



# Retention Focused – S-STEM Supported Program



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## Introduction

The Academy of Engineering Success (AcES) employs known best practices to support and retain underrepresented students in engineering through graduation<sup>1</sup>. AcES provides:

- Faculty-student and student-student interaction to facilitate the development of:
  - Feelings of institutional inclusion
  - Engineering and professional identity
- Academic support, including support for the development of broader success skills, such as time management<sup>1</sup>
- Scholarships via NSF S-STEM funding<sup>1</sup> (21 NSF S-STEM scholarships awarded)

## Definitions

- ENGR Track 1 – Students admitted in Calculus 1 or higher
- ENGR Track 2 – Students admitted in Pre-Calculus
- ENGR Track 3 – Students admitted in College Algebra
- *Underrepresented Groups* (URGs) include women, first-generation students, and underrepresented minorities

## Program Description



## Research Instrumentation

- Surveys: GRIT, LAESE, MSLQ
- Individual Interviews and Focus Groups



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## Results

### AcES Participation & Academic Success

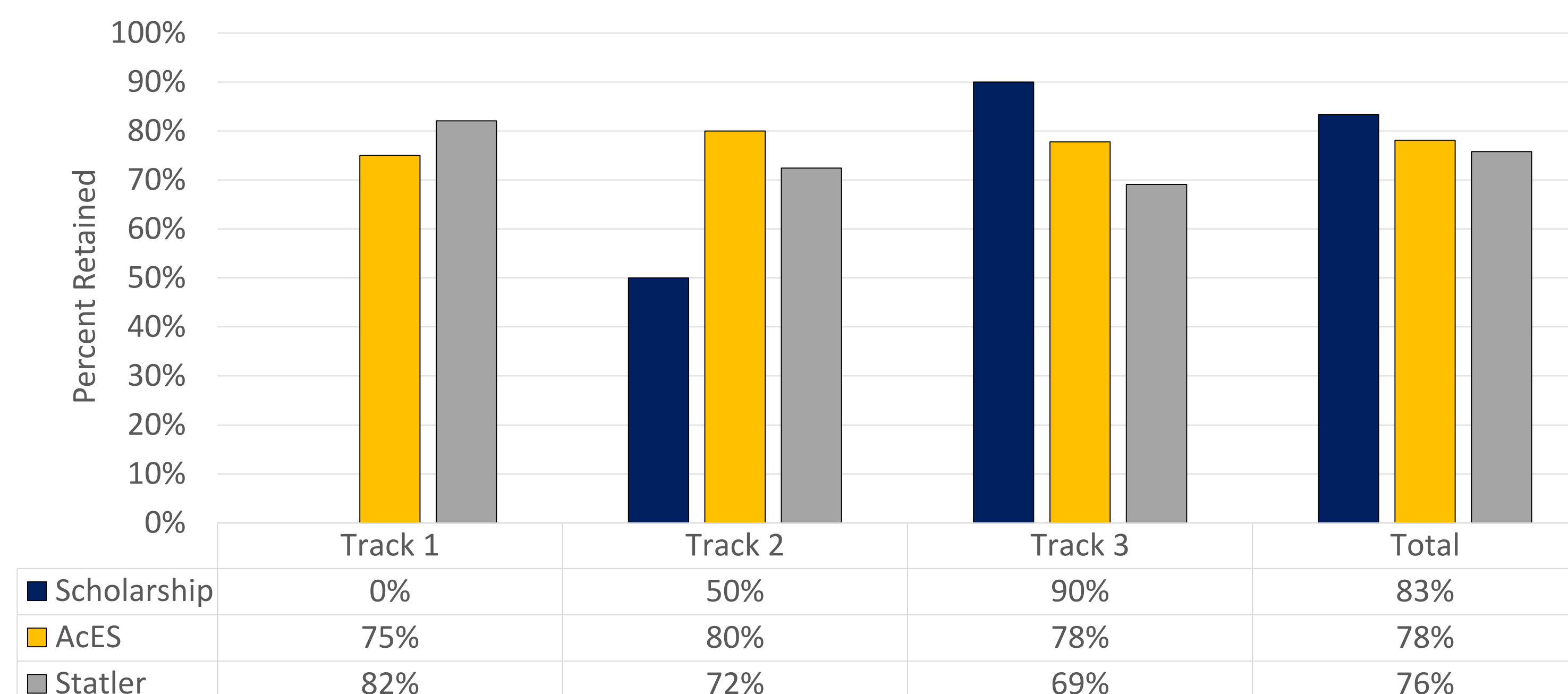


Figure 1. First to second year retention of scholarship recipients, AcES participants and FTFT students in the first-year engineering program by engineering track (2016 – 2018)

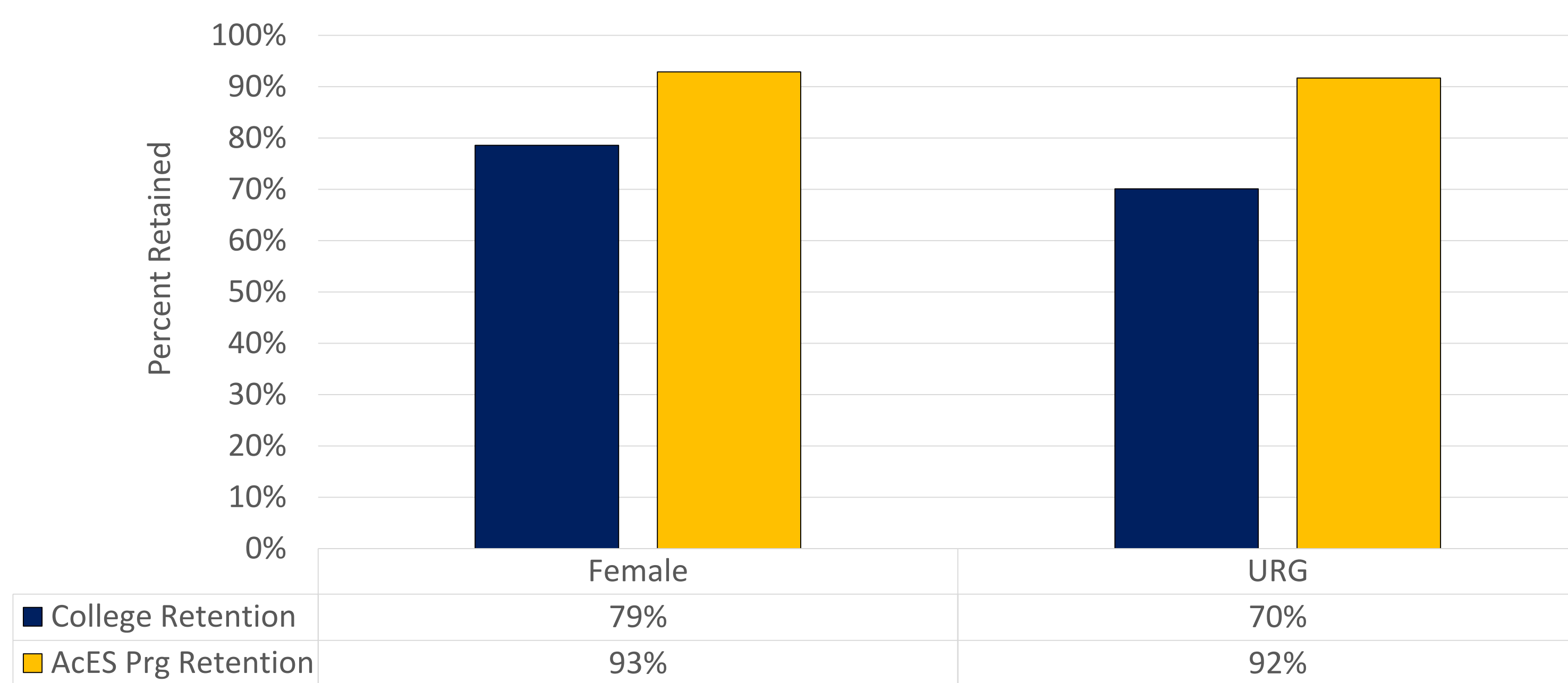


Figure 2. Retention comparison of FTFT URGs who participated in the AcES program compared to the retention of all FTFT URGs

## Survey Responses

Table 1. Comparison of survey response of students who retained in or left engineering

AcES Fall 2017 Cohort	Retained in ENGR	Left ENGR	AcES Fall 2017 Cohort	Retained in ENGR	Left ENGR
GRIT <sup>2</sup> (Likert scale: low 1– 5 high)	3.49	3.97	LAESE <sup>4</sup> (Likert scale: low 1– 7 high)		
MSLQ <sup>3</sup> (Likert scale: low 1 – 5 high)			• Engr Career Expectations	6.60	6.67
• Intrinsic Value	5.79	4.56	• Engr Self-Efficacy 1	5.87	6.87
• Self-Efficacy	5.61	5.15	• Engr Self-Efficacy 2	6.37	6.78
• Test Anxiety	3.59	3.67	• Feeling of Inclusion	5.38	5.00
• Self-Regulation	5.11	4.37	• Coping Self-Efficacy	6.49	6.44
• Strategy Use	5.14	4.18	• Math Outcomes Efficacy	6.29	6.89

## Discussion

### RQ1: Retention/Academic Success

AcES program appears to:

- Increase retention of ENGR Track 2 and Track 3 students (Fig. 1)
- Decrease retention of ENGR Track 1 students (Fig. 1)
- Increase retention of URG students and females (Fig. 2) compared to the overall engineering FTFT population

### RQ2: What impacts engineering student success?

- Academic support: learning center, tutoring
- AcES cohort, summer bridge, faculty/staff, guest lecturers
- Entering beliefs, feelings of inclusion, coping self-efficacy
- Development of learning strategies (self-regulation, strategy use) and motivational beliefs (value of studying engineering)<sup>1</sup>

### RQ3: How do students seek to overcome challenges?

- Students seek help from people (peers, tutors, and faculty)
- Students use on-line resources

## Conclusions

- Programs such as AcES have the ability to increase the 1<sup>st</sup>-to-2<sup>nd</sup> year retention of non-calculus ready students.
- Entering beliefs, grit, career expectations, math outcomes efficacy, and test anxiety appear to affect retention negatively
- Development of motivational beliefs and learning strategies appear to affect retention in engineering positively
- Results appear to support the Kruger-Dunning Effect<sup>5</sup>

## Future Work

- GRIT, MSLQ, and LAESE survey data are being analyzed to find attributes which may be indicators of student success
- Qualitative data from focus groups and interviews are being analyzed to determine the most impactful aspects of AcES and to assess the student feelings of belonging and inclusion

## References

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