From PIE to APPLES: The Evolution of a Survey Instrument to Explore Engineering Student Pathways

Center for the Advancement
of Engineering Education

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PIE vs. APPLES

- Longitudinal (7x)
- 160 students paid $175 annually
- Up to 40 minutes to complete

- Cross-sectional (1x)
- 4,200+ students paid $4
- 10 minutes to complete

Variables common to both PIE and APPLES instruments

- Academic and professional persistence
- Motivations for studying engineering
- Confidence in engineering-related skills and abilities
- Perceived importance of engineering-related skills and abilities
- Extracurricular involvement
- Curriculum overload
- Academic disengagement
- Exposure to and knowledge of the engineering profession
- Overall satisfaction with collegiate experience
- Interactions and satisfaction with instructors

PIE to APPLES Transition

- Reworded prompts and items
- Identified variables to be carried over
- Improved the measurement of common variables
- Added new variables

Prompt and Item Wording

- Will the items make sense to all survey respondents?
- PIE: engineering students from one academic year
- APPLES: engineering (current, former, and prospective) students; all academic years as well as transfer and part-time students

Which PIE variables should be carried over to APPLES?

- Based on the preliminary analysis of PIE data, identified promising variables
  - Analysis of persister vs. non-persister differences
- Looked at Cronbach's alpha scores from PIE, APPLES1 (Spring 2007), pilot tests
  - Generally speaking, for this kind of exploratory work, an alpha of .7 or above is acceptable

Financial Motivation

	PIE α	APPLES 2007 α	APPLES 2008 α
Engineers are well paid. Engineers make more money than most other professionals. An engineering degree will guarantee me a job when I graduate.	.76	.82	.81

Improving the measurement of PIE variables to be carried over

- The Cronbach's alphas were used to identify scales with low internal reliability such as Motivation (Mentor Influence)
- New items were piloted and then added to APPLES 2008

Motivation (Mentor Influence) Alphas

	PIE	APPLES 2007	APPLES 2008
A faculty member, academic advisor, TA or other university affiliated person inspired me to study engineering.	.65	.60	.77
A non-university affiliated mentor has encouraged and/or inspired me to study engineering.			
NEW: A mentor has introduced me to people and opportunities in engineering.			

New APPLES variables

- Based on responses to the open-ended question in APPLES 2007: *Is there anything else you want to tell us about your experiences in engineering?*
- 2 new variables added to APPLES 2008: Intrinsic Motivation: Psychological and Behavioral

Intrinsic Motivation

Psychological (α=.75)

- I think engineering is fun.
- I think engineering is interesting.
- I feel good when I am doing engineering.

Behavioral (α=.72)

- I like to figure out how things work.
- I like to build stuff.

Dissemination of Findings

- Reports for institutions participating in APPLES
- PIE analysis in the final stages
  - Paper focusing on the longitudinal aspects
- APPLES analysis ongoing
  - Paper focusing on the generalizability of longitudinal findings
  - Pragmatically, provides participating institutions with data they can act on

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Acknowledgement

This material is based on work supported by the National Science Foundation under Grant No. ESI-0227558, which funds the Center for the Advancement of Engineering Education (CAEE). 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.

CAEE is a collaboration of five partner universities: Colorado School of Mines, Howard University, Stanford University, University of Minnesota, and University of Washington.

Frequency of Interaction with Instructors

	PIE α	APPLES 2007 α	APPLES 2008 α
Instructors during class	.69	.74	.70
Instructors during office hours			
Instructors outside of class or office hours			