

Integrating the Lean Launch curriculum into engineering courses

Laura Hirshfield¹, Aileen Huang-Saad¹, Julie Libarkin²

1. University of Michigan
2. Michigan State University

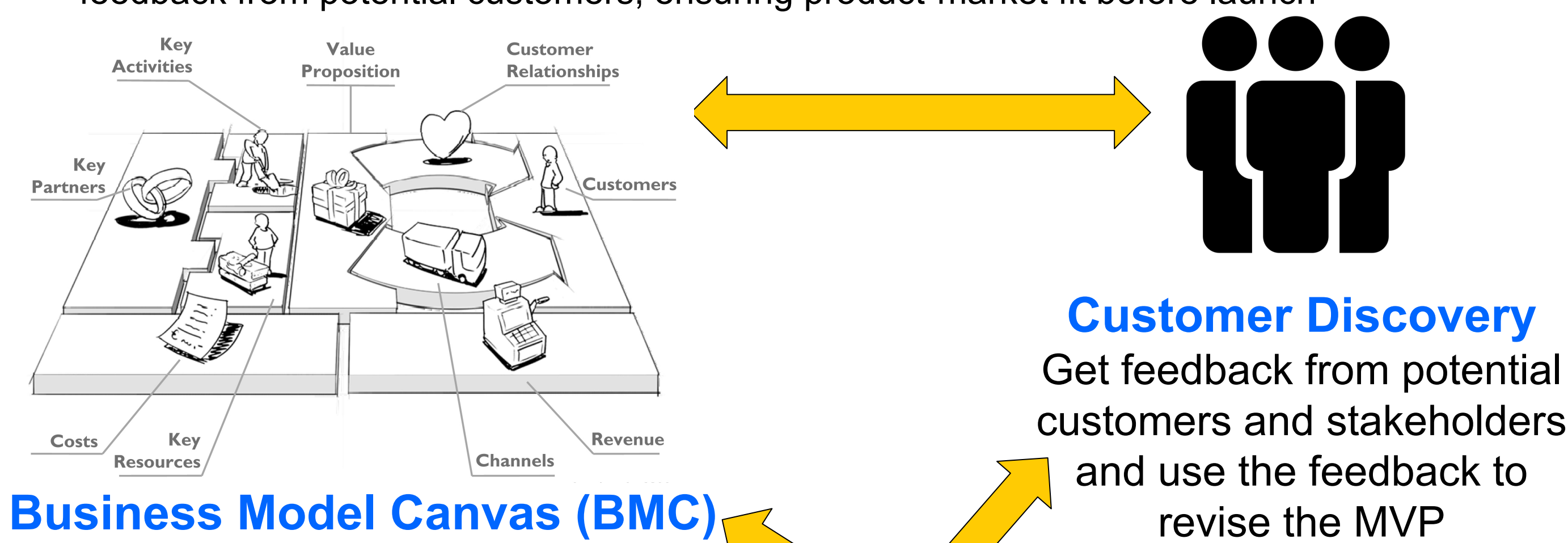
Motivation

- Entrepreneurship education brings many benefits to engineering students
 - Graduating students cannot simply be technically proficient
 - Entrepreneurial skills (professionalism, communication, creativity, flexibility) are important for any engineer
 - Engineers must be able to develop technologies *and* ensure their success on the market
- Traditional engineering curricula do not incorporate entrepreneurial development

How can we integrate entrepreneurship education into our existing engineering courses?

Lean Launch

- An entrepreneurship curriculum developed by Steve Blank
- Fast-moving development process to ensure success for entrepreneurs
- "Evidence-based entrepreneurship" = business models are iteratively revised using feedback from potential customers, ensuring product-market fit before launch



Minimum Viable Product (MVP)

Low-level prototype that serves to present the vision and gain feedback

Research Questions

1. How does the Lean Launch process compare or contrast to the **engineering design process**?
2. What **engineering learning outcomes** are also outcomes in the Lean Launch curriculum?
3. What types of **engineering behaviors** do instructors believe students develop by engaging in the Lean Launch curriculum?
4. What benefits does the Lean Launch curriculum bring to engineering design curricula?

Methods

- **Participants**
 - 3 entrepreneurs who leverage the Lean Launch curriculum
- **Settings**
 - Undergraduate and graduate Center for Entrepreneurship courses
 - I-Corps
 - Incubator for start-ups
- **Data collection**
 - Semi-structured interviews
 - Entrepreneurs checked off items related to engineering (in terms of the **design process**, **learning outcomes**, and **behaviors**) if they were present in the Lean Launch curriculum

Results

Parallels between the Engineering Design Process & Lean Launch

Step of the Engineering Design Process	Present in Lean Launch?	How Students Complete the Step in Lean Launch
Understand, define, reframe a problem	✓	Reworking the original problem statement by considering user feedback in Customer Discovery
Do research	✓	Researching user needs through Customer Discovery , researching competing products & businesses
Explore user needs	✓	Determining value and desired features of product via Customer Discovery
Prototype	✓	Minimum Viable Product
Conduct experiments	✓	Testing hypotheses by talking with consumers during Customer Discovery
Revise and iterate	✓	Revising their Minimum Viable Product with the use of feedback from Customer Discovery
Identify constraints	✗	Not an explicit step, but happens due to making assumptions or imposing boundaries
Generate ideas	✗	Need one idea that is a foundation of the process
Reflect on the process	✗	Not assigned
Execute the final solution	✗	Students rarely create a prototype beyond the Minimum Viable Product

Parallels between the Engineering Learning Outcomes & Lean Launch

Learning Outcome	Present in Lean Launch?	How This Learning Outcome is Met in Lean Launch
Strong analytical skills	✓	Analyzing feedback from customers given during Customer Discovery to determine value
Practical ingenuity	✓	Prototyping the Minimum Viable Product
Communication	✓	Talking to a wide variety of people during Customer Discovery
Dynamism, agility, resilience, flexibility	✓	Change is the foundation of the Lean Launch process
Lifelong learning	✓	Students apply Lean Launch principles outside of the course
Creativity	~	Determining unique ways to reach different people during Customer Discovery
Business and management skills	~	Interacting with someone with a business focus
Leadership	~	Not taught, but students may be empowered by leading
High ethical standards	✗	Students are instead taught to disregard rules or standards
Strong sense of professionalism	✗	Not taught

Parallels between the Engineering Behaviors & Lean Launch

Behavior	Present in Lean Launch?	How Students Develop this Behavior in Lean Launch
Empathy	✓	Focusing on discovering and understanding human need through Customer Discovery
Comfort with uncertainty, failure, and risk	✓	Constantly iterating gives "familiarity" with risk and failure
Collaboration	✓	Working in teams and with a variety of people via Customer Discovery
Iteration	✓	Constantly revising their Minimum Viable Product with the use of feedback from Customer Discovery
Critical questioning	✓	Asking the right questions during Customer Discovery to get the information they want
Creativity	~	Determining unique ways to reach different people during Customer Discovery
Curiosity	~	Students who are already curious will thrive, with more interest in research and Customer Discovery

Implications

Implementing Lean Launch into our courses can greatly improve the teaching and assessment of our curriculum. There are many specific benefits to integrating Lean Launch into engineering courses:

- Development of entrepreneurial knowledge
 - Creating a business model
 - Determining product market fit
- Engagement in **Customer Discovery**:
 - *Formalizing the human-centered aspect of design*: students must gain first-hand feedback about user needs
 - *Fostering the application and development of engineering skills in a different context*: students practice important engineering skills, but considering customer feedback as data
 - *Simplifying the teaching and assessing of ABET skills*

Contact: lhirschfi@umich.edu

Transforming Engineering Education Laboratory

This research was supported by the National Science Foundation under DUE-1504257. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

