

# Workshops on Fundamental Engineering Skills: A Graduate Student-Led Teaching Initiative

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## The Problem

Teaching opportunities for graduate students in engineering...

- Are often limited to facilitating an established lab section
- Provide limited curriculum development opportunities
- Do not provide ample instructional experience

Undergraduate classes often require the use of engineering skills or tools that...

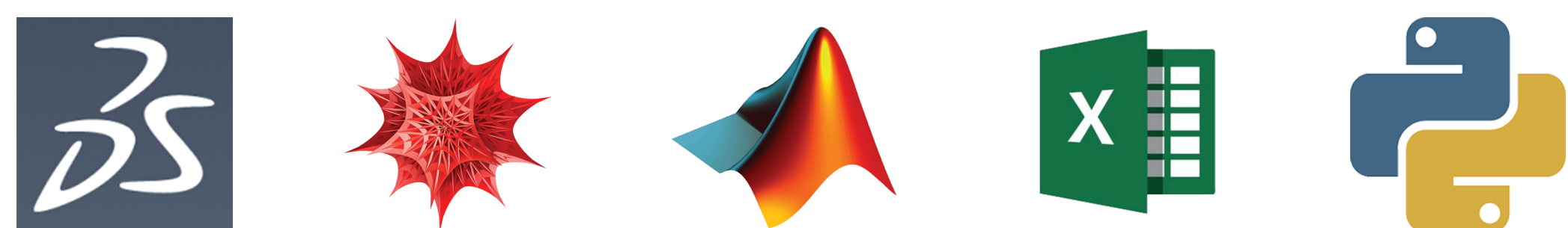
- Are not covered in class
- Students have forgotten
- Transfer students have not learned

## Our Proposed Solution

We have developed a graduate student-led teaching initiative, as part of a student chapter of the American Society for Engineering Education (ASEE), that aims to fill two needs within the engineering community:

- Curriculum development and implementation experience for graduate students
- Supplemental instruction on fundamental engineering skills for undergraduates

Undergraduate academic advisors have identified skills for which supplemental instruction may be advantageous to student success.



Supplemental instruction on these skills provides an attractive opportunity for graduate students to gain curriculum development experience while helping other students become better-equipped engineers.

## Workshop Topics

Since Winter 2013, we have developed and taught, or plan to teach, the following workshops:

- Introduction to MATLAB
- Introduction to Mathematica
- Introduction to Solidworks
- Introduction to Photoshop
- Introduction to Illustrator
- Introduction to LaTeX
- Introduction to Python
- Macros in Excel I
- Macros in Excel II
- Advanced plotting in Excel
- Advanced plotting in MATLAB
- Solving ODEs in MATLAB
- Equation solving in Mathematica
- Improving your presentation skills

## Workshop Development and Implementation

### 1. Written Proposals

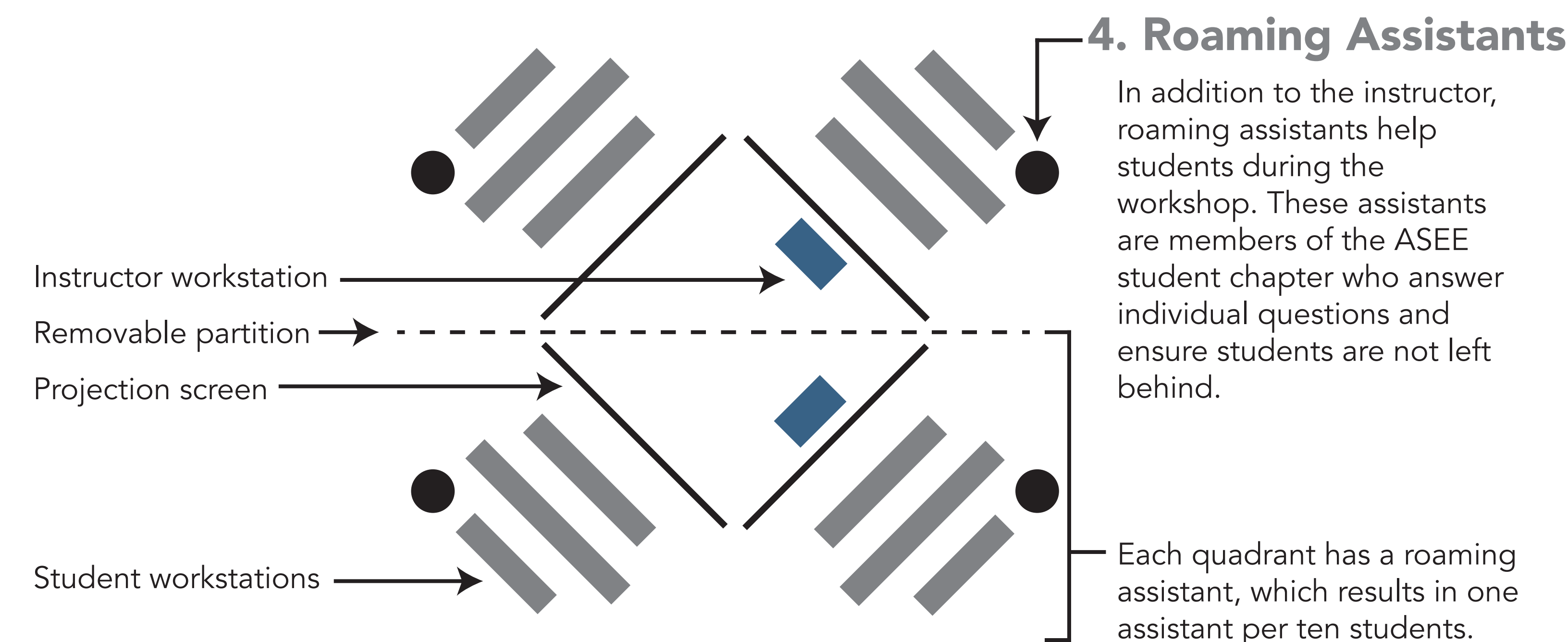
ASEE members interested in creating a new workshop are required to submit a proposal that outlines the workshop's scope, outcomes and prerequisites. Proposals are reviewed by the ASEE student chapter executive board.

### 2. Practice Workshops

To give student instructors a chance to implement their workshop prior to the official date, practice workshops are held with members of the ASEE student chapter. During these practice runs, peer participants provide feedback on workshop aspects that may need to be addressed prior to the official workshop, which include notation consistency, instructional pace, and breadth of material.

### 3. Workshop Environment

- 90 minutes of interactive, computer-based instruction
- Computer lab has 40 workstations and can be partitioned into two rooms
- Instructor sits at a single workstation
- Instructor's screen can be projected onto multiple quadrant screens
- Students follow the instructor's lead, making students active participants in learning



## Participant Responses and Discussions

The workshop series has been seen as an asset by student participants, as shown by their replies to completed online and paper-based surveys, as well as focus groups.

**95%** of students surveyed found the workshops to be worth their time.

**40%** of the students attending our workshops are transfer students.

**95%** of students surveyed felt more comfortable with the taught skill after the workshop.

**70%** of the students attending our workshops are undergraduates.

**157** students responded to surveys following our workshops.

**35%** of students, on average, attend more than one workshop.

**15+** departments are represented by students in our workshops.

Students have been able to implement the workshop content in their coursework:

*I found the plotting workshop extremely helpful. I think of it as a role model because they went through a variety of things covering a lot of aspects. When I do homework ... I refer to how it was done in that example. I find it quite useful.*

*I just had an assignment for my computer class they were talking about MATLAB (sic). I had the MATLAB workshop recently. When I forget something, I pull up the file so I can look up shortcuts [commands].*

Students saw the workshop series as a general asset:

*Applying the concepts to something that I would encounter in class was very helpful!*

*This was extremely helpful; the presenter did a great job. Thank you!*

## Instructor Responses and Discussions

A focus group for student instructors was held to gain an understanding of why graduate students are interested in developing workshops and whether the curriculum development experience is meeting their expectations and needs. Four instructors, who were not associated with the program evaluation presented here, participated.

**17** workshops held to date, with 4 more currently planned

**14** different instructors have developed and presented workshops

**20** different ASEE members have participated as roaming assistants or helped with practice workshops

Why members participated in the workshop series:

*Teaching is something I might want to pursue in the future and in general this [workshop development] is a great chance to develop skills you wouldn't otherwise have a chance to develop.*

*I was interested in putting my knowledge into structure and into a structured workshop (sic).*

## Conclusions

We developed a graduate student-led teaching initiative, which provides curriculum development experience for instructors and engineering skills for participants. With the initial success of the program and its continued development and improvement, we hope to provide meaningful growth opportunities for both graduate student instructors and workshop participants.