Effects of Involvement in SI on SI/LEAP Leaders

AMBER KEMPPAINEN, AJ HAMLIN
HAYLEE DIMENT, AMANDA MOYA

LEarning with Academic Partners (LEAP)
MICHIGAN TECHNOLOGICAL UNIVERSITY
Outline

• First Year Engineering Program
• What is LEAP?
• LEAP Program Logistics
• Study Methods and Results
  – Focus Group
  – Pre-/Post-Surveys
• Addressing Challenges
• Conclusions
First-Year Engineering at Michigan Technological University

Engineering Students enter common First-Year Program (n = 1,037)

Pre-Calculus-ready path (10%)

ENG1001 (2 cr) Engineering Problem Solving

ENG1100 (2 cr) Engineering Analysis

Calculus-ready path (90%)

ENG1101 (3 cr) Engineering Analysis and Problem Solving

ENG1102 (3 cr) Engineering Modeling and Design

Engineering Students leave First-Year Program

Michigan Tech Fast Facts
- Gender
  - Female: 27.1%
  - Male: 72.9%
- Undergraduate Majors Offered: 72
- Minors Available: 68
- 67% in Engineering
- Average entering GPA: 3.72
- First to second-year retention rate: 83.2%
First Year Engineering Program at Michigan Tech (2017-2018)

ENG1101: Engineering Analysis and Problem Solving
- Approximately 900 students
- 40 sections of 24 students
- Meets 2x per week for 110 min with 5 sections (class)
- Meets 1x per week for 50 min with 1 section (LEAP session)

ENG1102: Engineering Modeling and Design
- Approximately 800 students
- 27 sections of 30 students
- Meet 2x per week for 80 minutes with 4 sections (class)
- Meet 1x per week for 40 minutes (class) and 40 minutes (LEAP Session)
Revision of First-Year Engineering Program

Goals of revision:

• Strengthen the ability for open-ended problem solving
• Enhance student facility with computation problem solving applied to engineering problems

Prior Program (2000-2016)

• Active, collaborative learning environment
• Class size: 48, 64, 72
• One TA/grader per section
• Two desktop computers for a team of four students
• Students want more examples and practice

Revised Program Full-scale Fall 2017

• Fully-flipped environment
• Requires student owned laptops
• Class size: 120 students
• Near-peer mentoring
Benefits of SI model

Benefits to Students (UMKC, 2018)

1. Increased grades in the target course
2. Decreased rates of D, F, and W grades in the target course
3. Increased persistence at the university

Benefits to SI Leaders (Podolsky, 2016)

1. Communication skills
2. Team Building
3. Planning Skills
4. Teaching Skills
5. Study Skills

LEarning with Academic Partners
# SI and LEAP: Side by Side

## BOTH
- Leaders trained in group facilitation techniques
- Leaders participate in continuous training
- Leaders attend all class sessions
- Leaders plan and facilitate a (SI/LEAP) session
- Leaders meet with course faculty

## SI
- Usually used to supplement large lecture course
- SI sessions are held one per class period
- Attendance at SI Sessions is optional
- All SI sessions are observed by SI director

## LEAP
- Supplement active classrooms
- Leaders are assigned 20-24 students
  - Assist with classroom activities
  - Grade course work as needed
  - LEAP sessions are once a week
- Observe other LEAP sessions and provide feedback
- Assist with data collection
- Attendance at LEAP sessions are mandatory
- LEAP sessions are observed 3 times during the semester
- Leaders attend debriefing sessions for group problem solving
Development of LEAP (Pilot)

Fall 2016
- 9 leaders in ENG1101
- sessions included in course schedule

Spring 2017
- 3 leaders in ENG1101
- 9 leaders in ENG1102
- sessions outside of course schedule, optional attendance
Development of LEAP  
(Full-Scale - Fall 2017)

- ENG1101 (32 LEAP Leaders, 8 Head LEAP Leaders)
  - weekly 50 minute session with leader, included in course schedule
- ENG1001 and ENG1102 (12 LEAP Leaders)
  - biweekly 40 minute session with leader, included as part of one 80 minute class meeting
- Support Staff: 2 Directors, 2 Student Supervisors, 3 substitute leaders
LEAP Program Evolution

2016-2017

Orientation: online module + one full day in-person
Training: Track A, 1 hr/week
Debriefing: 1 hr/week
Observation:
  • Fall - 2 admin, 1 peer
  • Spring - 3 admin, 1 peer
Attendance:
  • Fall - Mandatory
  • Spring - Optional
Plan Submission: Google Drive
Plan Review: none

Fall 2017

Orientation: online module + one half day in-person
Training and Debriefing:
  • Track A
  • 1.5 hrs/week
  • returning leaders joined for debrief portion
Observations: 3 admin, 1 peer
Attendance: mandatory
Plan Submission: Canvas
Plan Review: weekly
LEAP Program Logistics – Fall 2017

Online Modules:
- FERPA, TITLE IX, Bloom’s Taxonomy
  - Pre-Semester

Semester Training
- Weeks 1-7

Supervisor Observation #1
- Week 3 and 4

Peer Observation
- Week 7, 8, or 9

Supervisor Observation #2
- Week 12 or 13

Program Assessment
- Week 13-14
Research Motivation

1. To assess the changes in self-efficacy of the LEAP Leaders.

2. To assess the effects of being a LEAP Leader as related to their own academics.

3. To assess the effects of being a LEAP Leader on professional skills (leadership, organization, time management, communication)

4. To compare with SI programs to determine if the results are consistent
Survey Methods

   a. Used engineering self-efficacy subscales to measure a) ability to succeed in engineering and b) confidence in abilities
   b. 7-point Likert Scale
   c. Used paired t-test to evaluate changes in pre-post data

2. Changes in academics measured by pre-and current-semester GPA
   a. Used paired t-test to evaluate changes in pre-post data

3. Changes in professional skills measured using questions developed by LEAP administration

4. Comparison with SI programs using questions used by Podolosky when measuring gains by SI leaders at the University of Manitoba

5. Focus Groups to gain qualitative data from leaders
LAESE Self-Efficacy Survey

LAESE Self-Efficacy I: Ability to Succeed in Engineering
1. I can succeed in an engineering curriculum
2. I can succeed in an engineering curriculum while not having to give up participation in my outside interests (e.g. extracurricular activities, family, sports)
3. I will succeed (earn an A or B) in my physics courses
4. I will succeed (earn an A or B) in my math courses
5. I will succeed (earn an A or B) in my engineering courses

LAESE Self-Efficacy II: Confidence in Abilities
1. I can complete any engineering degree at this institution
2. I can do well in an engineering major during the current academic year
3. I can complete the math requirements for most engineering majors
4. I can complete the physics requirements for most engineering majors
5. I can complete the chemistry requirements for most engineering majors
6. I can persist in engineering during the current academic year
LEAP Questions

LEAP Program Requirements

1. Currently, how confident are you that you will be able to develop a plan for a LEAP session?
2. Currently, how confident are you that you will be able to run a LEAP session?

Confidence in Major

1. Currently, how confident are you that you will graduate with your current major?
2. Currently, how confident are you that you will be enrolled in any major in STEM in the next academic year?

Leadership Ability

1. Currently, how would you rate your leadership ability?
2. Has being a LEAP Leader has improved your leadership ability?
3. Has being a LEAP Leader helped you deal with student conflict?
LEAP Questions

Being a LEAP Leader...

Academics
1. Has had a strong influence on my career choice
2. Has made me more aware of campus resources
3. Has taught me skills that have improved other areas of my life
4. Has helped me deepen my understanding of core concepts

Communication
1. Has positively influenced my communication skills
2. Has helped me become more effective when communicating with professors
3. Has helped me become more effective when communicating with peers
4. Has helped me become more effective when communicating with students
Focus Group Logistics

• Two sessions held in Fall 2017
  – Session 1: Week 10, 11 attendees
  – Session 2: Week 11, 11 attendees

• Run by LEAP administration: director(s) and student supervisor(s)

• Format
  – Welcome
  – Purpose
  – Guidelines
  – Topic Questions
  – Closing

1. Impressions of LEAP
2. Benefits
3. Challenges
4. Match your expectations?
5. Affected career aspirations or opportunities

Biggest takeaway
Focus Group Questions

1. What are your impressions of the LEAP Program so far?
2. Can you describe any benefits you have gained from your involvement in the LEAP Program?
3. Can you describe any challenges you have faced with regard to completing the requirements of the LEAP Leader position?
4. How have requirements of the LEAP Program matched your expectations?
5. Has being in the LEAP Program affected your career aspirations or opportunities?

Closing - What is the most valuable take away from your LEAP Leader experience?
LEAP Program Logistics – Fall 2017

Online Modules:
FERPA, TITLE IX, Bloom’s Taxonomy
- Pre-Semester

Pre-Survey
- Week 4

Peer Observation
- Week 7, 8, or 9

Focus Groups
- Week 10 and 11

Semester Training
- Weeks 1-7

Supervisor Observation #1
- Week 4 and 5

Supervisor observation #2
- Week 12 or 13

Program Assessment
- Week 13-14

Post-Survey
- Week 14
Sample Population

Figure 1. Comparison between student and LEAP Leader Majors
Figure 2. LEAP Leader Student Level

Figure 3. LEAP Leader Gender Distribution
Results

- Self Efficacy in Engineering
- Confidence in meeting LEAP Program Requirements
- Academic Performance
LAESE Engineering Self-Efficacy

No significant differences in SE between pre- and post-test. (p > 0.05)

Majority of LEAP leaders have very high engineering self-efficacy before being employed as a LEAP Leader.

First-Year Student Self-Efficacy
- Self-efficacy 1 = 28
- Self-efficacy 2 = 35
LEAP Program Requirements

- NOTE: Pre-survey was given during week 4 of the semester. At that time, leaders will have had 1 LEAP session and completed orientation training.
- Statistically significant differences pre to post (p <0.001)
Confidence in Major

Currently, how confident are you that you will be enrolled in any major in STEM in the next academic year?

Currently, how confident are you that you will graduate with your current major?

Two students switched majors between Fall 2017 and Spring 2018
- One added a second major
- One removed their second major
Academics

Average pre-GPA = 3.49 ± 0.11
Average post-GPA = 3.55 ± 0.12
no significant difference (p=0.571)
Skill Development: Impacts on Academics

- **Has helped me deepen my understanding of core concepts**
  - Agree: 83%
  - Neutral: 17%
  - Disagree: 0%

- **Has made me more aware of campus resources**
  - Agree: 67%
  - Neutral: 33%
  - Disagree: 0%

- **Has had a strong influence on my career choice**
  - Agree: 46%
  - Neutral: 25%
  - Disagree: 29%

- **Made me better at assessing and critiquing the quality of my own work**
  - Agree: 75%
  - Neutral: 25%
  - Disagree: 0%
Academics

I feel like it’s a really rewarding experience. . . It’s interesting to be on the other side of everything. . . to know what the instructional and leadership end of a class is like. So yeah, I feel more confident in interacting with instructors in other classes . . .

...it’s definitely deepened my understanding of the concepts.

The most valuable take away from LEAP was the ability to learn alongside your students while improving teaching skills and leadership abilities.

I feel much more comfortable with the material, I know that’s not the point of LEAP, but it’s a benefit.
I like getting a little taste of teaching. . . I didn’t really know how I’d like it, but I’m liking it. So, I don’t really know if that will affect my career path, what I’m choosing, but it’s good experience.

It has been enjoyable teaching and planning sessions.

I learned that I enjoy teaching, especially seeing other making breakthroughs and realizing their potential.

Getting a comprehensive teaching experience (i.e., no just grading papers)
Results

- Professional Skills
- Comparisons with another SI program
SI/LEAP Comparison Questions
(Tim Polodsky, University of Manitoba, 2016)

Being an SI/LEAP Leader....

Communication

1. Made me more confident when communicating with others
2. Helped me develop my ability to listen attentively to others
3. Helped me develop my presentation skills
4. Helped me develop my overall communication skills

Team Building

1. Made me more respectful and appreciative of different viewpoints
2. More confident when engaging a group of individuals on a task
   More confident when leading a group discussion
3. More confident when working as part of a group
Skill Development: Communication

Being an SI/LEAP Leader…

Helped me develop my overall communication skills
Helped me develop my presentation skills
Helped me develop my ability to listen attentively to others
Made me more confident when communicating with others
Skill Development: Communication

Being a LEAP Leader ...

- Has helped me become more effective when communicating with students: Agree 96%, Neutral 4%, Disagree 0%
- Has helped me become more effective when communicating with peers: Agree 88%, Neutral 8%, Disagree 4%
- Has helped me become more effective when communicating with professors: Agree 88%, Neutral 4%, Disagree 8%
- Has positively influenced my communication skills: Agree 96%, Neutral 4%, Disagree 0%
Communication

“I’ve always been really shy and like after like having to go through this and like presenting, I’ve gotten so much better at it and I don’t feel so like nervous when I talk. Like I even raise my hand in [other] classes . . . I feel more confident.

The public speaking - it was hard for me to get over. The first day that I had a session to myself I was like really scared . . . I just had a presentation in one of my mechanical engineering courses and it just was so much easier and it was great.

I became a lot more comfortable with public speaking after being a LEAP Leader.

“... you have to communicate with the students and the instructor and the other LEAP Leaders, so there’s a few different lines of communication that you have to ... keep in check.”
Communication

“... you have to communicate with the students and the instructor and the other LEAP Leaders, so there’s a few different lines of communication that you have to ... keep in check.”

I have seen ... how hard it is to ... communicate with multiple bosses [(faculty and LEAP admin team)]. At first it really was stressful.
LEAP Leadership Ability

Being a LEAP Leader...
Has helped me deal with student conflict
Has improved my leadership skills

- Agree
- Neutral
- Disagree

67% 33% 0%
96% 0% 0%

Currently, how would you rate your leadership ability? (0 - 100)

Pre Post

p = 0.001
Skill Development: Leadership/Team Building

- More confident when working as part of a group:
  - SI: 96% Agree, 4% Neutral, 0% Disagree
  - LEAP: 88% Agree, 13% Neutral, 0% Disagree

- More confident when leading a group discussion:
  - SI: 92% Agree, 8% Neutral, 0% Disagree
  - LEAP: 96% Agree, 4% Neutral, 0% Disagree

- More confident when engaging a group of individuals on a task:
  - SI: 87% Agree, 13% Neutral, 0% Disagree
  - LEAP: 96% Agree, 4% Neutral, 0% Disagree

- Made me more respectful and appreciative of different viewpoints:
  - SI: 79% Agree, 17% Neutral, 4% Disagree
  - LEAP: 83% Agree, 13% Neutral, 4% Disagree
Skill Development: Leadership/Team Building

It strengthened my ability to guide a group of students and be comfortable in a leadership position.

I’ve learned so much about facilitation techniques and how to lead a group. These are lifelong skills that can be used anywhere.

I found different ways to facilitate... learning

 Biggest Value?
 Being able to practice leading:
  • learning how to work with others as their teacher
  • learning how to deal with difficulties
  • I want to be a leader so this is helpful

Skill Development: Leadership/Team Building

Another thing is just, like building a relationship so that you know they respect you and you respect them.

I think making the plans too, it’s kinda forcing me to think about how differently everybody does things because trying to tailor [my LEAP session] to my specific students’ needs. Everybody learns totally different, like wants something different out of everything.

It’s helped me to be a lot more sensitive to the needs of particular students.

Seeing the students perspectives about what they need and learning how to balance the needs of a group of students.
You get exposed to a lot of **different student types**… I’ve been hang[ing] out with my friends. They all [have] the same kind of study habits. I think **teaching/facilitating [a] wide range of students** helped me to find different study habits for myself.
Professional Skills

I think LEAP Leaders get to like build this skill of like being **creative** and **[thinking] on your feet**, cause you have to make a plan ahead of time and it seems like a great plan and then you start to implement it and it’s not a great plan and then you have to **think about** how you can like fix it and adhere to how your **students** are feeling that day.

**Organizing my thoughts** and **thinking on the fly**. Helping students avoid the pitfalls that I got trapped in is rewarding.

I think overall the **organizational and communication skills** are improved … LEAP Leaders need to learn to **work under pressure**, they need to be more organized, they need to … communicate better with the students and with their instructors.

**Personal growth** particularly in communication skills and **time management**.
Challenges

- Focus Group
Challenges:
Biweekly sessions for ENG1001 and ENG1102

I think it does need improving for ENG1102 … I do think the program *works really well for ENG1101*. I didn’t LEAP for it, but I was in the LEAP program for it as a student and like I found it pretty helpful, but in ENG1102 … I feel like it’s still too choppy … *we do it every other week* and then *every other LEAP session is an assessment*, so really we have like three or four real LEAP sessions in the whole semester. *So I don’t think the students are really getting all that they could out of it.*

---

Spring 2018:
- Weekly LEAP sessions
- 40 minutes of 80 minute class period

Fall 2018 and Spring 2019:
- Weekly LEAP sessions
- Dedicated 50 minutes each week
Challenges: Grading

It’s not like the issue with grading, it's just the **time that goes into it**, and if you **fall behind** ... that builds up and you have to make that up somewhere else.

Another challenge that I...I don’t know...I mean it’s a judgement call, but like the **grading** some of this stuff has kind of **been left up to us** to decide how harsh I want to grade...**not everything has had a rubric**...more guidance with that would help...maybe just in your first semester.

I think some of that goes back to the **professor** that you’re working under too, because ours hands out rubrics for every homework assignment.

- Encouraged faculty to provide rubrics
- Leaders graded together
- Shared load
Challenges:
Too much scheduled time

I have a **structured meeting every single day of the week** for this job. Whereas before [as a TA], it was like I would show up to the classes and then do my grading on my own and do that when it was convenient for me … so I’m stuck on campus all day Monday through Friday.

- Reduce the number of debriefing sessions from weekly to 4 times per semester
- Some faculty have combined their meetings with team session planning
Challenges: Management

I feel like I’m bombarded with emails.

We have an email chain with the six of us that are LEAP Leaders. We also have emails that we get from [instructor] about like pre-lessons and the slides… homeworks, and rubrics and then we get emails from [LEAP directors] about filling out surveys and then we get emails from students with questions.

- Newsletter
- Conscientiously try to consolidate emails to leaders
- Use Canvas to manage plan submission, feedback, and reflections
Challenges: Management

Another thing is with Canvas. I was added to three Canvas courses for this: the LEAP course, the engineering book course, and then the course I was in and … my to-do list was like submit your weekly plan, submit your revisions, submit your review, submit this, grade this, grade this, and I ended up missing an assignment … because my own [course] workload was not present on my own Canvas page.

- No longer enroll in the book course in spring
- Improved Canvas plan submission (individual or group)
Challenges:
Difficulty balancing workload

Obviously the time commitments [have] been a challenge for me having 18 credits and trying to do this at the same time… I’ve been able to make it work so far, but …

- Head LEAP Leaders facilitate planning together when possible/desired
- In interviews, discuss potential leader future course load and expected time commitment if selected
Moving Forward – Fall 2018

• Address challenges as described
• Continue to obtain feedback from leaders, faculty, and students to improve the program
• Clarify and balance roles for faculty and LEAP directors in session planning and observation
• Assess impact of LEAP Program in ENG1001, ENG1100, and ENG1101
• Streamline interview process
• Created a required 1-credit course for training
• Created a LEAP coursework path in the leadership minor
Any Questions?

Amber Kemppainen, amber@mtu.edu
AJ Hamlin, ahamlin@mtu.edu
Michigan Technological University

LEarning with Academic Partners
First-Year Engineering Program


