Notices

- This session is being recorded
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Peace Engineering
A Definition

Peace Engineering is the intentional application of S&T principles for trans-disciplinary systemic-level thinking to build and support conditions for peace.

We work directly towards a world where prosperity, sustainability, social equity, entrepreneurship, transparency, community voice and engagement, ethics and a culture of quality thrive.

Community-Engaged Learning: Integrating Peace Engineering into the Engineering Undergraduate Curriculum

February 18, 2021

Speaker

Prof. William Oakes, P.E

150th Anniversary Professor
Director, EPICS Program
Professor of Engineering Education
GEDC 2020 Diversity Award Recipient

Moderator: Ramiro Jordan

- *University of New Mexico, Past President of IFEES*

Prof. William Oakes, P.E

150th Anniversary Professor
Director, EPICS Program
Professor of Engineering Education
GEDC 2020 Diversity Award Recipient

William (Bill) Oakes is a 150th Anniversary Professor, Director of the EPICS Program, Professor of Engineering Education at Purdue University, and a registered professional engineer. He is one of the founding faculty in the School of Engineering Education having courtesy appointments in Mechanical, Environmental and Ecological Engineering and Curriculum and Instruction. He was the first engineer to receive the U.S. Campus Compact Thomas Ehrlich Faculty Award for Service-Learning. He was a co-recipient of the U.S. National Academy of Engineering's Bernard Gordon Prize for Innovation in Engineering and Technology Education. He is a fellow of the American Society for Engineering Education and the National Society of Professional Engineers.

Community-Engaged Learning: Integrating Peace Engineering Into the Engineering Undergraduate Curriculum

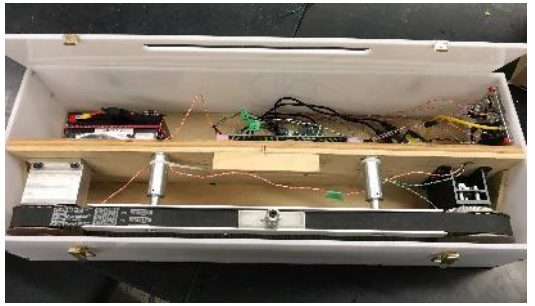
Prof. William (Bill) Oakes, P.E.
Professor, Engineering Education
Director, EPICS Program
Purdue University

Background

- Design Engineer with GE Aviation
  - Better way to prepare students for industry
  - Industry projects
    - Lots of jet engines…

Fundamental Skills

- Assigned to EPICS in 1998…

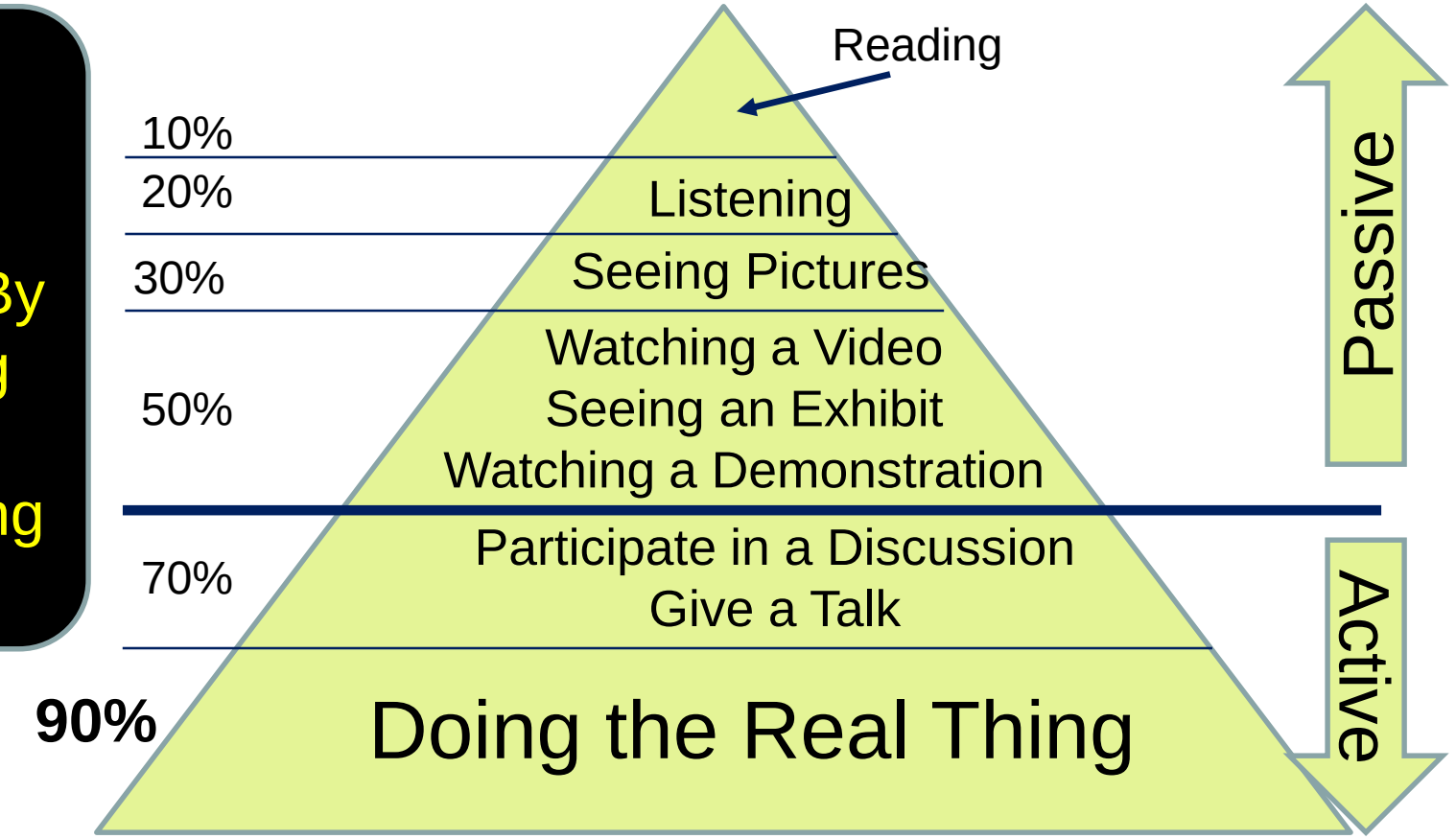


Motivation: Education & Society

- Education
  - Prepare future leaders in the global economy with quality ***experiences***
  - Sustain projects affordably
  - Connect societal needs with engineering >> **Diversity**
- Society
  - Opportunities for impact with REAL projects that are used by real people
  - **Long-term partnerships** to address needs of the underserved

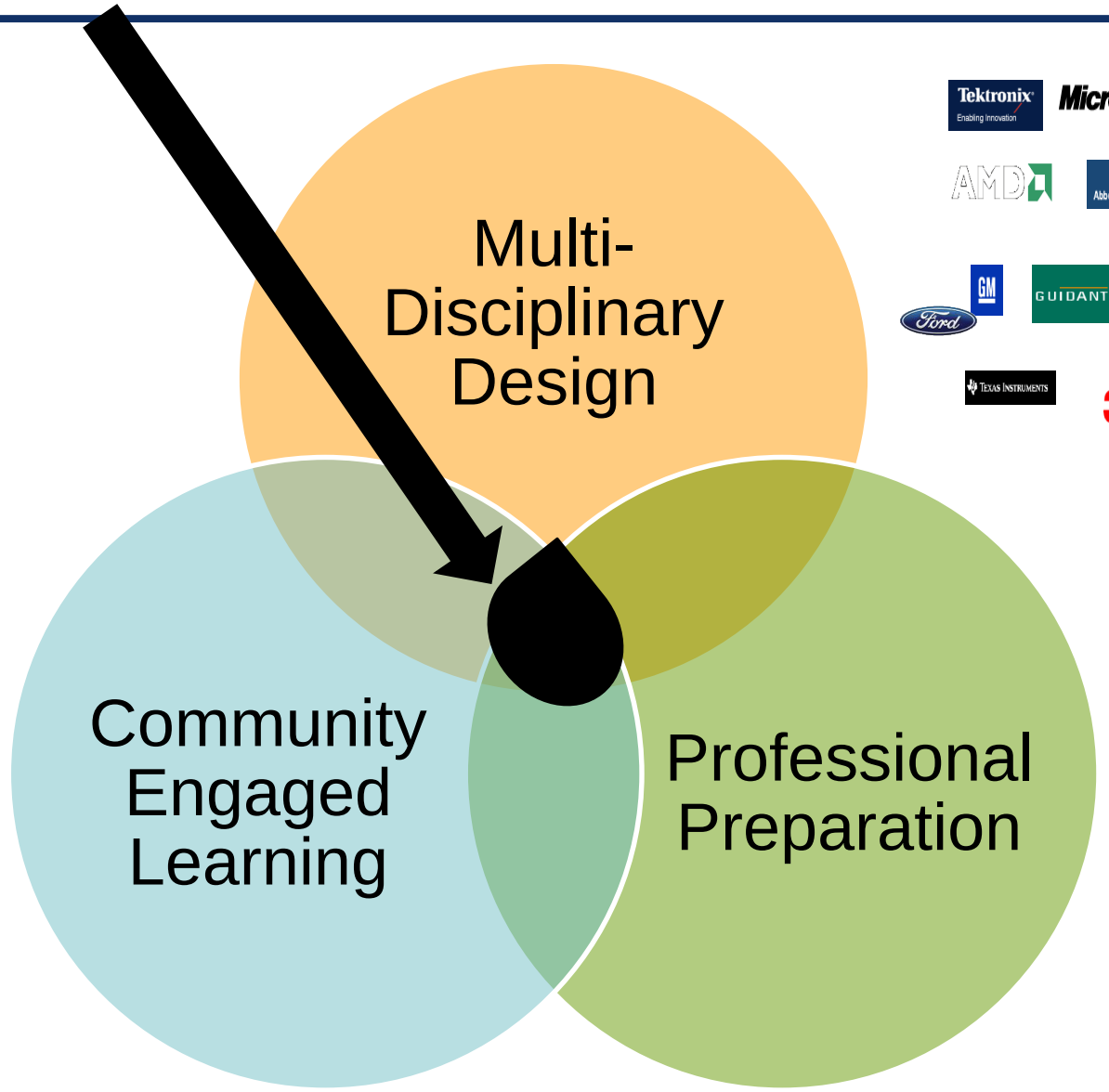
Recall after 2 weeks

Increase Student Learning By Engaging Them in Engineering



Adapted from *Edgar Dale Audio-Visual Methods in Teaching*, Holt, Rinehart and Winston

EPICS®



Tektronix Enabling Innovation · Microsoft · hp invent · Rolls-Royce · National Instruments · Cypress Perform
AMD · Abbott Laboratories · BAE Systems · Boeing · Caterpillar · DuPont
Ford · GM · Guidant · Honeywell · Intel · Lilly · Motorola · NASA · PPG
Texas Instruments · 3M · United Technologies · Vectren · Xilinx

EPICS®

EPICS®

Purdue University	University	Pre-University
• Headquarters • Academic Program • Multidisciplinary, Engineering-Centered Design Course • Community-based • Local and Global • 1100+ students • 45+ majors • 150+ projects 25 Years	EPICS University Consortium • 50+ Universities • U.S., Canada • Colombia, • Ireland, • Korea, • India	EPICS K12 • 100+ Schools • 17 U.S. States  IEEE-EPICS • 50+ projects • Latin America • Europe • Africa • Asia

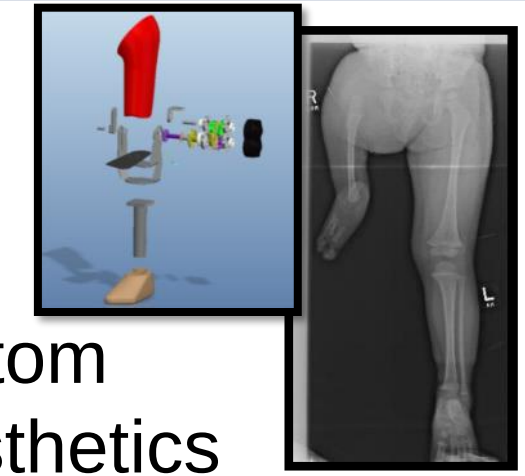
U.S. NAE Gordon Prize

IEEE Advancing Technology for Humanity

Signature Program

Projects: Access & Abilities

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



- Custom Prosthetics
  - Health Care Systems
- Employment for Adults

- Camp for Children with Disabilities

Projects: Education

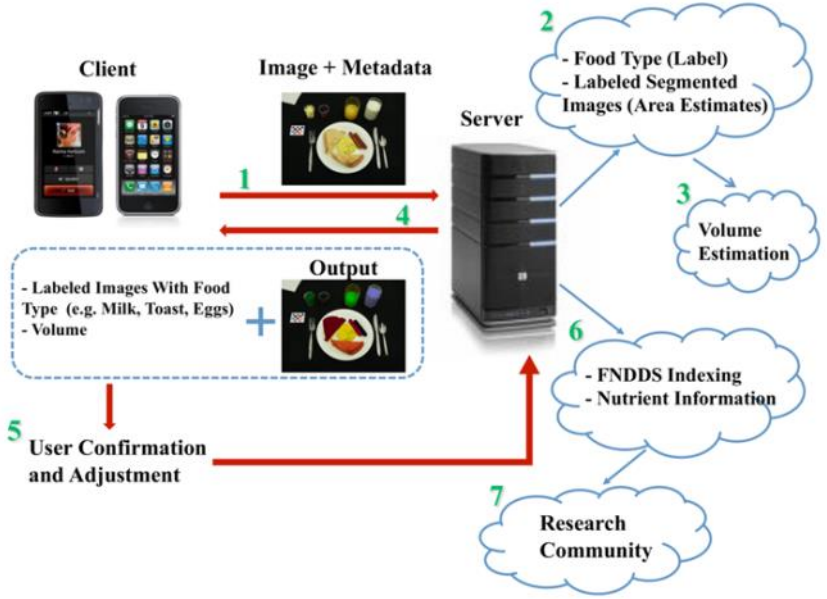
- Educational Designs
  - Schools
  - Museums
  - Libraries
  - Zoos

- Video learning systems

- Mobile Science Labs

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



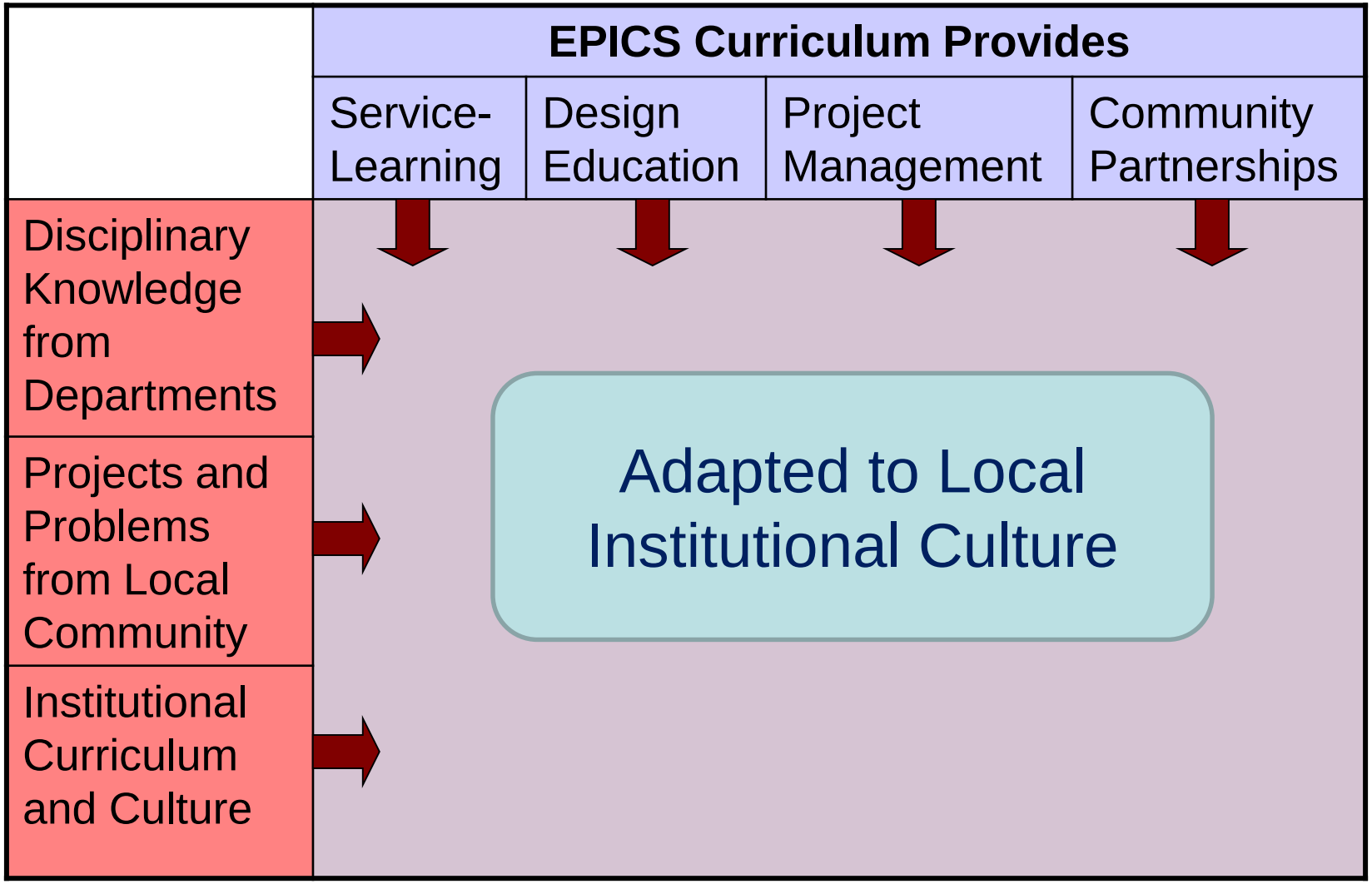
- Disaster resistant homes
- Feeding urban children
- Improving grain storage

Projects: Environment

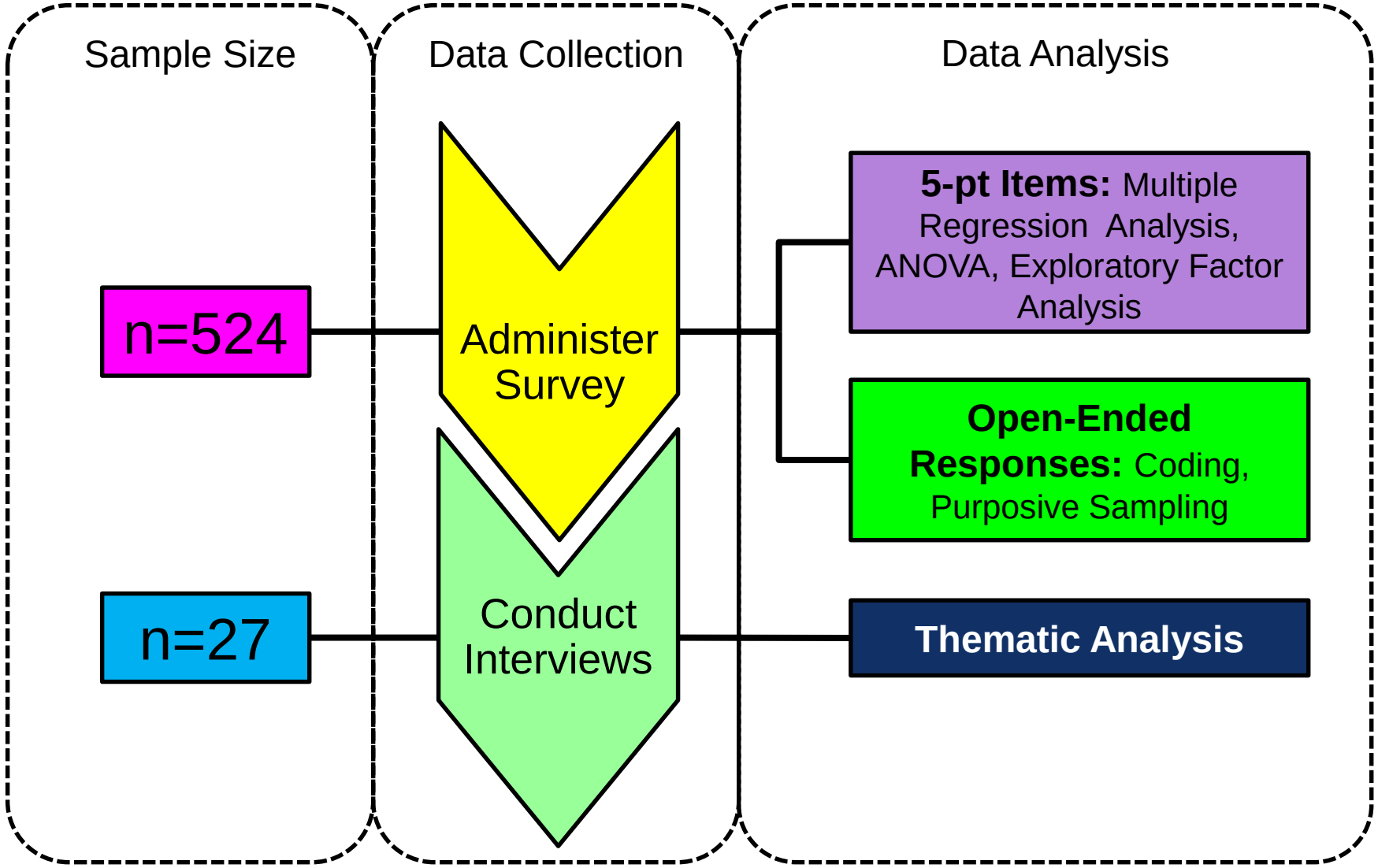
- Campus sustainability
- Sustainable communities
- Water and Waste Treatment
- Alternative Power Systems
- Habitat for Humanity
  - Sustainable designs poverty housing
  - Training of staff
- EWB-USA Projects
  - Credit for EWB-USA work

ENGINEERS WITHOUT BORDERS USA

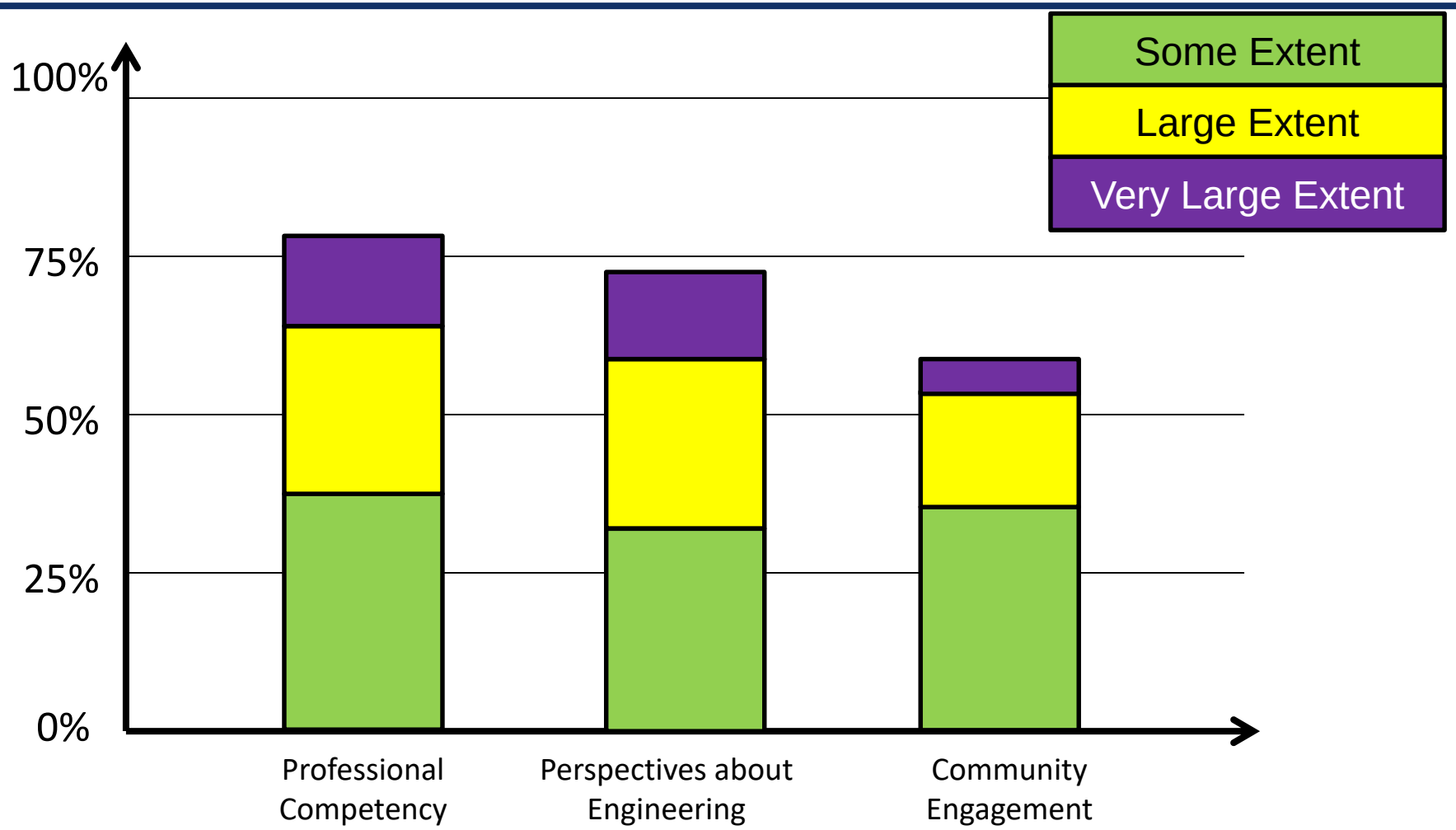
EPICS Programs



Impact on Alumni in Industry

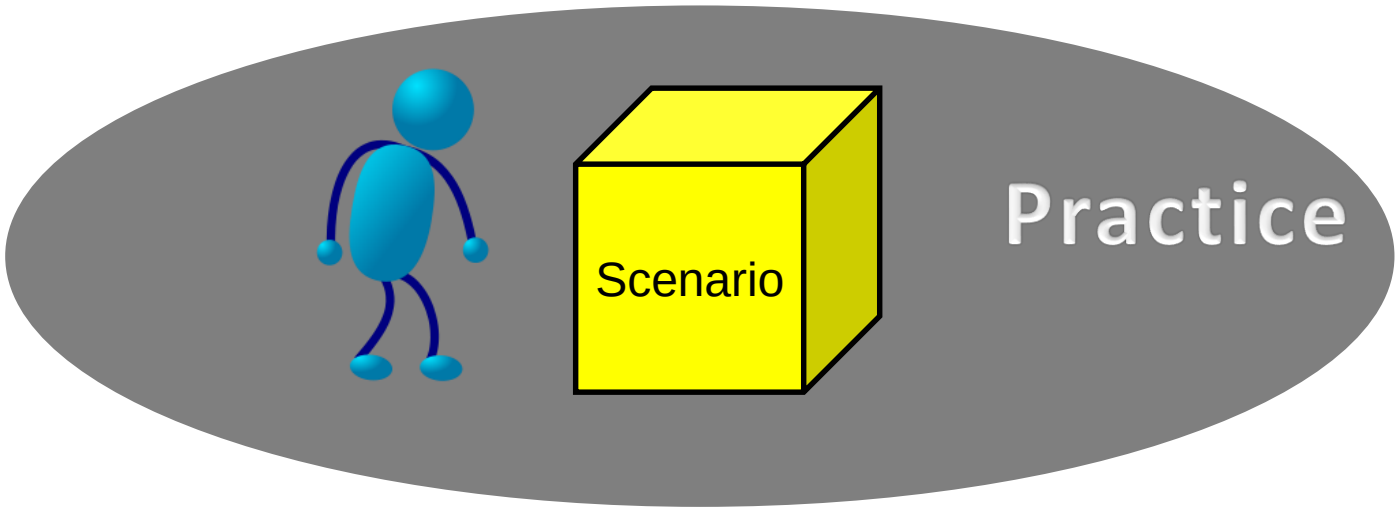


EPICS Alumni Study: Percentage of Alums that Attribute EPICS to Improving…

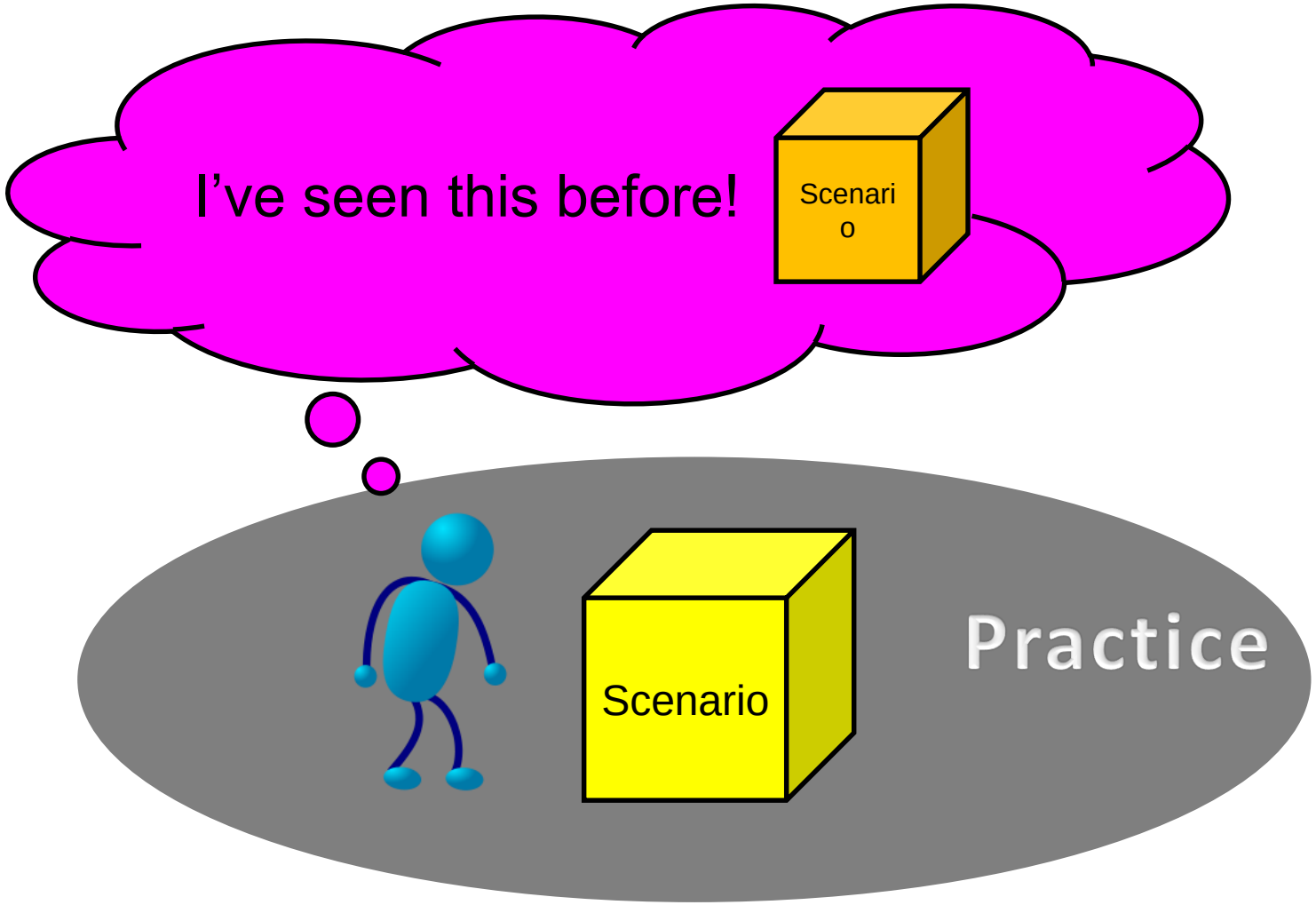


EPICS PURDUE

Experience

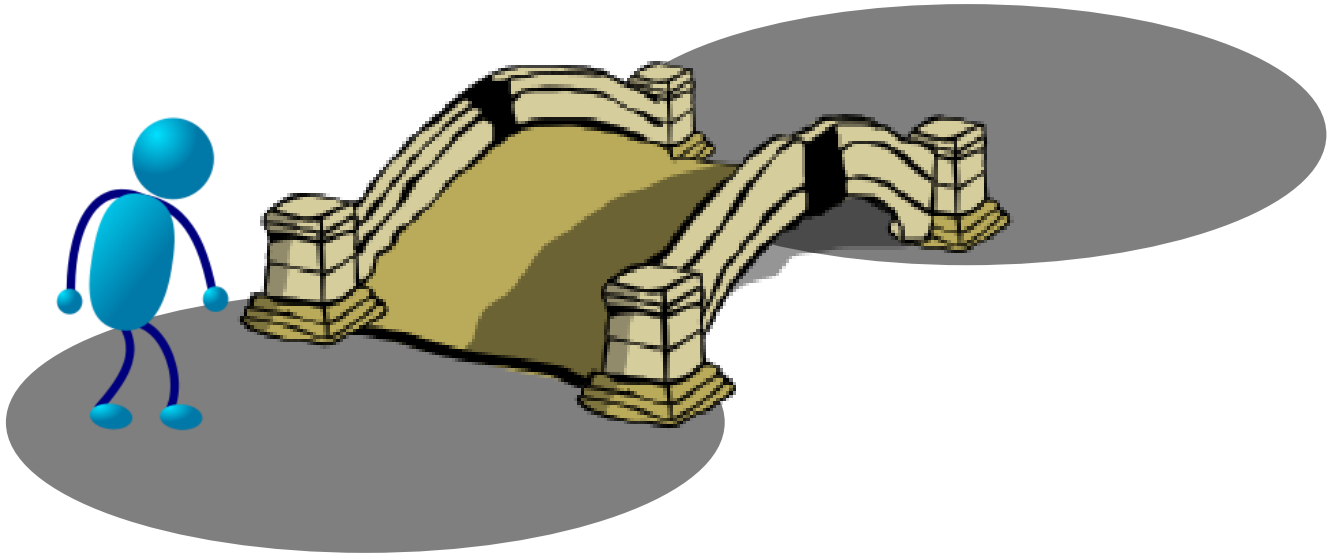


EPICS PURDUE



EPICS PURDUE

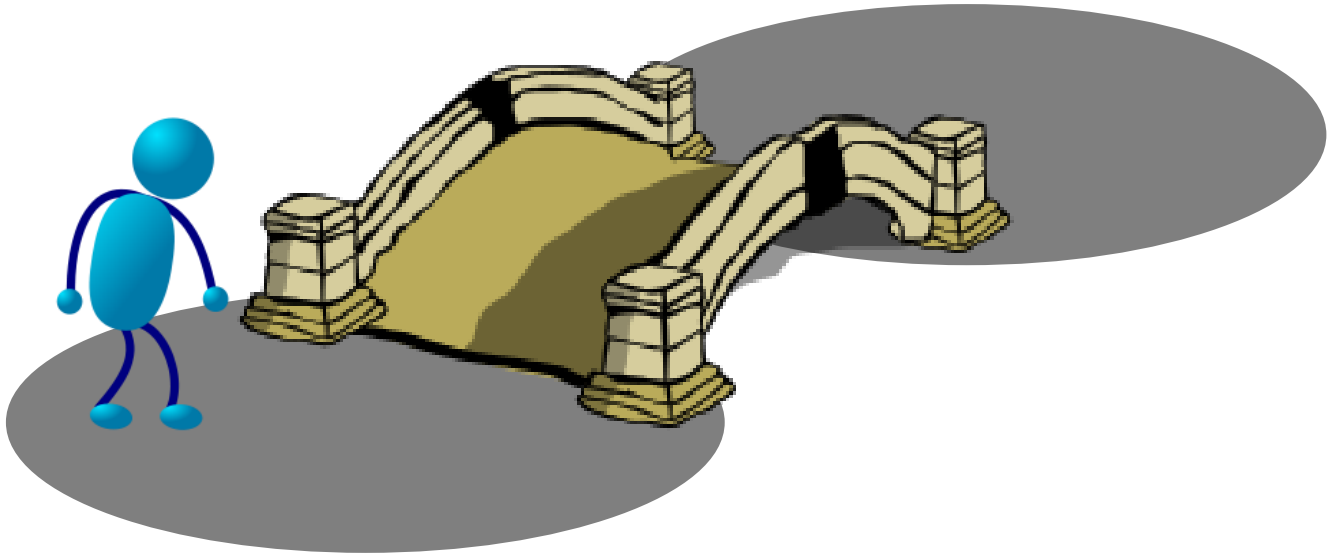
Connection



EPICS PURDUE

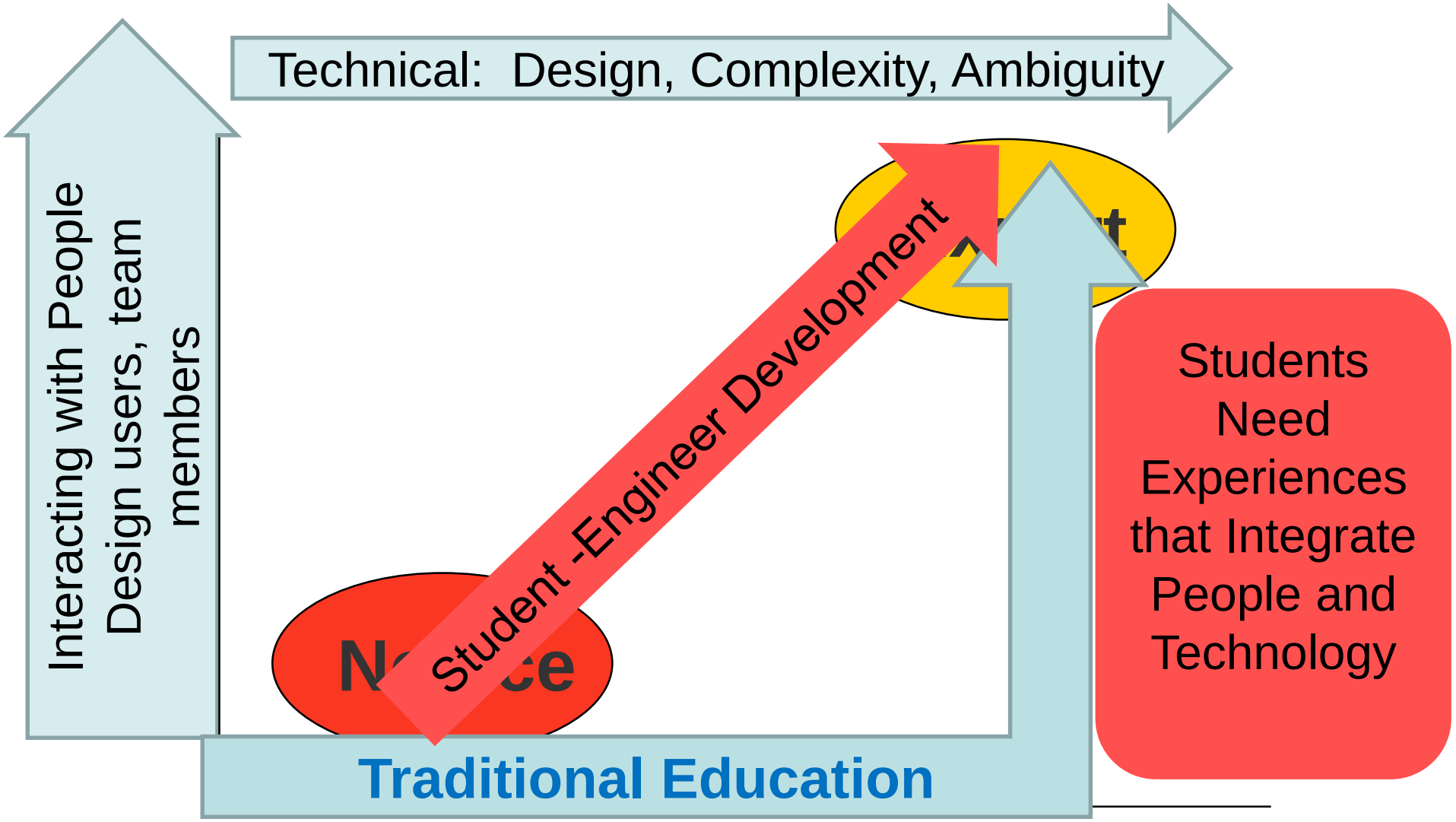
Safe
Structured
Engineering
Education

Real
Free
Service
Practice



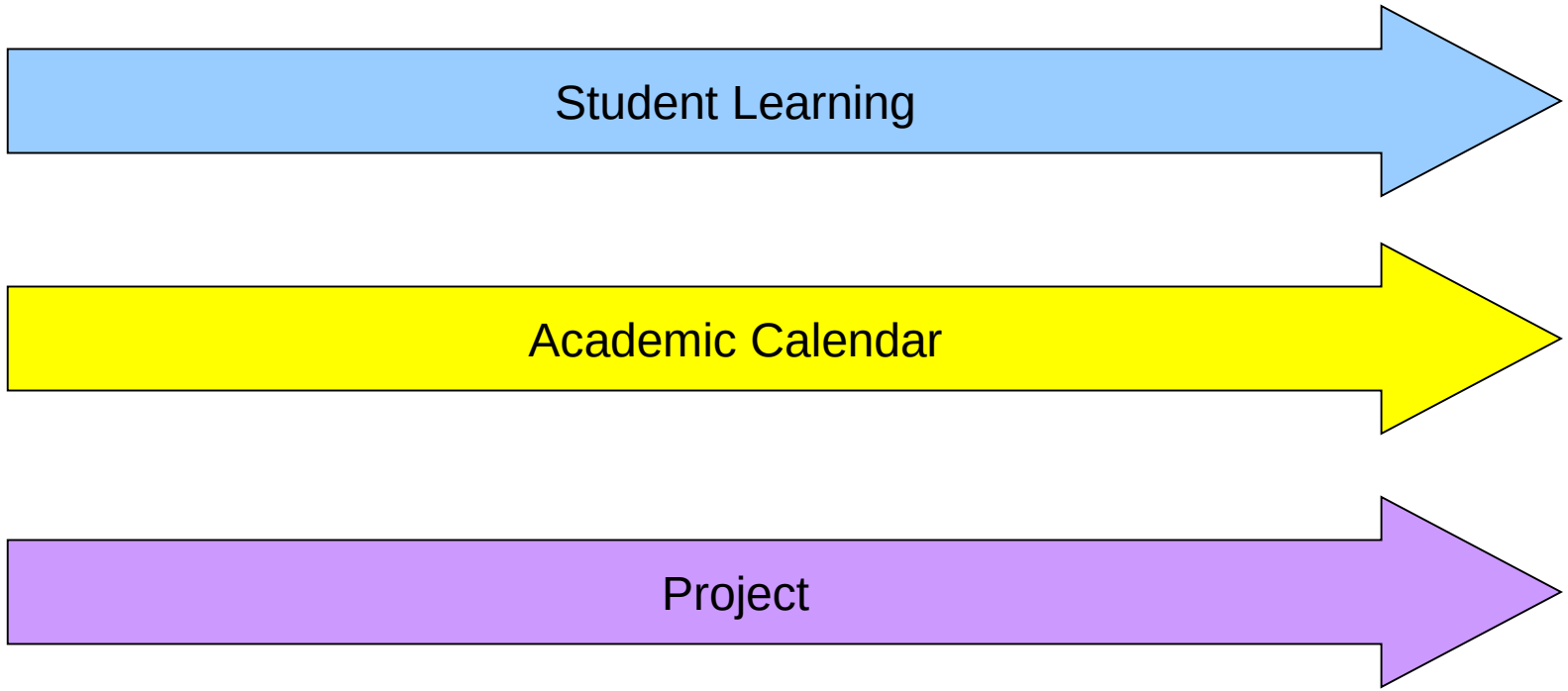
EPICS PURDUE

Research Results: People and Technical are Related

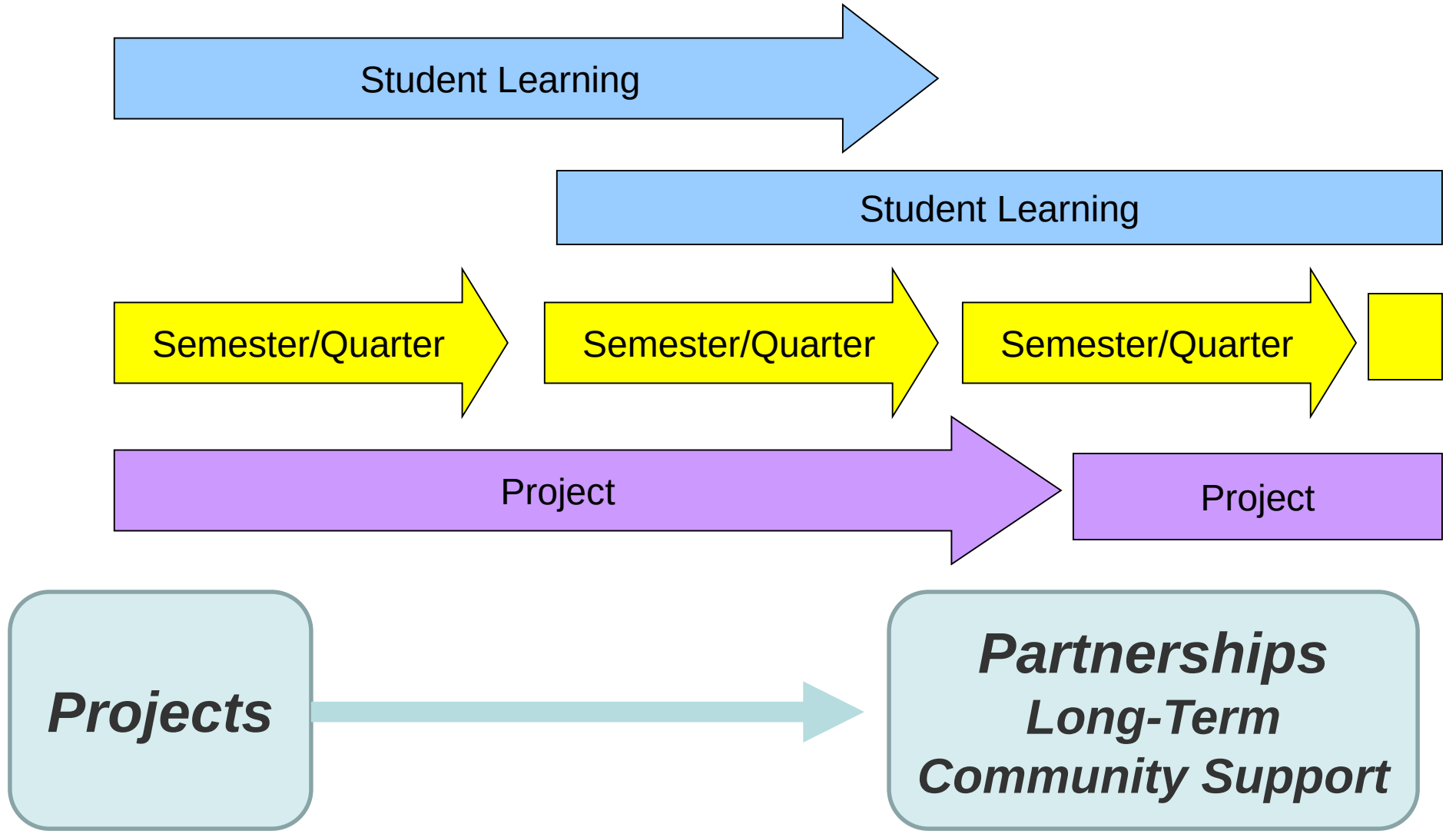


Time Scales: Traditional Courses

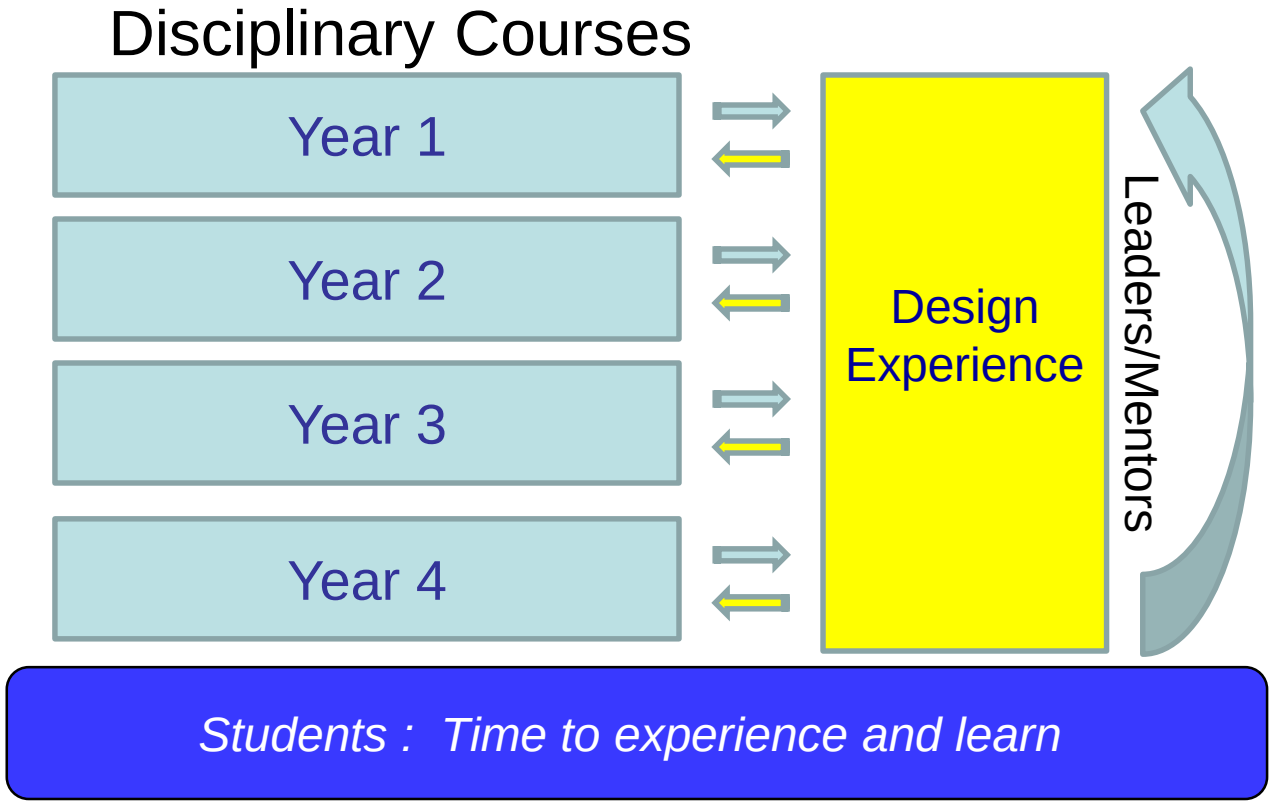
- Student learning and project development are tied to academic calendar
  - Semester/Quarter



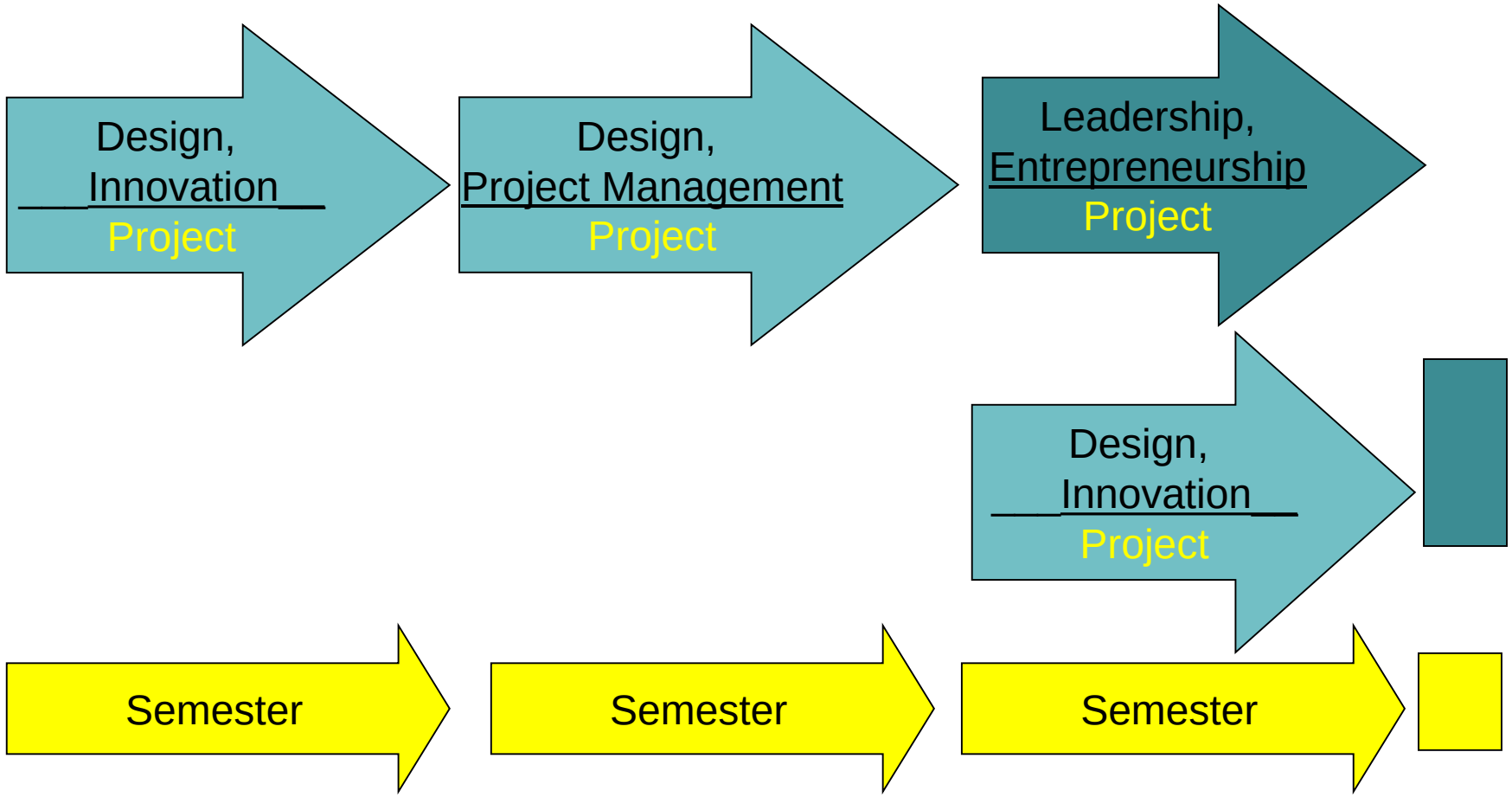
EPICS Decouples Timescales



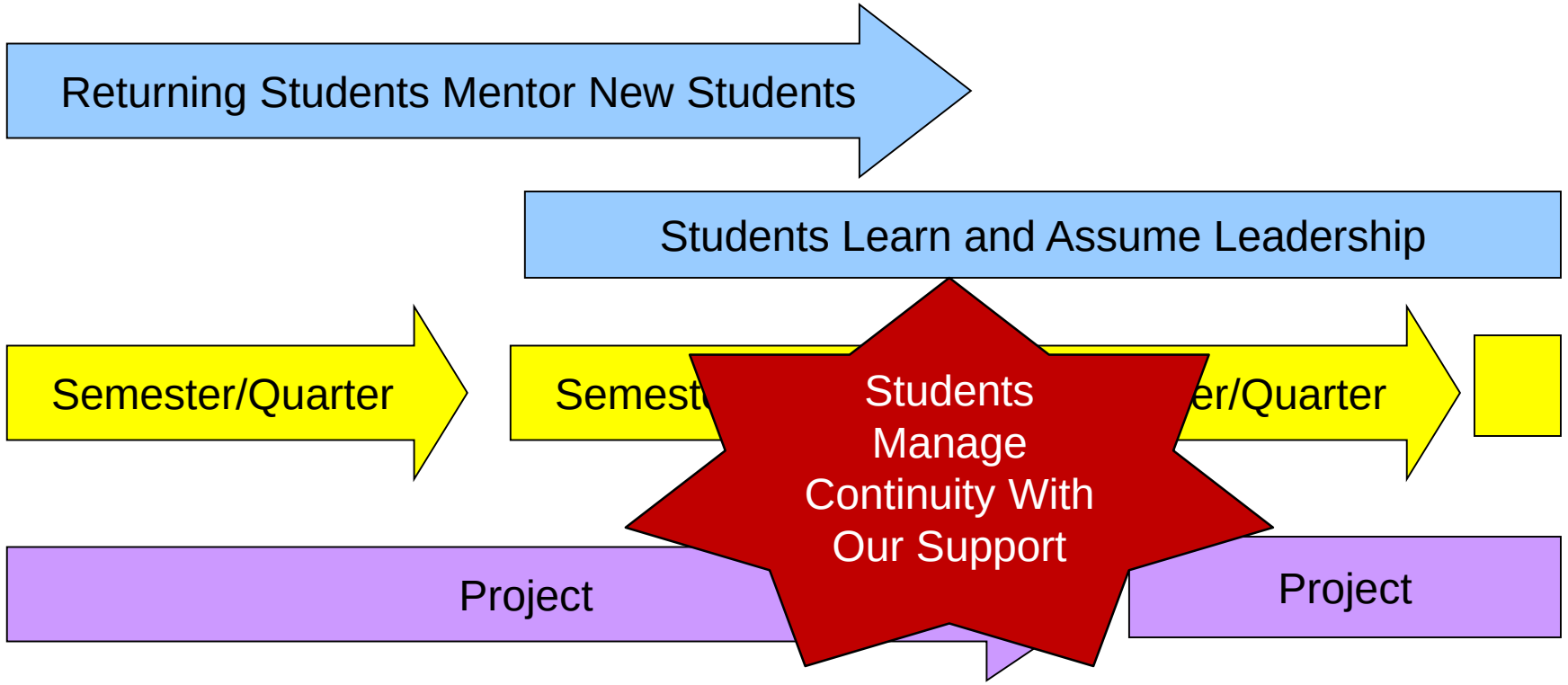
Design Thread Across Years



Examples: Three Semesters



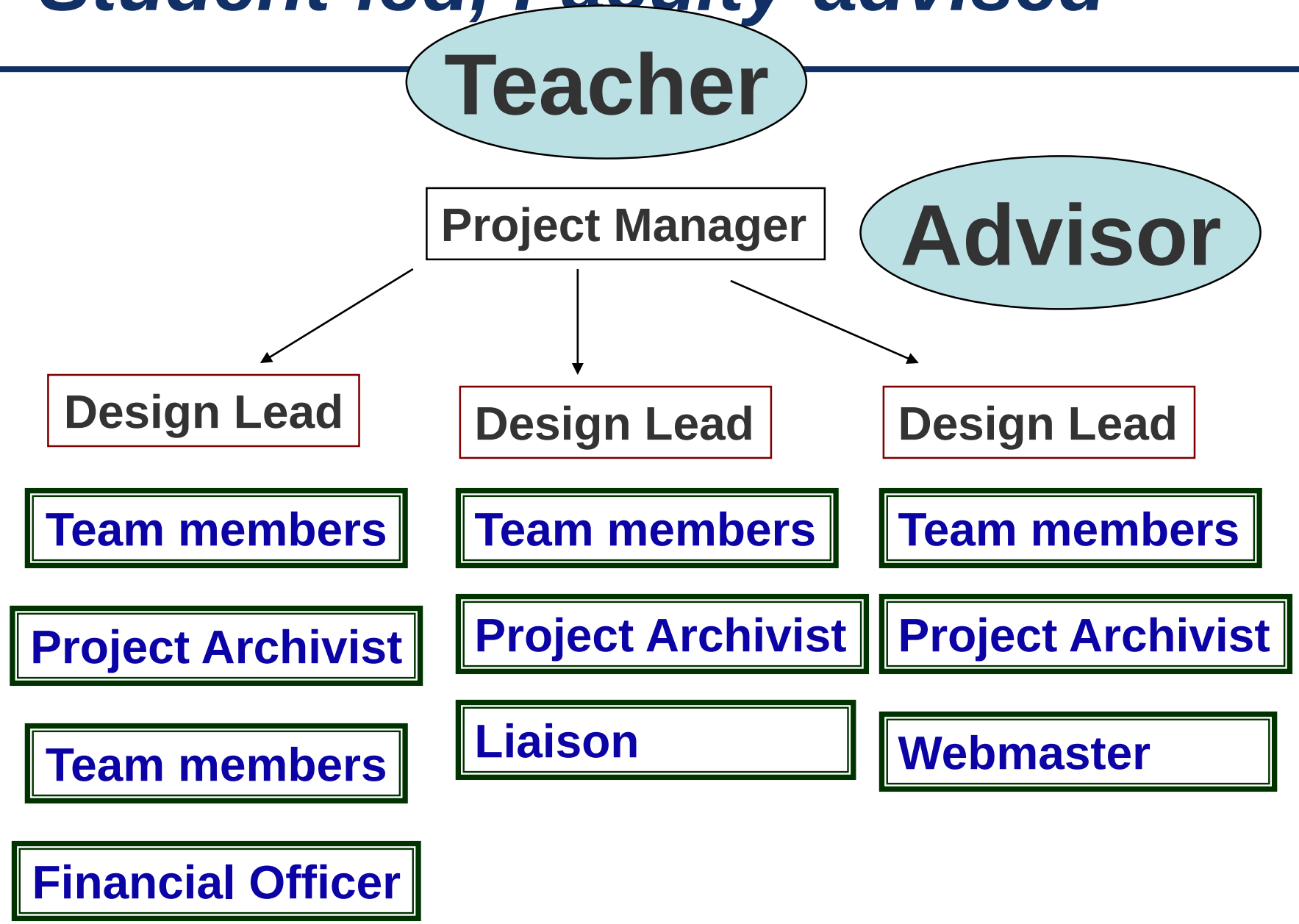
Managing Decoupled Timescales



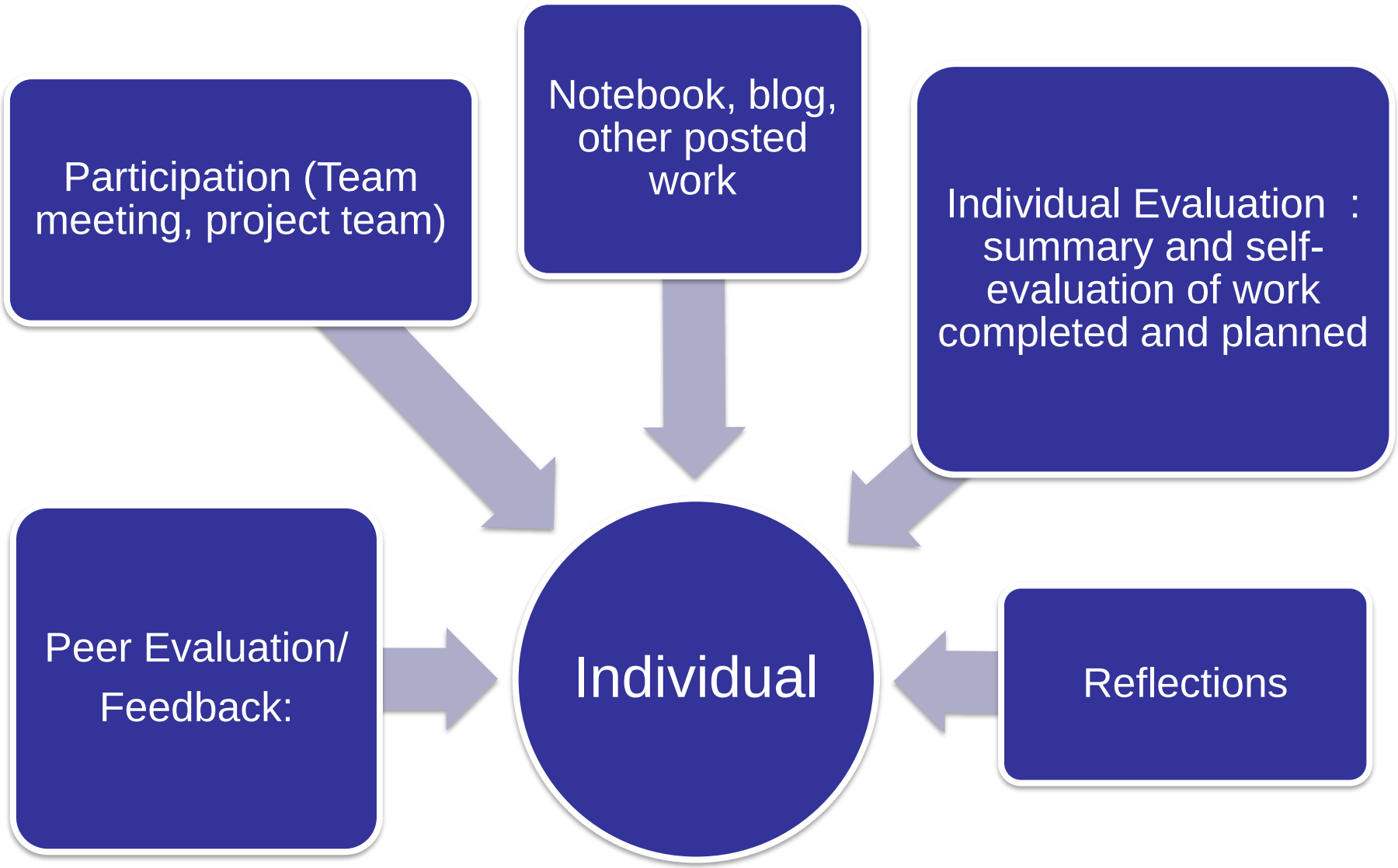
Curriculum and Assessment Goals:

1) ***Facilitating and assessing the student learning for the semester***
2) ***Ensuring project continuity***

Student-led, Faculty-advised



Individual Artifacts



Evaluation Rubric (www.purdue.edu/epics)

Outcomes	Excellent (E)	Proficient (P)	Competent (C)	Does Not (N) Meet Expectations	Assessment	Where Documented*
Accomplishing Project Goals: Primarily evaluated from project deliverables and 'work and accomplishments' section of the notebook.	Documented individual disciplinary contributions to the project are **outstanding**, adding significant value to the team, partnership and design.	Documented individual disciplinary contributions to the project are **good,** adding value to the team, partnership and design.	Documented individual disciplinary contributions to the project are **adequate,** adding value to the team, partnership or design	Documented individual disciplinary contributions to the project are **inadequate.** without significant value to the team, partnership or design	Self-Assessment:	
					Instructor's Assessment:	
Utilizing a Design Process: Primarily evaluated through Design Document and 'work and accomplishments' section of the notebook.	Demonstrates **comprehensive** understanding of the design process; implements process in the team design work and contributes in a significant way to the design document.	Demonstrates **good** understanding of the design process, with some evidence of putting process into practice and tangible contributions to the design document.	Demonstrates **adequate** understanding of the design process, implementing some elements into their own design work and contributing in some way to the design documents.	Demonstrates **lack of** understanding of the design process with no significant evidence of putting into practice or contributing to the design document.	Self-Assessment:	
					Instructor's Assessment:	
Reflective/ Critical Thinking:** Primarily evaluated through 'reflections' section of the notebook.	**Outstanding** critical and reflective thinking, including disciplinary, social, ethical, personal, and interpersonal aspects of the project, project partner, and their relationships.	**Good** critical and reflective thinking, including disciplinary, social, ethical, personal, and interpersonal aspects of the project, project partner, and their relationships.	**Adequate** critical and reflective thinking, including disciplinary, social, ethical, personal, and interpersonal aspects of the project, project partner, and their relationships.	**Inadequate** critical and reflective thinking, including disciplinary, social, ethical, personal, and interpersonal aspects of the project, project partner, and their relationships.	Self-Assessment:	
					Instructor's Assessment:	
Teamwork/ Leadership: Primarily evaluated through team observation, 'meetings' section of notebook, and peer reviews.	**Outstanding** participation in class and team work, develops professional relationships, and fulfills role-specific responsibilities. **Excels** in work with team members, within and outside of formal team roles to accomplish team goals and leads when appropriate. Promotes team unity, assists others. **Outstanding** contribution to peer reviews.	**Good** teamwork and participation in class as well as role-specific responsibilities. **Willing** to work with other team members, within and outside of formal team roles, to accomplish team goals, Acquires new knowledge when prompted by others. **Good** contribution to peer reviews.	Participates in class and teamwork **when prompted**, including role-specific responsibilities. Shows **some willingness** to work with other team members, within and outside of formal team roles, to accomplish team goals, Acquires new knowledge when prompted by others. **Adequate** contribution to peer reviews.	**Inadequate** participation in class and teamwork, little or nothing done to build team unity. Incomplete role-specific responsibilities. **Little willingness** to work with other team members, within and outside of formal team roles, to accomplish team goals. **Inadequate** contribution to peer reviews.	Self-Assessment:	
					Instructor's Assessment:	
Communication: Primarily evaluated through written and verbal, formal and informal communication in team observation, design reviews, Design Document, and peer reviews.	**Outstanding** communication with all audiences. Completes all documentation needed for the team, design, project management, and transition with minimal need for editing.	**Good** communication with all audiences. Completes all documentation needed for the team, design, project management, and transition with some need for editing.	**Adequate** communication with all audiences. Completes most documentation needed for the team, design, project management, and transition with need for editing.	**Inadequate** communication both written and orally, formally or informally, to most audiences. Incomplete documentation needed for the team, design, project management, and transition.	Self-Assessment:	
					Instructor's Assessment:	

Opportunities for Impact

- Research shows higher learning actively engaging students
- Opportunities for more project-based learning that engage people within the curriculum
  - Impact within our local and global communities
- Models that can be adapted to individual institutions
  - Faculty development and mentoring
- Make the world a better place for all

Thank you!!!!

William Oakes
oakes@purdue.edu

How to Get Involved

Peace Engineering – ECHO recordings and documents
http://www.ifees.net/webinars/

Peace Engineering ECHO *rjordan@unm.edu*

Project ECHO *http://www.ifees.net/echo-peace-engineering/*

Project ECHO COVID-19 Response *https://echo.unm.edu/covid-19*

Transforming Perspectives for a Sustainable Global Future

Imagine. Design. Create.

Building a better world through Peace Engineering