

EM @ ASU Case Studies



"Overtly reinforcing the importance of developing an entrepreneurial mindset to students who are enrolled in an entrepreneurship elective is vitally important. If the objective cannot be achieved in this course, we are likely missing a bigger opportunity."

- Brent Sebold, Director of the Fulton Engineering Startup Center

Case at a glance

Integration goals: Plan and implement the integration of EM into course materials for a junior-level technology elective

Materials affected: Syllabus, new lecture video, lecture slides, assessments, online course shell

Lessons learned: Elective space for students, particularly in engineering and business, can be limited; otherwise, integrating EM in this kind of course can be seamless

Context

Currently, the Entrepreneurship and Value Creation course serves approximately 500 ASU undergraduate, junior-level engineering and business students as well as 150 engineering graduate students annually. The course is inherently multidisciplinary, requiring both technological and business skill sets. Real-world, project-based, and offered via several 15-week hybrid (in-person and online) sections using a flipped classroom model, the course focuses on applications rather than theory. A summer version is offered only online.

The specific focus is on having students practice one iterative cycle of entrepreneurial methodology, with the aim of taking them from knowing essentially nothing to having a fully functioning start-up business. An average of four students comprise a typical entrepreneur/start-up team (“E-Teams,” as they’re called in the class and beyond). As a result, the course currently creates approximately 163 undergraduate and graduate E-Teams every year.

The course has higher enrollment numbers than might be expected for a junior-level elective, because it has “tech elective” status, which makes it an attractive option for most programs of study in Fulton Schools of Engineering, instead of being perceived solely as a business elective. That said, the course is cross-listed with the W.P. Carey School of Business, where it is offered in the school’s entrepreneurship sequence (as ENT 360) and coordinated with the Technology Entrepreneurship Management (TEM) team. The Course is offered regularly, at the same frequency from year to year, and presents a huge opportunity, as it engages students in hands-on cross-curricular collaboration, and its enrollments consistently trend upward.

The course’s structure is based on Lean LaunchPad® and Design Thinking methodologies, whose five components are tied to student learning activities and assigned deliverables:

1. brainstorm and down-select a pressing problem worth solving
2. form a multidisciplinary team
3. design an innovative solution and test a minimum viable product (MVP) for problem and market fit
4. engage 100 potential influencers/users/payers to determine whether to pivot or persevere
5. complete a minimum of three evidence-based pitch iterations and compete for follow-on support

All five of these course components are driven by Rigorous, Evidence-based, Action-oriented, Learning (REAL) within the realm of Entrepreneurship and Value Creation (abbreviated as “EVC” in Lean LaunchPad® terminology).

Unlike other project-based courses such as Engineering Projects in Community Service (EPICS) or senior capstone classes, problems that are identified and selected within FSE 301 are not externally sourced from industry, community partners, or researchers. Instead, students are encouraged to align possible societal or marketplace pain points with the following ASU-wide “innovation challenge” question: “How do we educate in a rapidly changing world; focus information and technology to produce meaningful change; build strong, vibrant communities; create a sustainable way of life; promote economic opportunity and security; lead healthier, more fulfilling lives; defend and extend human rights; and understand the past and present for the sake of the future?” It should be noted, however, that students within this course are ultimately provided the latitude to identify problems that they are most passionate about solving, regardless of their alignment with these institutionally defined challenges. In turn, the course sometimes yields several “lifestyle” ventures whose problem-solving goal has less to do with reducing societal or market pain points than the majority of the E-Team ventures.

At the undergraduate level, the course began as disparate junior-level courses in business and engineering: MGT 360, Entrepreneurship and Value Creation, and FSE 301, Entrepreneurship for Engineers. At the graduate level, the course is drawn from two engineering electives: FSE 501, Technology Entrepreneurship, and IEE 552, Strategic Technology Management. All four of

these courses were initially developed circa 2005 after ASU received a large grant from the Kauffman Foundation's Kauffman Campuses initiative to make entrepreneurship education available across our campuses and enable any student, regardless of field of study, to access entrepreneurial training.

As the above summary suggests, FSE 301 strongly utilizes and so also exhibits ASU's robust entrepreneurship and EM ecosystem, starting with the course's lead, Dr. Brent Sebold, holding joint appointments in ASU's office of [Entrepreneurship + Innovation](#) and Fulton Schools of Engineering. The successful integration of EM in this course required (and continues to require) developing faculty, staff, and teaching assistants' familiarity with EM as well as coordination with lower-level courses and programs including Devils Invent, Venture Devils, and GCSP.

Integration details

Our FSE 301 EM integration effort started with the recognition that EM could be addressed even more explicitly in this course, and, in fact, that if the entrepreneurial mindset cannot be achieved in this course, where students are enrolled in an entrepreneurship elective, we would be, as Dr. Sebold puts it, "likely missing a bigger opportunity." The growing enrollment numbers fueled our sense of urgency and added the challenge of refining the course to mentor student teams through the venture development process at greater scale.

The first step we took was modifying the course syllabus, specifically adapting the course's learning outcomes and assessment plan. We added the following EM-relevant learning objectives:

- Learn how to effectively identify and critically analyze an entrepreneurial opportunity and formulate the steps in establishing a value proposition oriented toward that opportunity.
- Learn how to analyze customer groups and develop a plan to identify and reach customers in a specific target market.
- Learn how to critically assess business model choices and select an optimal strategy for a chosen business concept.
- Prepare and deliver evidence-based pitches for new ventures as a process to help understand the complicated sales and funding experiences and the mindset of a customer, investor or partner.
- Work as a contributing and collaborative team member within a team in order to habitually find value in the many different backgrounds and viewpoints of those you interact with during your lives.

To ensure consistency across sections of the course (within academic calendar years and from year to year), the TEM team developed EM content for several weeks of the course, including a full module on entrepreneurship and the entrepreneurial mindset that includes having students apply the entrepreneurial mindset with their technical and business skillsets in their E-Team projects. This module includes a new video we created that provides an overall [introduction to entrepreneurship and value creation](#) (assigned during week 1); a customer discovery lecture in week 3; and two KEEN EM videos that can be used in both hybrid and fully online sections: [Traditional Versus EM Engineering](#) (week 1) and [Why EM Matters](#) (week 4). Students are required to contribute discussion posts and are invited to comment on the EM videos. To implement the new syllabus and material, we redeveloped the online course shell (on Blackboard), created new lecture slides, revised the course's project description and

requirements (a further adaptation of the Lean Launch curriculum of VentureWell/Steve Blank), and planned and recorded the new introductory video.

Importantly, we also developed an end-of-term assignment that returns students' attention to the 3Cs, with its specific purpose being having students reflect on the process they engaged in as both individuals and team member throughout their work on the final V3 Evidence-Based Pitch Deck deliverable. The starting point for this assignment is students thinking about the work that was involved in the following course activities:

- Collecting feedback/data from your target customer
- Developing a well-researched and well-tested design solution
- Justifying the value of your design solution from multiple perspectives (e.g., technological, economical, societal, environmental, etc.)

Reminded that there are no right or wrong answers and encouraged to answer honestly, students then write and submit a one- to two-page personal reflection that includes responses to each of the following questions:

- What behaviors do you think are important in accomplishing each task above? Consider behaviors to be specific actions that you perform as part of completing a particular activity.
- What attitudes do you think are important in accomplishing each task above? Consider attitudes as views, ideas, or ways of thinking that you bring to bear on a particular activity.
- Among the behaviors and attitudes you mentioned, which of these behaviors and attitudes do you think you have? Which of these behaviors and attitudes do you think you still need to work on? Give specific examples from working on the final project to support your answers.
- Do you envision these behaviors and attitudes being helpful in your work after graduation? Explain why you do or do not. How might you continue to develop these behaviors and attitudes in the future?

The above changes were included in what was a new 7.5 week, fully online version of FSE 301 that we developed as well as implemented in its on-ground sections. Finally, we have incorporated EM-related events happening around campus as optional extra-credit assignments for on-ground sections. These events have included the following:

- A talk given by Doug Melton, Director of the Entrepreneurial Engineering Program at the Kern Family Foundation, titled "Just Start with an Entrepreneurial Mindset"
- ASU Venture Devils Demo days, an ASU Venture Devils pitching showcase where students can see 10 of ASU's top student and faculty ventures compete for cash and connections
- ASU eSeed Challenge Demo Day, where students enjoy a free lunch on campus and watch 15 finalist ventures compete for a second tranche of funding and acceptance into ASU's eSeed Accelerator cohort

To get the full points available for these events, students simply take and submit a selfie photo of themselves at the event by the given due date to prove they were there.

NOTE: Supporting resources, including the activity's facilitator training guide, discussed in this case study can be found in resource folders that are part of its companion KEEN card (see below), which is also where the community can discuss the case and its broader topic of student orientation programs.

Integration outcomes

Students' answers to the following questions from the end-of-term assignment are the ultimate measure of the outcomes we've achieved through explicitly integrating EM in FSE 301:

- Among the behaviors and attitudes you mentioned, which of these behaviors and attitudes do you think you have?
- Do you envision these behaviors and attitudes being helpful in your work after graduation?

These and other questions are part of larger student mindset assessment efforts that are underway at ASU to measure and ultimately ensure EM learning outcomes. To that end, more than 50 of Dr. Sebold's students have completed the "EM Reflection" for qualitative analysis by ASU's assessment team. Data collection is ongoing and preliminary results are expected in late 2018.

For now, we are best able to measure outcomes in regard to the numbers of sections offered and students who have completed the course, which includes the number of additional Faculty Associates (FA) who are oriented to teach the EM-enhanced course. For example, Dr. Sebold's sections of FSE 301 have scaled from 40 to 80 junior-level students, and two new FAs shadowed him to learn the course pedagogy. Collectively, 436 new students (enrolled in nine sections of the course) were exposed to the EM learning outcomes and module content. Nearly 100 junior-level students have completed the fully online course.

All in all, we're more than halfway to where we set out to be but keep seeing potential for more and deeper integration of EM learning objectives and module content.

Future plans

Beyond iterative, incremental semesterly improvements and ongoing faculty and TA training, our future plans include further diversifying the course's student mix, increasing its enrollments, and expanding and fortifying its infrastructure.

In particular we want to cross-list this course with not only the business school but also the design school, as the ideal student mix on E-Teams would be 1/3-engineering, 1/3-business, and 1/3-industrial and graphic design, as designers in these areas are important collaborators within the realm of applied innovation and marketplace impact.

As noted, FSE 301 currently serves approximately 650 undergraduate and graduate students annually and enrollments are growing. Our specific goal is to serve 1,000 undergraduate and graduate students. We also intend to develop a shared course syllabus, a faculty training and support program, and a course website. Finally, we hope to make prototyping materials,

professional services, and seed funding more readily available to the student-led ventures that are formed within each class section.

Considerations

As mentioned at the start, ASU's culture of innovation and well-developed ecosystem, including the ASU Innovation Advancement Program and Office of Entrepreneurship + Innovation, and the commitment to EM that runs ever stronger throughout FSE, are essential to this course's success, including its integration of EM. Ultimately, our entrepreneurship ecosystem is well suited to support the most promising E-Teams and technologies.

Our cross-listing the undergraduate version of this course for engineering and business majors is something else to keep in mind, because it serves to "force" diversity among our student E-Teams, in terms of technical skill as well as mindset, and the collaboration between ASU's engineering and business schools is one key aspect that makes this course unique. As a result, each course section comprises about half of each discipline and the instructor is able to easily help the students form cross-functional teams. We are fortunate that the level of transdisciplinary collaboration at ASU is high. We are also fortunate that this course counts toward many majors within engineering, curriculum flexibility that allows students to take this course despite its being an elective that they otherwise likely would not have the time or budget, or possibly even the motivation, to take.

You may also want to consider that, regarding the process of designing solutions and testing minimal viable products for problem and market fit, the student E-Teams are encouraged to generate their own intellectual property, which they ultimately own (per Arizona Board of Regents policy), vis-a-vis technologies or services developed in class. Alternatively, students may elect to leverage technologies that may be developing within their research labs or those that may be available for license from our technology transfer offices.

KEEN Card

This case study has a companion card on the KEEN [website](#).

Related Cases

Curriculum

Foundations 1: EGR 101 and FSE 100

Immediate Contributions: EPICS (FSE 104 and 494)

Level Up: Use-Inspired Design (EGR 201)

Direct Instruction: Entrepreneurial Mindset - 3Cs of Innovation (FSE 294)

Engagement

Starting Strong: E2 Camp

A Natural Fit: Grand Challenge Scholars Program

The Energy of Inquiry: Fulton Undergraduate Research Initiative (FURI)

May 2018

Deep Dive: Entrepreneurship and Value Creation (FSE 301)

Category: Curriculum

Change Makers: KEEN Professorships
Golden Opportunities: KEEN Student Mini-Grants

Workshops

Onboarding 1: EM Workshop for Faculty
Onboarding 2: EM Workshop for Staff
Onboarding 3: EM Workshop for UG Teaching Assistants

Life Cycle

The Impact Meter: Assessing Student Mindset