



2018 Annual INCOSE  
**Great Lakes Regional Conference**  
**SYSTEMS AT THE CROSSROADS**  
17 - 20 October 2018 | Indianapolis, Indiana

**Systems Engineering and Community Engagement:**

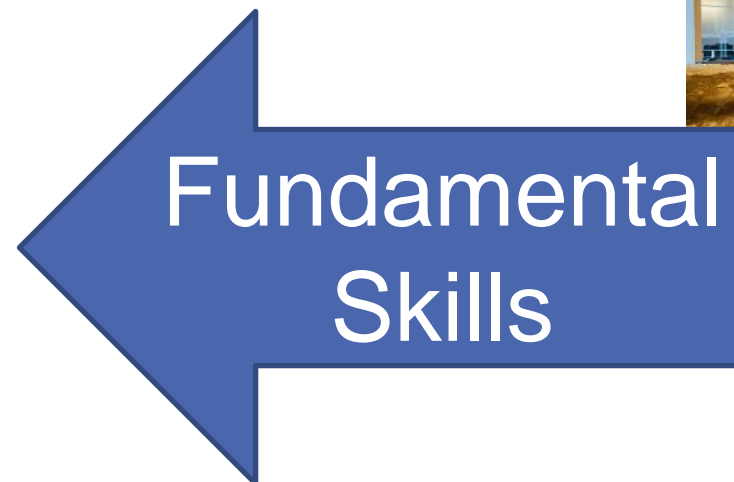
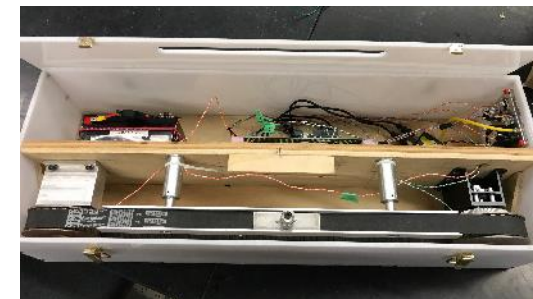
# **EPICS and INCOSE**

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# Background

- Andrew's Background
  - EPICS student
  - BME graduate
    - BS and MS
  - Biomet Engineer

- Returned to EPICS in ...



# Connecting together = IMPACT



# Motivation: Education & Society

- Education
  - Prepare future leaders in the global economy with quality ***experiences***
  - Sustain projects in an affordable and sustainable manner
  - Connect societal needs with engineering
- Society
  - Opportunities for impact with REAL projects that can be used by real people
  - Long-term partnerships to address needs of the underserved



# EPICS®

## Purdue University

- Headquarters
- Academic Program
- Multidisciplinary, Engineering-Centered Design Course
- Community-based
- Local and Global
- 1200+ students
- 45+ majors
- 150+ projects

22  
Years



NAE Gordon  
Prize

## University

### EPICS University Consortium

- 53 Universities
- U.S., Canada
- Colombia,
- Ireland,



Signature Program

## EPICS K-12

### EPICS K12



IEEE-EPICS  
+ projects  
Latin America  
Europe





## Multi-Disciplinary, Community-Based Design



**650+ students per semester**

**45+ majors**

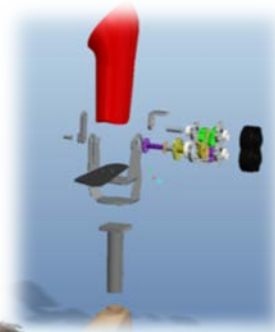
**1<sup>st</sup> Year – 4<sup>th</sup> Year Students**

**~150 Active Community Projects**

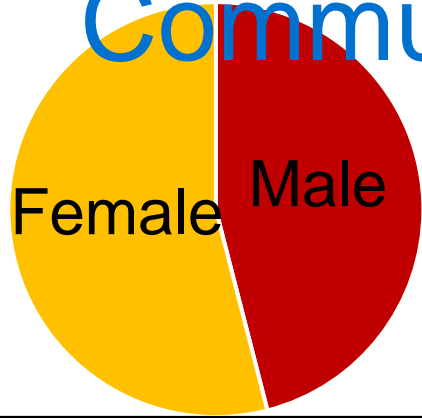
**400+ deployed**

**200+ alumni**

**2 years**



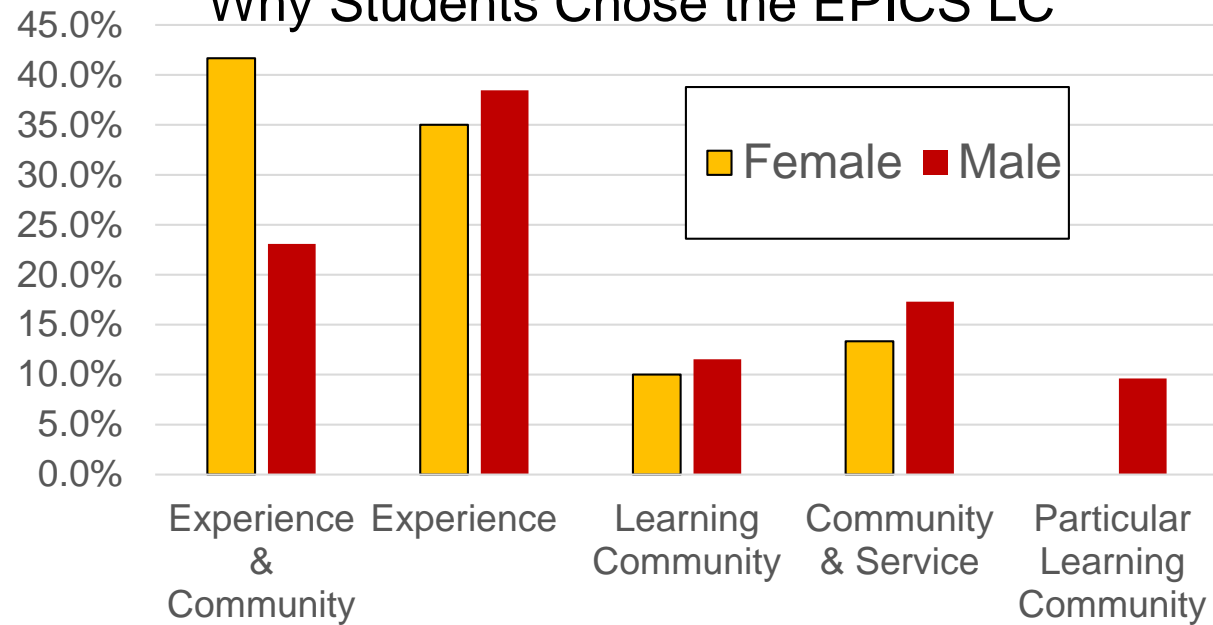
# EPICS 1<sup>st</sup> Year Learning Community



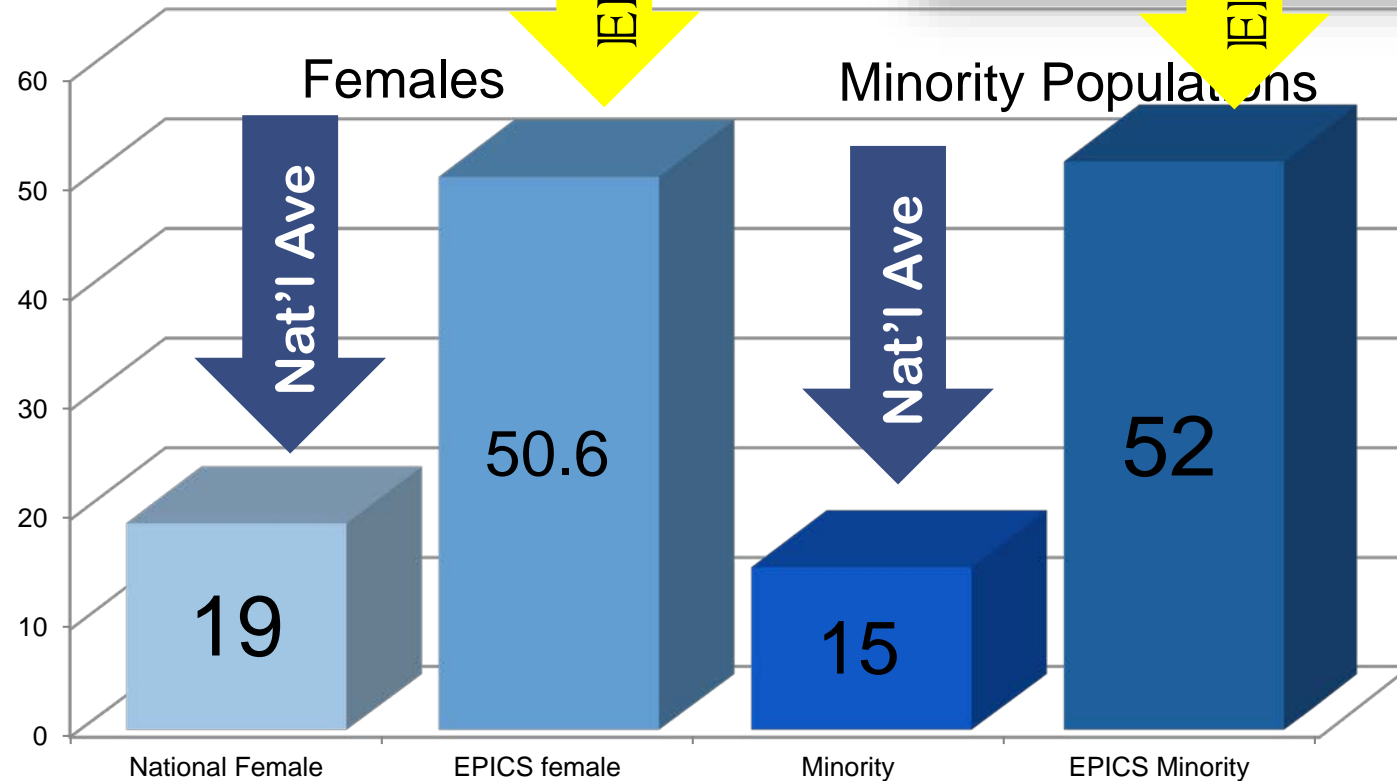
2014: 54% Female

2015: 46% Female

## Why Students Chose the EPICS LC



# High School EPICS<sup>®</sup> Demographics





# EPICS Projects



**Access & Abilities**



**Education & Outreach**



**Human Services**



**Environment**

# Projects: Access & Abilities

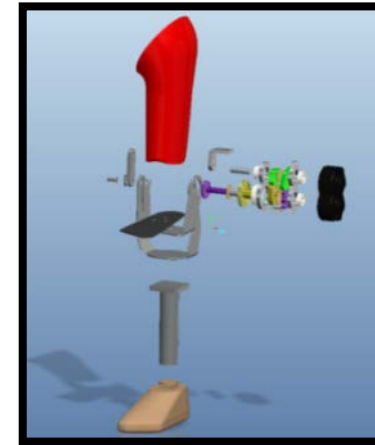
- Communication devices
  - Tablets, mobile devices
- Braille eReader
  - Multi-line



## ❑ Custom Prosthetics



- Camp for Children w Disabilities



# Projects: Education

- Educational Designs
  - Schools
  - Museums
  - Libraries
  - Community Centers
  - Zoos

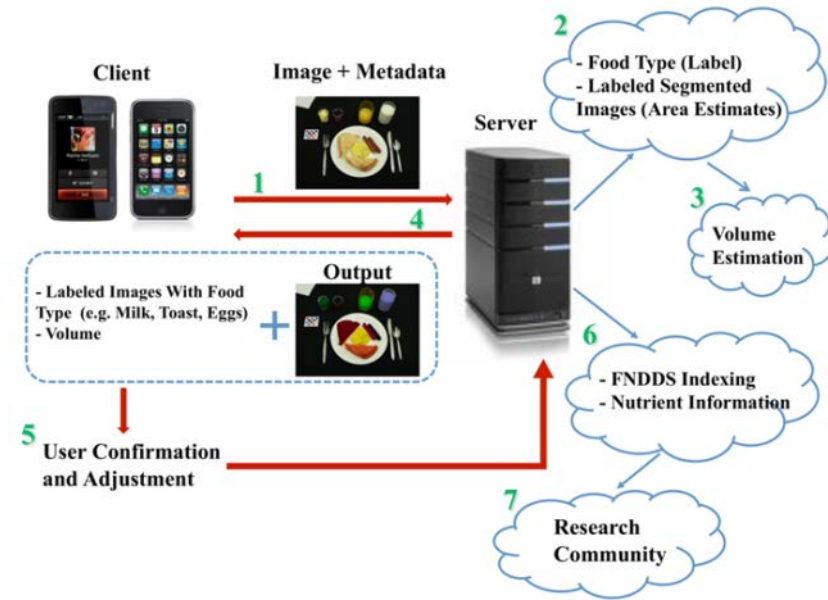


- Video I  
system for rural  
school



# Projects: Human Services

- TADA Project -  
Android App to track  
food intake
- Software solutions for  
non-profits or NGO
  - ❑ Scheduling and data  
management
  - ❑ Volunteer Management systems



- Disaster resistant  
homes
- Feeding urban  
children
- Improving grain  
storage

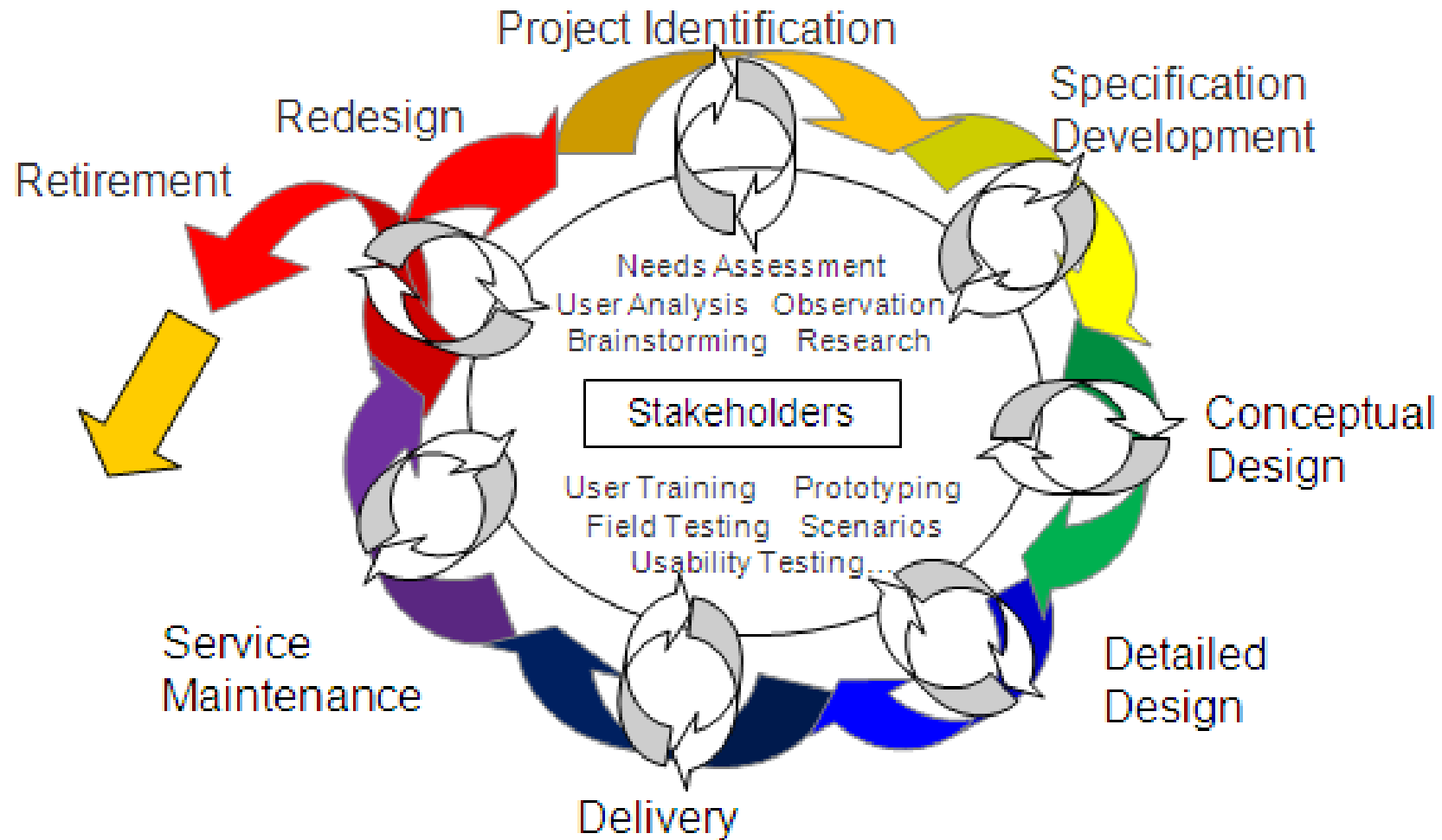
# Projects: Environment



- Campus sustainability
- Water and Waste Treatment
- Alternative Power Systems
  - Solar power for rural Colombian schools
  - Accessible Solar Cart to transport Children
- Habitat for Humanity
  - Sustainable designs
  - Training of staff
- Sustainable communities
  - Hydroponics



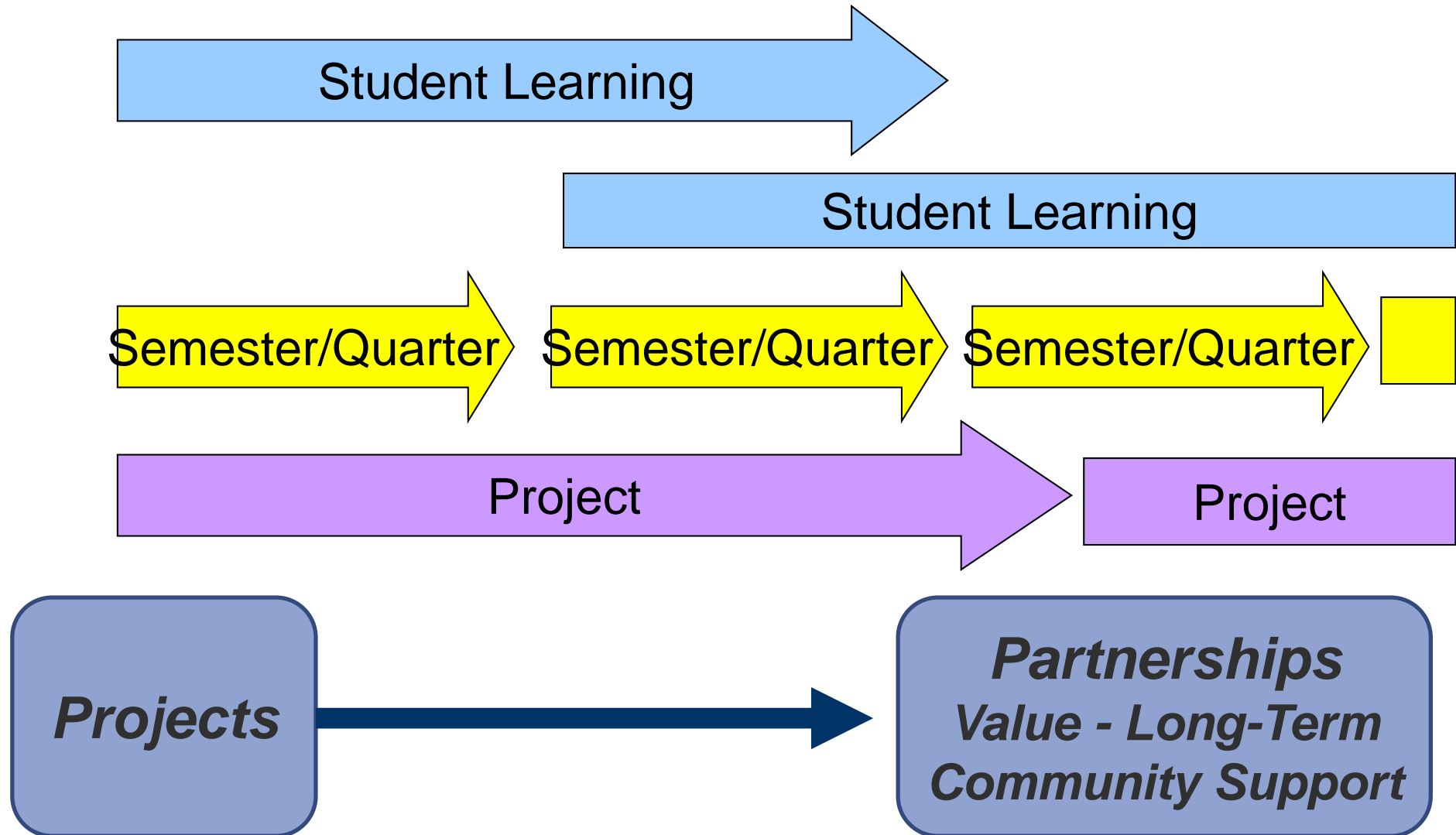
# *Human-Centered Design*



- Interactions with Community
- Communications at all stages

Also draw from:  
IDEO, Stanford's  
d.school

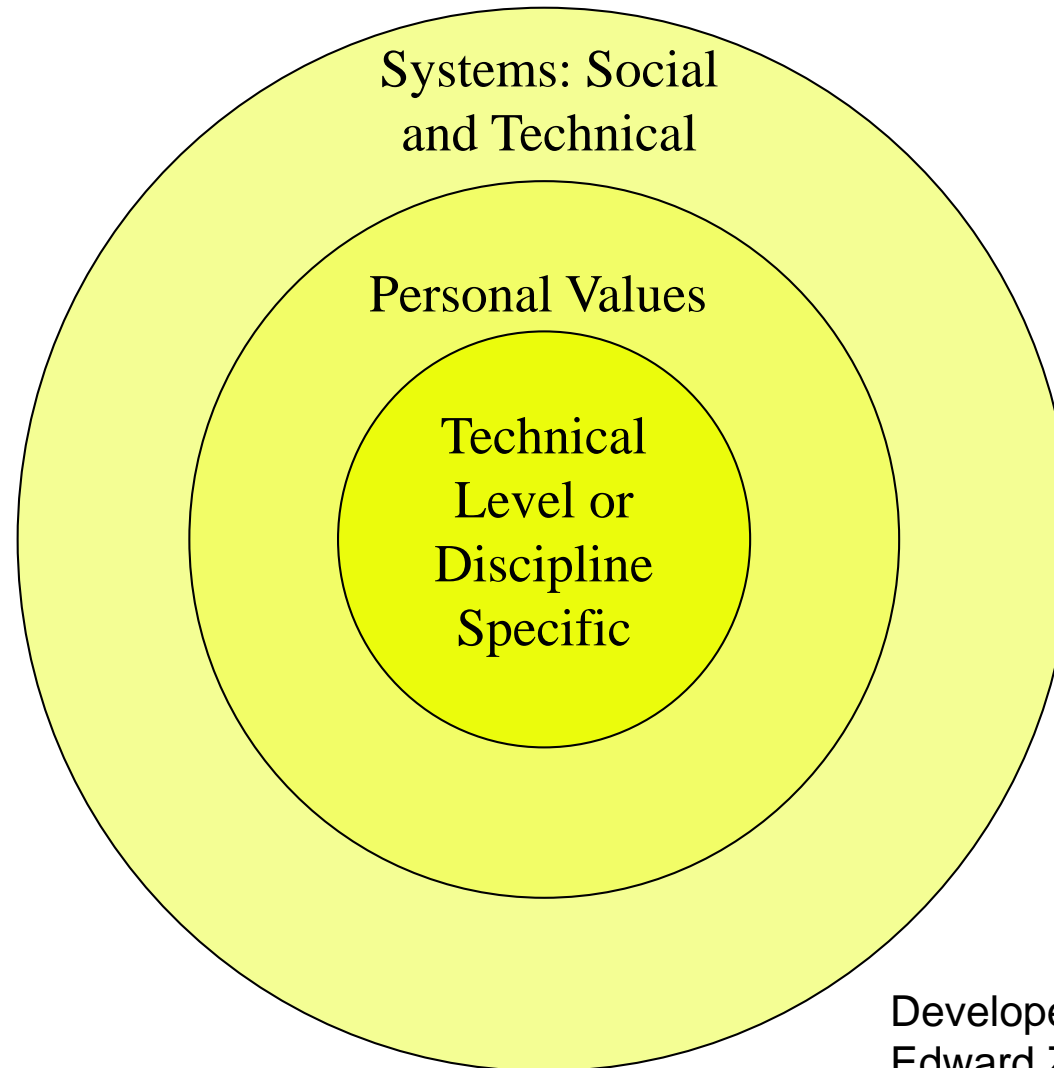
# EPICS Decouples Timescales



# Reflection

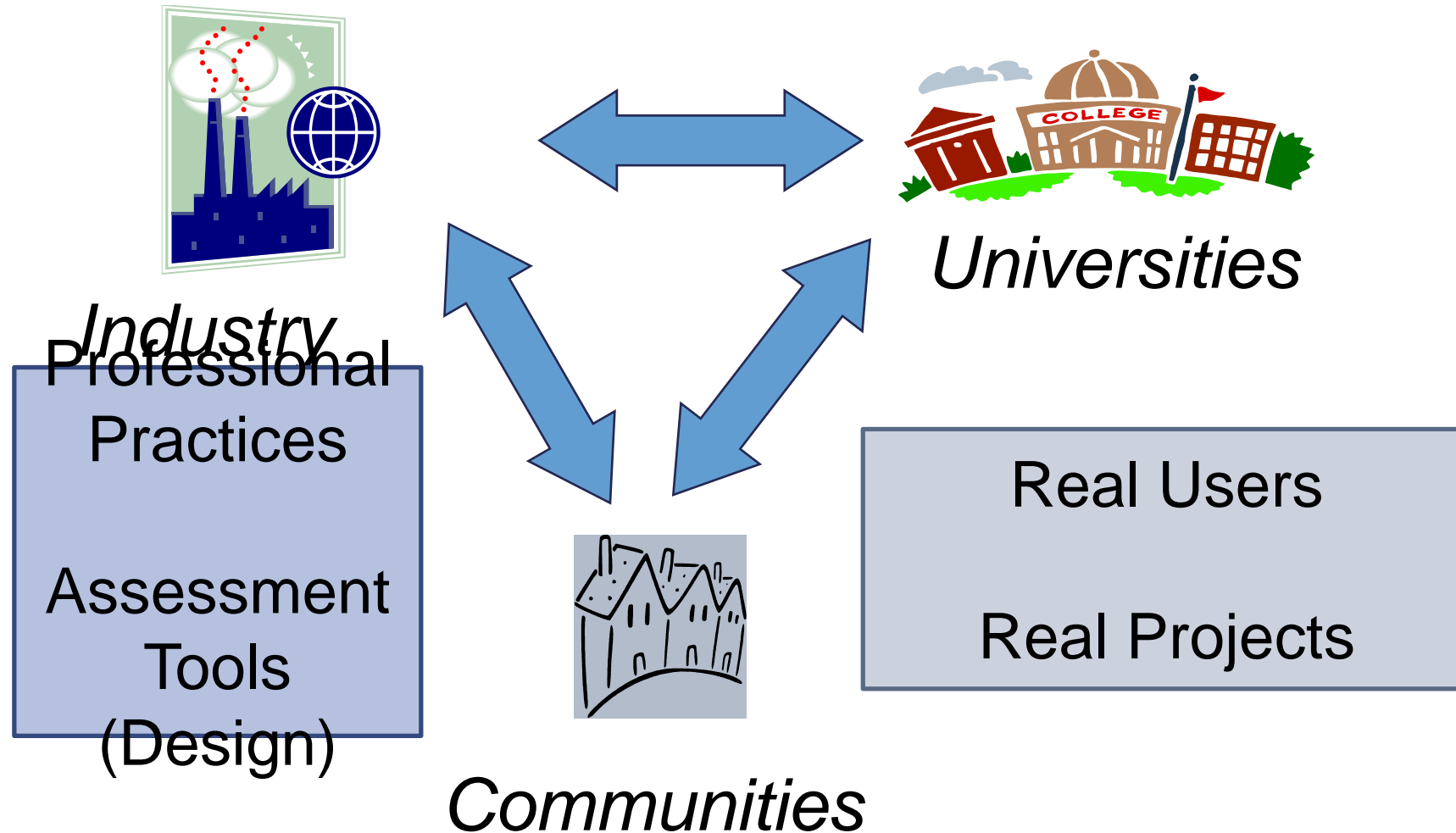
- Connect service to academic learning
  - Metacognitive activity
  - Students compartmentalize experiences and learning
- Address student reaction and/or experience from service
  - Were stereotypes challenged or reinforced?
  - Was there unintended learning?
- Draw out learning
  - Students may miss learning opportunities if not pointed out
  - How is the service connected to Systems?

# Reflection Model



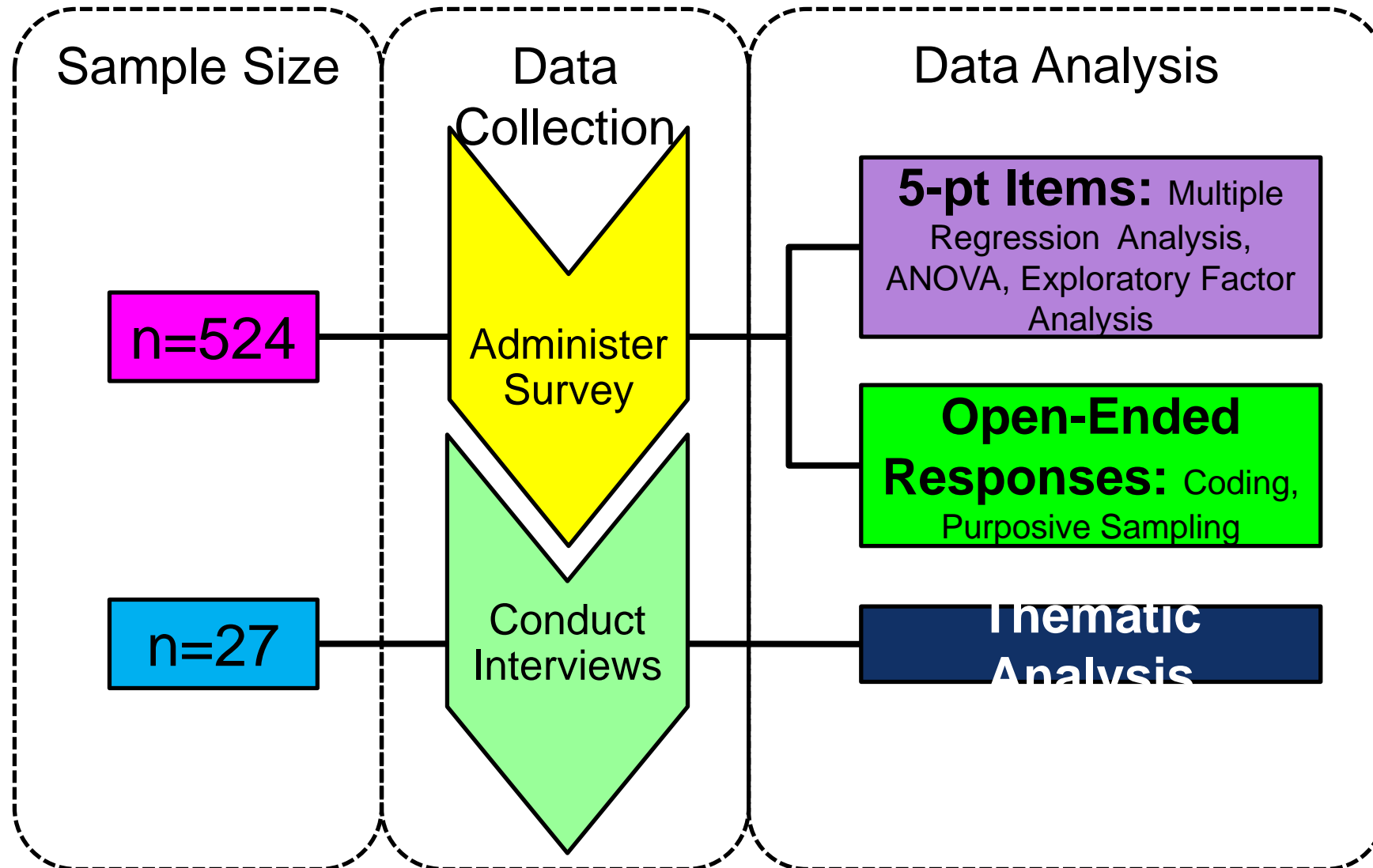
Developed by  
Edward Zlotkowski

# Partnerships and Opportunities

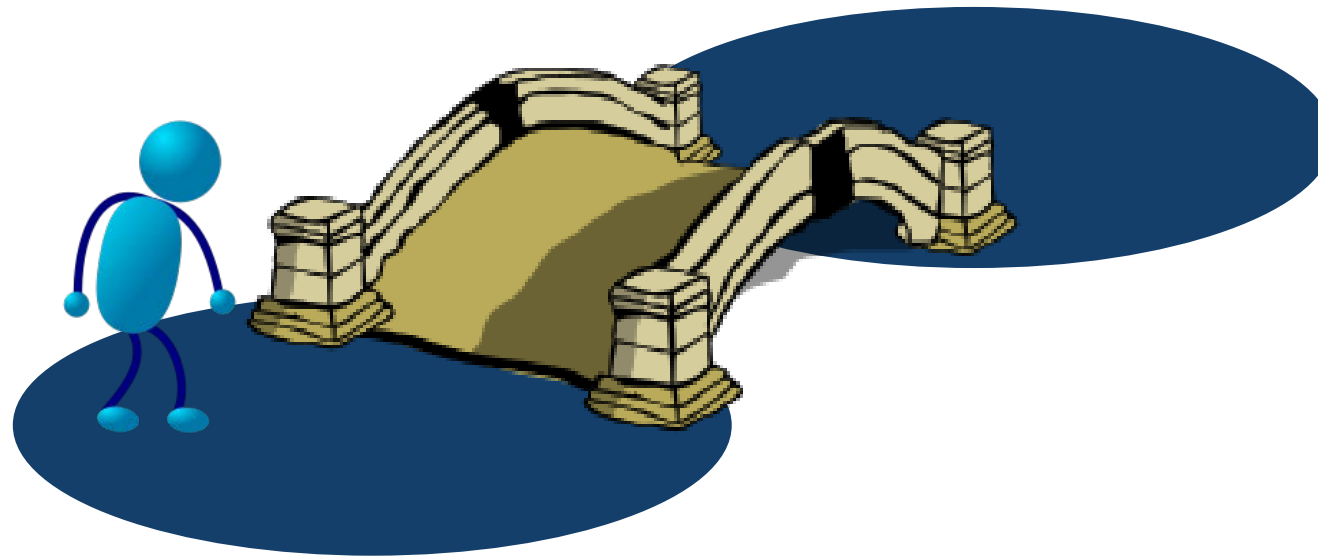




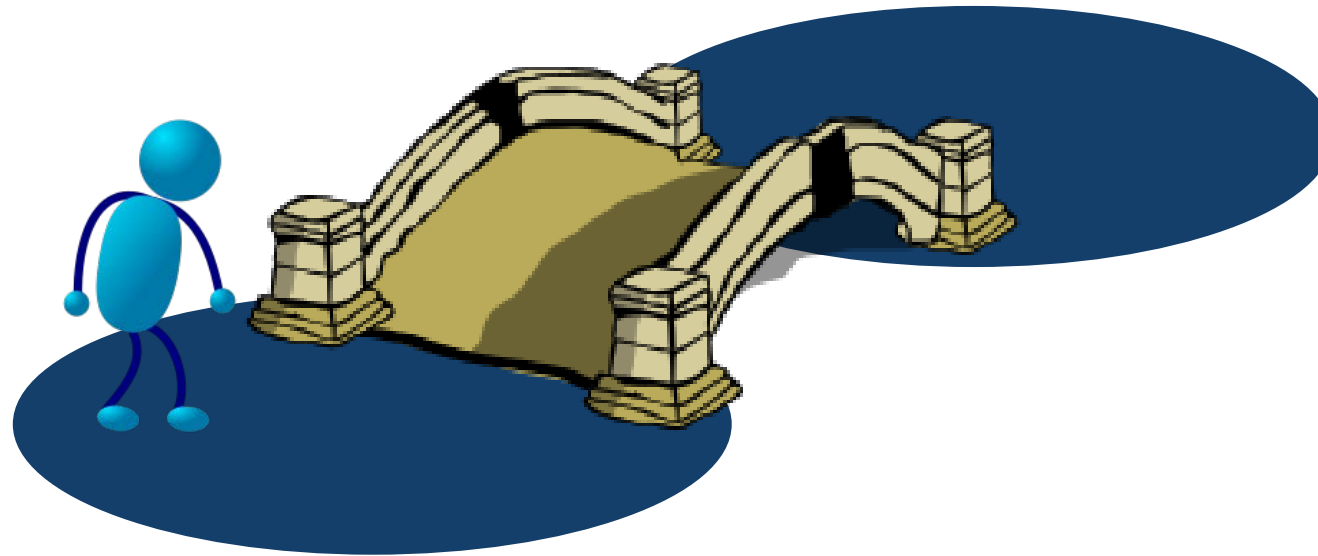
# Impact on Alumni in Industry



# Connection

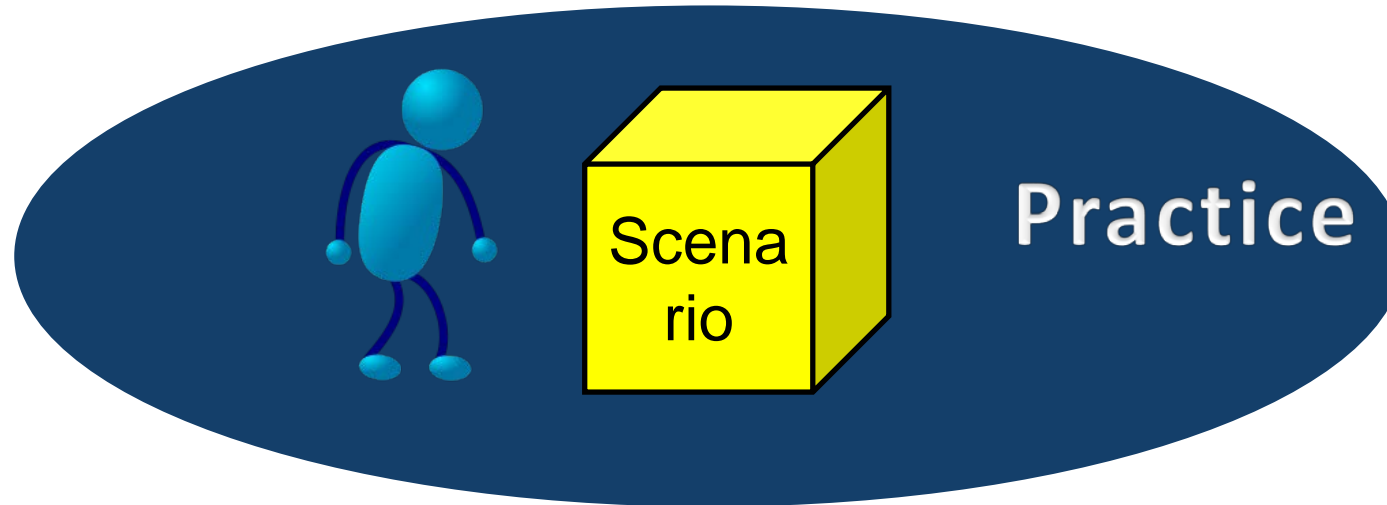


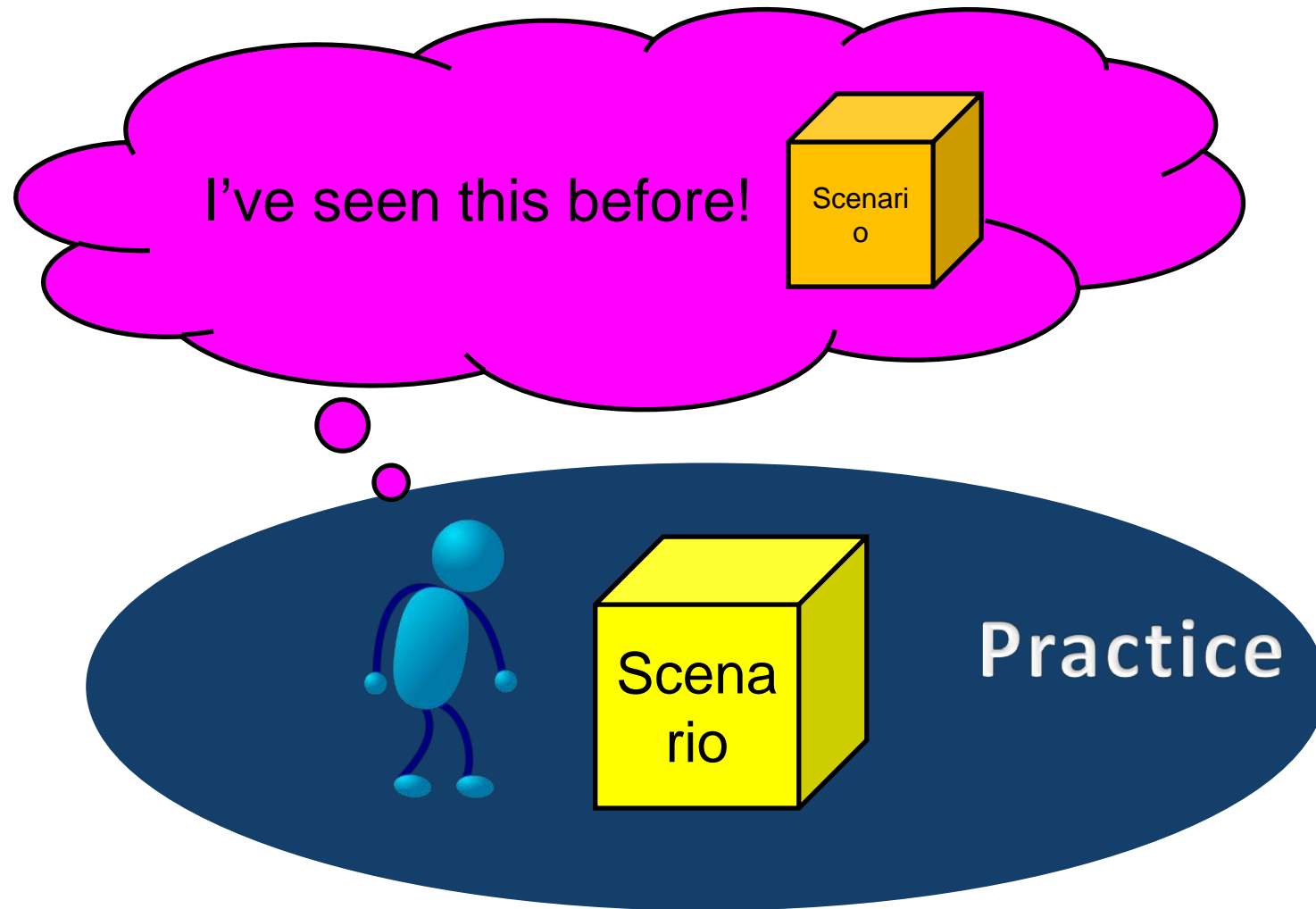
EPICS / PURDUE



EPICS / PURDUE

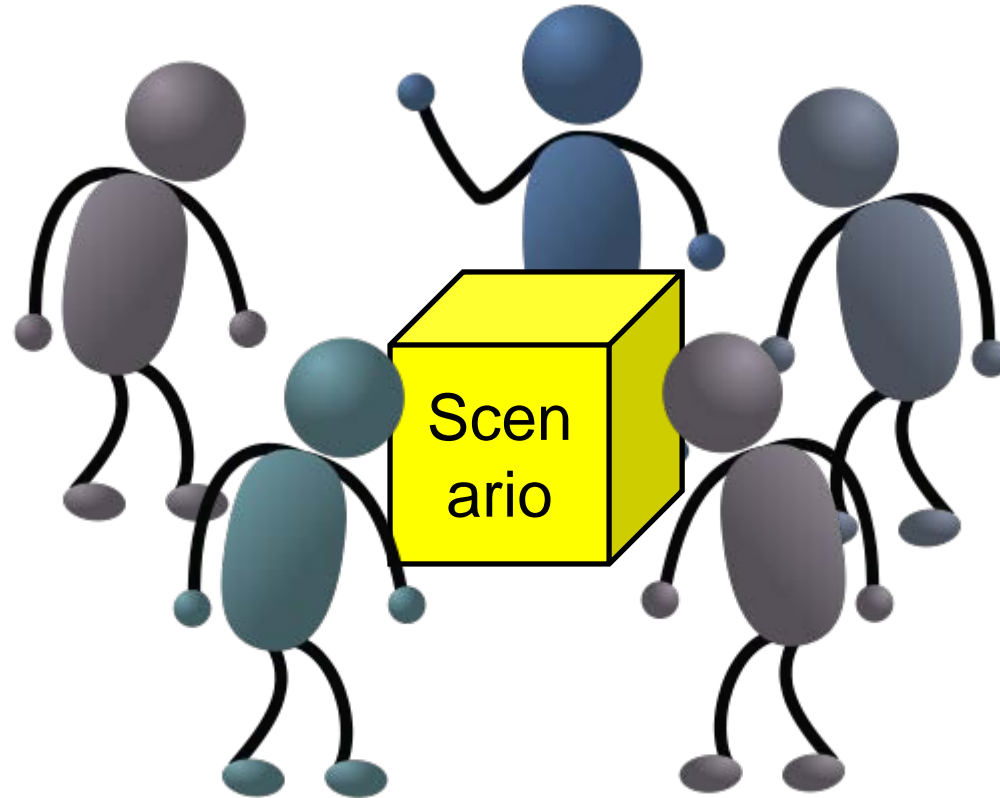
# Experience



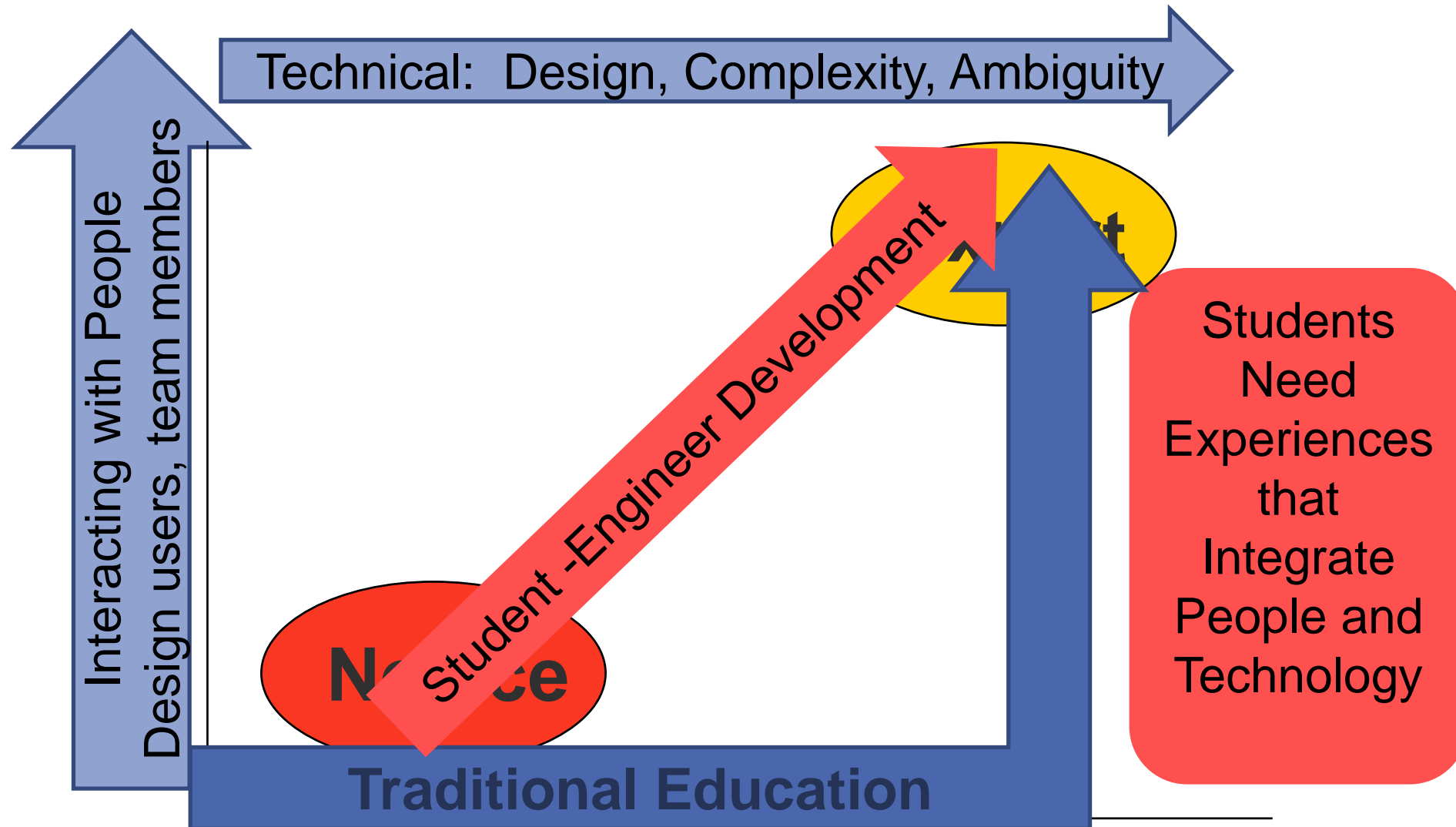




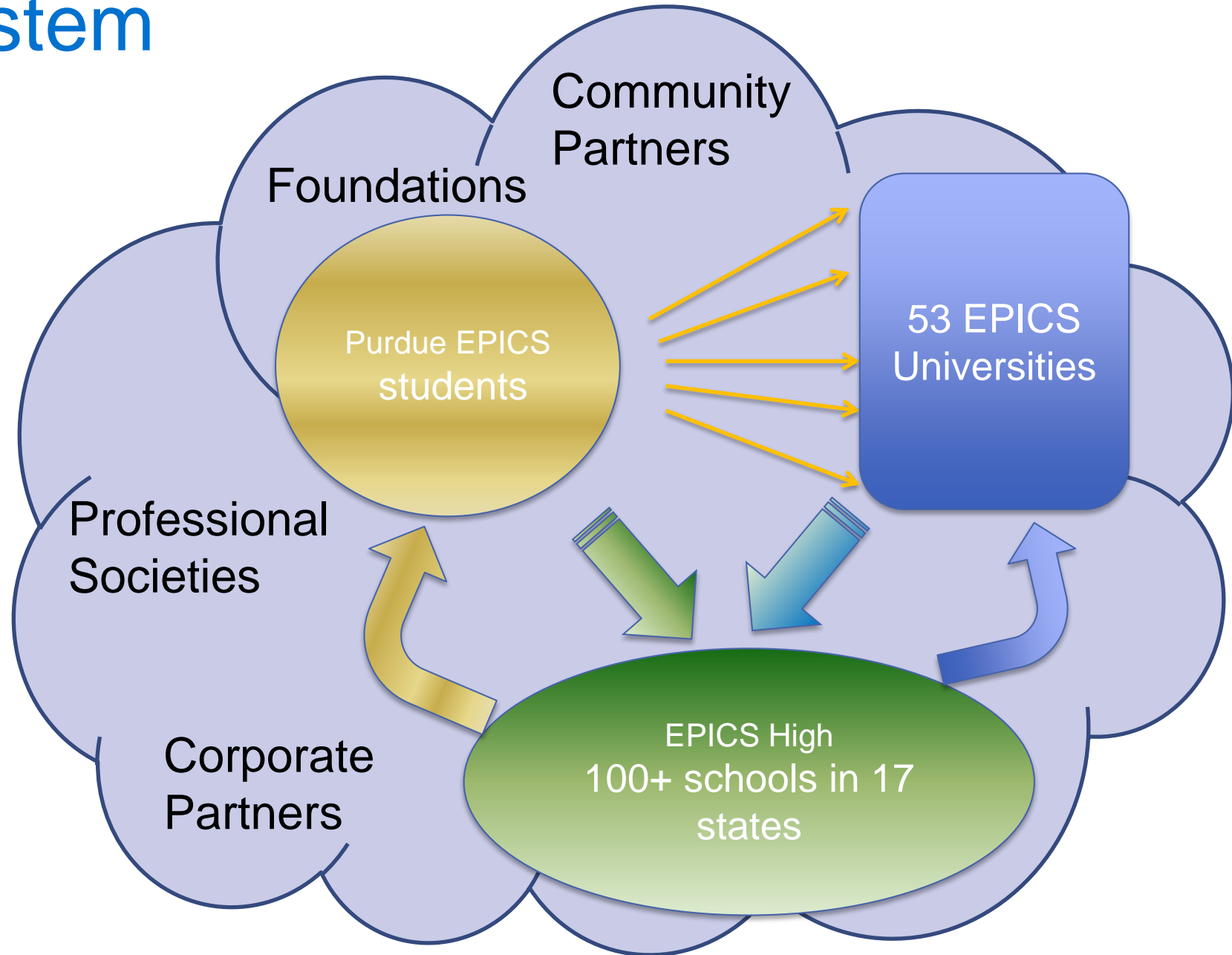
# Working with Others



# Research Results: People and Technical are Related



# EPICS is a Community and System



# Collaborative Opportunities

- Purdue University
  - Design Reviews (in-person or remotely)
    - Oct 2-5
    - Dec 4-7
  - PDH's on systems thinking

Other universities

Butler

Notre Dame

# Collaborative Opportunities

- Pre-University
- Free EPICS design curriculum
  - Opportunity to draw more students into Engineering
  - Address diversity (e.g. gender balance)
- Systems learning modules

## Collaboration Opportunities

- Engage volunteers as mentors for EPICS schools
  - Start new schools
  - Mentor existing schools
- EPICS Curriculum additions
  - Systems approaches to community design



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Questions?