing the program to better assess opportunities for improvements and positive program impacts.

Upon completion of the first part (New Curriculum Development, Implementation, and Assessment), the faculty participants answered these open-ended evaluation questions:

1. What were the three best things about this professional development experience for you?
2. What were three "noticings" (or things that you observed) from this professional development experience?
3. What were three "wonderings" (or ideas for improvement) you have for this professional development experience?
4. What were three lessons you learned from participating in this professional development experience?
5. How has participation in this professional development experience impacted the development of your other coursework?
6. Is there anything else you'd like to share?

Upon completion of the second part (Reflection and Dissemination of Findings), faculty participants answered these open-ended evaluation questions:

1. What were the three best things about this professional development experience for you?

2. What were three “wonderings” (or ideas for improvement) you have for this professional development experience?
3. What were three lessons you learned from participating in this professional development experience?
4. What advice might you have for new faculty participants starting this program?
5. This is the end of the evaluation. Is there anything else you’d like to share?

Data Analysis

The qualitative open-ended evaluation responses were analyzed using thematic analysis, which is defined as a foundational qualitative method for discovering patterns within the data [13]. Using the 6-step process of conducting thematic analysis, first, the researchers familiarized themselves with the data by reading and rereading participants' responses. Second, the NVivo Pro 12 qualitative analysis software was used to code the reflections. Third, after coding, the researchers searched for patterns within the data. Fourth, the researchers examined the data to generate initial themes and exchanged findings. Fifth, after the themes were identified, a visual was created highlighting each theme and its corresponding sub-themes. Due to the qualitative nature of the research, the main purpose of the analysis was to explore potential themes within the data. Quotes were drawn from the data to allow readers to make their own judgments on credibility, accuracy, and fairness [14].

Results

Theme #1: IDEA (Inclusion, Diversity, Equity, and Access)

The IDEA theme includes attributes pertaining to the integration of new methods and diversity of perspective. Two sub-themes were observed here.

Sub-Theme #1: Integration of New Methods

The theme "Integration of New Methods" refers to the incorporation or assimilation of novel or innovative approaches, techniques, or strategies into existing systems, processes, or practices. In the context of education or teaching, it suggests the adoption and utilization of new instructional methods or pedagogical approaches to enhance teaching and learning outcomes. This sub-theme exists as many participants reported learning about strategies to implement methodology in manners that do not come intuitively, to potentially surpass a lack of experience in the area. Example quotes are provided below:

- “I learned what an implementation of "Arts" in an engineering technology setting can look like.”
- “I learned how to frame the entrepreneurial mindset as a target in curriculum.”
- “I have had limited experience in bioinspired design and STEAM, and was surprised at how well we were able to integrate the concepts into my course module.”

Sub-Theme #2: Diversity of Perspective

The theme "Diversity of Perspective" refers to the inclusion of a wide range of viewpoints, experiences, and expertise among instructors who collaborate, share insights, and provide feedback to one another within an educational context. This diversity encompasses various dimensions such as cultural background, educational background, teaching methodologies, research interests, professional experiences, and personal perspectives. This sub-theme exists because many participants described the value of collaborating with faculty members from different geographic regions and academic institutions. Example quotes are provided below:

- "Backgrounds of those participating in the PD varied widely."
- "Faculty members from different institutions and exploring new ideas."
- "The ability to collaborate with faculty across the United States."
- "I appreciated hearing their stories and learning from them."
- "Seeing other peoples' curriculum work was constructive and helped provide ideas for future projects in various implementation styles."

Summary of Themes

Due to space limitations, only one theme is fully shared. The other themes (and sub-themes) are summarized in Figure 3.

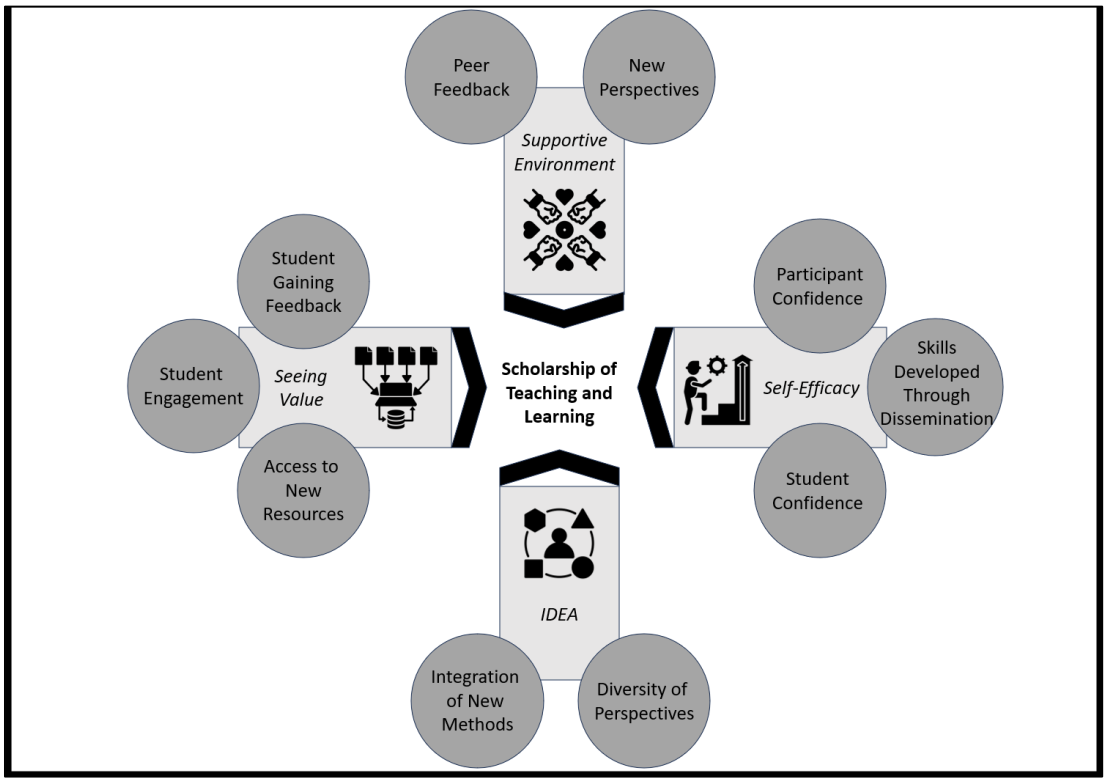

Figure 3. Summary of Themes and Sub-Themes

Lessons Learned

There are three key lessons learned.

First, of the six tools, faculty participants found three tools particularly helpful.

- Peer Feedback Tuning Protocol (https://www.sotlaccelerator.com/s/Tool-2-Peer-Feedback-Tuning-Protocol.pdf): Participants commented on the benefit of timing and structure in obtaining feedback. Specifically, participants commented on the benefit of using this tool in the classroom for students to provide peer feedback on group projects.
- Assessment of Student Learning (https://www.sotlaccelerator.com/s/Tool-3-Assessment-of-Student-Learning.pdf): For many of the participants, this was their first time assessing student learning beyond the grade. Participants commented on the value of qualitative gaining student feedback, especially discovering increased student engagement.
- SoTL Template (https://www.sotlaccelerator.com/s/Tool-6-SoTL-Template.pdf): For many of the participants, this was their first time drafting a SoTL-focused paper. Participants commented on having increased confidence to write the paper given the guidance provided in the template.

Second, it was discovered that preparation, structure, and accountability were key to success. Participants commented that the schedule, weekly and bi-weekly meetings (same day and time), milestones, and learning activities helped ensure a paper was drafted by the end of the cohort session.

Third, the SoTL Accelerator program isn't for everyone. Given the tight schedule and the importance of meeting deadlines to stay on track, not all participants who started made it through the program. Future program delivery will consider additional approaches such as a two-semester cohort (implement teaching intervention in the first semester and draft SoTL-focused paper in the second semester), a self-paced option, a team option, and an accelerated summer option.

Conclusion

The Scholarship of Teaching and Learning (SoTL) Accelerator program (a new engineering faculty professional development program) was created, implemented, and assessed with funding provided by the Kern Entrepreneurial Engineering Network and Arizona State University Mentorship 360 Program. The SoTL Accelerator program had two core parts: (1) New Curriculum Development, Implementation, and Assessment, and (2) Reflection and Dissemination of Findings. The SoTL Accelerator program was delivered in a virtual, structured, cohort manner to promote accessibility, accountability, and a sense of belonging. The SoTL Accelerator has preliminary quantitative supporting data [15-19] concerning learning gains, and the program has acquired third-party validation in that the first 12 papers submitted to the American Society of Engineering Education (ASEE) conference were all accepted. Additional details can be found here: https://www.sotlaccelerator.com/.

Stakeholder recommendations include the following:

- Engineering Professors should consider incorporating different perspectives into the engineering classroom, such as STEAM, bio-inspired design, and entrepreneurial mindset. Moreover, engineering professors should seek student qualitative feedback throughout the semester to better understand perceptions of student learning and engagement.

- Engineering PhD Programs should consider adding an educator training program (including IRB) to the doctoral program requirements to better prepare graduates for entering the academic workforce.
- University-level Centers for Teaching and Learning should incorporate new pedagogical approaches into training, including dissemination of findings using tools and strategies outlined on the project website: https://www.sotlaccelerator.com/.
- The Provost's Office should consider modifying promotion and tenure guidelines to incentivize professors to be proactive in teacher professional development.

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