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## ECSEL: Electrical, Computer, and Software Engineers as Leaders

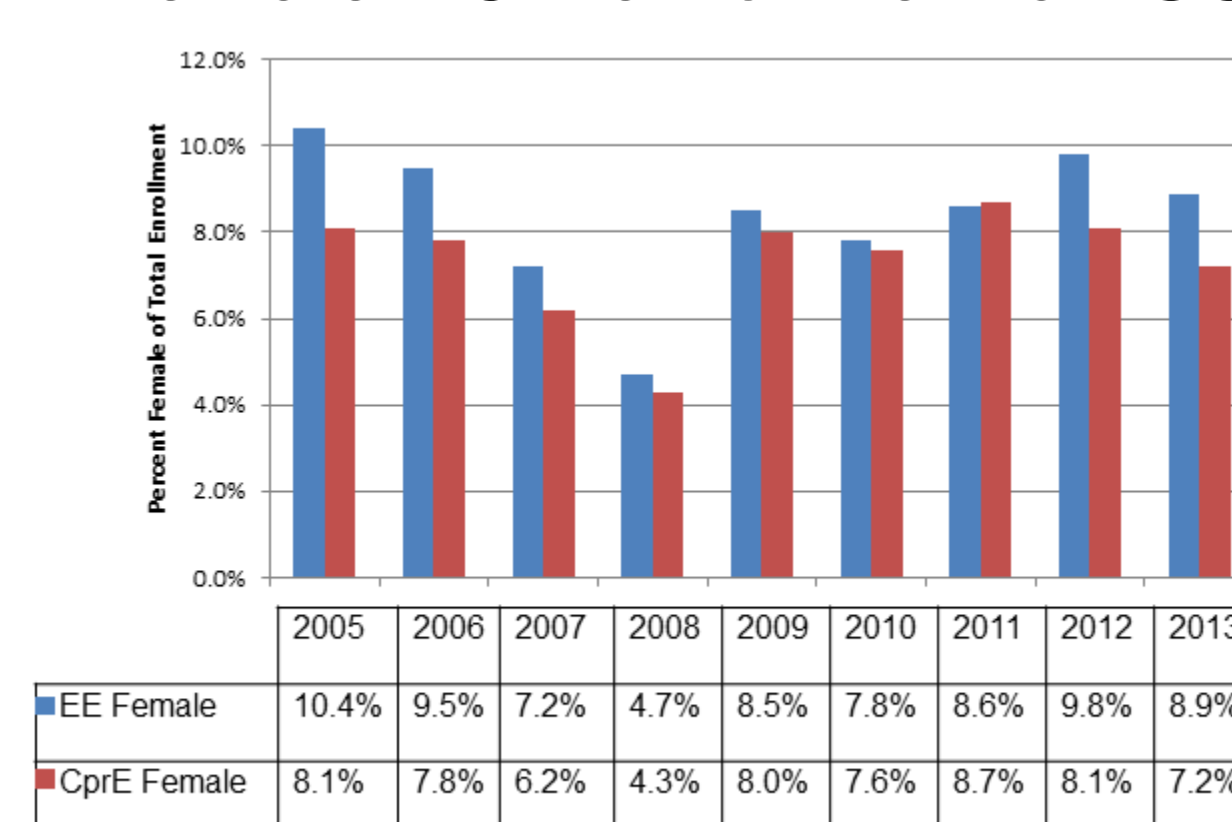
### Objectives

- Improve diversity and inclusion in electrical, computer, and software engineering (ECSE) programs and in the workforce.
- Provide scholarships to a diverse population of low-income academically talented students with financial need.
- Adapt, implement, and test a student experience model, which is a set of well-established evidence-based practices that form an ecosystem of academic and co-curricular supports and is designed to foster retention, transfer, and graduation.
- Increase interest in cyber security.
- Partner with Des Moines Area Community College (DMACC) and Kirkwood Community College (KCC) to support CC and transfer students.
- Increase the percentage of undergraduate women enrolled in ECSE degree programs to 16%, thus doubling the number of women enrolled from 120 to 240.

### Background

The percentage of women in undergraduate electrical and computer engineering at Iowa State University is below the national average. Based on an external assessment, the department has committed to creating an enhanced student experience model for women in ECSE through the ECSEL program.

Female ECE enrollment at ISU



Female ECE enrollment nationally



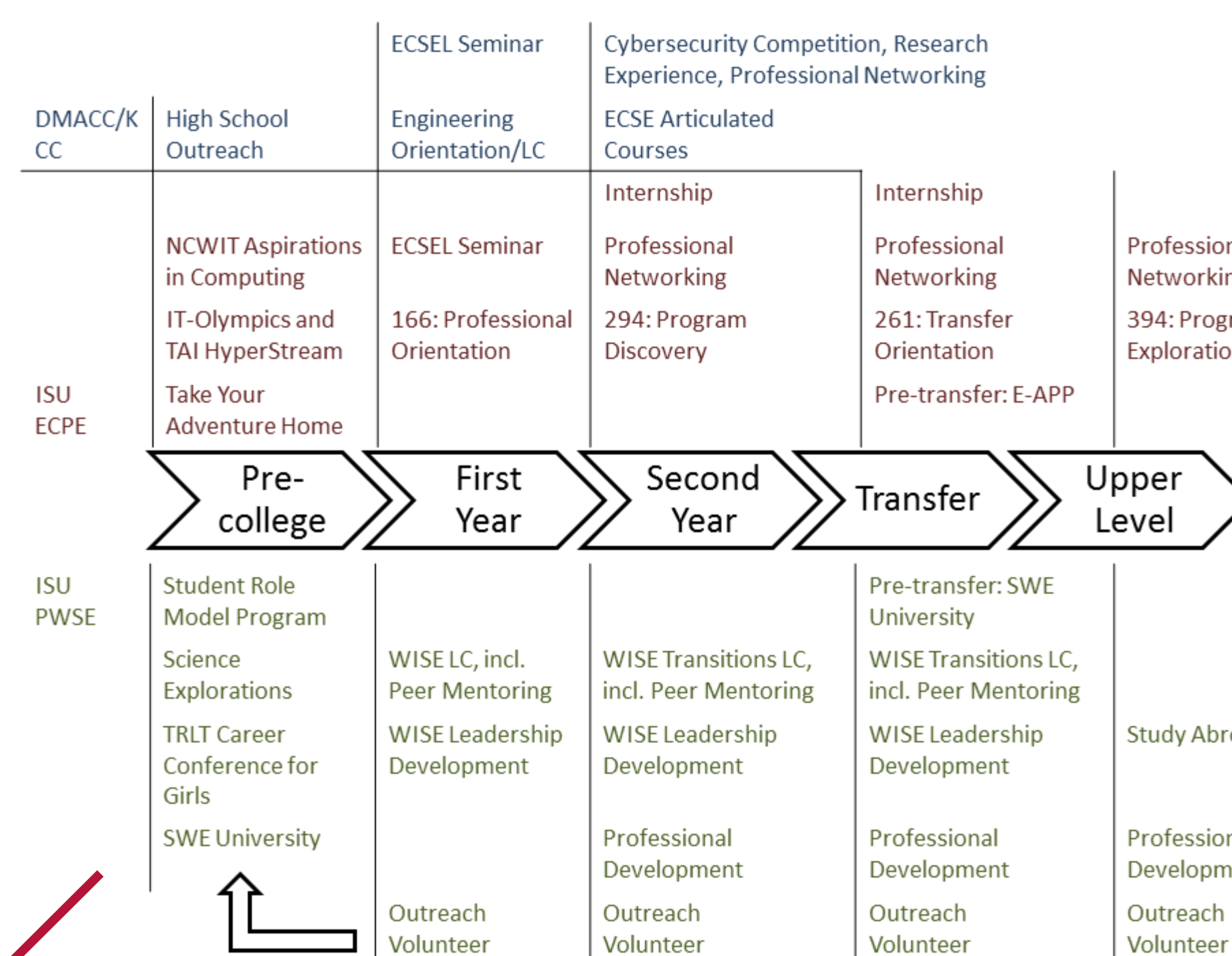
### ECSEL Student Experience



At Taking the Road Less Traveled conferences, scholars lead 9<sup>th</sup> and 10<sup>th</sup> grade girls in integrating circuit components with sunhats to make "sunscreen reminder hats"



Class of 2016 of SWE University, where female high school students learn about engineering and explore Iowa State



Cyber Defense Competition, where students learn to set up and defend a computer network



WiSE students study abroad in London over spring break (2017)



ISU women attend the Grace Hopper Celebration of Women in Computing

### Research

#### Identity Research

Research question: How do women and other diverse students participating in the ECSEL program develop and sustain their engineering identities?

- Examine engineering identity development through the use of Social Cognitive Career Theory (SCCT)
- Perform in-depth interviews to discover perspectives of ECSEL program participants

#### Motivation Research

Research question: What drives underrepresented students to thrive and persist in ECSE degree programs?

- Use Self-Determination Theory (SDT) of motivation to explain how environment affects students and the factors that affect their likelihood of persisting in ECSE

### Evaluation



- **Examination of Process and Contextual Factors**  
Interviews with team members to examine opinions about activities, progress towards project objectives, and contextual factors.
- **Understanding of Participating Students' Experiences**  
Studies with participating undergraduate students to examine their opinions about the student experience.
- **Management of NSF's Student Tracking Data**  
Information required for NSF's data collection activities to track participating students.
- **Evaluation of Broader Impacts**  
Departmental records, surveys to understand attitudes/engagement of pre-college audiences with ECSE, and surveys about the cyber security program.