FAILING GRACEFULLY: A REFLECTION ON SCHOLARSHIP ENGAGEMENT IN ENGINEERING

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ABSTRACT

The reasons women engineers decide to resign the engineering field has been a significant focus in the current STEM literature due to high turnover rates of qualified women engineers from the profession (Fouad, Chang, Wan, & Singh, 2017; Singh, Zhang, Wan, & Fouad, 2018). While there is a significant number of women engineers that leave the profession due to the work environment and organizational structure of the engineering field, there are some that remain despite the adversity (Fouad et al., 2017; Singh et al., 2018). The purpose of this article is to provide insights into the elements that constructed my decision-making process, which resulted in a decision to persist working in engineering. In following John Dewey's critical reflection process, elements of my decision-making process considered the effect of stress on decision-making, the influence of identity development, and the influence of scholarly engagement on my persistence and final decision to remain in the engineering industry. As a result, the management of my physiological stress responses allowed for engagement in these scholarly activities in and outside of my school work. Furthermore, the engagement in scholarly activities are suggested to have strongly influenced the enrichment of established engineering identities.

Keywords: Reflection, scholarly engagement, women engineers, persistence, doctoral identity, John Dewey

STATEMENT OF THE PROBLEM

As a woman in engineering with two degrees in mechanical engineering and a productive career with foundations from the automotive, defense and now aerospace industry, I highly considered walking away from it all. Demanding pressures of product development and difficult work environments were overwhelming for me at six months pregnant with my second child. Therefore, resigning from the engineering profession seemed like the only viable option at the time. However, instead of resigning I chose to understand what was psychologically happening to me and all the other women who resigned before me. I enrolled in a doctoral program where I began my studies in psychology with emphasis on human performance. What was unexpected about this process was that the application of doctoral scholarship into my engineering profession provided validation, understanding, and explanations needed to make meaning of my experience. This motivated me to persist as a woman working in engineering, while simultaneously researching the underrepresentation of women in engineering. This paper describes my reflection of my engagement in scholarly practices, acquired from a doctoral program, into my profession of engineering.

In exploring the elements of my unique situation, I was able to identify three themes from current literature that are postulated to have initiated my consideration to resign from the engineering profession. The culmination of engineering as a demanding profession, the high-risk nature of engineering, and harsh work environments were sources that lead to my predicament, the decision to persist or opt-out from the profession. There

is no question that the engineering profession is a demanding profession due to the pressures of product development, as well as the risks involved with design (Giorgi, Leon-Perez, Pignata, Demiral, & Arcangeli, 2018). Long work hours accompanied with minimal rejuvenation can have a negative impact on the well-being of an individual as well as a reduction in their performance (Whitfield & Cachia, 2018). Most employees of engineering firms typically work under pressure to achieve a high quality, cost-optimized product with a demanding schedule (Giorgi et al., 2018). Engineers must contend with physical, psychological, and physiological factors in a healthy manner, or suffer the consequences that translate into their personal well-being, organizational performance, and unfortunately, our society (Olafsen, Niemiec, Halvari, Deci, & Williams, 2017). Additionally, the nature of engineering tasks, such as innovation and designing for our society, also involve the unnerving risks of catastrophic engineering failures. An article published by the American Society of Civil engineers revealed the nature of tasks as a primary concern of psychological distress among workers (Langdon & Sawang, 2018). Compounded with designing in a stressful, risky engineering environment, women engineers, unfortunately, experience harsh work environments. Much literature has revealed women engineers at various levels decide to leave the engineering profession due to the perception of a hostile work environment (Fouad, Singh, Cappaert, Chang, & Wan, 2016; Rincón & George-Jackson, 2016). This type of work environment produces additional stress and anxiety, directly affecting work performance (Olafsen et al., 2017).

Current literature calls for explorations of engineers' persistence elements such as the aspects of self-regulation (Concannon, Serota, Fitzpatrick, & Brown, 2018), professional identity and engagement in professional activities (Nadelson et al., 2017), and processes of their decisions (Bonneville-Roussy, Evans, Verner-Filion, Vallerand, & Bouffard, 2017). To explore these aspects, the subsequent sections detail the reflective process, as formulated by John Dewey (1933/2018). This reflective process was implemented to explore my decision-making process, which resulted in a decision to remain working in engineering.

STATEMENT OF PURPOSE

Reflective thinking, a concept attributed to John Dewey (1933/2018), provides a systematic approach to learning by critically thinking about an event or situation (Rodgers, 2002). John Mezirow (1990) and Dewey (1933/2018) both stress the purpose of reflective thinking to make meaning of an event. Participating in a reflective practice gives meaning to a situation by providing explanations that are based on theoretical evidence and are used in future attempts if the situation is experienced again. Dewey (1933/2018) asserts a reflective approach requires deliberate and intentional action based off what was learned from implementing systematic methodology. There are four fundamental principles to the practice of reflection, followed by six procedural steps that ensure an authentic and rigorous reflection occurs. The four principles, as outlined by Rodgers (2002), are as follows:

1. Reflection as a meaning-making process
2. Reflection as a rigorous way of thinking
3. Reflection in community
4. Reflection as a set of attitudes
   a. Whole-heartedness
   b. Directness
   c. Open-mindedness
   d. Responsibility
   e. Readiness (p. 845)

Rodgers (2002) concisely interprets Dewey's reflection process into six distinct steps. First, is the occurrence of the experience. A reflective approach allows for a methodology to understand experiences, situations, or events that were not deliberate or anticipated. Second, a first-order interpretation of the event allows for a person to define a starting point from which the process can proceed. Third is a definition of the problem. While this may seem straightforward, Rodgers (2002) identifies the difficulty in this step as being able to remove one's self from the personal experience. Fourth is the formation of explanations of the event, based on prior knowledge, as well as knowledge sought from a variety of domains. Fifth is highly integrated with the fourth but evolves the reflection process by intensifying the explanations into scientific hypotheses. This is done by utilizing theories, models, and other empirical research studies to help with the explanations. The sixth and last step is to test the hypotheses for soundness. At

the completion of these steps, Dewey identified the result as "a resolution to the disequilibrium" caused by the inquiry of meaning for the experience (as cited by Rodgers, 2002, p. 855).

DESCRIPTION

This next section will provide a description, in chronological order, of essential events that influenced my decision to stay. Furthermore, key thoughts and decisions made in those instances will be described, as they are believed to have contributed to my persistence in the engineering field.

The sudden inability to physically and mentally manage my demanding work environment was the earliest event that I had noted as unusual. The many responsibilities at my job created anxiety, stress, and a new sense of fear of failure. This paralyzed my decision-making abilities, which added to my negative feelings. In addition, my responsibilities to my husband, my toddler, baby on the way, and the three organizations at which I volunteered also demanded my time and resources. I consistently strived to over perform at each of these roles as I wanted to be defined by my commitment and contributions. I referred to the year of 2016 as the "Year of Fear" because I felt as if I had to perform perfectly to avoid failure in each of these roles. I remember being frustrated and confused as I had been successfully managing this type of stress and adversity for ten years. I felt completely lost between rational and irrational thinking.

While I believed pregnancy and hormones did affect the way I perceived the work environment, I knew not all stress and anxiety could exclusively be attributed to that. I attributed the stress and demanding work environment to limited resources (people and equipment), immense workload, and idealistic work schedules of projects. These demanding work circumstances stimulated the attrition rate and therefore cultivated the negative attributes of the demanding work environment. This is a commonality amongst all the previous production centric engineering design corporations I previously worked; my place of employment was not unique.

To address this anxiety, my husband and I planned to use the three months of maternity leave to develop a strategy to resign from engineering. We developed a three-step plan that included the development of a new family budget, updating my resume, and finally, the development of a new mindset. The development of a new budget was to plan the adjustment in our finances as we transitioned from two sources of incomes to one. This would help us live on a single income while I found a new job. My resume was to be updated so I could start applying for jobs which aligned with my career aspirations. We also agreed I would remain working until the end of the year to save up for my career change. Therefore, we agreed I needed a new mindset to survive the remaining six months of employment. I remember feeling the sense of security and peace that came from this planning and goal setting.

During my parental leave, I began reading Carol Dweck's book, *Mindset: The New Psychology of Success* (2006) to improve my mindset. This book resonated with me so emphatically I felt empowered to learn as much as I could about a growth mindset. I no longer viewed my world as a series of events working against me; I viewed my world as full of learning opportunities. Additionally, I reassessed past events I considered failures and asked myself what I could have done differently. By adding that last step to all previous failures, I recognized I was learning and growing as a person. My fear of failure was transformed into eagerness to learn; this is what I call *failing gracefully.*

By the end of my parental leave, I had decided my career change would require a Ph.D. Therefore, I enrolled in a doctoral program in psychology with an emphasis on human performance to investigate the psychological reasons women engineers leave the profession. I reasoned it was a novel way to contribute to the field of engineering. Therefore, my journey as a doctoral student in psychology began when I enrolled to understand the attrition of women from engineering. Scholarly instruction began by learning to critically research a problem through empirically based articles, to ensure the research had been through a systematic and rigorous peer-review process. As each class went on, I applied the perspectives, thoughts, and theories to the problem of the underrepresentation of women in engineering. Subsequently, the research studies validated my feelings, and my work environment became more manageable. I did not expect what I was learning would motivate me to persist working as an engineer.

While I had initially planned to use my doctoral education to obtain an alternative career, I ended up discovering I could use my job as a place to informally observe and investigate theories learned in my courses. As an example, the doctoral program explained that the establishment of a doctoral identity strongly supported the persistence within the doctoral program and the completion of a terminal degree (Smith & Hatmaker, 2014). The research study indicates doctoral candidates' doctoral identity is formulated through scholastically conversing with other learners and engaging in academic scholarship (Smith & Hatmaker, 2014). From this, I assessed my engineering identity and realized certain aspects, such as isolation and disengaged work tasks, could potentially be contributors to my consideration of resigning. My doctoral work was fueling the metacognitive processes of understanding why I felt the way I did about myself as an engineer.

At the same time, I was researching empirical studies, developing a doctoral stance and viewpoint based on empirical, peer-reviewed research, I was doing the same on a similar topic in engineering. The topic was directly related to my current job task, and I remember reflecting on my sense of belonging to the engineering community. Based on all I knew from empirical and peer-reviewed articles on Highly Accelerated Life Testing (HALT), an engineering reliability test method, I remember truly identifying as an engineer.

Fundamental theories from psychoanalysis, behaviorism, humanistic, transpersonal, and existential psychology were learned and applied to understand why women in engineering resigned. Theories of inquiry, human performance psychology, and psychological statistics transformed my research question from "why do women leave?" to "why do they stay?" All throughout the process, the question of "why?" was asked. I worked through understanding what was happening to me by maintaining a presence in engineering and seeking answers from a psychological perspective.

My doctoral scholarship allowed me to organize a comprehensive and sound synthesis of my understanding of my experience. I was motivated to prepare relevant content to explain how I was able to change my mindset at a national conference for women engineers, where 13,000 participants were expected to attend. Based on Dweck's theory of mindset and perception of intelligence, I provided a thorough explanation of my most personal story to over 200 strangers in a breakout session (Haimovitz & Dweck, 2016). By presenting mindset and intelligence theories as they applied to my experience, it was my hope other women in situations similar to mine could relate. Presenting at the national conference was due to a sense of responsibility to the generation of women engineers embarking on the life transitions I had just survived. Yet, I felt that my personal experience, deliberating whether to remain working as an engineer or to resign, could be interpreted negatively by many. This extreme vulnerability made me rethink my presentation to the point I almost did not go through with presenting. However, I reasoned that if it helped at least one person, it was the right thing to do. Additionally, I came to the justification that this would be practice for theory synthesizing, residency preparation, and dissertation defense. My doctoral scholarship provided me the process to provide sound evidence supporting my observations and transformed my story into a scholastic exercise of synthesis. A sense of responsibility to the next generation of women engineers forced me to vulnerably expose my instability, but my doctoral engagement allowed me to be prepared and effective.

I recall the most daunting step was practicing in front of family, friends, classmates, and coworkers. Exposing my vulnerability to my engineering manager and high-level directors within my company was the most intimidating step. However, this process became the most validating and rewarding as it resulted in positive feedback, remarks of similar experiences, observations of gaps in the explanations and theories, and encouragement to persist with the momentum of my research.

At the national conference, my room was full of 200 strangers that included men and women interested in my topic on how I worked through deciding to persist in engineering.

Several women, overcome with emotion, came up to me and explained my story could be theirs. They expressed they felt a sense of validation based on the theories I described and were relieved to know they were not alone in their struggle. Surprisingly, I had a manager from one of the nation's largest tech companies ask me for a

summary in electronic format. He wanted to share a summary of the content with his employees as he felt it was relevant to all engineers dealing with the anxiety of stressful work conditions, a problem not specific to women.

The feedback from engineers at all stages within their careers brought closure to an unsettling period of growth. Strangers openly revealed they struggled with the exact same things I presented but never had the language to describe what they were experiencing. The extent to which my experience resonated with other engineers motivated me to persist in the field of engineering and motivated me to engage more as a scholar.

REASONS FOR THE PROBLEM

While these essential events that influenced my decision to stay can be viewed as simple facts, they contradicted the rules in which I constructed my epistemic foundation. Dewey's approach to reflection refers to these events as observed and limited if one does not consider a higher complexity for its truth (Dewey, 1933/2018). Mezirow (1990) identifies this step in the reflection process as challenging our "presuppositions on which our beliefs have been built" (p. 1). In searching for a higher complexity of the truth, three pivotal events emerged as possible reasons why I decided to remain in engineering. The following subsections will propose possible reasons why these events contributed to my decision to remain in the engineering profession.

The Effects of Parental Leave on Cognitive Processes

Parental leave and family medical leave policies require an individual to abstain from working during this duration. Parental leave provided me a three-month mental and physical break from my stressful environment. My environment changed from a stressful work environment to the peacefulness and security of my home. Feelings of sickness and threat were eliminated because, for a short period of time, I was no longer responsible for dealing with confrontations with respect to my work tasks. I felt as though a significant load was lifted from my back. The only responsibilities I had were to my family. This time off work provided me an instance where my stress and anxiety were reduced. I felt like I was in a recovery period and was able to clear my thinking.

Engineering and Scholarly Identity

The enhancement of my engineering identity was a result of the initial development of my doctoral identity. In my curriculum, the intention of focusing on the development of a doctoral identity was to help learn to navigate through the doctoral journey by means of scholarly engagement (GCU, 2016). Furthermore, to progress from a learner to a researcher required the learner to identify as a scholar. What was practiced as a doctoral learner developed into a characteristic I transposed to my identity as an engineer. Scholarly engagement was initially practiced in a safe manner through course discussion questions and class essays. This provided feedback and developed my doctoral identity. This subsequently provided confidence in my communication as I perceived myself as a doctoral learner who could communicate in a scholarly manner. This confidence in communication was then tested in my profession as an engineer and resulted in the same type of confidence and engineering identity development. Therefore, I observed the identity development process could be applied in both domains, engineering and academic, and result in the same manner.

Scholarly Engagement

While the application of psychological theories into my experiences as engineer allowed me to make sense of my reaction to resign from the profession, engagement in academic discussions and presentations provided valuable feedback on how I was performing as a doctoral learner. This feedback built confidence and developed both of my identities. Synthesizing these theories was a necessary skill that allowed for me to organize and present my thoughts and ideas, yet have them grounded in scholarly evidence. By actively participating in the process of synthesizing, engaging, and receiving feedback, I was receiving information from others on how I was existing as a scholar. When professors corrected my language during discussions, I quickly noted my mistake and corrected myself. Throughout this process the result of one attempt at being scholarly, whether it be a conversation or essay, would be applied to the next attempt. I recall receiving critical feedback on one presentation that was addressed by adding supporting evidence from a research study prior to the presentation at the conference. Both positive

and negative feedback was strongly desired as I wanted to make a sound argument. Additionally, the positive and encouraging feedback from my professors on my writings, ideas, and discussions in class gave me the confidence to present my content at the national engineering conference. My main intention was to receive feedback on my content from the engineering domain and then for it to advance my doctoral research direction.

EVALUATION OF REASONS FOR THE PROBLEM

This fifth step in the reflection process creates the theoretical foundations for the meanings of the afore described experiences. Mezirow (1990) identifies this as the procedural step in the reflection where we are enabled to "correct distortions in our beliefs" (p. 1). Mezirow (1990) identifies this step as instrumental due to the ability of "learning to control and manipulate the environment" to achieve the best possible action and outcome based on rigorous theories or models (p. 3). The following subsections will use theories, models, and empirical studies to further evaluate the proposed reasons as foundations for my decision to remain in the engineering profession.

Theories Evaluating the Effect of Parental Leave on Cognitive Processes

A notable difference was my perception of my work environment before and after my parental leave. Parental leave required I take time away from work to care for my newborn and myself, but also allowed for a reduction in anxiety and stress from work. Hewitt, Strazdins, and Martin (2017) investigated the effects of a universal paid parental leave (PPL) on the health and wellbeing of their employees. The study suggested a longer paid maternity leave was positively correlated with the duration of a PPL for professional mothers; they had the ability to combine the universal PPL with the leave from their employers to create longer durations. It further postulated it reduced stress due to the secure income and delaying exposure of their young infant to sicknesses from childcare as a contributor to the well-being of the employees. The responses of stress from a physiological and cognitive perspective are further evaluated based on models of stress. Furthermore, the effects of stress on cognitive processes are explored through a cognitive neuroscience perspective.

Dhabhar (2018) explains a three-part model of stress occurring in the following manner. First, a person is exposed to the stressor, followed by their formation of a perception of the stress, and followed by a response to the stressor based on the calculated perception. Similar models of stress also follow the stimulus, organism interpretation, and physiological and psychological response (Silva, 1990; Smith, 1986). However, in addition to the harmful effects, Dhabhar (2018) argues the protective and beneficial effects of stress. Dhabhar (2018) contends short-term stress may be beneficial up to a certain point, as biological responses can enhance cognitive and physical performance. Zhao, Yang, Liu, and Zeng (2018) use the Yerkes-Dodson Law (1908) to elucidate the effect of stress on performance. The model represents performance as a function of these positive and negative emotional influences, illustrating an optimal point where a moderate amount of stress results in optimal performance. At this time in my decision-making process, the models suggest physiological fight or flight systems were initiated due to the culmination of events, resulting in my response to resign from my job (Dhabhar & McEwen, 1997, as cited in Dhabhar, 2018). This contrasts with how I viewed my environment post-parental leave. When a perception of a challenged is received, an individual's innate survival mechanisms do not deploy, and cognitive processes are not negatively altered (McEwen & Sapolsky, 1995; Putwain, Symes, & Wilkinson, 2017). After maternity leave I was able to view my work environment as a challenge and demonstrated motivation to further engage. Research examining spatial memory performance and stress hormones demonstrate the correlation from a neurobiological point of view (Conrad, Lupien, & McEwen, 1999; McEwen & Sapolsky, 1995). Although, exposure to stress for too long of a duration has negative effects that can be harmful to one's wellbeing (Dhabhar, 2018; Olafsen et al., 2017). Constant, long-duration exposure to stress is suspected to permanently alter the brain structure by damaging neurons (McEwen & Sapolsky, 1995).

Drawing from the results of the studies by McEwen and Sapolsky (1995), the time away from my stressful work environment allowed for hormone levels to normalize. Fortunately, this is thought to have allowed my memory and other cognitive processes to additionally be restored (Conrad et al., 1999). Therefore, the ability for me

to change my perception of my environment to that of a challenge was permitted.

Theories Evaluating Engineering and Scholarly Identity

The development of my doctoral identity stimulated the reassessment of my engineering identity. This resulted in an updated engineering identity that influenced my decision to remain in the engineering profession by allowing me to once again identify as an engineer. The identity formation happens when an individual understands what it means to be (Ennals, Fortune, Williams, & D'Cruz, 2016; Zoltowski, Buzzanell, Brightman, Torres, & Eddington, 2017). Identity formation is described as the integration of acquiring the specific skills of a domain with the attainment of knowledge of what it means to be a member of that domain (Smith & Hatmaker, 2014). The birth of my second child created a shift in my engineering identity as I did not know how to be a mother of two, working the expected long work hours, and accomplishing tasks.

The engineering work culture valued employees that put extensive time and effort beyond what was required into work. This was something I could not do at the time. An identity development for a domain is dependent on interpreted domain values, efficacy of skills needed, and is strongly correlated with persistence (Smith & Hatmaker, 2014; Vogel & Human-Vogel, 2018; Zoltowski et al., 2017). My values and beliefs were not aligned with the work domain due to my newly added responsibilities of a new baby and consequently disrupted my commitment to the profession.

While an engineering ontology differs from a doctoral ontology, I discovered the epistemic process is closely related. Much research on doctoral identities acknowledges the tacit elements in the process of a learner's transition to a scholar such as attainment of knowledge and values of a domain (Ennals et al., 2016; Gardner, 2008). The progressive change in responsibilities from "consumer of knowledge" to "creator of knowledge" mirrored my change in responsibilities from an engineer to the next level engineer (Gardner, 2008, pp. 328; Smith & Hatmaker, 2014). My doctoral tasks required me to create a doctoral voice and therefore allowed me to practice being a scholar and demonstrate what I knew, which then resulted in my doctoral identity formation. Being affords an individual to develop their professional identity through mentoring relationships, scholarly or professional engagement practices (Ennals et al., 2016; Smith & Hatmaker, 2014; Vogel & Human-Vogel, 2018; Zoltowski et al., 2017). Research investigating the identity formation of doctoral students in public affairs, as well as occupational therapy scholars, emphasized values and engagement as aspects of their doctoral identity development (Ennals et al., 2016; Smith & Hatmaker, 2014). Additionally, research investigating the relationship between persistence of engineering students in their academic program and their professional identity was also influenced by their values and engagement in professional activities (Vogel & Human-Vogel, 2018; Zoltowski et al., 2017). Therefore, because I also practiced being the next level engineer, my engineering identity was redeveloped in parallel. The development of my doctoral identity through engagement with my engineering colleagues was by means of my doctoral compositions. This socialization subsequently positively affected my decision to remain working in the engineering profession.

Theories Evaluating Scholarly Engagement

The key concept to identity development is first, engagement. I would argue identity development cannot happen without the first step of engaging in one's community. The process of scholarly engagement is recognized as a facilitating method in which scholars can collaborate with professional industries to validate academic knowledge with industry knowledge (Berei et al., 2017; Everingham, McLean, Mancini, Mitton, & Williams, 2018; Lyken-Segosebe, 2017). Harpe and Phipps (2018) use a slightly varied process based on Ernest Boyer's (1990) seminal work, to emphasize the purpose of the model of scholarly engagement is to teach and learn. The process I followed of synthesizing theories and empirical studies, engaging with both professions, receiving the feedback, and iterating is acknowledged in research studies as maintaining industry currency through the academic-industry relationship (Everingham et al., 2018). Presenting psychological theories as it related to my experience in engineering to several engineering centric audiences, allowed me to define a research process in which to engage both my professional and doctoral realms.

The process of engaging in collaboration with

both fields promoted my self-efficacy and identity development, a concept expected to increase self-efficacy of the learner (Berei et al., 2017). Collaboration was necessary for the progression of my doctoral thoughts and ideas and is proposed as a cornerstone of scholarly engagement (Lyken-Segosebe, 2017). A qualitative research study revealed collaboration as one of four thematic concepts after assessing scholarly engagement of physical education faculty (Berei et al., 2017). Therefore, the participation of scholarly engagement with my engineering profession by means of my doctoral activities, simultaneously affected my persistence in engineering.

DECISION

The 5-Whys approach was utilized to evaluate the reasons, outlined in the previous sections, to determine the cause for my persistence as a working engineer. The method was chosen because it is a systematic and straightforward root-cause analysis (RCA). An RCA can be performed through several different approaches; however, the outcome is always to arrive at a cause for a problem's occurrence (Peerally, Carr, Waring, & Dixon-Woods, 2017; Perry & Mehltretter, 2018). The 5-Whys method was developed by Sakichi Toyoda, inventor and industrialist, but further distinguished by Taiichi Ohno to become integral part of the Toyota Production System in identifying the root-cause reason for an occurrence (Chiarini, Baccarani, & Mascherpa, 2018; Ohno, 1988). The benefits of this method are recognized in the manufacturing and production fields, and is recognized as a prominent methodology in the scientific literature (Braglia, Frosolini, & Gallo, 2017). The main criticism of this approach is that practitioners of this methodology are limited in their knowledge of the root-cause of this problem (Braglia et al., 2017; Serrat, 2017). However, this method is ideal in this situation for the following reason. As part of the reflection process, and in contrast to critiques of this RCA method, the researcher is required to "cast their minds beyond current information and knowledge" by means of scholarly literature (Serrat, 2017, p. 310). Dewey (1933/2018) asserts "the reflex of the scientific method of experimentation" is part of the process that requires the researcher to "deliberately and intentionally [endeavor] to bring about the conjunction[s]" of the circumstance (p. 105). This was completed with the support of the theories and models outline in the previous section. Furthermore, the purpose of the four fundamental principles of the practice of reflection address the concerns of solely relying on deductive reasoning.

The 5-Whys process was performed as follows:

1. Why did you decide to remain in engineering?
   a. Because I finally identified as an engineer.
2. Why did you finally identify as an engineer?
   a. Because I engaged in engineering practices and received positive feedback.
3. Why did you engage in engineering practices and receive positive feedback?
   a. Because I engaged in scholarly practices.
4. Why did you engage in scholarly practices?
   a. Because I enjoyed the positive feedback from my professors and engineering peers.
5. Why did you enjoy positive feedback from my professors and academic peers?
   a. Because I looked forward to implementing the feedback into my next attempt at further scholarly practices.

The 5-Whys analysis indicates the challenge, and not threat, perception of future engagement in scholarly practices were the reason for my persistence in engineering as the root cause. Aligning with this result is the research study by Putwain et al. (2017) that demonstrated a significant correlation between an individual's assessment of a situation as a challenge and an increase in behavioral engagement.

Additionally, Dhabhar's (2018) three-part model of stress explains my perception and subsequent lower stress response as my perceived environment was not activated the performance reducing fight or flight systems. Dhabhar (2018) asserts that an individual's unique genetic, experiential, and environmental aspects should be considered when applying the principles of the stress model to understanding a phenomenon. This suggests that the same stressor, such as an environment, can be perceived differently based on the cumulative experiences of an individual. These models help highlight the differences in perception of my environment before and after parental leave. Additionally, the Yerkes-Dodson (1908) model of performance, gives the theoretical foundation to understand the physiological occurrence as a

function of anxiety and stress. Increased cognitive processes have a significant positive correlation to lower levels of stress (Conrad et al., 1999; Dhabhar, 2018). My perception of my environment as a challenge, opposed to a threat, presents itself as a plausible reason for my persistence in engineering (Conrad et al., 1999; McEwen & Sapolsky, 1995). Moreover, the last answer (5a) indicates fight or flight systems were disengaged because I looked forward to future attempts of engaging in scholarly practices. This allowed for scholarly engagement to occur. The "further scholarly practices" indication suggests the implementation of feedback into future iterations of scholarly work in both engineering and doctoral domains. This process aligns with the four forms of scholarship from Boyer's theory of the scholarship of engagement: "discovery, integration, teaching, and application" (Everingham et al., 2018, p. 85). The result of the RCA reveals an integration of both, a reduced physiological responses and scholarly engagement as the reason for my persistence in engineering. Using the 5-Whys RCA method, I conclude both scholarly engagement and the perception of this engagement as a challenge are the reasons for my persistence as a working engineer.

REFLECTIVE CRITIQUE

This paper utilizes Dewey's (1933/2018) reflective practice to explore how the aspects of stress on decision-making, identity development, and scholarly engagement influenced my decision to persist in the engineering field. While Dewey's approach was used in this article, there are several other approaches that can be implemented. Models such as Schön's (1987) reflection-in-action, and Mezirow's (1990) transformative learning are both consistent with Dewey's (1933/2018) approach to make meaning of an experience, situation, or event. All approaches require the practitioner to apply theory to support, or argue against, reasons for the problem of the experience. The practitioner is then able to choose the best possible answer as a product of synthesizing experience and the "produced cases" of explanation; Dewey indicates this process "secures scientific warrant" for the result (1933/2018, p. 105). As Rodgers (2002) thoughtfully acknowledged, Dewey's writing style is complex as it integrates his philosophical perspective with his argument for the benefits of thinking reflectively. The benefits of Dewey's reflective process is its precise requirements and the resulting rigor.

This reflection currently affects my decision to remain in the engineering field by giving awareness to my daily decision to persist. The first, second, and third steps in the reflective process identified and formulated a baseline event: the decision to remain in engineering despite the culmination of stress, identity, and engagement. Stress and anxiety are still present in my experiences at work, although I am learning to control my location on the Yerkes-Dodson (1908) model of performance and stress by practicing all I have learned from this experience. As the pressures from the work environment never cease to exist, I have engaged in practicing coping mechanisms such as positive self-talk (Karamitrou, Comoutos, Hatzigeorgiadis, & Theodorakis, 2017), focusing on proficient skills, and focusing on progress (van der Kolk & Kaufmann, 2018). This direction was taken as a result of reading practical implications as detailed in current literature (Cotterill, 2017). Additionally, engagement in scholarly practices within the engineering field and my doctoral program are still practiced. My initial presentation at the national engineering conference resulted in two subsequent presentations on these topics from two different viewpoints: diversity and inclusion, and technical innovation and risk. This activity required me to, once again, iterate through the scholarly engagement process. Therefore, based on this reflection, I am participating in scholarly engagement opportunities preparing future presentations, as I now understand its implications for my identity development. This baseline as a result of this reflection allows for me to constantly assess and manage these elements which, through this reflective process, were identified as critical to my persistence. Should the decision to remain in the engineering industry or opt-out present itself to me in the future, I will highly consider the root cause of the problem.

Other practitioners trying to understand the reason for the underrepresentation of women in engineering can use this reflection in a variety of ways, although there are two that should be noted. The first way this reflection can be used is to provide a glimpse into the lived experience of a woman engineer grappling with the decision to leave or stay working in engineering. The second

is to consider the elements of the decision-making process women engineers use to evaluate their decision to persist or to resign.

Subjective experiences are unique in the way individuals perceive information due to chemical, physical, and cognitive aspects unique from individual to individual (Dhabhar, 2018). This helps practitioners to understand the same stressful situation can be perceived as a nonthreatening motivator to some women in engineering, while other women engineers can view the same stressful situation as threatening that impedes their motivation; subsequently affecting their performance (Dhabhar, 2018; Putwain et al., 2017). The discrepancy between qualified, established women engineers and their resignation can be construed as a defense mechanism for perceived threats and not a deficiency in the capability of the engineer (Dhabhar, 2018). A substantial amount of research has been conducted on the phenomenon of qualified and established women engineers resigning from workforce that points to the environment in which the women are expected to operate (Cadaret, Hartung, Subich, & Weigold, 2017; Cardador & Hill, 2016; Fouad et al., 2016; Fouad et al., 2017; Mlambo & Mabokela, 2017; Seron, Silbey, Cech, & Rubineau, 2016).

Elements within my personal reflection indicated three primary elements that constructed my decision to remain in the engineering field. This process can be used by practitioners to explore elements of other engineers decision-making process that might have experienced the same dilemma and external culmination of events. Furthermore, the results of this reflection can be compared to evaluate similarities, patterns, or differences to fully understand the phenomenon of the persistence of women engineers.

This reflection gives significance to a single established woman engineer's decision-making process and the navigation through a decision to remain employed in the engineering industry. It is recommended to explore more than one perspective of the decision-making phenomenon women engineers perform, or performed, to decide to persist despite the stressors caused by the nature of engineering and the challenging work environments. Additionally, the results of this reflection concluded once I made the decision to remain working in the engineering field. Future research would benefit from understanding how established women engineers continue to manage their decision to persist working in the engineering field. Through women engineers' perceptions, future research should explore self-regulation, self-management, and coping mechanisms utilized by these established women engineers to persist despite their working conditions. It provides future inquiries for practitioners seeking to understand the underrepresentation of women in engineering.

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