EPICENTER

# research summit

AUGUST 4-5, 2014 • STANFORD UNIVERSITY

# Session E: Re$^3$

## Re-cap, Re-flect, Re-search

Sheri Sheppard and Mark Schar
*Stanford University*

Angela Shartrand
*NCIIA*

epicenter
National Center for
Engineering Pathways to Innovation

NSF

Stanford
University

NCIIA

# Session E

**Re-cap** (30 minutes)

Review what you have discovered at this Summit

**Re-flect** (20 minutes)

Synthesize your thoughts

**Re-search** (40 minutes)

Generate exciting, breakthrough ideas for research

# Re-cap

Reflect on your own (5 minutes)

Discuss at your table (10 minutes)

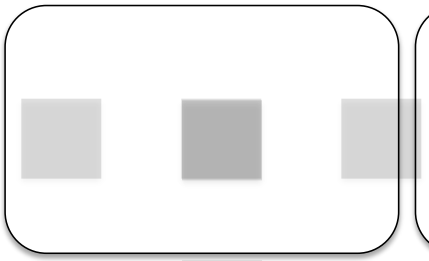
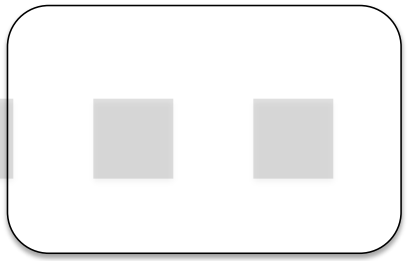
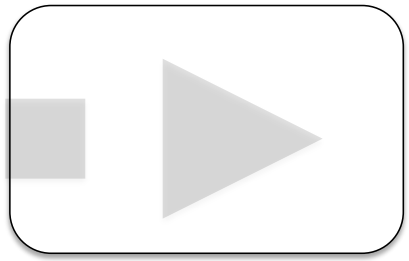
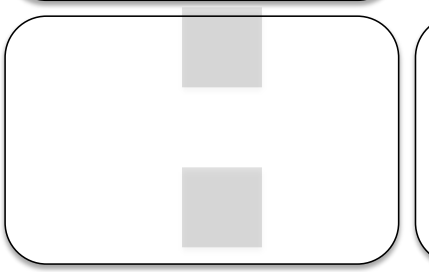
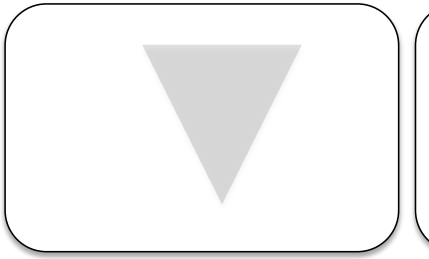
Discuss as a Group (15 minutes)

Use “I Like,” “I Wish” and AHA! format

## **Session E:** Re-Cap Round-Up

EPICENTER research summit
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Your Name: _____

| Topic Areas | I Like<br>What did you like about this Session? | I Wish<br>What did you wish was discussed … that was not? | AHA!<br>What is a Big Thought or Big Idea from this Session? |
|---|---|---|---|
| **Students**<br>*Session A & B Entrepreneurial development, pathways, research ideas* |  |  |  |
| **Programs**<br>*Session C Research on Entrepreneurship Programming and Unprogramming* |  | | |
| **Curriculum**<br>*Session D Research on Curricular Approaches* |  | | |

**Process:**

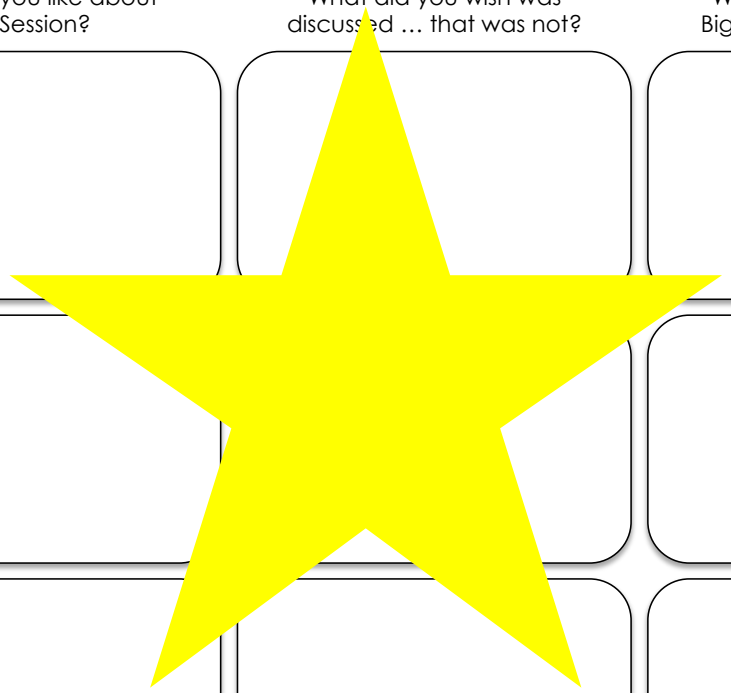
- On your own, think back to the Sessions. Capture your thoughts as "I Like" and "I Wish," then a new thought … your AHA! (5 minutes)
- As a table, share your AHAs! Place your gold stars on AHAs you like. (15 minutes)
- As a table, pick three AHAs that are your favorite, write them on the yellow stickies provided, and we will talk as a Group (10 minutes)

## **Session E:** Re-Cap Round-Up

EPICENTER research summit
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Your Name: _____

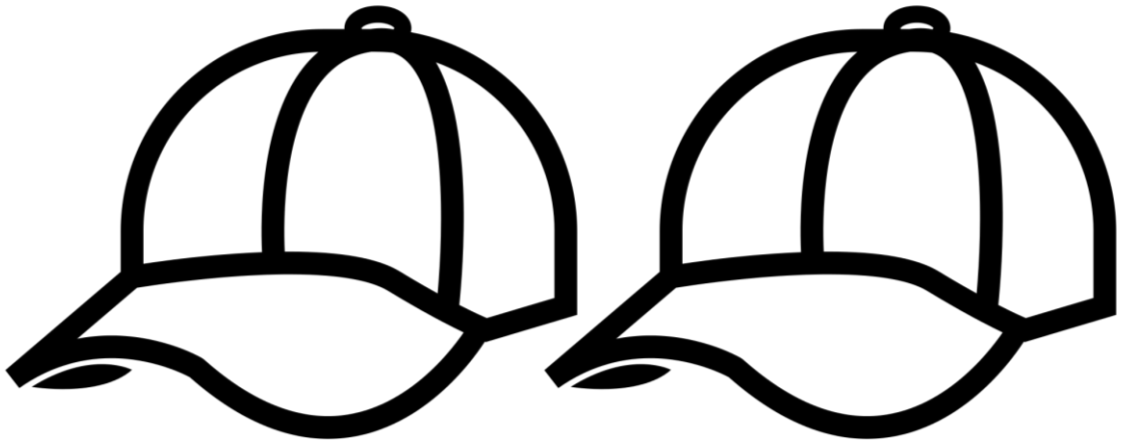
| Topic Areas | I Like<br>What did you like about this Session? | I Wish<br>What did you wish was discussed … that was not? | AHA!<br>What is a Big Thought or Big Idea from this Session? |
|---|---|---|---|
| **Students**<br>*Session A & B Entrepreneurial development, pathways, research ideas* | | | |
| **Programs**<br>*Session C Research on Entrepreneurship Programming and Unprogramming* | | | |
| **Curriculum**<br>*Session D Research on Curricular Approaches* | | | |



**Process:**

- On your own, think back to the Sessions. Capture your thoughts as "I Like" and "I Wish," then a new thought … your AHA! (5 minutes)
- As a table, share your AHAs! Place your gold stars on AHAs you like. (15 minutes)
- As a table, pick three AHAs that are your favorite, write them on the yellow stickies provided, and we will talk as a Group (10 minutes)

# Re-Cap



# Re-flect

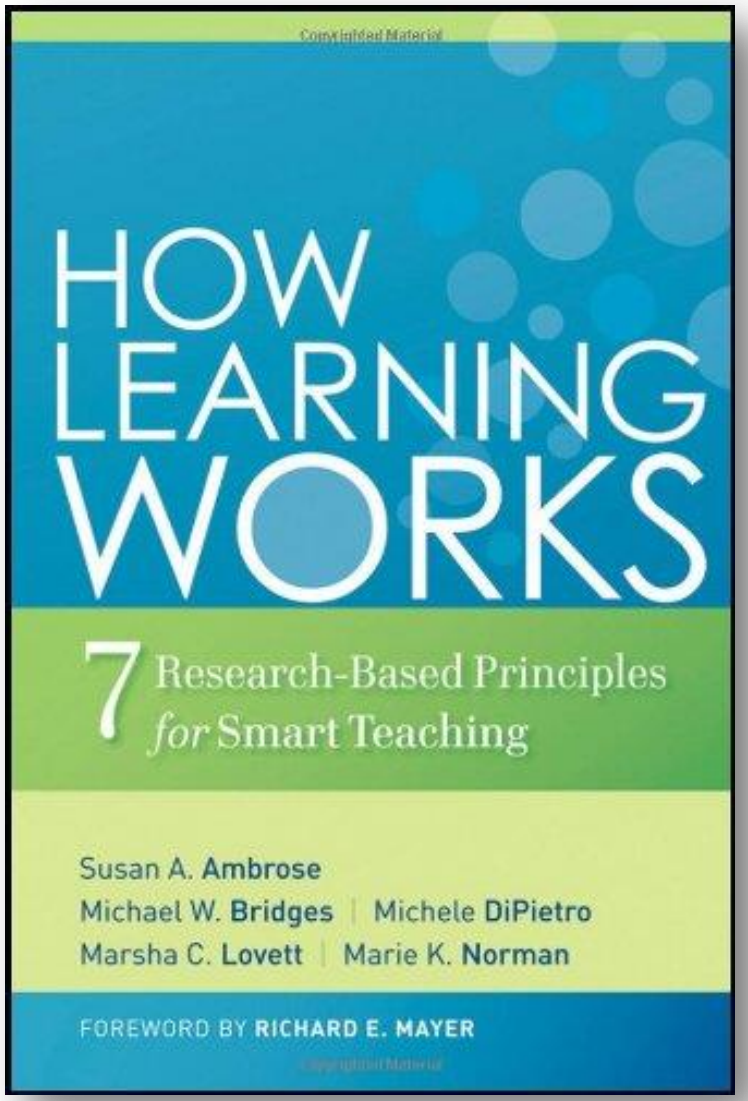
Learning Theory Micro-Lecture (10 minutes)

AHA! Summary (10 minutes)

# Learning Theory

**How Learning Works**

by Susan Ambrose



## **Session E:** Re-flect

EPICENTER
research summit
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Your Name: _____

# Learning Theory

Micro-Lecture

***How Learning Works***
**Susan Ambrose**

**UNDERSTANDING THE STUDENT –**
**BACKGROUND AND MOTIVATION**

- Students' **prior knowledge** can help or hinder learning
- How students **organize knowledge** influences how they learn and apply what they know
- Students' **motivation** determines, directs, and sustains what they do to learn
- Students' **current level of development** interacts with the social, emotional, and intellectual climate of the course to impact learning

**THE STUDENT INTERACTING WITH THE MATERIAL**

- To develop mastery, students must **acquire component skills**, practice integrating them, and know when to apply what they have learned
- **Goal-directed** practice coupled with **targeted feedback** enhances the quality of students' learning
- To become **self-directed learners**, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed

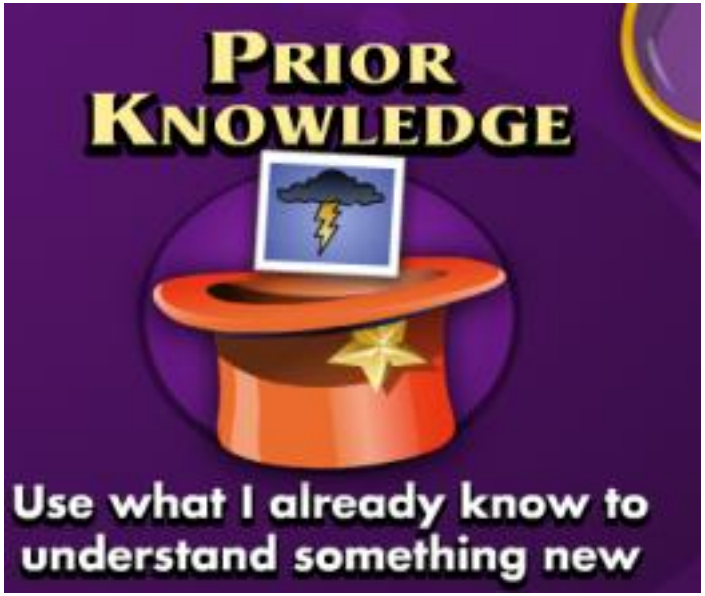
**Notes:**
Thoughts and Reflections
on Learning Theory

**Notes:**
Thoughts and Reflections
on the AHAs!

# How Learning Works:
## UNDERSTANDING THE STUDENT (Background & Motivation)

1. Students' **prior knowledge** can help or hinder learning

ME as teacher:
*How can I make transparent my students' understanding of the relationships between engineering and business?*




ME as researcher:
*How do engineering students conceive of business? Of entrepreneurship?*

# How Learning Works:
## UNDERSTANDING THE STUDENT (Background & Motivation)

1. Students' **prior knowledge** can help or hinder learning
2. How students **organize knowledg**e influences how they learn and apply what they know

ME as teacher:

*How can I help my students see opportunity recognition as connected to their knowledge of design?*

ME as researcher:

*How do engineering students conceptualize engineering in relationship to business? How do they develop identify around their various roles?*

# How Learning Works:
## UNDERSTANDING THE STUDENT (Background & Motivation)

1. Students' **prior knowledge** can help or hinder learning
2. How students **organize knowledg**e influences how they learn and apply what they know
3. Students' **motivation** determines, directs, and sustains what they do to learn
4. Students' **current level of development** interacts with the social, emotional, and intellectual climate of the course to impact learning

# How Learning Works:
## THE STUDENT INTERACTING WITH THE MATERIAL

1. Students' **prior knowledge** can help or hinder learning
2. How students **organize knowledge** influences how they learn and apply what they know
3. Students' **motivation** determines, directs, and sustains what they do to learn
4. Students' **current level of development** interacts with the social, emotional, and intellectual climate of the course to impact learning

5. To develop mastery, students must **acquire component skills**, practice integrating them, and know when to apply what they have learned
6. **Goal-directed practice** coupled **with targeted feedback** enhances the quality of students' learning
7. To become **self-directed learners**, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed

# How Learning Works:
## THE STUDENT INTERACTING WITH THE MATERIAL

5. To develop mastery, students must **acquire component skills**, practice integrating them, and know when to apply what they have learned


6. **Goal-directed practice** coupled **with targeted feedback** enhances the quality of students' learning

# How Learning Works:
## THE STUDENT INTERACTING WITH THE MATERIAL

7. To become **self-directed learners**, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed

# How Learning Works

**UNDERSTANDING THE STUDENT**--- BACKGROUND AND MOTIVATION

1. Students' **prior knowledge** can help or hinder learning
2. How students **organize knowledg**e influences how they learn and apply what they know
3. Students' **motivation** determines, directs, and sustains what they do to learn
4. Students' **current level of development** interacts with the social, emotional, and intellectual climate of the course to impact learning

THE STUDENT **INTERACTING WITH THE MATERIAL**

5. To develop mastery, students must **acquire component skills**, practice integrating them, and know when to apply what they have learned
6. **Goal-directed practice** coupled **with targeted feedback** enhances the quality of students' learning
7. To become **self-directed learners**, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed

# How Learning Works

**UNDERSTANDING THE STUDENT**--- BACKGROUND AND MOTIVATION

1. Students' **prior knowledge** can help or hinder learning
2. How students **organize knowledge** influences how they learn and apply what they know
3. Students' **motivation** determines, directs, and sustains what they do to learn
4. Students' **current level of development** interacts with the social, emotional, and intellectual climate of the course to impact learning

THE STUDENT **INTERACTING WITH THE MATERIAL**

5. To develop mastery, students must **acquire component skills**, practice integrating many skills, and know when to apply learned
6. **Goal-directed practice** coupled **with targeted feedback** enhances the quality of students' learning
7. To become **self-directed learners**, students must learn to assess the demands of the task, evaluate their own knowledge and skills, plan their approach, monitor their progress, and adjust their strategies as needed

How do these principles suggest:

1) Good practices for entrepreneurship education?

2) Things we don't understand about how entrepreneurship and engineering education connect?

# AHA Summary

# Re-search

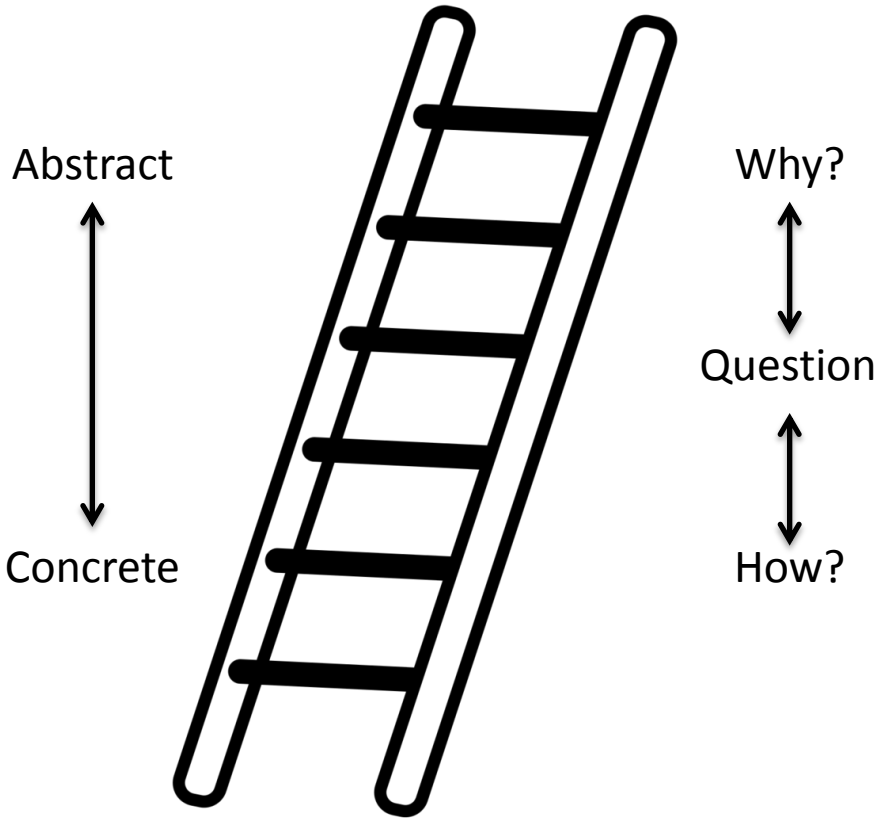
Identify a research question that is important to you (10 minutes)

Table discussion with stars (10 minutes)

Group discussion (20 minutes)

# Ladder of Abstraction

**S. I Hayakawa**
Language in Thought and Action (1949)



## **Session E:** Re-search

Ladder of Abstraction
S.I. Hayakawa

EPICENTER research summit
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Your Name: _____

**Why?** So that we might …

… *and why is that important?*

**Why?** In order to …

… *and why is that i…*

**What is your research question?**

★

… *and how would I do that?*

**How?** By …

… *and how would I do that?*

**How?** Or by …

**Three Word Title:**

**What is your research question?**

●

**Why is this an important question?**

**…oes it connect to goals, motivation and/or …back?**

**…tners do you need in this research?**

**How would you categorize your research question? Choose only ONE answer:**

◎ **Students** ◎ **Programs** ◎ **Curriculum**

**Process:**

- On your own, think of a research question that you would like to answer from this Summit. Write it in the center box on the left. Move up the ladder with *"and why is that important"* and down the ladder with *"and how would I do that?"*
- Review your thoughts, then re-write your research question. Answer a few prompts about this question. (10)

## **Session E:** Re-search

Ladder of Abstraction
S.I. Hayakawa

EPICENTER research summit
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

Your Name: _____

**Why?** So that we might …

… *and why is that important?*

**Why?** In order to …

… *and why is that important?*

**What is your research question?** ★

… *and how would I do that?*

**How?** By …

… *and how would I do that?*

**How?** Or by …

2

2

1

**Three Word Title:**

**What is your research question?** ●

3

**Why is this an important question?**

**How does it connect to goals, motivation and/or feedback?**

4

**What partners do you need in this research?**

**How would you categorize your research question? Choose only ONE answer:**

◎ Students ◎ Programs ◎ Curriculum

**Process:**

- On your own, think of a research question that you would like to answer from this Summit. Write it in the center box on the left. Move up the ladder with *"and why is that important"* and down the ladder with *"and how would I do that?"*
- Review your thoughts, then re-write your research question. Answer a few prompts about this question. (10)

## Session E: Re-search

Your Name: Mark Schar

**Ladder of Abstraction**
S.I. Hayakawa

EPICENTER
**research summit**
AUGUST 4-5, 2014 • STANFORD UNIVERSITY

**Why?** So that we might …
Have more female engineers in the workplace

*… and why is that important?*

**Why?** In order to …
Increase participation in engineering programs by women

*… and why is that important?*

**What is your research question?**
★ Does case study curriculum increase interest in engineering by women?

*… and how would I do that?*

**How?** By …
Develop curriculum that shows engineering work within the social world

*… and how would I do that?*

**How?** Or by …
Testing with both current and potential female engineering students

**Three Word Title:**
Empathetic Non-Engineering

**What is your research question?**
● Can case study curriculum increase interest in women who are not in engineering programs?

**Why is this an important question?**
Female participating in engineering lags all sciences. We can't win with men alone.

**How does it connect to goals, motivation and/or feedback?**
Motivation = see the benefit

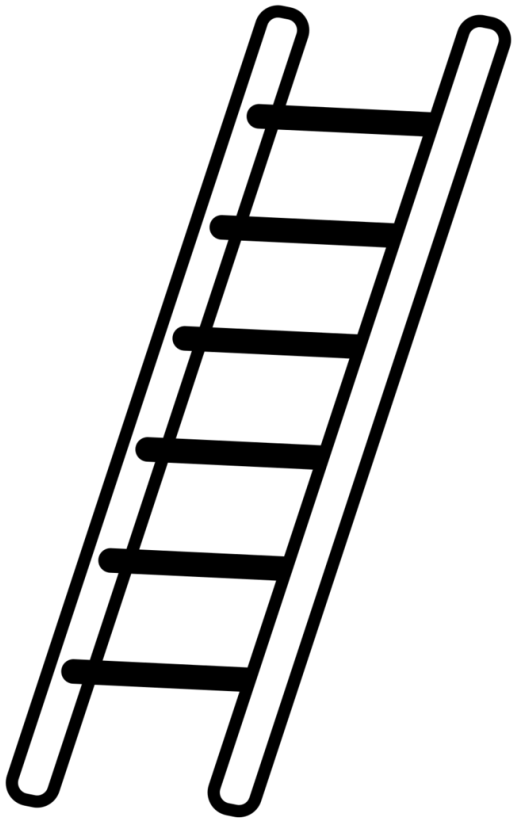
**What partners do you need in this research?**
ASEE communities, workplace resources

**How would you categorize your research question? Choose only ONE answer:**

◎ Students ◎ Programs ◉ Curriculum ✔☐

**Process:**
- On your own, think of a research question that you would like to answer from this Summit. Write it in the center box on the left. Move up the ladder with *"and why is that important"* and down the ladder with *"and how would I do that?"*
- Review your thoughts, then re-write your research question. Answer a few prompts about this question. (10)

# Re-search

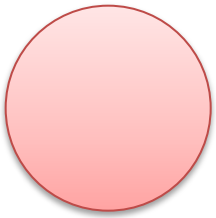


# Session E - Conclusion

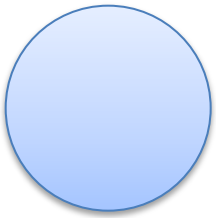
Collect your worksheets

Hand to Summit Associate
(Copied and returned to you later)

Sticker your nametag



Students



Programs

Curriculum

EPICENTER

# research summit

AUGUST 4-5, 2014 • STANFORD UNIVERSITY

# Thank you!

#EpicenterResearch
@EpicenterUSA

facebook.com/EpicenterUSA

bit.ly/epi-email

epicenter.stanford.edu epicenter@stanford.edu

epicenter
National Center for
Engineering Pathways to Innovation

NSF

Stanford
University

NCIIA