

## **Work in progress: Creating micromoments to develop a student's entrepreneurial mindset**

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## Introduction

Engineering programs aim to prepare students for their careers. This includes training students to be innovative and to adapt to fast-changing professional environments. To address this aim, many programs adopt pedagogical approaches that promote inquiry and use skill-based learning, such as entrepreneurial minded learning (EML). With the framework that was developed by the Kern Entrepreneurial Engineering Network (KEEN) [1], EML promotes curiosity, connections, and creating value strategies, known as the 3C's. EML encourages students to think broadly to address engineering challenges. These EML experiences have been included into courses and across curricula at many institutions [2].

EML is often associated with large scale project-based activities, which can be daunting to faculty to implement into their course. Many faculty members are underprepared for their instructional roles [3] and do not have sufficient support in their teaching [4]. One way in which we supported faculty in integrating this new approach is through creating a KEEN Faculty Learning Community (FLC) at UNC-Chapel Hill. An FLC is a small group of faculty and staff who engage in an active, collaborative yearlong experience [5]. The program includes a year-long curriculum that covers learning development and the scholarship of teaching, while also building a community of faculty. Through a yearly cohort of 6-8 participants, the UNC KEEN FLC meets monthly to discuss topics related to the KEEN Framework [1] in addition to providing curriculum support and coaching.

Faculty in our FLC were provided resources and coaching to implement EML [6]. However, with an emphasis on large-scale project-based activities, we were concerned about the sustainability of our approach. As an alternative, we wanted to have faculty try small-scale EML activities that can be completed in 2-30 minutes. To make this implementation easier, we needed to develop a set of these activities that faculty could choose from and immediately implement into their courses. Our hypothesis is that these "micromoment activities" will help students to develop their entrepreneurial mindset, while requiring minimal preparation and class time. This will encourage faculty to become more comfortable and confident with this approach, which will help to sustain pedagogical change, and encourage more extensive and frequent implementation. Most importantly, students will have more opportunities for engaging learning experiences to develop an entrepreneurial mindset.

In this paper, we describe our process for generating these examples of micromoment activities, including the dissemination and assessment of these activities. The purpose of the micromoment pilot is to seek feedback on the activities and explore the benefits of these micromoment activities for future research.

## Methods

### *Phase 1: Micromoment Activity Development*

We developed a set of micromoment activities by searching through existing materials and doing outreach to the KEEN community, including the following methods:

- We hosted a KEEN Live Discussion [7] to gather ideas through a one-hour virtual brainstorming session that included approximately ten participants.
- We reviewed the published KEEN Card database to identify and modify activities to be implemented in 2-30 minutes [8]. A KEEN Card includes instructions and resources so that faculty and instructors who use the Engineering Unleashed platform can adapt this activity for their own courses [6]. Not all KEEN Cards were reviewed.
- We gathered ideas from an online discussion forum at the 2022 KEEN National Conference.

Our list includes the following information about each activity: a description, an example of the implementation, activity tips, and other relevant resources.

### *Phase 2: Micromoment Activity Pilot Study and Dissemination*

For pilot testing, these activities were disseminated to UNC-Chapel Hill faculty and through KEEN and other engineering education communities. After the pilot, we will continue to present this tool at workshops in the engineering education space to support the use and development of these activities. In addition, we will continue to collect data on the activities, including their influence on faculty instruction, student engagement, and development of the students' entrepreneurial mindset.

Faculty agreed to participate on a voluntary basis. Participants were recruited through the UNC KEEN Faculty Learning Community, UNC Center for Faculty Excellence, the KEEN Engineering Unleashed email list, and LinkedIn posts. The participating faculty selected an activity of their choice, piloted the activity, and completed a post-activity survey. We collected preliminary data in March and April 2022 with nine faculty members from eight institutions with 247 students who participated in the activities.

### *Phase 3: Data Collection and Analysis*

Pilot participants completed a brief survey about their experience with implementing the micromoment activity. Faculty answered the questions shown below in Table 2 on a five-point Likert scale (from strongly agree to strongly disagree). Additional questions provided the faculty a member an opportunity to describe their implementation and to provide feedback and suggestions for the micromoment card. At the conclusion of the pilot study, the quantitative questions were summarized, and the qualitative responses were thematically analyzed.

## Preliminary Results

### *Phase 1: Micromoment Activities*

The initial list of 40 activities was evaluated on a rubric with four criteria: (1) easy preparation and support faculty instruction, (2) enhances student outcomes for technical skills, (3) enhances student outcomes for EML, and (4) engaging, fun, and motivating for students. Three evaluators then reviewed each activity to identify the best activities to be used in the pilot study to create a final list of 25 activities [9]. Examples of the activity descriptions can be seen in Table 1.

**Table 1. Examples of Micromoment Activities**

<b>Title</b>	<b>Activity</b>	<b>Time (min)</b>
<b>Question Frenzy</b> <i>Developed from KEEN Cards [10, 11, 12]</i>	Present a topic, image, or statement and ask students to list as many questions as possible surrounding the stimuli within 2 minutes. Encourage the crazy!	5
<b>What is at stake?</b> <i>Developed from KEEN Cards [13]</i>	Present a product, system, or process to students. Ask students to brainstorm 5-10 stakeholders and features of the product, system, or process. To create a <i>Stakeholder-Feature Model</i> use the list to draw a line between the <i>stakeholders</i> and their respective desired <i>features</i> .	15
<b>Bodystorming</b> <i>Developed from the Live Discussion</i>	Meet with students in a public area that is a heavily populated area (ex. cafeteria, student union) in which students are interacting with a product. Ask students to observe the area for 15 minutes. In pairs, ask students to identify an individual who interacted with a product, what was the value of the product, and feedback to improve the product for that particular user. Bring students together to do a brief share-out for 10 minutes.	30

### *Phase 2: Pilot Survey Results*

There were 12 implementations for seven activities, including “Just Google It” (n=3), “Question Frenzy” (n=2), “What is value?” (n=2), “Gallery Walk” (n=2), “Connect the Dots” (n=1), “How do we make this better?” (n=1), and the “Reviews are in” (n=1). The participants included tenure track (n=6), teaching track (n=2), and clinical (n=1) faculty. Faculty had a range of experience of 1-5 yrs. (n=3), 6-10 yrs. (n=3), and 11-15 yrs. (n=3).

From the survey results, faculty described a strong interest and engagement in the activities and willingness to implement more EML activities, with survey statements #1-3 rated 4.0 and higher, as shown in Table 2. However, the EML micromoment activities did not significantly influence a faculty member’s confidence in implementing EML, as described in statement #4 in the survey. The results were also influenced by one faculty member who evaluated an activity as 1.0 on the

five-point scale for all four statements in Table 2, which was an outlier to the other survey results and could be a misinterpretation of the Likert scale. Without this data point, each statement average would be increased by 0.2-0.3.

Faculty mentioned many successes in the EML micromoment successes, including:

- “I used the micro-moment activity to allow for further consideration of the concept of design and process components potentially missed while working on the design.”
- “The activity helped students clearly recognize value by thinking and writing/typing it out. It allowed them to reflect in class and discuss to hopefully guide them in presenting in relation to the course.”

**Table 2. Evaluation of the influence of the micromoment activities**

<b>Survey Statement (on a five-point Likert-scale)</b>	<b><i>M</i></b>
1. My students were very interested and engaged in this activity	4.2
2. I am likely to implement this activity again.	4.5
3. I am likely to implement other EML micromoment activities like this again.	4.3
4. My confidence in my ability to implement EML through micromoment activities increased significantly.	3.6

Faculty reported that they selected these activities based on ease of implementation (n=10), appropriateness for the subject matter (n=9), and amount of class time (n=7). The activity challenges listed in the post-survey were the time limitations, the need for more examples, time to plan, and assessment. Time limitation is the most significant challenge (n=3) mentioned, as faculty felt that the suggested time length for each activity was not long enough. For the activities selected, the average suggested time was 7.9 minutes.

### **Discussion and future work**

We plan to continue to develop the EML micromoment activities, make additions, and seek feedback and ideas from the engineering education community. The preliminary data was limited to less than ten participants with only 12 activities piloted. We will continue to collect data in Fall 2022. Once the activities are refined and developed, they will be adapted to a physical card deck template. The micromoment activity is already available online as a KEEN Card [9].

We also see these micromoment activities as a tool to overcome the challenges of FLCs in sustaining pedagogical change [14]. The goal is to provide faculty at both large and small institutions with a method to encourage more sustainable and effective teaching practices that promote an entrepreneurial mindset. This will prepare students for their future careers by encouraging them to question, adapt, and recognize opportunities in addressing today’s biggest challenges [15].

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