Assessing the Long-Term Impact of Undergraduate Global Experiences on Engineers' Career Outcomes

Dr. Kirsten Davis

School of Engineering Education, Purdue University

4 April 2025

Kirsten Davis

Assistant Professor, Engineering Education

Ph.D. Engineering Education

M.S. Systems Engineering

M.A.Ed. Higher Education

Engineer at General Electric

B.S. Engineering & Management

PURDUE UNIVERSITY
School of Engineering Education

Clarkson UNIVERSITY

Global Engineering Course TA

Study Abroad Leader

International Research Experiences for Students Programs

GLIDE
GLOBAL LEARNING INITIATIVES FOR THE DEVELOPMENT OF ENGINEERS

Research Team

Joe Tort
Managing Director
Office of Professional Practice

PURDUE UNIVERSITY

Office of Professional Practice

Lexy Arinze
Ph.D. Student
School of Engineering Education

Motivation for this Talk

Engineers need to be prepared for a global workplace

Study abroad programs are designed to meet this need

We only study impacts of these programs during undergrad years

Project Purpose

The purpose of this project is to explore the impact of global experiences during and after the undergraduate years on global career outcomes.

National Science Foundation Grant EEC-2308607

Project Overview

A multiple-case study of three long-running global engineering programs to explore the impact of global undergraduate experiences on engineers' career pathways and approaches to engineering work.

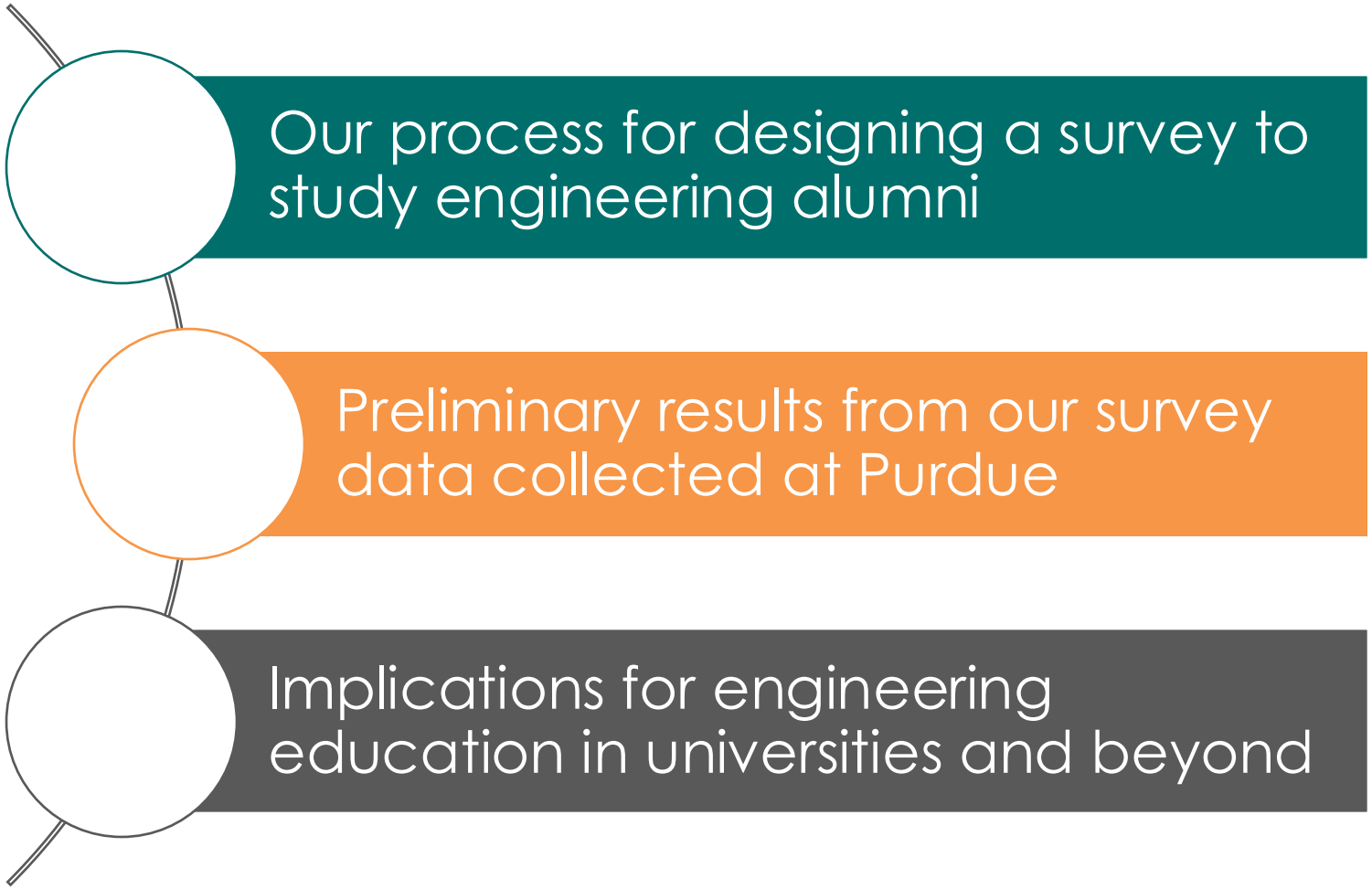
Phase 1: Survey

Phase 2: Interviews

Case 1	Case 2	Case 3
THE UNIVERSITY OF RHODE ISLAND	University of CINCINNATI	PURDUE UNIVERSITY
International Engineering Program	International Co-op Program	Global Engineering Alliance for Research & Education
Alumni, Comp.	Alumni, Comp.	Alumni, Comp.

Phase 3 Cross-Case Comparison: Develop case summaries based on Phase 1 and 2 data and compare to determine which patterns are case-based and which are replicated across cases.

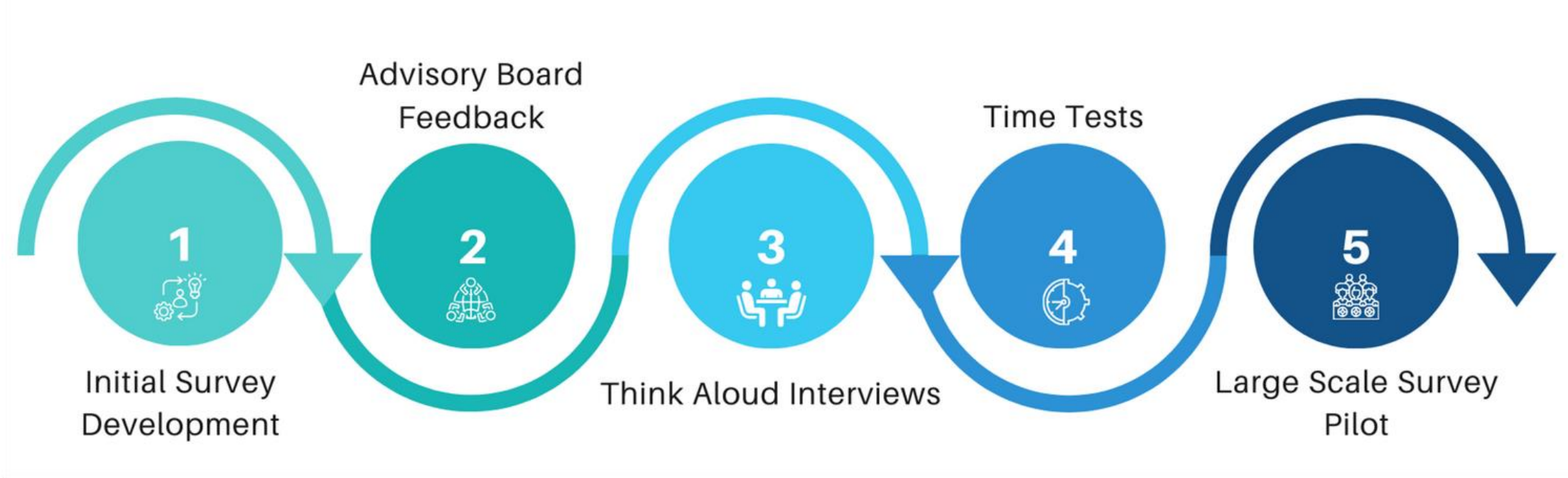
Topics to Cover Today



Survey Design

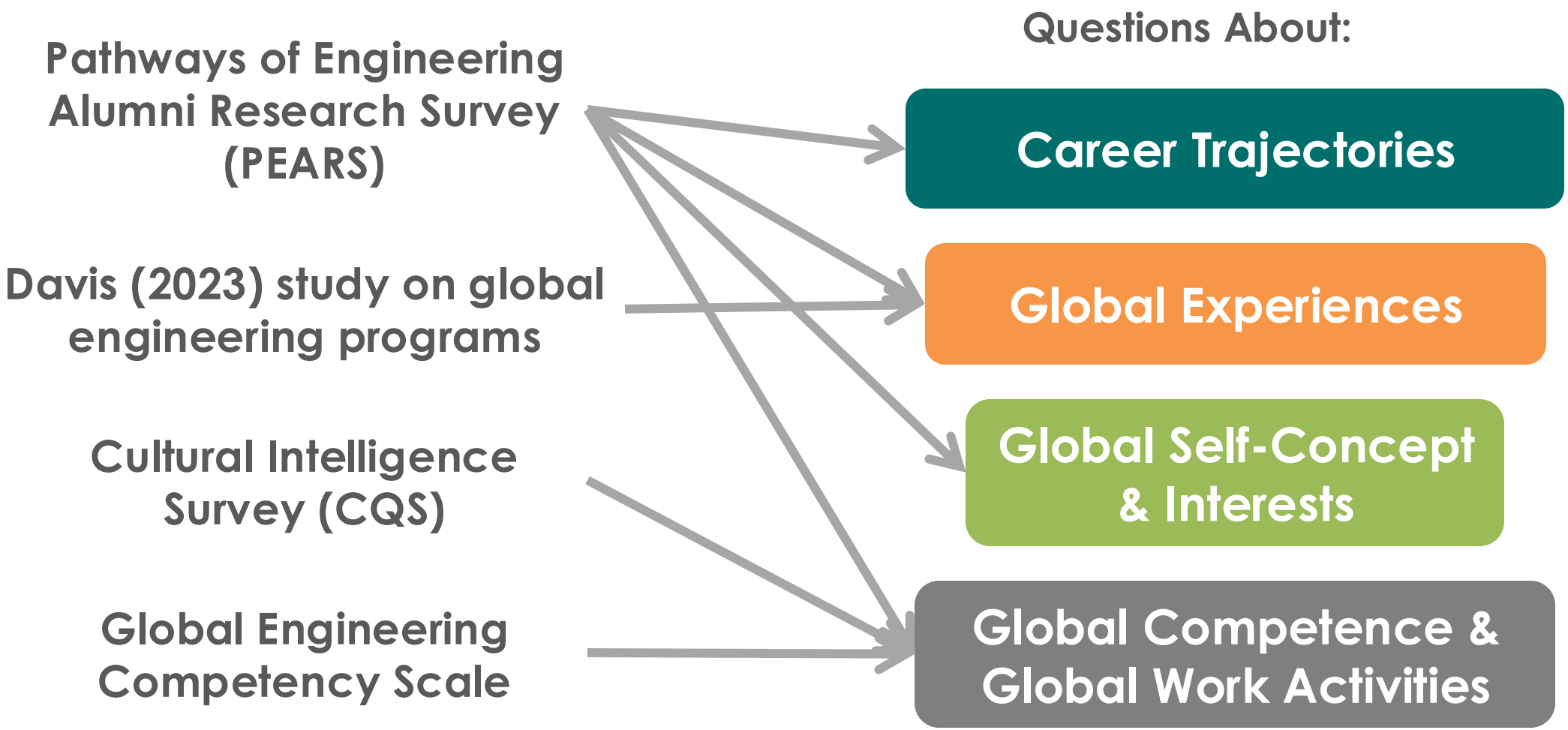
Our process for designing a survey to study engineering alumni

Survey Design Process



Phase 1 of the project focused on development of a survey about career trajectories, global experiences during and after college and global career outcomes.

Step 1: Initial Survey Development



Step 2: Advisory Board Feedback

Research Advisory Board

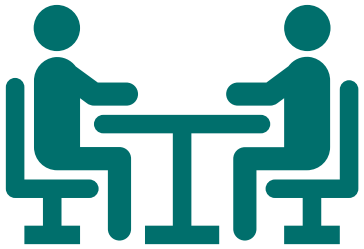
Brent Jesiek, Purdue
Samantha Brunhaver, ASU
Chris Cooper, U of Cincinnati
Sigrid Berka, URI

Industry Advisory Board

Tony Denhart, State of Indiana
Matt Edwards, Eli Lilly
Jim Adelsperger, Daimler

- ✓ Reorganized the survey into five sections.
- ✓ Added questions comparing the impacts of global experiences to the impacts of other experiences.
- ✓ Refined phrasing on some questions to more closely align with our project research questions.

Step 3: Think Aloud Interviews



- We conducted **three one-hour interview sessions** with potential participants
- Participants asked to **"think" out loud** as the read the instructions and answered each question on the survey.

Outcome: We rephrased several questions to enhance readability and understanding for participants.

What was the least valuable aspect of the global educational program(s) you participated in?

Based on your professional experiences so far, what would you change about the global educational program(s) you participated in?

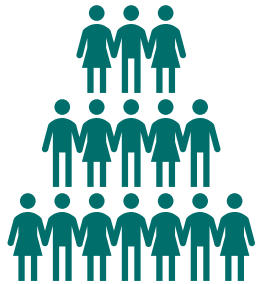
Step 4: Time Tests

- Four potential participants (two target group and two comparison group) completed the survey.
- Participants asked to **track their time on each section** of the survey and provide feedback about section length.

Outcome: We identified two sections that took notably longer than anticipated. We removed questions from these sections.

- ✓ Reviewed these sections with advisory board members to identify opportunities to remove and consolidate questions.
- ✓ Our aim in this process was to keep the survey under 25 minutes total.

Step 5: Large-Scale Survey Pilot



- Piloted the survey with alumni of global programs at **Virginia Tech and Texas A&M** (31 participants).
- We were able to test out both the survey and the **recruitment materials** for the actual study.

Outcome: We identified sections of the survey where participants took the longest to complete or stopped responding entirely.

"The amount of time to take the survey was a barrier to completing it..."

- 58 participants began the survey but did not make it to the end.
- We removed more questions and adjusted estimated completion times for some sections.

Data Collection & Results

Preliminary results from our survey data collected at Purdue

Data Collection

THE UNIVERSITY OF RHODE ISLAND

University of CINCINNATI

PURDUE UNIVERSITY

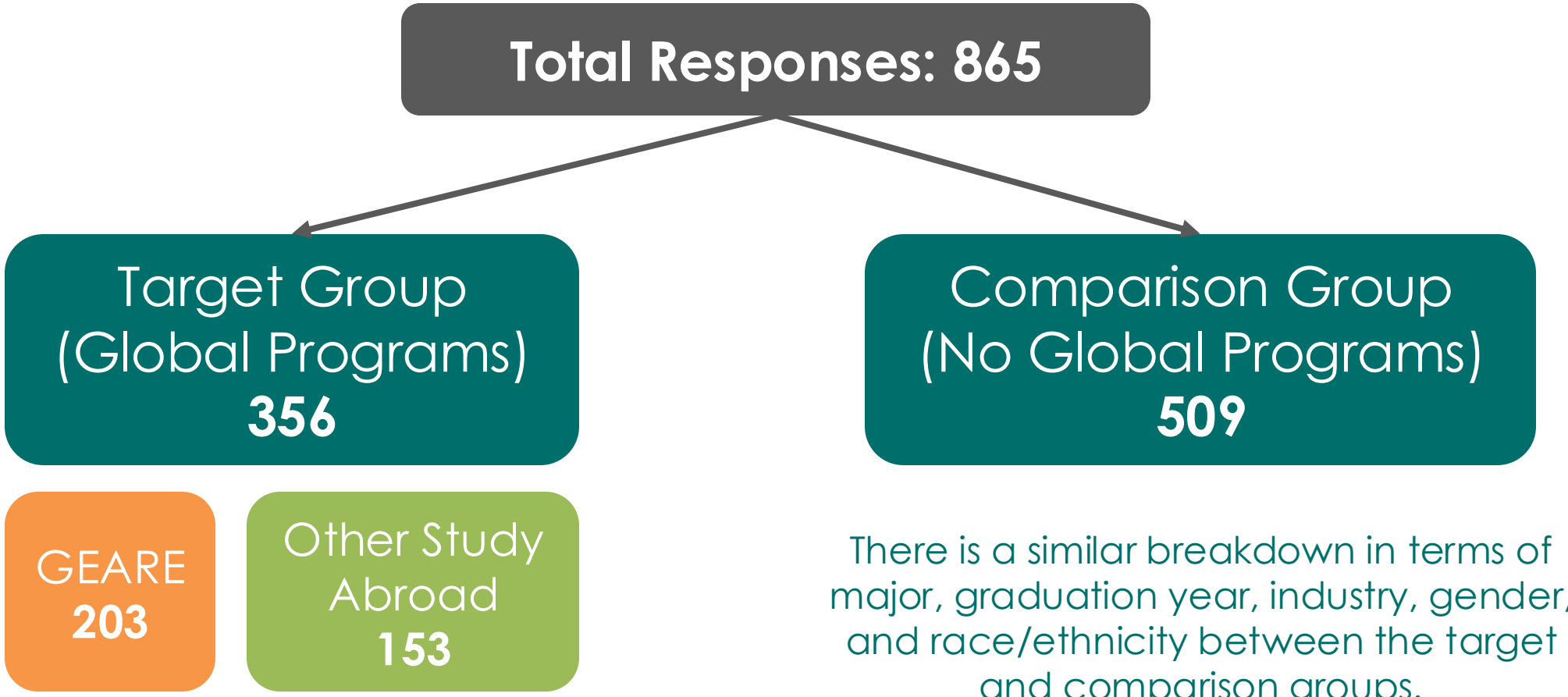
Fall 2024

Target Group Recruitment → Comparison Group Recruitment → Additional Recruitment as Needed

- Initial email the week before survey opens
- Survey opening email
- Two follow up reminders
- Social media posts on Linked In

- Targeted specific groups (e.g., majors)
- Individual Linked In messages

Purdue Sample Overview



There is a similar breakdown in terms of major, graduation year, industry, gender, and race/ethnicity between the target and comparison groups.

Results: GEC Cognitive Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Demographics Model

- **Gender significant (negative)**
- **R-Squared = 1.7%**

Results: GEC Cognitive Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Educational Experiences:

- **Gender (negative)**
- **Global experiences**
- **R-squared = 3.8%**

Results: GEC Cognitive Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Global Confidence:

- **Gender (negative)**
- **Global Task Confidence**
- **Global Task Interest**
- **CQS Cognitive**
- **CQS Behavioral**
- **R-squared = 42.3%**

Results: GEC Behavioral Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Demographics Model

- **Age significant (negative)**
- **Gender significant (negative)**
- **R-Squared = 1.3%**

Results: GEC Behavioral Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Educational Experiences:

- **Gender (negative)**
- **Global experiences**
- **R-squared = 4.2%**

Results: GEC Behavioral Score

Outcome Variables: Global Engineering Competency Survey (GECS) has two dimensions: Cognitive and Behavioral. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Global Confidence:

- **Age (negative)**
- **Global Task Confidence**
- **CQS Metacognitive**
- **CQS Cognitive**
- **CQS Motivational**
- **R-squared = 38.3%**

Results: Global Work Tasks – Current

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Demographics Model

- **Age (positive)**
- **R-squared = 3.9%**

Results: Global Work Tasks – Current

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Educational Experiences:

- **Age (positive)**
- **Global experiences**
- **R-squared = 7.6%**

Results: Global Work Tasks – Current

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Global Confidence:

- **Age (positive)**
- **Global experiences (small)**
- **Global Task Confidence**
- **Global Task Interest**
- **R-squared = 38.2%**

Results: Global Work Tasks – Career

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Demographics Model

- **Age (positive)**
- **R-squared = 4.5%**

Results: Global Work Tasks – Career

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Educational Experiences:

- **Age (positive)**
- **Global experiences**
- **# Grad Degrees (small)**
- **R-squared = 10.4%**

Results: Global Work Tasks – Career

Outcome Variables: How often participants complete global work tasks both in current role and across entire career. We conducted regression for each, with similar results.

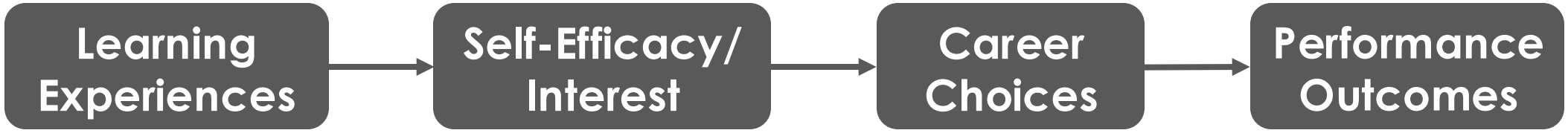
Age
Gender (Woman=1)
Global Undergrad Experiences (Yes=1)
Number of Graduate Degrees
Global Task Performance Confidence
Global Task Performance Interest
CQS – Metacognitive
CQS – Cognitive
CQS – Motivational
CQS – Behavioral

Add Global Confidence:

- **Age (positive)**
- **Global Experiences (small)**
- **# Grad Degrees (small)**
- **Global Task Confidence**
- **Global Task Interest**
- **R-squared = 45.3%**

Summary of Our Initial Findings

- ✓ **Global learning experiences** are a significant but limited predictor of global work outcomes.
- ✓ **Global self-confident and interest variables** are much stronger predictors of global work outcomes.
- ✓ This finding can be explained through the lens of **Socio-Cognitive Career Theory**, which suggests the following relationships:



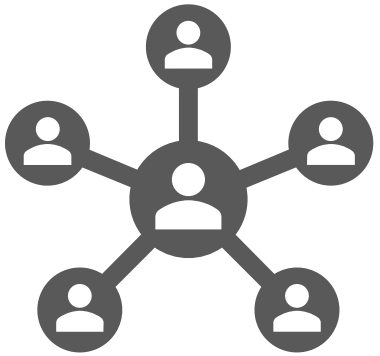
Impact

Implications for engineering education at universities and beyond

Potential Implications

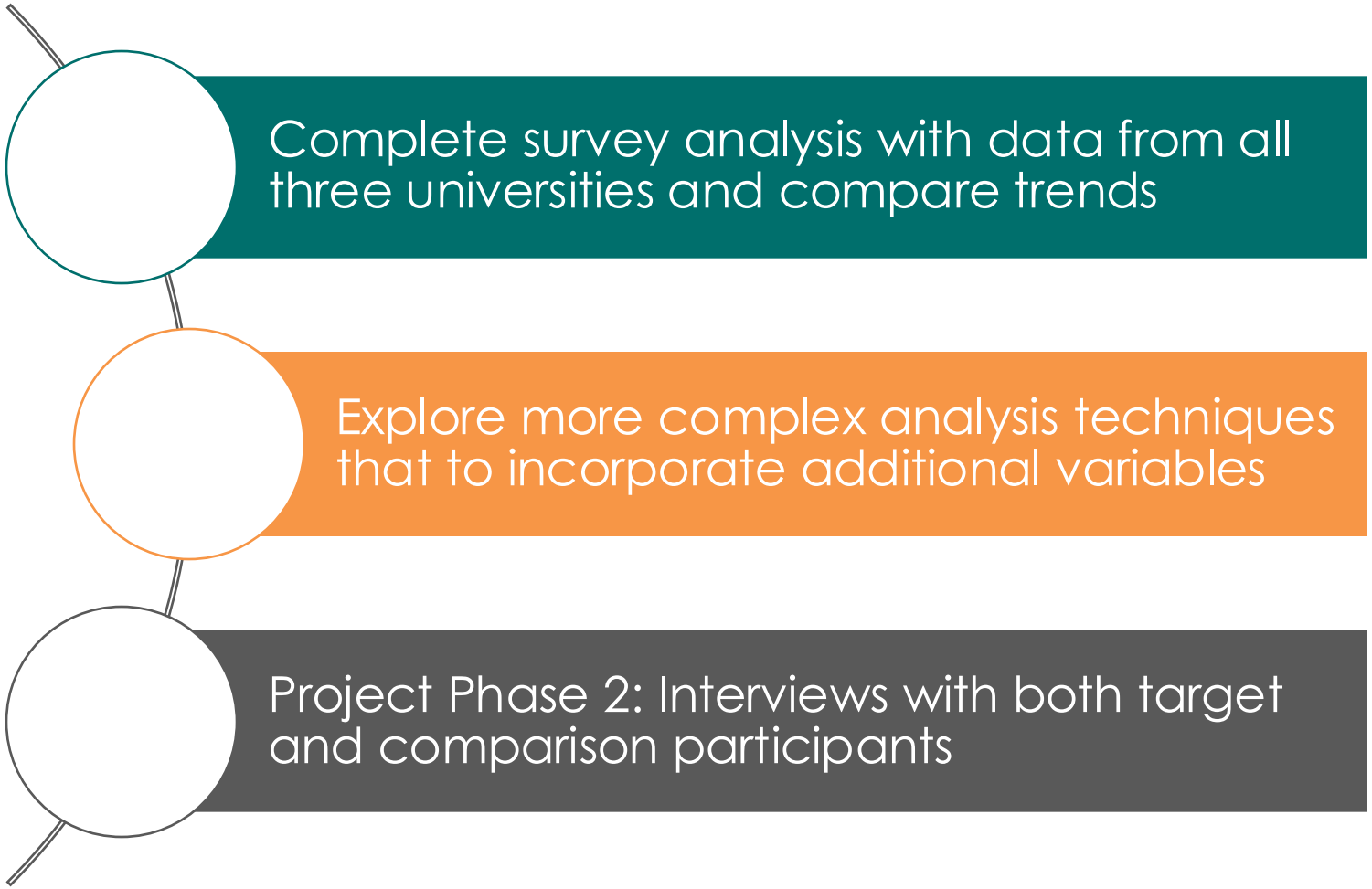
Global undergraduate experiences may primarily impact interest/confidence

Global experiences post-graduation may be important in longer term career outcomes



Survey will be available soon for others to expand on this project

Future Work


Complete survey analysis with data from all three universities and compare trends
Explore more complex analysis techniques that to incorporate additional variables
Project Phase 2: Interviews with both target and comparison participants

Disclaimer

This material is based upon work supported by the National Science Foundation under Grant Number EEC-2308607. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Assessing the Long-Term Impact of Undergraduate Global Experiences on Engineers' Career Outcomes

Dr. Kirsten Davis
kad@purdue.edu

Project Website

Social Cognitive Career Theory