

Enhancing the Transfer Experience through a Collaborative Cohort Program for Fresno City College Engineering Scholars: Design of Concrete Mixtures using Alternative Aggregates

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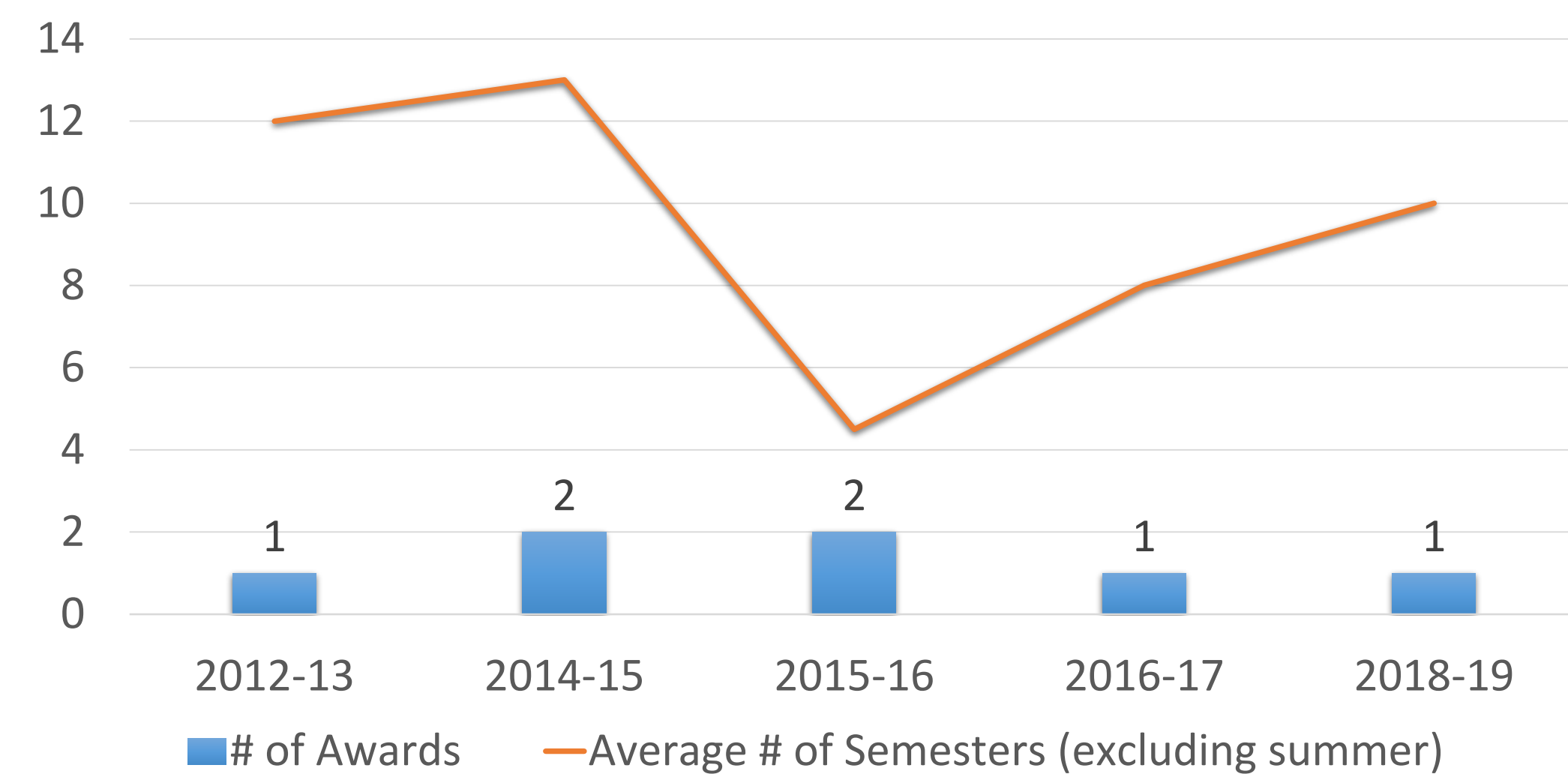
Abstract

The Fresno City College Engineering Scholars program conducted research on concrete mix design in conjunction with the Fresno State Lyles College of Engineering, Department of Civil and Geomatics Engineering. The purpose of the project is to broaden the participation of community college students in engineering research and practice. The experiential learning approach of the project in the first phase involved the design of concrete mixtures using alternative aggregates; lightweight expanded clay aggregate (LECA) and high-density polyethylene (HDPE). Characteristics of these materials were evaluated and taken into account in the design. This work resulted in the production of small concrete cylinders of concrete for testing in future phases. Throughout the project, sociological factors were considered. These topics included ethics in engineering, documentation, and quality control practices.

Research Questions

- How does participation in collaborative cohort experience contribute to students' membership within a STEM community?
- In what ways do students use community membership to construct their own STEM identity?

Time to degree or transfer for engineering students in Fresno City College



Experiential Learning: Knowledge

Concrete Fundamentals
Elnaz Mohammadyaghini, B.S. and Fariborz M. Tehrani, Ph.D., PE for FCC/CSU Fresno NSF S-STEM

Design and Control of Concrete Mixtures

Proportioning Concrete Mixtures
Fariborz M. Tehrani, Ph.D., PE
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Design and Control of Concrete Mixtures

Bias and Precision: Repeatability and Reproducibility in Engineering Testing
Elnaz Mohammadyaghini and Fariborz M. Tehrani, Ph.D., PE
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Experiential Learning: Skills

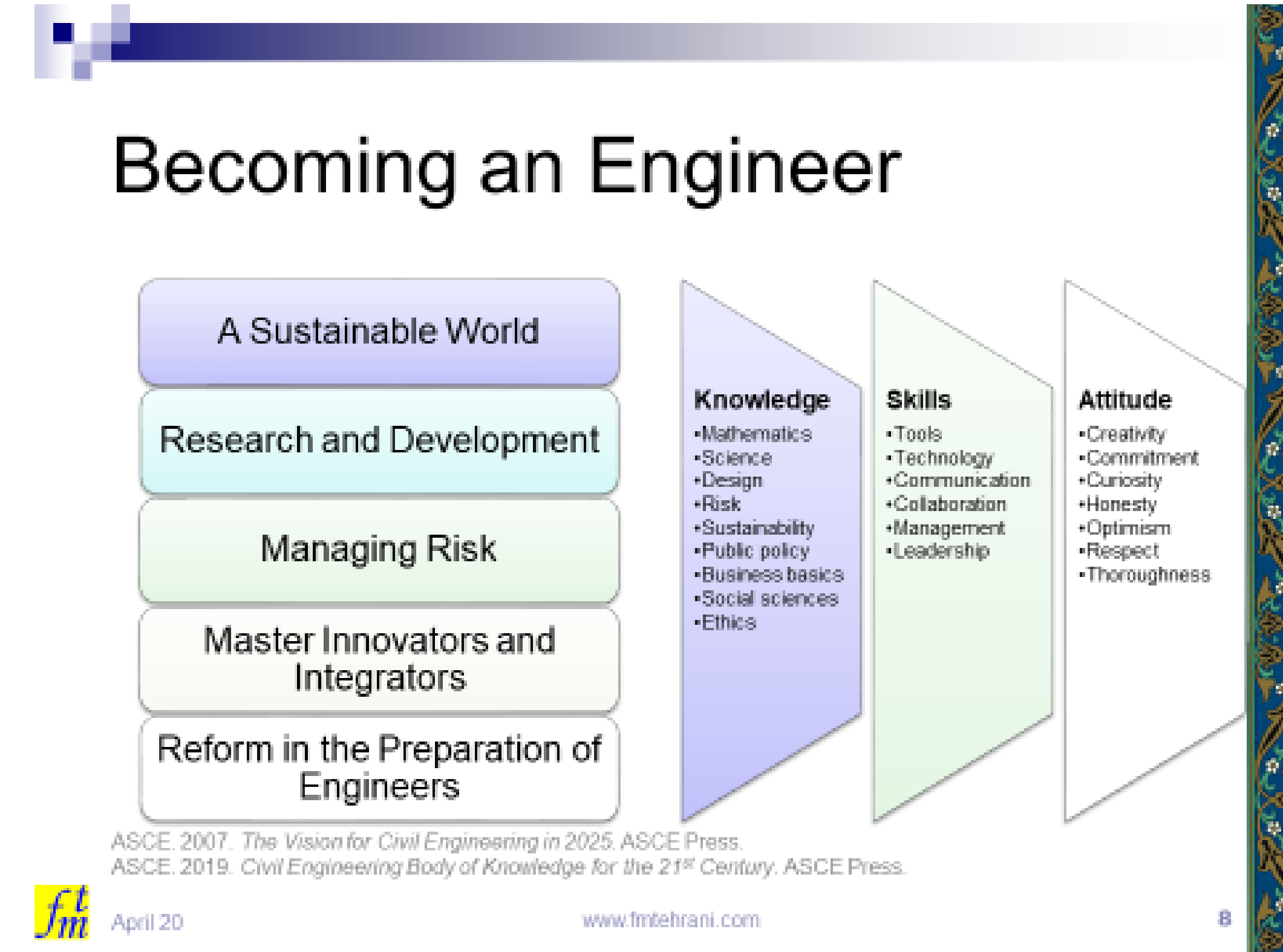
Mixture Proportions Design		fc (psi) 3000	w/cm 0.55	Design Slump (in.) 3	Temp (°F)	Actual Slump (in.)								
Material Properties		Fineness	Cement Type I	Max Agg Size (in.) 3/8		Actual Temp (°F)								
		Design	1 CY	Trial (ft³) = 0.0637		Actual Proportions								
Ingredients	Relative Density (Gg)	Bulk Density (pcf)	Water Absorption (%)	Existing Moisture Content (%)	Absolute Volume (ft³)	Weight (lb)	Bulk Volume (ft³)	Weight (lb)	w/SSD (lb)	Bulk w/Moist (lb)	Weight (lb)	w/Moist (lb)	Weight (lb)	Calculated Absolute Volume (%)
Cement	3.15	70			3.56	700	10.0	1.6	0.02	1.6	10.0	1.6	0.02	1.6
Water	1	62.4			6.17	385	6.2	0.9	0.01	1.0	1.0	0.01	1.0	1.0
Coarse Aggregate	1.28	60.6	0.0	0.0	10.24	818	13.5	1.9	0.03	1.9	1.9	0.03	1.9	1.9
Fine Aggregate	2.64	100	6.0	0.5	6.20	1021	10.2	2.6	0.02	2.4	2.4	0.02	2.4	2.4
Air					0.81									
Total					27.0	2924		7.0		7.0				
Check					27									

Material	Average	Repeatability Standard Deviation	Reproducibility Standard Deviation	Repeatability Limit	Reproducibility Limit
	\bar{x}	S_r	S_R	r	R
A					
B					
C					
D					
E					

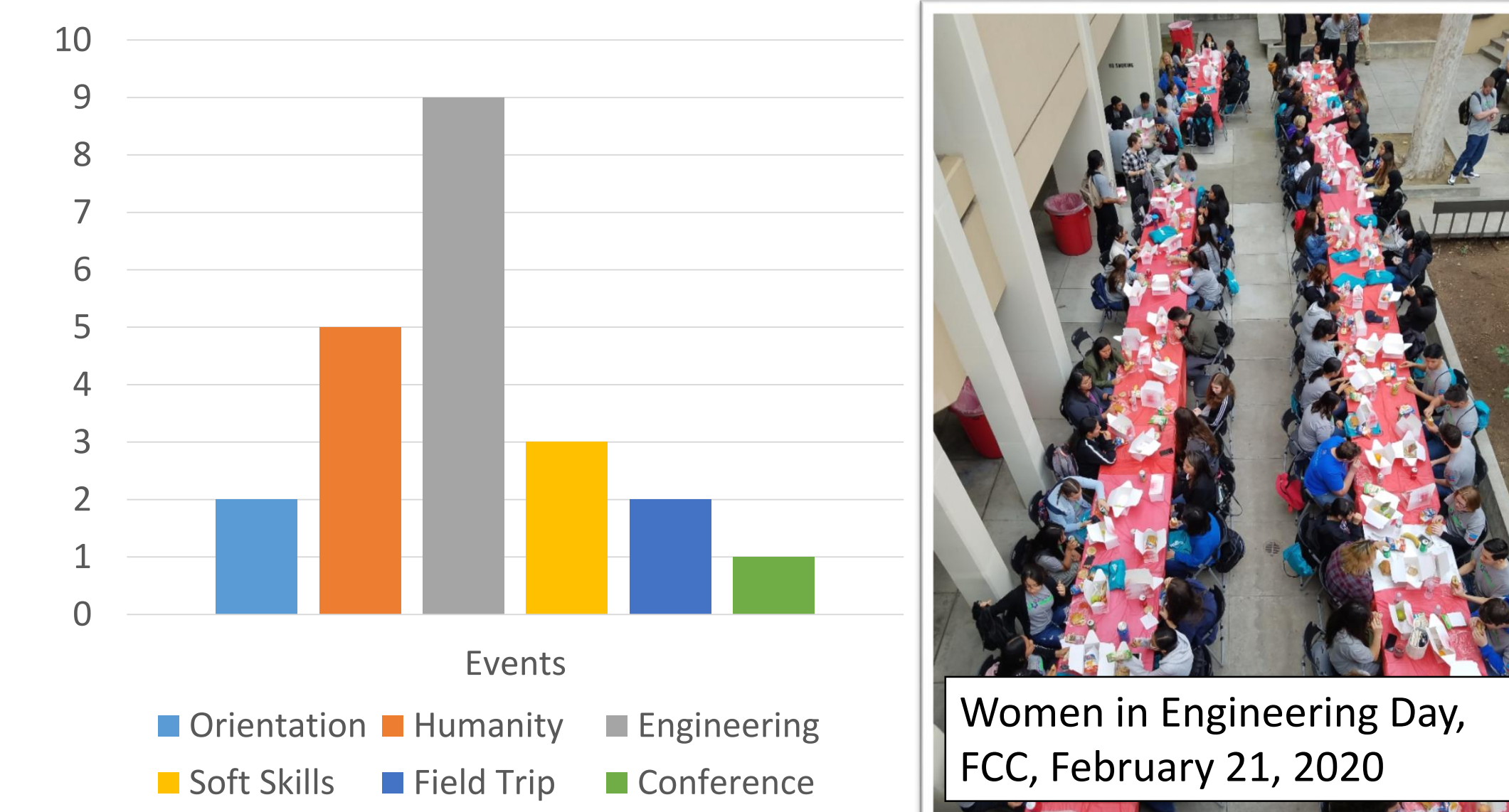
Experiential Learning: Attitude



Development: Faculty



Development: Students



Acknowledgement

Fresno City College **CLEMSON UNIVERSITY**

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