Hidden curriculum (HC) consist of the particular assumptions that are held by individuals about schooling that are manifested in practice (Smith, 2014). These assumptions can be recognized through socio-cultural interactions, experiences with their physical surroundings, or exposure to virtual environments (The Glossary of Education Reform, 2017; Killick, 2016; Margolis, 2001; Smith, 2014). HC has been explored widely in fields such as education, psychology, business, and medicine (Baird, Bracken, & Grierson 2016; Borges, Ferreira, Borges de Oliveira, Maconi, Caidana, 2017; Cotton, Winter, & Bailey, 2013; Joughin, 2010; Margolis, 2001; Rabah, 2012; Smith, 2014) but is relatively unaddressed in engineering (Erickson, 2007; Villanueva et al., 2018) and more specifically neither the positive or negative implications of HC in engineering have been explored. This study sought to use a mixed-method approach to understand the mechanisms behind HC recognition (via emotions and self-efficacy) for engineering students and faculty nationwide. 

### Frameworks

#### Emotions (EM)

In the classroom, relationships are integral to the learning and socialization process (Michael, 2015) of students and their instructors. These interpersonal interactions in the classroom are not devoid of emotion. Hargreaves posits that when a classroom environment becomes hyper-rational, data driven, and testing and tracking become target areas, factors such as “health, wellness, and physical activities are pushed to the sidelines” (Hargreaves, 2003, p. 2) leading to stress, burn-out, and dropout. Engineering is traditionally known as a rational and cognitively focused field (Matusovitch, Streveler, & Miller, 2013; Hilpert, Husman, & Carrión, 2014). While attaining an emotional understanding of the phenomenon of hidden curriculum may not be linear or intuitive, sub-conscious expressions, gestures, visible signs of interest, concentration, and self-identification and evaluation of their emotions and self-efficacies that can cue to them the supportive nature of their surroundings.

#### Self-efficacy (SE)

In academia and other settings, an individual must possess self-efficacy (SE) (Bandura, 1993, 2006) or an individual’s belief in their ability to succeed in specific situations or accomplish a task. Individuals with high self-efficacy are more capable of executing control over their own motivation, behavior, and social environment (Bandura, 2006). SE is an important regulatory tool for the management of challenges and setbacks (Bandura, 1993; 2006). Prevailing negative forms of HC in engineering could serve to block mechanisms of self-efficacy and deter an individual from executing control over their engineering education experience.

### Research Questions and Design

#### The underlying research questions for this study were:

1. In what ways are emotions self-reported by engineering faculty, graduates, and undergraduates when evaluating hidden curriculum?
2. In what ways are self-efficacy self-reported by engineering faculty, graduates, and undergraduates when evaluating hidden curriculum?

### Participants

As part of a larger study (Villanueva, Gelles, Di Stefano, Smith, Tull, Lord, Benson, Hunt, & Riley, 2018; Villanueva, Campbell, Raikes, Jones, & Putney, 2018), two hundred and forty-eight engineering participants (55 faculty, 54 graduate students and 139 undergraduates) were recruited electronically via email and through social media to complete a custom-created survey around hidden curriculum, emotions, and self-efficacy. All procedures were compliant with Institutional Review Board policies.

### Data Collection

Participants were asked to view a video vignette (Table 1) representing what the engineering education literature suggests are common issues of hidden curriculum, particularly around issues of social equity and inclusion (Margolis, 2001; Erickson, 2007; Tonso, 2006; 2014). Soon after, they were presented with a definition of hidden curriculum (The Glossary of Education Reform, 2017; Killick, 2016; Margolis, 2001; Smith, 2014) and some example statements (Table 2) of hidden curriculum identified in the higher education literature (Margolis, 2001; Smith, 2014).

### Data Analysis

The qualitative questions were collected and holistic and thematic analysis of the responses were conducted. To compare group responses, magnitude coding was also conducted to consider the instances where emotions and self-efficacy were self-reported; additionally, negative and positive emotions were tabulated among the participants.

### Results

#### Summary of Results:

- Across the 6 HC statements, undergraduate students self-reported the highest number of emotions the primary ones being “frustration” and “anger.”
- Negative emotions were self-reported 2x higher than positive emotions among undergraduates, 3x higher for faculty, and 1.3x for graduate students.
- Interestingly, high self-efficacy levels were reported mostly by faculty, while mid-levels of self-efficacy were reported mainly by undergraduate and graduate students.
- Qualitatively, participants from minoritized groups expressed higher levels of hidden curriculum awareness compared to their majority counterparts.
- Themes of inequities of access, resources, and respect for diverse groups in engineering were found among participant responses.

### Discussion

Together, the data suggests that amongst engineering faculty, graduates, and undergraduates, there is an overall lack of awareness of hidden curriculum, and more predominantly among the majority populations. One interesting finding was that each group responded differently to the emotions and self-efficacy self-reports to each HC assumption statement. Undergraduates expressed the highest incidences of negative emotions with mid-levels of self-efficacy. Graduate students reported disparate levels of negative and positive emotions with mid-levels of self-efficacy. Faculty expressed the highest instances of negative emotions (e.g., frustration) with the highest levels of self-efficacy across the statements.

### Significance

This work presents the first attempts to explore the mechanisms behind hidden curriculum in engineering via emotions and self-efficacy. Identification of hidden curriculum is central to an individual’s successful navigation of their education and future careers. The findings from this work can inform future mentoring, advising, and advocacy methods that can be used amongst colleagues of engineering to ensure equitable success of all individuals at all stages in this field.

### References

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