THE IMPACT OF CHANGING ENGINEERING PERCEPTIONS ON WOMEN'S BEHAVIORAL INTENTIONS TO PURSUE AND REMAIN IN ENGINEERING FIELDS

by

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ABSTRACT

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In recent decades women have continued to move towards, and even reach, equality with men in terms of educational and professional representation and success in numerous fields. Yet women consistently are underrepresented in the field of engineering in both settings. The present study sought to develop and test interventions in both academic and employment settings aimed at promoting women's behavioral intentions to pursue and remain within engineering. Grounded in *Social Role Theory* and the *Theory of Planned Behavior*, I proposed that an intervention involving a shift of emphasis in the perceptions of engineering toward the communal and people-oriented aspects of engineering roles – increasing engineering's alignment to women's gender identity.

To empirically test the effectiveness of the intervention, I conducted two studies using two populations of women. The first study involved women who had not yet declared a major and the second study involved women who were presently working as an engineer. The aim was to examine the effectiveness of the intervention to increase women's intention to pursue an engineering major and women's intention to remain versus leave an engineering career, in Study One and Study Two, respectively. I predicted that women in the condition emphasizing the communal and people-oriented aspects of engineering would experience more positive outcomes as compared to women in the condition emphasizing the agentic and thing-oriented aspects of engineering.

Collectively, the results were mixed in terms of supporting the effectiveness of the intervention on the outcomes of interest for the study populations. For Study One, there was substantial support for the intervention's positive impact on women's attitudes and behavioral intentions, particularly for women who had not previously considered engineering. However, for Study Two, there was no support for the intervention's

effectiveness. While helping to improve women's intention to pursue engineering is important, future work must continue to seek theoretically and empirically founded ways to improve women's state in engineering across all stages of the academic and employment cycle.

INTRODUCTION

Over the last several decades women have continued to move towards, and even reach, equality with men in terms of educational and professional representation and success in numerous fields in the United States. Yet women consistently are underrepresented in the field of engineering in both settings. Collectively over half of all degrees are earned by women and almost half of the workforce is comprised of women, but in engineering women continue to earn less than a quarter of bachelor's degrees awarded and comprise less than one fifth of the workforce (Society of Women Engineers [SWE], 2018). This statistic is particularly troubling when considering that women's representation in engineering has remained essentially stagnant the last two decades despite women reaching parity with men in other traditionally male-dominated fields such as law, business, medicine, and other science and mathematics [STEM] fields (SWE, 2019). The persistence of women's underrepresentation in engineering has led universities and organizations to seek theoretically and empirically grounded ways to increase the recruitment and retention of women in engineering.

Recent research has proposed that while many factors likely lead to the underrepresentation of women in engineering, one key psychological factor is the *perceived* disconnect between engineering roles and a woman's gender identity (i.e., *Social Role Theory*; Diekman, Weisgram, & Belanger, 2015; Eagly & Wood, 1999) leading to outcomes that diminish women's behavioral intention to pursue or remain in engineering (i.e., *Theory of Planned Behavior*; Ajzen, 1991; 2002). More specifically, women's inclination towards communal, people-oriented work, or work that affords them the opportunity for collaboration and/or helping others (Boucher, Fuesting, Diekman, &

Murphy, 2017; Diekman & Steinberg, 2013), does not correspond with engineering fields which are often perceived to be agentic and thing-oriented—two traditional dimensions of engineering. This disconnect leads to negative attitudes, a diminished sense of belonging, and low self-efficacy towards engineering which negatively impacts women's behavioral intentions to pursue or remain in engineering (Diekman, Brown, Johnston, & Clark, 2010; Diekman, Clark, Johnston, Brown, & Steinberg, 2011; Hill, Corbett, & St. Rose, 2010; Su, Rounds, & Armstrong, 2009; Webb, Lubinski, & Benbow, 2002).

Based on past findings and relevant theories, I propose that a key to increasing women's intention to pursue and remain in engineering both at educational and professional levels may be to *change* the *perceptions* of engineering by highlighting communal, people-oriented aspects within engineering (Eagly & Wood, 1999). Initial work has demonstrated experimentally that reorienting one's perception of engineering fields to be more communal or people-oriented can increase women's proclivity towards these fields (Diekman & Steinberg, 2013). Building on this work I seek to further develop and test the idea that a shift of perception regarding engineering's communal attributes, both in educational and organizational contexts, may lead to more positive evaluations, greater sense of belonging, and increased self-efficacy towards engineering which can ultimately increase women's behavioral intention to pursue and remain in engineering.

Specifically, I propose that describing engineering fields (i.e., major descriptions) in more communal, people-oriented terms and by encouraging women to reflect on their engineering work in more communal and people-oriented ways (i.e., daily diary reflections) can lead to outcomes that ultimately increase behavioral intentions to pursue and remain in an engineering field. This work will provide an experimental test of gender-identity focused interventions, derived on the basis of *Social Role Theory* along with the *Theory of Planned Behavior*, to determine its effectiveness in addressing women's intentions to pursue and remain in engineering at two points in the academic-employment cycle.

To provide foundation for this work, I first review the current state of women in engineering to establish the need for developing an evidence and theoretically based intervention. Following this section, I will provide an overview regarding past work involving both the selection and retention intentions of women in engineering in educational and organizational contexts. Next, I will shift focus to the proposed psychological factors contributing to women's underrepresentation within the integrated theoretical framework based on *Social Role Theory* and influenced by *Theory of Planned Behavior*. This review will provide theoretical support for the components of these theories as key mechanisms for this intervention.

The State of Women in Engineering

The state of women in engineering has captured the attention of governments, universities, organizations, and researchers alike. The United States, among other nations, has established women's underrepresentation in engineering and other STEM fields as a top priority to address due to its immense social and economic consequences (U.S. Department of Commerce, 2017). Many STEM-oriented colleges and STEM-reliant organizations have made it a priority to increase women's representation and success in STEM fields broadly as well (e.g., American Association of University Women [aauw.org]; GE Reports Staff, 2017). The amount of attention on this matter is well deserved considering that at all stages of the engineering educational and organizational life cycle women are underrepresented. Women are less likely than men to (1) select an engineering field of study, (2) remain in an engineering field of study, (3) choose an engineering-related job post-graduation, and (4) remain in an engineering career long-term.

Exploring the State of Women in Engineering

Burgeoning research on women's state in engineering has led to an expansive, and at times disjointed, literature on the factors that contribute to women's underrepresentation in engineering and STEM fields more broadly. Numerous papers have been devoted solely to the review of this literature and the factors that have been proposed to explain the underrepresentation (e.g., Kanny, Sax, & Riggers-Piehl, 2014; Kossek, Su, & Wu, 2017; Wang & Degol, 2013). Across these reviews, there are several recurring factors including women's actual and perceived abilities in science and mathematics courses, stereotypes about the work one does in these fields, limited role models, insufficient educational experiences and support, lack of interest, and a chilly climate (i.e., unwelcoming climate), among others.

Researchers importantly note that these are not standalone factors, but rather are characterized as "overlapping sources of impact" (Kanny et al., 2014, p. 134), yet they are rarely discussed as such. Therefore, while there are multiple factors underlying women's underrepresentation in engineering, I seek to focus on joining these ideas within the prominent *Social Role Theory* complimented by the components of the *Theory of Planned Behavior*–enabling the consideration of many of the factors unearthed in the rich research thus far of this topic while allowing a more substantial and comprehensive theoretical grounding.

Theoretical Foundation for Women's Underrepresentation in Engineering: Social Role Theory

To best understand the origins of gender differences within the field of engineering, it is important to consider the premises set forth by *Social Role Theory* which is prominently featured in the explanation of gender differences as well as in understanding the implication of these differences (Eagly et al., 2000). Generally, *Social Role Theory* proposes that the positioning of men and women in both past and present social structures and roles generated differences in beliefs regarding the roles themselves as well as the attributes, beliefs, and expectations of and for men and women who occupy them.

According to this theory, men and women's placement in the social structure originates from biological sex differences, such as women's ability to bear children and men's innate physical strength. Historically, these differences required men and women to adopt different social roles for familial and societal functioning, such that women had to take on the role as the caregiver and men had to take on the role as the provider and protector. These different roles led men and women to develop particular and distinctive skills and qualities that allowed them to be successful in their specific social role. For men, the development of agentic traits such as competitiveness, ambition, and self-orientation proved to be beneficial; whereas, for women, the development of communal traits such as being helpful, compassionate, and people-oriented proved to be important. Over time, women's assignment to this position within the social structure resulted in what some may argue are observed gender differences in attributes and preferences, as well as stereotypes regarding what a man and woman should be. More specifically this socialization led to men adopting more agentic traits and preferences and a woman to adopt more communal traits and preferences, or at least, have the societal expectation of possessing these attributes (Abele & Wojciszke, 2007; Bakan, 1966; Deaux & LaFrance, 1998; Judd, James-Hawkins, Yzerbyt, Kashima & Yoshihisa, 2005). Further, these social role divisions led to certain expectations and beliefs surrounding the roles themselves such as the types of attributes and orientations one needs to have to fit in, be successful, and be happy in a given role (Cejka & Eagly, 1999).

Implication on women's values and orientations. Despite men and women often being more similar than different on many attributes (Hyde, 2005), women's communal, people-focused orientation is a gender difference that has remained stable and significant, which is consistent with the propositions of *Social Role Theory* (Eagly & Diekman, 2003; Diekman et al., 2011; Twenge, 1997). A meta-analysis of gender differences in job attribute preferences showed the greatest differences were women's preference for helping people (d = -0.35) and working with people (d = -0.36) such that women's preference was greater on both as compared to men (Konrad, Ritchie, Lieb, & Corrigall, 2000; Su et al., 2009). Even women who indicated enjoying working with things, reported that they preferred to work with people as compared to things (Su et al., 2009).

Implication on engineering role perceptions. For decades engineering has been inundated with stereotypes regarding the type work it entails, the benefits gleaned from the work, and the type of people best suited for these roles. Many of these propagated stereotypes revolving around ideas such as engineers "must love math and science" or that “engineers sit at computers all day” leading to “social isolation” with an “intense focus on machinery” (Cheryan, Master, & Meltzoff, 2015; Purdue Engineering, 2017).

While many dismiss these stereotypes as biased-based inaccuracies, according to *Social Role Theory*, these stereotypes regarding engineering and other roles often emerge from gender representation within these roles (Cejka & Eagly, 1999). In other words, stereotypes regarding roles do not occur because of a flaw in human nature or processing, but because they reflect social convention more often than not–a feature that evolutionarily served humanity well–but now has the potential to further engrain the status quo (Cejka & Eagly, 1999; Jussim, Cain, Crawford, Harber, & Cohen, 2009).

Subsequently, while *Social Role Theory* proposes that people’s beliefs and expectations regarding men and women were derived from their sex-typical work, the reciprocal link is also believed to be true such that gender-based stereotypes regarding certain occupations lead to sex segregation of employment by occupations. Essentially, research suggest that people use the sex-ratio of occupations as a heuristic to suggest the extent to which masculine versus feminine qualities are required for success in the role subsequently leading to stereotypes regarding the role itself (Cejka & Eagly, 1999).

Evidence suggests that these stereotypic disassociations between engineering, or STEM, and communal attributes such as “helping” begin as early as elementary-aged children and persist in to adulthood. One study found that K-12 students had trouble connecting helping behaviors with engineers (Committee on the Public Understanding of Engineering Messages, 2008). Another study found that a vast majority of elementary students believed engineering tasks involved installing wiring, repairing cars, and driving machines, and a minority reported that engineers work allowed for more collaborative activities such as working as a team (Cunningham, Lachapelle, & Lindgren-Streicher, 2005). A second study focused on elementary-age children found that students draw STEM professionals working alone as compared to social scientists that they draw as working with others (MacDuffie, 2001). The belief that agentic tasks in engineering leave no room for communal attributes persists in to college by both STEM majors and non-majors alike (Diekman et al., 2011) and among adults as well (Committee on the Public Understanding of Engineering Messages, 2008). The Committee on the Public Understanding of Engineering Messages (2008) found that only a small percentage of adults supported the statements that engineers save lives (14%) or are sensitive to societal concerns (28%)–attributes generally deemed communal and people-oriented. Further evidence suggests that even those who may not publicly endorse this stereotype may be influenced by these perceptions of engineering and STEM unconsciously, ultimately impacting their subconscious avoidance of engineering (Diekman et al., 2011; Greenwald, McGhee, & Schwartz, 1998).

Collectively, *Social Role Theory* operates under the premise that social gendered structures and experiences overtime have led to: (1) specific attributes of men and women including their values and orientation leanings, as well as (2) stereotypical evaluations about specific roles as well (See Figure 1). Whereas women have been socialized over time to value and prefer jobs that are perceived to help others, make meaningful contributions to society, and allow working with others (Abele & Spurk, 2011; Ferriman, Lubinski, & Benbow, 2009; Konrad et al., 2000; Schwartz, Rubel, & Shalom, 2005), stereotypes about roles such as engineering lead to the perception that engineering is incongruent with the values and orientational leanings of women, subsequently steering woman away from entering or remaining in engineering (Cheryan et al., 2015).Work has supported this idea citing women's tendency towards people-oriented work as a significantly influential factor propelling women throughout the educational and organizational life cycle, which helps to explain some of women's continued under-employment in STEM fields, including engineering, despite women's educational gains in these disciplines (Ceci & Williams, 2010; Eccles, 2009; Joyce & Farenga, 2000; Maltese & Tai, 2010; Su et al., 2009; Wang, Lubinski, & Benbow, 2015).

Theoretical Foundation for Behavioral Intentions: Theory of Planned Behavior

While *Social Role Theory* is foundational in understanding the collective consequence of gender differences in values/orientations and engineering role perceptions on women's intention to pursue and/or remain in engineering, one must consider further theoretical basis for behavioral intentions more directly to design an effective intervention. In other words, it is important to have a theoretical basis for the mechanisms by which behavioral intentions are produced which *Social Role Theory* does not directly address. While there are many theories of behavioral motivations, I refer to the *Theory of Planned Behavior*, due to it integrating–both directly and indirectly–mechanisms that have been well-established as critically important in understanding–and addressing–women's underrepresentation in engineering (i.e., for reviews see Liben & Coyle, 2014; Linley & George-Jackson, 2013). In other words, the Theory of Planned Behavior allows for an examination of these "overlapping sources of impact" researchers have sought to explore and understand (Kanny et al., 2014, p. 134).

According to the *Theory of Planned Behavior* (Ajzen, 1991; 2002) there are several sources of impact that influence behavioral intentions: (1) behavioral beliefs are favorable or unfavorable attitudes based on the consequences or benefits of the intended behaviors, (2) normative beliefs regarding the normative expectations of others regarding the behavior leading to the experience of social pressure or subjective norms to abide by, and (3) control beliefs are the perceived easy or difficulty to perform intended behavior based on factors that may hinder or help performance (Ajzen, 2002). I argue that these factors do not operate in a vacuum, but are impacted by the gendered social structure that has persisted overtime as proposed by *Social Role Theory*. As such, I inform my present study via a conceptual integration of *Social Role Theory* and *Theory of Planned Behavior* (See Figure 1).

Integrating these theories enables an understanding not only of the overarching consequences of the engrained social structures and gendered expectations–women's underrepresentation in engineering–but the direct processes by which to understand and influence the behavioral intentions that lead to this ultimate reality. Specifically, the compilation of these theories allows for the consideration of the interacting influence of the society's gendered expectations of both women and the roles they occupy on women's belief that they can succeed in a role, belief that they belong in a given role, and general attitudes towards the role–all of which ultimately impact their behavioral intention to pursue or remain in a role such as engineering.

The Intervention: Changing Women's Behavioral Intentions by Changing the Perceptions of Engineering

According to *Social Role Theory*, engineering viewed as thing-oriented (Su et al., 2009; Webb et al., 2002), less social (Hill et al., 2010), and more agentic, leads to the perception that engineering fields of study and professions do not allow women to fulfill their communal values or person-orientations, which according to the *Theory of Planned Behavior*, leads to limited behavioral intentions to pursue or remain in engineering roles.

As such, if one is to change behavioral intentions, then one must first change behavioral beliefs (i.e., attitudes), subjective normative beliefs (i.e., person-environment fit), and/or control beliefs (i.e., confidence). In order to positively impact these antecedents, one must intervene on one of two pathways. First, one may attempt to change women's values and orientation leanings, or second, one may attempt to change the stereotype-based perceptions regarding engineering. Researchers agree that rather than trying to change women or society's engrained social structures, it may be most productive and actionable to focus on what engineering already is, but not widely thought to be: communal and people-oriented. This shift in perceptions of engineering may better align women's gender identities with engineering rather than trying to realign women to the role (see Figure 4 for theoretical model with study variables). In other words, based on the importance of communal values to women as well as women's orientation towards people-oriented fields, I propose changing the gendered stereotypes surrounding engineering fields may increase women's behavioral intentions to pursue and remain in engineering.

The proposition to change the conversation around engineering is in line with the push from the National Academy of Engineering (2008) regarding a shift in the perceptions regarding engineering to be viewed as a helping profession in such that engineers provide solutions to problems and create technology that improves human health, safety, and function. It is further supported by the preponderance of evidence regarding the strength and persistence of stereotypic engineering associations, researchers have proposed that unless the belief that STEM careers are incongruent with women's values and orientations is addressed the gender gap in STEM may persist despite the dissolution of other barriers (Diekman, Steinberg, Brown, Belanger, & Clark, 2017). In other words, unless the stereotype of engineering changes, the benefits gleaned from the removal of other barriers may not be visible or as impactful as they could be otherwise. As such, I propose that designing an intervention to focus on the communal and people-oriented aspects of engineering is a key to increase women's intent to pursue and remain in engineering roles (Wang & Degol, 2013). Empirical support for the interventions potential to influence the theoretical factors proposed are discussed below.

Empirical support for the intervention. A collective body of work empirically has demonstrated the impact of stereotypical evaluations of engineering negative impact on outcomes such as interest. Further, there is support on the other hand that suggests changing stereotypes or perceptions–either by describing it in a different way or through directed reflection–may lead to positive outcomes as well. In other words, viewing engineering fields in more traditional ways will lead to negative consequences on behavioral intentions and their antecedents, whereas if women see engineering fields as collaborative and as a key to helping many people, there may be positive changes regarding behavioral intentions and their antecedents (Diekman et al., 2010; Diekman et al., 2017; Sachdev, 2018; Settles, Jellison, & Pratt-Hyatt, 2009; Su & Rounds, 2015). Below, I review pre-existing empirical evidence that role evaluations (i.e., perceptions) influence the outcomes of interest.

Role evaluations impact on behavioral beliefs. Again, behavioral beliefs refer to perceptions regarding the consequences or benefits of the intended behaviors leading to a favorable or unfavorable attitude towards the intended behavior (Ajzen, 2002). It has been demonstrated that behavioral beliefs, or rather attitudes, towards engineering as a field is impacted by engineering stereotypes. Research by Diekman et al. (2011) found women's attitudes towards STEM professions, of which engineering is a part of, were more positive when the profession's role was framed in a communal way as compared to when it was framed in a more traditional, or stereotypical, manner (i.e., agentic). Relatedly, a couple of projects have demonstrated that by asking women to evaluate and write on the ways in which a role relates to their personal lives, rather than focusing on differences, led to an increase in positive attitudes (i.e., interest) in these subjects (Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Hulleman & Harackiewicz, 2009).

Role evaluations impact on normative beliefs. Normative beliefs involve the internalization of socialized expectations from others leading to the experience of social pressure or norms to abide by, ultimately creating the perception of whether a person belongs or does not belong (Ajzen, 2002). Women's normative beliefs, or rather internalization of social views and subsequent sense of belonging in a given environment, is influenced by evaluations, or stereotypes, of engineering roles. Support for the consequences of normative beliefs is evident in findings that women, particularly those with more feminine qualities, perceive a more "chilly climate"–or the sense of not belonging and not being welcomed–in engineering roles than men (Callister, 2006; Settles, Cortina, Malley, & Steward, 2006). Further, research has more directly examined women's reported sense of belonging in STEM, including engineering, when they viewed a video depicting either a stereotypically unbalanced gender representation versus a balanced gender representation at a conference for their field. Women who viewed the more stereotypical representation reported a lower sense of belonging, or fit, as compared to the balanced representation (Murphy, Steele, & Gross, 2007).

Role evaluation impact on control beliefs. Control beliefs refer to the perceptions of factors that may help or hinder performance of the intended behavior leading to a conclusion regarding the ease or difficulty in performing the intended behavior (Ajzen, 2002). There is evidence for engineering stereotypes impact on one's control beliefs, or rather confidence in one's ability to succeed in engineering. Objectively scholars have concluded women's abilities in math and science are on par with men's and women's own belief in their abilities within an engineering role (i.e., engineering skills and knowledge, engineering abilities) are rated much lower than their male peers (Besterfield-Sacre, Moreno, Shuman, & Atman, 2001). Additional evidence has found that women who enter engineering majors confident in their ability to succeed experience a steady decline in their self-efficacy throughout their engineering education. This decline indicates that the role itself influences their efficacy beliefs–though the exact manner in which engineering impacts self-efficacy is unclear (Brainard & Carlin, 1998; Marra, Rodger, Shen, & Bogue, 2009).

Role impact on behavioral intentions. While there is tremendous evidence for the impact of traditional evaluations of engineering on the antecedents of behavioral intentions, some initial work has also provided evidence for the positive impact of changing these evaluations, or perceptions, on behavioral intentions. First, research has shown that the more an applicant perceives an organizational role to endorse or require similar values to their own, the more the positive recruitment outcomes (Bretz & Judge, 1994; O'Reilly, Chatman, & Caldwell, 1991). Further, research seeking ways to increase women's representation in leadership positions—another area in which women struggle to be on equal footing as men—found success in increasing women's intention to apply by using language aligned with communal traits and values to describe the role (Hovarth & Sczensy, 2016). Broadly, feminine or gender-neutral language in job ads has been encouraged to advance gender parity in STEM fields (Streets, Kurtessis, Northon, & Alonso, 2018).

Second, past work has shown success by shifting perspectives to positively impact people who are already engaged in a behavior as well. For example, a study found that when women were asked to reflect on their personal values, they experienced less self-doubt, or rather greater confidence, in environments in which they were already, but which they were negatively stereotyped – such as women in engineering (Kinias & Sim, 2016; Miyake, Kost-Smith, Finkelstein, Pollock, Cohen, & Ito, 2010).

The Present Study

Based on the theoretical underpinnings of *Social Role Theory*–and the further elaboration of the *Theory of Planned Behavior*–the present study seeks to intervene on the perceived communal and person-oriented components of engineering to lead to positive behavioral intentions regarding engineering for women. Despite the fact that engineering has the potential to be viewed as agentic/thing-oriented *and* communal/people-oriented, I intentionally seek to test the impact of a communal and people-oriented focus *versus* an agentic and thing-oriented focus so that I may distinctly determine the unique effects of each. Further it allows for a more direct test of our theoretical mechanisms that communal/people-oriented perceptions of engineering leads to positive outcomes for women, as the theory does not directly support what would occur with communal/people-oriented aspects coupled with agentic/thing-oriented.

Despite the empirical and theoretical support, which has been propagated widely by social change organizations (i.e., National Academy of Engineering, 2008), questions remain as to whether an intervention of this manner will be sufficient considering how engrained current perceptions of engineering are (Gandhi-Lee, Skaza, Marti, Schrader, & Orgill, 2015; Yang & Barth, 2015). This question highlights the crux of why this present study is critical to further the literature on this topic.

This study examines the impact of reorienting the way engineering majors and careers are both described and evaluated on woman's attitudes towards engineering, confidence in their ability to succeed in engineering, and/or perceived fit in engineering roles. Ultimately, based on the *Theory of Planned Behavior*, increasing women's intention to pursue and remain in engineering across the academic-employment life cycle: the selection of an engineering major based on undergraduate women who have not yet declared a major and the intention to remain in an engineering career based on women presently in an engineering role (see Figure 4 for theoretical basis with study variables).

First, I predict that by presenting engineering majors in more communal, people-oriented ways, will lead to more favorable attitudes and outcomes which ultimately will lead women to report a greater likeliness to pursue engineering as a major. Second, I predict that by encouraging women in engineering to think about their work in more communal, people-oriented ways will lead women to experience more favorable attitudes and outcomes which ultimately will lead women to report greater likeliness to remain in their roles. Hypotheses are outlined in Table 1.

STUDY ONE: COMMUNAL/PEOPLE ORIENTED DESCRIPTIONS IMPACT ON INTENTION TO PURSUE ENGINEERING MAJORS

Methods

In Study One, I studied the impact of describing engineering major's career options in a communal and people-oriented way on women's evaluations of the major and intention to pursue an engineering major as compared to the more traditional, agentic descriptions.

Participants

Participants were 134 female students that had not yet declared a major or were in an exploratory studies program at a large Midwestern public university. Participants were recruited through an introductory psychology pool as well as directly through the exploratory studies program. The majority of participants identified as Caucasian (75.4%). The average age was 18 years old. Of the total number of participants that took the survey, several were removed due to the following reasons: (a) failing more than one of the six attention checks, (b) failing to complete the majority of the primary variables, (c) failing to provide their permission at the end of the study for their data to be used, and/or (d) taking less than five minutes to complete the study. While the median time to take the survey was 13.81 minutes, the cut-off of five minutes was chosen based on the approximate rate of 489 words per minute (WPM) which is just slightly over the average of 450 WPM for college students (Nelson, 2012). Further, there was correlation of -0.87 between taking more than five minutes (i.e., being engaged in the study) and the number of attention checks failed across all participants.

Materials

Engineering major's descriptions were created based on *EducatingEngineers.com* descriptions of engineering majors and the university's own descriptions for each engineering major. Two versions were created for each field of study area: an agentic and a communal version. The agentic condition materials were adapted with minimal changes from the original descriptions created by *EducatingEngineers.com* and the university's description representing traditional ways of describing engineering (see Appendix C). The experimental version of the descriptions varied from the agentic versions by adding a communal focus to them (e.g., emphasizing collaboration, helping others, people-focused; see Appendix D). The communal and agentic additions and changes were based on the items from the validated scale created by Diekman et al. (2010) as well as O*Net's descriptions of people-oriented vs. thing-oriented work.

Manipulation Check

Several analyses were conducted to ensure that the materials created for this study represented the communal and agentic themes they sought to communicate.

First, manifest qualitative analysis was conducted to determine the representation of communal versus agentic words within the created text for the major descriptions. Manifest qualitative analysis is a form of summative qualitative analyses–or the identifying and quantifying of certain words or content in text in order to explore usage of particular words (Hsieh & Shannon, 2005; Potter & Levine-Donnerstein, 1999). Data analysis involved searching for specific sets of words representing communal and agentic topics as influenced by Diekman et al. (2010; see Appendix E) measure of communal and agentic values and counting the numbers of times relevant words appeared in the text

(Morgan, 1993). In this case, the search was aided by a computer search function that was then confirmed to be the appropriate context and counted by a coder. This task was completed independently by two trained coders who compared their independent findings until complete agreement was reached. Results indicated that for the communal major descriptions the percentage of words that were communal/person topics present within the text was 11.91% of words used, whereas the percentage for agentic/thing topics was 5.49%. Further, results indicated that for the agentic major descriptions the percentage of words that were agentic/thing topics present within the text was 11.62% of words used, whereas the percentage for communal/people topics was 0.62% (See Table 2).

Second, six other raters reviewed and rated each version of the major description on its “Communal” themes and “Agentic” themes each on an anchored scale of 1 (Not at all communal/agentic) to 7 (Extremely communal/agentic). This process meant there were two ratings by six raters for each version of the major description. Based on these ratings, I ran a paired samples t-test to compare the agentic and communal ratings for the Agentic and Communal major descriptions across the six same raters. Results indicated that the Agentic major descriptions ($M = 5.14$) was significantly more agentic on average than the Communal major descriptions on average ($M = 2.39$), $t(15) = 9.57$, $p < .00$. Second, results indicated that the Communal major descriptions ($M = 5.95$) was significantly more communal on average than the Agentic major descriptions on average ($M = 2.85$), $t(15) = -15.84$, $p < .00$ (see Table 3 and Figure 2)

Lastly, to confirm that these ratings were reliable, I calculated the intra-class correlation (ICC) for all the communal and agentic ratings by the six coders. The ICC estimates and their 95% confidence intervals were calculated based on a mean-rating ($k =$

6), consistency, 2-way mixed-effects model. ICC estimates for communal ratings indicated excellent reliability (.95) and agentic ratings indicated good reliability (.83; Shrout & Fleiss, 1979; see Appendix F). These results supported that the Communal major descriptions strong communal ratings and the Agentic major descriptions strong agentic ratings were reliable.

Procedure

For the experiment, participants were asked to complete an online survey in which they reviewed engineering major descriptions. Participants were randomly assigned to either the communal/people-oriented or agentic/thing condition where they were given either a communal/people-oriented or agentic/thing-oriented major description for each area engineering major. They were then asked to rate these major options and engineering overall on several different dimensions.

Measures. In order to capture the impact of the intervention as supported by the *Theory of Planned Behavior*–several outcomes of interest were measured.

Perceptions regarding field of study career options. Students were asked with a single item to rate (1) how likely they would be to select this as their field of study on an anchored scale ranging from 1 (Not at all likely) to 7 (Extremely likely) [*behavioral intentions*]; (2) interest in major on an anchored scale ranging from 1 (not at all interested) to 7 (Extremely Interested) [*behavioral beliefs*]; (3) confidence they could succeed in the major rated on an anchored scale ranging from 1 (Not at all confident) to 7 (Extremely Confident) [*control beliefs*]; and (4) how enjoyable they would anticipate each field of study would be to study on an anchored scale ranging from 1 (Not at all enjoyable) to 7 (Extremely Enjoyable) [*behavioral beliefs*]. Participants were also asked these questions regarding an engineering major course of study *overall* following exposure to text on "Program Description for Engineering Majors" that highlighted learning objectives in communal versus agentic terms.

Self-efficacy in STEM. Participants rated their level of agreement with a series of statements on a seven-point anchored scale from 1 (Strongly disagree) to 7 (Strongly agree). Statement included, "I could succeed in an engineering curriculum" and "I could succeed in math courses" among others. These scales were averaged to produce a single self-efficacy index.

Value endorsement. Participants were asked to rate the importance of each of several goals on an anchored 7-point scale ranging from 1 (Not at all important) to 7 (Extremely important). These value endorsement scales were created by Diekman et al. (2010). The communal value scale included the items "serving community," "working with people," "altruism," "helping others," "connecting with others," "serving humanity," "attending to others," "caring for others, "spirituality," and "intimacy." The agentic value scale included the items "power," "recognition," "achievement," "status," "focus on the self," "success," "financial reward," "self-direction," "mastery," "self-promotion," "independence," "individualism," "demonstrating skill," and "competition." A "value leanings" variable was created based on the difference between one's mean communal value score and one's mean agentic value score, such that a more positive value indicated greater leanings towards communal values versus agentic values.

Person-thing orientation. To assess their person vs. thing orientation, participants were asked to rate their reported enjoyment on a seven-point anchored scale from 1 (Not at all enjoyable) to 7 (Extremely enjoyable) for a set of thirteen various activities

(Graziano, Habashi, & Woodcock, 2011). Example items include, “Listen in on a conversation between two people in a crowd,” “Stop to watch a machine work on the street,” and, “Gain a reputation for giving good advice for personal problems.” An “orientational leanings” variable was created based on the difference between one’s mean person-orientation score and one’s mean thing-orientation score, such that a more positive value indicated greater leanings towards persons versus things.

Demographics. In addition, participants reported their prior consideration of engineering, their age, their ethnicity, and year in college. Participants were also asked to report their past exposure to science and mathematics courses, and their parent’s professions–many of which were used as control variables in the analyses.

Results for Study One

Prior to conducting the primary analyses, I examined the extent to which the two randomly assigned groups differed significantly on initial measures such as their prior consideration of engineering, the seriousness which they considered engineering, their communal values, their agentic values, their person-orientation, their thing-orientation, their STEM self-efficacy, their age, their ethnicity, the number of science classes they had previously taken, and the number of math classes they had previously taken (*p’s* > .05)–all of which they did not significantly differ (see Appendix G.) Additionally, to explore the data, correlations across all relevant study variables were also ran and are reported in Appendix H.

To test *Hypothesis 1A, 1B, 1C,* and *1D,* I performed analyses testing the extent to which the framing manipulation would influence women’s positivity towards a field of study on several dimensions. First, using an independent-samples *t*-test, I compared evaluations of the engineering majors framed to be communal/people-oriented versus those framed to be agentic/thing-oriented considered collectively (i.e., overall). Specifically, following exposure to the program outcomes, women were asked questions such as, “Taking in to consideration the information above, how interesting do you think studying engineering *overall* would be?” on the same seven-point scale described earlier. I used an overall value for the analyses to determine the effectiveness of the intervention as it was designed to lead to positive outcomes *collectively* for engineering rather than for any one specific major within engineering. Further, the overall value allows the participant to rate these outcomes internally considering the major or majors which they had the greatest affiliation towards–which I would not be privy too and could not control for in the variance across the individual majors. In other words, students’ individual preferences for specific majors may add noise to the conclusions drawn, whereas an overall evaluation allows for this subjectivity to be considered. As such, I did not base the conclusions on the averages across majors however they are reported in Appendix I.

In support of *Hypothesis 1A*, there was a significant difference in interest scores for communal/people-oriented (M = 3.53, SD = 1.58) and agentic/thing-oriented (M = 2.94, SD = 1.81) conditions ($t(132) = 1.99$, $p = .05$). These results suggest that communal/people-orientations in a field of study description does have a significant effect on women’s interest in the field when considered overall. Failing to support *Hypothesis 1B*, there was not a significant difference in enjoyment scores for communal/people-oriented (M = 2.94, SD = 1.61) and agentic/thing-oriented (M = 2.56, SD = 1.71) conditions ($t(132) = 1.30$, $p = .20$). These results suggest that communal/people-orientations in a field of study description does not have a significant effect on women's anticipated enjoyment in the field when considered overall. In support of *Hypothesis 1C*, there was a significant difference in confidence scores for communal/people-oriented (*M* = 2.84, *SD* = 1.56) and agentic/thing-oriented (*M* = 2.29, *SD* = 1.59) conditions (*t*(132) = 2.01, *p* = .05). These results suggest that communal/people-orientations in a field of study description does have a significant effect on women's confidence in the field when considered overall. Finally, failing to support *Hypothesis 1D*, there was not a significant difference in intention to select scores for communal/people-oriented (*M* = 3.78, *SD* = 1.64) and agentic/thing-oriented (*M* = 3.22, *SD* = 1.76) conditions (*t*(66) = 1.35, *p* = .18). These results suggest that communal/people-orientations in a field of study description does not have a significant effect on women's intention to select engineering as a major when considered overall. Specifically, results suggest that when women review communal/people-oriented engineering major descriptions, their likeliness to pursue the engineering field of study does not increase when considered overall (See Table 4)

Supplementary Analyses

To further examine the effectiveness of the intervention, I compared the effect of the communal framing on two sub-group populations: women who had previously considered engineering and those who had not previously considered engineering. Since the motivation for this study is to find ways to encourage women to more positively evaluate engineering that previously had not, I was interested in the effect of the intervention on this population in particular. To examine this effect, I ran an independent samples t-test comparing the communal versus agentic conditions for women who had previously considered engineering and found that there was a significant difference in scores for women who had never previously considered engineering, including for their intention to select the major, but not for women who had previously considered engineering (see Appendix K).

STUDY TWO: COMMUNAL AND PERSON-ORIENTED REFLECTION IMPACT ON INTENTION TO REMAIN IN ENGINEERING POSITION

Methods

Participants

Participants were 63 female professionals currently employed in an engineering position either full-time or part-time These professionals were recruited through the alumni network of a large Midwestern university. The majority of the participants identified as Caucasian (88.9%), and the average age was 38 years old. While most of the women's highest degree was a bachelors (53.9%), some women held a professional degree (31.7%) or a doctorate (14.2%). The women represented a variety of engineering majors including Aeronautical and Astronautical (7.9%), Chemical (7.9%), Civil (19%), Electrical (14.3%), Industrial (17.5%), Materials (7.9%), Mechanical (19%), with the remaining coming from other engineering backgrounds (6%). Subsequently, the women came from a variety of industries including: Engineering (46%), Science/Healthcare (8%), Technology (6%), Manufacturing (14%), Government (6%), Higher Education (3%), among others (17%).

Of the 227 women who participated in the pre-test survey, only 139 participated in the daily dairy studies at least one day and only 63 of those women completed a Time 2 survey of on which the primary analyses are based. While more than 227 women began the pre-test survey, some were excluded for failing more than one of the six attention checks, failing to complete at least half of the primary variables of interest, indicating that they were not currently working in an engineering role, failing to create a three-part code for connecting data across time, and/or taking less than seven minutes to respond to the survey. While the median take taken to complete the pre-test survey was 17.70 minutes, the cut-off of seven minutes was selected based on a rate of approximately 334 WPM, which is just slightly higher than the average rate for an adult of 300 WPM (Nelson, 2012). Further, there was a strong negative correlation between taking more than seven minutes and the number of attention checks failed across all participants (r = -.74).

Procedure

A daily diary study was conducted using the Expimetrics platform (2018). Prior to beginning the daily diary portion of the study, participants were asked to complete a pre-test survey including demographic and attitudinal measures reporting current levels of satisfaction, perceived fit, and interest regarding their current job as well as their intention to remain in their job and commitment to engineering as a career.

The diary portion of the study was conducted over a period of 10 days. Participants were prompted every day on their cellular devices at 5PM in their time zone to complete a brief survey that took no more than 3-5 minutes to complete. A follow up reminder would be sent if they had not completed the survey one hour later. The prompt received varied depending on the condition. In the agentic condition, participants were asked "*Regarding the work you did today for your job, what activities or tasks did you do independently*?" and, "*How does the work/development/tasks /activities you did today enable you to be a more competitive employee currently? In the future?*" In communal condition, participants were asked, "*Regarding the work you did today for your job, what activities or tasks did you do collaboratively?"* and, "*How does the* *work/development/tasks/ activities you did today enable you to help other people currently? In the future?*" In both conditions, participants were also instructed to provide sufficient detail to get a clear understanding of the experience or experience(s) and asked to report how difficult it was to think of a response. Participants were prompted to think deeply about the day if something did not immediately come to mind to encourage women to think of at least one experience. They were also instructed to not complete the survey on Saturday or Sundays since the project was based on work experiences. On average, women participated in 5 of the 8 days they were asked to respond over the period of 10 days. The participants were randomly assigned to conditions.

Following the end of the 10 days of diary entries, participants were asked to complete a post-test survey in which they again reported current levels of satisfaction, perceived fit, and interest in their job as well as their intention to remain in their job. However, due to some technical difficulties with the Expimetrics application, the number of days between the pre-test survey and the post-test survey ranged from a minimum 9 days and a maximum of 39 days with an average 22 days between Time 1 and Time 2 following the daily diary responses.

Manipulation Checks

Several analyses were conducted to ensure that the daily diary prompts created for this study represented the communal and agentic themes they sought to communicate.

First, five raters reviewed and rated the two versions of the two prompts on their "Communal" themes and "Agentic" themes each on an anchored scale of 1 (Not at all communal/agentic) to 7 (Extremely communal/agentic). This process meant there were two ratings by five raters on each version of the prompts. Based on these ratings, I ran a one sample t-test to compare the differences for the agentic and communal ratings across the Agentic and Communal prompts across the same five raters. Results indicated that the Agentic prompts (M = 6.25) were significantly more agentic on average than the Communal prompts on average (M = 2.26), $t(4) = 7.76$, $p < 0.01$) though this is likely a function of the very limited number of items to rate across a limited number of raters. Second, results indicated that the Communal prompts (M = 6.40) were significantly more communal on average than the Agentic prompts on average (M = 1.40), t (4) = -11.18, $p < 0.01$; see Table 5 and Figure 3)

Second, to confirm that these ratings were meaningful and interpretable, I calculated the inter-class correlation (ICC) for all the communal and agentic ratings by the five coders. The ICC estimates and their 95% confidence intervals were calculated based on a mean-rating (k = 5), consistency, 2-way mixed-effects model. ICC estimates for communal ratings indicated excellent reliability (.99) and agentic ratings also indicated excellent reliability (.99; see Appendix L). This supported that the Communal major descriptions strong communal ratings and the Agentic major descriptions strong agentic ratings were reliable.

Measures. Again, to capture the impact of the intervention as supported by the *Theory of Planned Behavior*–several outcomes of interest were measured.

Job attitudes. Participants were asked about their current attitudes on a number of dimensions measured with a single item. First, they were asked regarding their prior consideration of changing their job and how frequently they have considered changing their job [*behavioral intentions*] and how certain they were that they would remain in an engineering role for the remainder of their career on a scale of 1 (Not at all certain) to 7

(Extremely certain) [*behavioral intentions*]. Second, participants were asked to report their satisfaction with their decision to pursue a career in engineering on an anchored scale from 1 (Extremely dissatisfied) to 7 (Extremely satisfied) [*behavioral beliefs*]. Third, participants were asked how satisfied they are with their current job on an anchored scale from 1 (Extremely dissatisfied) to 7 (Extremely satisfied) [*behavioral beliefs*]. Lastly, participants were asked how interesting they find their job to be on an anchored scale from 1 (Not at all interesting) to 7 (Extremely interesting) [*behavioral beliefs*].

Person-environment fit (P-E Fit). Three commonly used items are used to measure P-E fit (e.g., Cable & Judge, 1996; Chatman, 1989; Lauver & Kristof-Brown, 2001). These items include, “I can relate to the people around me in my organization,” “The other employees in my organization share my personal interests,” and, “The things that I value in life are very similar to the main principles endorsed by my organization.” Participants were asked to rate both their level of agreement with these items on an anchored 7-point scale ranging from 1 (Strongly disagree) through 7 (Strongly agree). These items were averaged to produce a single person-environment fit score [*normative beliefs*]. While P-E fit does not directly measure subjective normative beliefs, I argue that it does provide an indirect measure of the construct such that it represents the extent to which a person believes or feels that they belong, or fit in a given environment, which is known to be influenced by societal expectations and other more distinct referent groups such as peers, parents, and educators (Edwards, Cable, Williamson, Lambert, & Shipp, 2006). As such, rather than create a new measure that captures the beliefs of all possible referent others noted in the *Theory of Planned Behavior,* I use P-E fit to indirectly capture this influence.

Self-efficacy in job. To measure their self-efficacy in their jobs participants rated their level of agreement with a series of statements on a seven-point anchored scale from 1 (strongly disagree) to 7 (strongly agree). Statement included, “I am very confident that I can perform well in my job” and “I have what it takes to be successful in my job” among others. These items were averaged to produce a single self-efficacy index [*control beliefs*].

Value endorsement. Participants were also asked to rate the importance of each of several values on an anchored 7-point scale ranging from 1 (Not at all important) to 7 (Extremely important). These value endorsement scales were created by Diekman et al. (2010). The communal value scale included the items “serving community,” “working with people,” “altruism,” “helping others,” “connecting with others,” “serving humanity,” “attending to others,” “caring for others, “spirituality,” and “intimacy.” The agentic value scale included the items “power,” “recognition,” “achievement,” “status,” “focus on the self,” “success,” “financial reward,” “self-direction,” “mastery,” “self-promotion,” “independence,” “individualism,” “demonstrating skill,” and “competition.” These items were averaged to produce a single communal value score and a single agentic value score. A “value leanings” variable was created based on the difference between one’s mean communal value score and one’s mean agentic value score, such that a more positive value indicated greater leanings towards communal values versus agentic values.

Person-thing orientation. To assess their person vs. thing orientation, participants were asked to rate their reported enjoyment on a seven-point anchored scale from 1 (not at all enjoyable) to 7 (extremely enjoyable) for a set of thirteen various activities (Graziano et al., 2011). Example items include, “Listen in on a conversation between two people in a crowd,” “Stop to watch a machine work on the street,” and “Gain a reputation for giving good advice for personal problems.” These items for averaged to produce a single person-orientation value and a single thing-orientation value. An “orientational leanings” variable was created based on the difference between one’s mean person-orientation score and one’s mean thing-orientation score, such that a more positive value indicated greater leanings towards persons versus things.

***Demographics*.** In addition, participants reported their age, major in college, the highest degree earned, industry, and ethnicity. Many of these variables were used as control variables in the analyses.

Results for Study Two

Prior to conducting the primary analyses, I examined the extent to which the two randomly assigned groups of those who participated in at least one day of daily reflections differed significantly on initial measures such as their frequency of turnover considerations ($p > .05$), job satisfaction ($p > .05$), career satisfaction ($p > .05$), commitment to engineering ($p > .05$), job interest ($p > .05$), person-environment fit ($p > .05$), self-efficacy ($p > .05$), communal values ($p > .05$), agentic values ($p > .05$), person-orientation ($p > .05$), thing-orientation ($p > .05$), and their age ($p > .05$)–all of which they did not significantly differ (see Appendix M.)

To ensure that participants were *actively* engaged in the manipulation, a coder went through the diary responses to ensure that at least one of the questions contained actual content related to the prompt. If a participant did not actively engage in at least 5 of the 8 possible days they could have responded (sans Saturday and Sunday), they were excluded from the analyses. A total of 43 participants engaged in the analyses at least 5 of the possible 8 days (i.e., over half). A total of 20 (31.7%) participants were excluded.

To understand the potential confound of self-selection in the intervention, I examined the extent to which those who participated and those who did not participate differed on pre-test measures in terms of important attributes. Those who participated in five or more days versus those who participated in less than five days did not significantly differ on initial measures such as their frequency of turnover considerations ($p > .05$), job satisfaction ($p > .05$), career satisfaction ($p > .05$), commitment to engineering ($p > .05$), person-environment fit ($p > .05$), job interest ($p > .05$), self-efficacy ($p > .05$), communal values ($p > .05$), agentic values ($p > .05$), person-orientation ($p > .05$), thing-orientation ($p > .05$), or their age ($p > .05$; see Appendix N.) Additionally, to explore the data, correlations across all relevant study variables were also ran and are reported in Appendix O.

Following the conclusion that these two groups did not differ significantly prior to the manipulation, *Hypothesis 2A* through *Hypothesis 2G* examined the extent that women in the communal condition as compared to the agentic condition would differ significantly on a number at attributes at Time 2 following their reflections. Specifically, I predicted that women in the communal condition would score higher on the positive outcomes of interest and lower on the negative outcomes of interest. To test this hypothesis, I conducted a repeated measures ANOVA with a Greenhouse-Geisser correction. Broadly, there was no support for *Hypothesis 2A* through *Hypothesis 2G* (see Table 6). Specifically, based on the interaction outcomes between time and condition it was determined that women in the communal versus agentic condition did not significantly differ at time 2 on turnover considerations, commitment to engineering, career satisfaction, job satisfaction, person-environment fit, or self-efficacy (*p's* >.05)–though results generally were found in the right direction such that women in the communal condition had indicated greater levels of positive outcomes (e.g., satisfaction, etc.) and lower levels of negative outcomes (e.g., turnover intentions). Further results indicated that there was no significant condition between-subjects effects (*p*'s > .05) or time within-subjects effects (*p*'s > .05). One caveat to this finding is that there was a significant time within-subjects effect on job interest such that job interest significantly decreased from time 1 to time 2.

Supplementary Analyses

To further understand the lack of support for the hypotheses, supplementary analyses were performed to compare the two groups on their Time 1 versus Time 2 scores with a paired samples t-test. Results indicated that women in the communal condition did not significantly differ from Time 1 to Time 2 except for interest in their job–which actually decreased from Time 1 to Time 2 (see Appendix P). Second, the agentic group did not have any significantly differences either between Time 1 and Time 2 independently (see Appendix Q). Further, I sought to examine if the manipulation may only be effective on women who had previously considered leaving engineering. However, there was not any support for this possibility (see Appendix R).

DISCUSSION

This study developed and tested interventions to promote women's behavioral intentions to pursue and remain within engineering which were theoretically supported *by Social Role Theory*–complimented by the *Theory of Planned Behavior*. *Social Role Theory* provided a foundation to understand gender differences as well as gendered role expectations, whereas the *Theory of Planned Behavior* provided theoretical grounding for behavioral intentions, which I sought to ultimately change for women within engineering. I proposed that changing engineering role perceptions (i.e., the intervention) would directly affect behavioral beliefs (i.e., satisfaction, interest, etc.), normative beliefs (i.e., person-environment fit), control beliefs (i.e., self-efficacy, etc.), and behavioral intentions (i.e., pursue engineering, remain in engineering; see Appendix B).

Specifically, the intervention involved a shift of emphasis in the perceptions of engineering toward the communal and people-oriented aspects of engineering roles. More broadly, a core contribution of the study is providing *empirical* evidence for an idea that has been widely endorsed and shared by social change organizations (i.e., National Academy of Engineering, 2008)–that a key to increasing women's recruitment and retention in engineering is to change the conversation around engineering to its societal implications and people-oriented qualities.

To test this empirically, I conducted two studies using two populations of women. The first study involved women who had not yet declared a major and the second study involved women who were presently working as an engineer. The aim was to examine the effectiveness of the intervention to increase women's intention to pursue an engineering major and women's intention to remain versus leave an engineering career, in Study One and Study Two, respectively. I predicted that women in the condition emphasizing the communal and people-oriented aspects of engineering would experience more positive outcomes as compared to women in the condition emphasizing the agentic and thing-oriented aspects of engineering. Specifically, for Study One, I predicted that women in the communal condition would experience higher levels of interest *(behavioral beliefs*), enjoyment (*behavioral beliefs*), and confidence (*control beliefs*)–ultimately leading to a greater intention to select engineering as a major (*behavioral intentions*; See Table 1). For Study Two, I predicted that women in the communal condition would experience higher levels of interest, job satisfaction, and career satisfaction (*behavioral beliefs*), person-environment fit (*normative beliefs*), and self-efficacy (*control beliefs*)–ultimately leading to a lower intention to leave engineering and a greater commitment to engineering as a profession (*behavioral intentions*; See Table 1).

Collectively, the results were mixed in terms of supporting the effectiveness of the intervention on the outcomes of interest for the study populations (See Table 7). While there was substantial support for the intervention's effectiveness in Study One, there was no support for its effectiveness in Study Two.

Study One

Overall, results indicated that the communal/people-oriented intervention was effective at encouraging women to evaluate engineering majors as more interesting and for women to feel more confident in their ability to succeed when examined overall. In other words, when women were provided more communal/people-oriented descriptions of engineering majors as compared to more agentic/thing-oriented descriptions, they were more likely to report that, overall they found engineering interesting and felt confident in their ability to succeed in an engineering major. Though it is important to note that these values were still below the mid-point on these scales, indicating still low levels of interest and confidence despite significant changes occurring. Further, when examining the participants collectively, results indicated the intervention was not effective at increasing women's enjoyment of the major or their likeliness to select the major. These mixed results, coupled with the theoretical rationale for the study, suggested that there may be further mechanisms operating that were important to explore to understand the bounds of the intervention's effectiveness. As such, supplementary analyses were conducted to more fully explore the data.

Exploring Sub-Group Results

First, because the intervention was designed to address the fact that few women choose to pursue engineering as compared to men, the focus would be on the majority of women who would not consider selecting engineering as a major–rather than the small portion of women who would. As such, I compared results for women who indicated prior consideration of engineering to those who indicated that they had never considered engineering before. Results indicated that the intervention was effective for women who had never previously considered engineering, including increasing their likeliness to select the major, but was ineffective for women who had previously considered engineering (see Appendix K).

This result is consistent with what one would expect considering the intervention is designed to change the conversation around engineering to make it more appealing for women who do not currently find it able to match their values or orientational preferences. Therefore, the intervention likely would not have an impact on women who already were open to pursuing engineering as a major as the traditional aspects of engineering are already appealing to them–potentially due to having weaker communal values and people-orientational leanings. In other words, if women were already interested in pursuing engineering despite the stereotypically agentic/thing-oriented traditional understanding engineering, then it likely means they do not endorse the communal values and person-orientations as strongly as those women who did not consider engineering. Thus, making an intervention designed around manipulating these factors ineffective on them.

Another possibility is that women who had indicated that they previously had considered engineering may have considered it and dismissed the possibility, rather than considered it and were open to the possibility of majoring in engineering. Due to the wording of the question, it is unclear whether their prior consideration resulted in their openness to engineering as a major or not. As such, it is difficult to determine whether the intervention was ineffective because of their endorsement of engineering in its traditional understanding or if it was ineffective because they were already completely closed off to the idea of engineering as a major.

However, post-hoc analyses of the differences of women who previously considered engineering and women who had never previously considered engineering provide supporting evidence for the possibility that these women were in fact already open to engineering as a major and welcomed the traditional aspects on it. In so far as women who had previously considered engineering (N = 44) had significantly lower levels of person-orientational leanings (M = 1.52; SD = 2.31) as compared to women who had never considered engineering (N = 89; M= 3.14; SD = 1.08; $t(131)$ = 5.50, p = .00).

Second, while not significant, the difference on communal values was also in the direction one would predict such that women who had previously considered engineering had significantly lower communal value leanings (M = .14; SD = 1.21) as compared to women who had not previously considered engineering (N = 89; M= .55; SD = 1.28; $t(131)$ = 1.79, p = .08).

Exploring Enjoyment Results

Another interesting result worth considering following the prior sub-group analyses was that the intervention still did not significantly impact women's perceived enjoyment of an engineering major. Upon further consideration of the results, I believe this may be a factor that rating enjoyment actually requires the rating of *anticipated* enjoyment. Upon further reflection, it clear that enjoyment may be more future-oriented–even though it was not intended to be–as compared to the other outcomes of interest which can be presently evaluated. For instance, following a review of the major, women with their general knowledge of engineering could report on their confidence to succeed and their interest in the topic, as well as their likeliness to select it. However, enjoyment of the major may be hard to determine without being actively engaged in said experience. As such, the rating of enjoyment may be their anticipated enjoyment, or a future-oriented prediction–rather one they can presently report. Because of this, participants may not be able to accurately evaluate this outcome. Though there is no way to empirically support for this as qualitative data was not collected allowing women to explain their ratings on these various outcomes. However, some past research has found that a person's predicted future attitude or evaluation towards a stimulus or experience often has little to no correlation of their attitude sometime in the future (Kahneman & Snell, 1992). Other work on affective forecasting—or rather people's ability to predict their future emotions—has drawn similar conclusions that people often are errored regarding their future emotional state as it relates to the valence, type, or intensity of their future emotions (Wilson & Gilbert, 2003).

Study Two

Overall, results indicated that the communal/people-oriented reflection intervention was *not* effective in creating positive attitudes towards women's jobs as an engineer, greater confidence in their ability to succeed, improved person-environment fit, or stronger intentions to remain in their position. In other words, following their reflections on the communal/people-oriented aspects of their work as compared to the the agentic/thing-oriented aspects of their work, women did not differ in their interest in their job, their satisfaction in their job, their career satisfaction, their perceived person-environment fit, their self-efficacy, their commitment to remain in engineering, or their frequency of turnover intentions (see Table 7). These results were surprising as they failed to support the hypothesis that reflecting on the communal and people-oriented aspects of engineering would lead to positive outcomes for women in engineering jobs. Despite the non-significant results, many of the outcomes trended in the correct direction (See Table 6), suggesting the necessity to explore these results more deeply particular in considering the issue of having the power to detect an effect. As such, supplementary analyses were conducted and are discussed below.

Exploring Sub-Group Comparisons

I conducted sub-group analyses to explore whether the intervention may again only be effective, or most effective as it was in Study One, on a sub-population of women in the sample. In this analysis, I compared the outcomes for women who had reported previously considering leaving engineering to those who had never previously considered leaving engineering. Similar to the logic presented in Study One, because the intervention was designed to decrease women's intention to leave engineering, it may not impact women who have never considered leaving engineering before. However, the same conclusions were reached as when examining the sample as a whole (see Appendix R). This result seems to indicate the intervention lacks effectiveness for women already in engineering roles.

Exploring Within Conditions

To further explore this conclusion, paired sample t-tests were conducted to compare the communal group individually across Time 1 and Time 2 on the outcomes of interests. For the communal condition women did not significantly differ from Time 1 to Time 2 except for one outcome–interest in their job–which was lower at Time 2 than Time 1 (see Appendix P). This result was particularly discouraging as it suggests that not only was the intervention ineffective, but it may have had negative consequences on the women it was designed to help.

The agentic group did not have any significant differences between Time 1 and Time 2 either, however every outcome–including their commitment to engineering as a career–trended in the direction that would suggest agentic or thing-oriented reflections have a negative consequence on women's evaluations of their engineering role (see Appendix Q). This would likely have been to this condition exaggerating and exasperating the misfit between women's gender role and engineering roles.

Exploring Effectiveness Conclusions

While results seem to indicate that the intervention is not effective on current female engineers in terms of leading to positive outcomes such as increased commitment to the career or decreased turnover considerations, it is important to consider other factors that may be operating to explain these results. Reflection on this resulted in two main possibilities that may explain the non-significant results beyond the ineffectiveness of the intervention.

First, I may lack the power necessary to detect an effect of the intervention. Prior to completing the analyses, a power analysis indicated that for a small to moderate effect size (as based on other similar studies) would require around 100 participants in the study to detect the effect if there was one present. Ultimately, I was able to obtain only forty percent of the recommended sample size. Post-hoc power analysis based on my own data, while certainly debated (e.g., Levine & Ensom, 2001), indicated that for turnover intentions, commitment to the career, job satisfaction, career satisfaction, self-efficacy, and person-environment fit outcomes I had less than 10% of the power needed to detect an effect and less than 20% for interest. Further, I conducted sensitivity analyses to determine the smallest effect that I would have been able to detect (Faul, Erdfelder, Lang, & Buchner, 2007). Using my sample size, the analyses reported the smallest effect I would have been able to detect was $d = 22.7$, which is larger than the effect that I anticipated. As such, the lack of significant results may be less indicative of the ineffectiveness of the intervention and more indicative of lacking the power to detect what could be a small effect. These results may also be indicative of the effect size being even smaller than what I had originally thought. In other words, values and orientation leanings may not play as *large* of a factor because women's preference for communal values and person-orientations is small – though it does exist. This is supported by the fact the for the overall sample the positive value leanings value (*M* = .41; *SD* = 1.13) indicates a preference for communal work and the positive orientation leanings value (*M* = .24; *SD* = 1.66) indicates a preference for people-orientations. However, the magnitude of values themselves are quite small–indicating only a small preference, particularly as compared to the population in Study One.

A second possibility is that women in engineering may have already normed to the stereotypical aspects of engineering and therefore a lack of communal values and people-orientations experiences may not negatively impact their experiences at work as they may already accept, or possibly even prefer, the traditional agentic/thing-oriented aspects of engineering roles. As such, the manipulation of communal/person reflections may not have an effect on this population. Support for this possibility exists based on several pieces of evidence.

One piece of supporting evidence is that women who had previously considered leaving engineering (*N* = 16) compared to those who had never considered leaving engineering (*N* = 47) did not significantly differ in their communal value leanings (considered *M* = .50; *SD* = 1.16; never considered *M* = .38; *SD* = 1.13; $t(61) = .39$, $p = .70$) or their person-orientation leanings (considered before *M* = .50; *SD* = 1.74; never considered *M* = .38; *SD* = 1.63; $t(61) = .93$, $p = .35$). This similarity would suggest that despite these two groups differing on their commitment to the field of engineering, their values or orientational preferences did not significantly differ. It is important to note, however, that while these groups did not significantly differ on these two outcomes–they did trend in the direction that one would expect based on the theoretical and empirical groundwork–that women who had considered leaving engineering had greater leanings towards communal values and person-orientations than those that had not. It is also important to highlight however, how minimal the overall endorsement of communal values (M = 5.13; SD = .92) and person-orientations (M = 4.52; SD = .84) were overall as compared to agentic values (M = 4.72; SD = .84) and thing-orientations (M = 4.28; SD = 1.46) **–** with the latter (i.e., person v. thing endorsements) differing drastically from the sample in Study One results.

Another piece of support for women's norming to the traditional understandings of engineering is that many participants failed to respond as *intended* to the prompts provided in the communal condition. This subsequently limits the potential for these reflections to positively impact their evaluations of their work. In coding the qualitative responses in the communal condition based on several themes: people-focused, thing-focused, self-focused (See Table 8), it was apparent that many women, despite being prompted to reflect on their engineering roles in non-traditional ways, failed to break away from the stereotypical associations regarding engineering. More specifically, upon reviewing the qualitative responses more deeply that it was evident for the "collaboration" prompt many participants focused only on what tasks were accomplished (i.e., thing-oriented), rather than the *how* the task was accomplished *with people* and for the "help" prompt participants focused on the way they helped better *products and processes* (i.e., thing-oriented) or *themselves* (i.e., self-focused/agentic) rather than *people or society*.

In fact, barely half of the responses for the "collaboration" prompt (54.95%) and 'help' prompt (53.64%) were answered as the intervention has intended–in a people-focused or communal manner (see Table 8). Whereas the remainder of the responses fell in to more agentic or thing-oriented themes despite having been prompted with communally/people-based questions. This difference in prompt response may have limited the effectiveness of the intervention. It is therefore possible that if the questions were improved upon to ensure that engineers are in fact *changing, or adjusting, their perceptions* of their work rather than just reporting on their work in ways that align with the status quo (i.e., agentic, thing-oriented). Greater guidance in the prompt may enable more participants to reflect on their work in the intended way and therefore make the intervention more effective. However, another possibility is that this intervention may only be effective on women who have not yet been full ingratiated to the traditional nature of engineering—such as women early on in the career—a population of women who were very limited in the present study (*N* = 12 women with less than 5 years in the role indirectly measured via reported age). This possibility is in line with the literature that has found women who are more likely to leave engineering—the ones who this intervention is designed to help—do so in their first few years (Kahn & Ginther, 2015).

Relatedly, it is possible that engineering does not *actually* allow for communal/people-oriented tasks such as helping people or collaborating crippling the intervention's potential to be effective, though there is mixed evidence for this possibility. When examining the daily diary reflections themselves, there were more communal days (*N* = 81) than agentic days (*N* = 46) left blank (i.e., participants commented that they could not think of an appropriate response). This result may suggest that engineering careers are less communal and people-oriented as compared to agentic and thing-oriented. However, when examining participants reported difficulty of thinking of a response each day that they responded, the average rating for the agentic reflections (M = 3.13) was greater than the communal reflections (M = 2.71). Though, this may reflect that it was not difficult to report that nothing communal or people-oriented happened. However, it may also indicate to some extent that thinking of communal/people-oriented examples is not challenging for current female engineers to do. As such, the results are inconclusive regarding engineering's lack of communal/people-orientation tasks.

Taken Together: Theoretical and Practical Implications

Collectively, this work answered the call of universities and organizations seeking theoretically and empirically grounded ways to improve women's state in engineering. This work empirically tested an intervention grounded in *Social Role Theory* to explore a potentially key psychological factor: the *perceived* disconnect between women's gender identity and engineering roles (Diekman et al., 2015; Eagly & Wood, 1999). According to this theory, this perceived disconnect leads to lower behavioral intentions to pursue these roles. However, according to the *Theory of Planned Behavior*, these lowered behavioral intentions direct antecedents include negative attitudes towards engineering, including diminished interest, reduced confidence, and a dismissed sense of belonging. Many of which are factors that have been explored often independently in the expansive, at times disjoined, literature on women's underrepresentation in engineering. This aspect of the study highlights an added benefit of the work–looking at these theoretically grounded factors as researchers have suggested–not as standalone factors, but rather "overlapping sources of impact" (Kanny et al., 2014, p. 134). Broadly, this work provided further evidence for the relevance of these complementary theories on the study of women's underrepresentation in engineering, but perhaps more so for particular stages in the cycle (i.e., recruitment) as compared to stages later on (i.e., retention). While numerous theories and factors have been put forth to understand women's underrepresentation in engineering, this work provides evidence that gender roles and socialization on women's values and orientations may be key in understanding how to help improve the state of women in engineering fields–and perhaps other STEM disciplines.

Further, this work builds on the promising empirical evidence in the literature, particularly that of Diekman et al. (2010; 2013) that indicated emphasizing communal/people-oriented aspects of STEM roles (i.e., scientist) leads to more positive evaluations of these roles. There are several ways this study builds on this initial groundwork of the role that communal values and people-orientations play in addressing women's underrepresentation in engineering, specifically. First, I expanded upon prior empirical work by providing evidence for the role that communal values and people orientations have *not only* on women's positivity towards engineering majors, but on a wide range of outcomes including women's behavioral intention to pursue engineering and evaluations such as interest and confidence. Further, I explored the impact across two points in the academic/employment lifecycle including the selection of an engineering major–for which there was empirical support for–and persistence in an engineering career–which lacked empirical support. This exploration allowed for a further understanding of the potential implications and possible limitations of an intervention based on these factors. I also explored the implication of these factors for samples beyond psychology subject pools–focusing on the actual women that these interventions would be designed to impact: women deciding on a major and women in engineering roles. Lastly, my experimental manipulation did not only test the impact of changing the description of engineering, but looked at the possibility of changing the way women *themselves* perceive experiences within engineering. Collectively, this work allowed a broader empirical exploration of the potential effectiveness, and limitations, of communal value and person-oriented based interventions.

The results of the empirical evaluation of a theoretical grounded intervention have two clear practical applications. First, it provides empirical support for the work by social change organizations aimed at shifting the conversation around engineering–and STEM broadly. Based on the results of this study, there is evidence for the effectiveness of changing the way we talk about and describe engineering, at least to initially open up the possibility of majoring in engineering to women who have never before considered engineering as a major. Second, this shift in the conversation should be taken up by universities in their efforts to encourage more women to consider engineering. These results suggest universities should be very intentional about the messages they are sending about engineering in lieu of their aims to attract more women to the major as current messaging often rectifies agentic norms and thing-focused aspects of engineering that deter women.

Taken Together: Limitations and Future Directions

While this work has promising implications by providing further evidence to the role that communal/people-orientations play in women's pursuit and persistence in engineering, there are important limitations and related future directions. First, while the ability to fulfill one's communal values and people-orientations appears to be an impactful factor for women's pursuit of engineering, this alone cannot explain women's underrepresentation across all stages of the academic/employment lifecycle. There are numerous other factors such as limited opportunities and discrimination that women may face in these fields that contribute to their underrepresentation that need to be explored alongside women's ability to fulfill one's communal values and people-orientations. It will be important to understand the ability communal values and people-orientations to explain women's underrepresentation *above and beyond* other prominent factors in the literature to ensure that this explains and addresses a unique portion of the problem. Further, it will be important to test not only the impact of communal/people-oriented framing above and beyond other factors, but the impact of this *coupled* alongside an agentic/thing-oriented framing. While often the two are pitted against one another, this may not necessarily lead to the greatest outcomes nor are they inherently opposite of one another. Future work should seek to understand the implications of this type of framing.

Second, while there was experimental evidence for the effectiveness of the intervention for Study One and none for Study Two, the generalizability and long-term impact of these interventions are unknown. For Study Two in particular, there is evidence that the results may be a factor of a low sample size. As such this study should be replicated to determine if a larger sample may unveil the potential for the effectiveness of this intervention. Second, for both studies only one sample was used from one university (i.e., student body; alumni). It is important that these studies are replicated not only for the ability to better detect an effect, but to generalize these results to other geographical areas and types of programs to confirm the impact of the intervention. This should also include other areas beyond engineering, such as science, technology and mathematic fields where women are also frequently underrepresented. Relatedly, for Study One, the long-term effects are unknown. Future research should follow these students over time in order to see how the manipulation impacts actual behavior–such as actually pursuing an engineering degree. Future research should also seek to test the longevity of results for Study Two, should a larger sample size indicate a meaningful impact of the intervention over time.

Lastly, while experimental in nature, this study only manipulates women's *perception* regarding engineering fields rather than changing one's *actual experience* within engineering. While addressing perceptions is important and mirrors the focus of numerous organization's attempt to change the conversation surrounding engineering—perceptions can only be so impactful. Future work should seek to not only change the way that women perceive engineering, but the impact of changing the *actual experiences* within engineering fields of study and careers. More specifically, future work should attempt to apply the same idea to job design within engineering course work and careers to understand how changing the work to objectively be more reliant on collaboration and have a greater emphasis on how the role helps others. Further, work on job crafting could further examine women's ability themselves to actively change and adapt their work experience to be more communal and people-oriented.

In Conclusion

There is substantial evidence from educators and employers alike that women's underrepresentation in engineering is a critical societal and economic issue that requires the attention of both researchers and policymakers. To better address this issue, one must understand how to attract women to engineering as well as how to keep them there– improving the state of women in engineering. The present study sought to expand upon prior theoretical and empirical work to further understand the implication of re-orienting the way engineering majors and careers are discussed. This study intervenes on the perceived disconnect between what women want from their studies and work and what they believe engineering can provide by highlighting communal and people-oriented aspects of engineering majors and careers. This proved to be a successful intervention in that it encouraged women who had never before considered engineering to report a greater intention to select an engineering major. While addressing the women's state in engineering at the very beginning of the cycle is important, further work must continue to seek theoretically and empirically founded ways to improve women's state in engineering across all stages of the academic and employment cycle.

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APPENDIX A

Table 1

Study Design and Hypotheses

Stage	Sample	Manipulations	Hypotheses
Study One. Intention to Pursue an Engineering Major	Female Students with Undeclared Majors	Communal/People-Oriented Major Descriptions vs. Agentic/Thing-Oriented Major Descriptions	H1. When engineering majors are described in more communal/ people-oriented was, as compared to agentic/thing- -oriented ways, women will report: a.) Greater interest in the major [*behavioral beliefs*], b.) Greater enjoyment in the major [*behavioral beliefs*], c.) Greater confidence in ability to succeed in the major [*control beliefs*], d.) Greater likeliness to select the major [*behavioral intentions*][1]
Study Two. Intention to Stay in an Engineering Career	Female Engineering Professionals	Communal Work Reflections vs. Agentic Work Reflections	H2. Women reflecting on engineering jobs in communal/people- -oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report: a.) Greater interest in their job at Time 2 [*behavioral beliefs*], b.) Greater satisfaction in their job at Time 2 [*behavioral beliefs*],

(*table continues*)

Stage	Sample	Manipulations	Hypotheses
			c.) Greater satisfaction in their career at Time 2 [*behavioral beliefs*], d.) Greater person-environment fit at Time 2 [*normative beliefs*][2], e.) Greater self-efficacy in their ability to succeed in their job at Time 2 [*control beliefs*], f.) Greater commitment to engineering as a career at Time 2 [*behavioral intentions]* g.) Decreased frequency of turnover considerations at Time 2 [*behavioral intentions*]

Note. [1]Person-environment fit was not measured in Study One as measures were intentionally chosen that only required information students were already privy to. In other words, because students are not presently in the major it was believed they may not be able to accurately report out on their fit within the major.
[2]Person-environment fit is argued to be an indirect measure of subjective normative beliefs as based on rationale that will be discussed in the methods section.

Table 2

Study One Major Descriptions Content Analysis

	w Communal/People Topics	% Communal/People Topics	*w* Agentic/Thing Topics	% Agentic/Thing Topics	Total Word Count
Communal Texts	178	11.91%	82	5.49%	1,494
Agentic Texts	8	0.62%	150	11.62%	1,291

Note. *w* = raw word count within each topic area taken cumulatively. % = Percentage of topics based on the number of topic words divided the total number of words in the text.

Table 3

Paired Sample T-Test for Study One Major Descriptions

		Paired Differences		95% Confidence Interval of the Difference				
		M	*SD*	Lower	Upper	*t*	*df*	*p*-value
Pair 1	Agentic Major Description Agency Rating vs. Communal Major Description Agency Rating	2.28	.95	1.77	2.79	9.57	15	.00
Pair 2	Agentic Major Description Communal Rating vs. Communal Major Description Communal Rating	-3.56	.90	-4.04	-3.08	-15.84	15	.00

Note. *M* = Mean. *SD* = Standard Deviation. Communal Ratings range from 1 (Not at all communal) to 7 (Extremely communal). Agency Ratings range from 1 (Not at all agentic) to 7 (Extremely agentic).

Table 4

T-Test Results Study One Overall Outcomes in Agentic vs. Communal Conditions

	Agentic		Communal		95% Confidence Interval of the Difference					
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value	*d*
Interest										
(*N*= 72; 62)	2.94	1.81	3.53	1.58	.00	1.17	1.99	132	.05	.35
Enjoyment										
(*N*= 72; 62)	2.56	1.70	2.94	1.61	-.20	.96	1.30	132	.20	.22
Confidence										
(*N*= 72; 62)	2.29	1.59	2.84	1.56	.01	1.09	2.01	132	.05	.35
Intention to Select										
(*N*= 36; 32)	3.22	1.76	3.78	1.64	-.27	1.39	1.35	66	.18	.33

Note. *M* = Mean. *SD* = Standard Deviation. *df* = degrees of freedom. *d* = Cohen's d effect size. The outcomes scores range from 1 to 7 and represent a single overall score. Intention to select is based on only data from '2' to '7'on the scale. This was due to an error in the surveys in the communal that would not ask their likeliness to select on a 7-point scale if they answered that they would not consider engineering on a dichotomous scale (yes vs. no). As such, only values on the 'likeliness' scale that indicated some degree of consideration ($\geq$2) were used for these analyses. Results with 1s included can be found in Appendix J.

Table 5

Study Two One Sample T-Test for Daily Diary Prompts

	Mean Difference		95% Confidence Interval of the Difference				
	M	*SD*	Lower	Upper	*t*	*df*	*p*-value
Agentic Ratings	3.08	1.10	2.44	5.16	7.76	4	0.00
Communal Ratings	-5.00	1.00	-6.24	-3.76	-11.18	4	0.00

Note. *M* = Mean. *SD* = Standard deviation. Communal Ratings range from 1 (Not at all communal) to 7 (Extremely communal). Agency Ratings range from 1 (Not at all agentic) to 7 (Extremely agentic).

Table 6

Study Two Repeated Measures ANOVA for Communal vs. Agentic Condition Across Time and Conditions

Outcome	Agentic		Communal		Predictor	Type III Sum of Squares	*df*	Mean Square	*F*	*p*
	M	*SD*	*M*	*SD*						
Turnover Frequency	1.73	1.19	1.57	1.03						
(*N* = 11; 21)										
					Time	0.02	1	0.02	0.09	0.76
					Condition	0.21	1	0.21	0.08	0.78
					Time * Condition	0.44	1	0.44	2.10	0.16
					Error	8.56	41	0.21		
Commit	3.88	1.03	3.93	0.78						
(*N* = 16; 27)										
					Time	0.00	1	0.00	0.00	0.95
					Condition	1.66	1	1.66	1.33	0.25
					Time * Condition	0.03	1	0.03	0.13	0.72
					Error	14.97	61	0.25		
Career Sat	6.13	0.81	6.22	0.80						
(*N* = 16; 27)										
					Time	0.00	1	0.00	0.01	0.93
					Condition	0.13	1	0.13	0.08	0.79
					Time * Condition	0.07	1	0.07	0.28	0.60
					Error	14.43	61	0.24		
Job Sat	4.81	1.60	5.63	1.31						
(*N* = 16; 27)										

(*table continues*)

Outcome	Agentic		Communal		Predictor	Type III Sum of Squares	*df*	Mean Square	*F*	*p*
	M	*SD*	*M*	*SD*						
					Time	0.01	1	0.01	0.03	0.87
					Condition	2.79	1	2.79	0.78	0.38
					Time * Condition	0.01	1	0.01	0.03	0.87
					Error	26.48	61	0.43		
Job Interest	5.25	1.24	5.63	1.21						
(*N* = 16; 27)										
					Time	3.88	1	3.88	7.84	0.01
					Condition	0.19	1	0.19	0.08	0.78
					Time * Condition	0.07	1	0.07	0.15	0.70
					Error	30.23	61	0.50		
PE Fit	4.99	0.98	5.17	1.03						
(*N* = 16; 27)										
					Time	0.06	1	0.06	0.28	0.60
					Condition	3.12	1	3.12	1,59	0.21
					Time * Condition	0.14	1	0.14	0.62	0.44
					Error	13.44	61	0.22		
Self-Efficacy	6.18	0.60	6.25	0.67						
(*N* = 16; 27)										
					Time	0.00	1	0.00	0.02	0.90
					Condition		1			

(*table continues*)

	Agentic		Communal							
Outcome	*M*	*SD*	*M*	*SD*	Predictor	Type III Sum of Squares	*df*	Mean Square	*F*	*p*
					Time * Condition	0.01	1	0.01	0.08	0.78
					Error	7.75	61	0.13		

Note. *N* = Number of data points for agentic condition; communal condition. *M* = Mean. *SD* = Standard Deviation. *M* = Mean at Time 2. *SD* = Standard Deviation at Time 2. *df* = degrees of freedom. Turnover Frequency = How often they consider leaving their current job on a 7-point likert scale. Commit = Commitment to remain in engineering on a 7-point anchored scale. Career Sat = Career Satisfaction on a 7-point anchored scale. Job Sat= Job satisfaction on a 7-point anchored scale. PE Fit = Person-Environment in the Organization on a 7-point anchored scale.

Table 7

Outcomes of Study Hypotheses

Stage	Hypothesis		Support
Study One. Intention to Pursue an Engineering Major	H1A.	When engineering majors are described in more communal/people-oriented ways, as compared to agentic/thing-oriented ways, women will report greater interest in the major [*behavioral beliefs*]	Supported
	H1B.	When engineering majors are described in more communal/people-oriented ways, as compared to agentic/thing-oriented ways, women will report greater anticipated enjoyment in the major [*behavioral beliefs*],	Not Supported
	H1C.	When engineering majors are described in more communal/people-oriented ways, as compared to agentic/thing-oriented ways, women will report greater confidence in ability to succeed in the major [*control beliefs*],	Supported
	H1D.	When engineering majors are described in more communal/people-oriented ways, as compared to agentic/thing-oriented ways, women will report greater likeliness to select the major [*behavioral intentions*]	Not Supported
Study Two. Intention to Stay in an Engineering Career	H2A.	Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater interest in their job at Time 2 [*behavioral beliefs*]	Not Supported
	H2B.	Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater satisfaction in their job at Time 2 [*behavioral beliefs*]	Not Supported
	H2C.	Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater satisfaction in their career at Time 2 [*behavioral beliefs*]	Not Supported

(*table continues*)

Stage	Hypothesis	Support
	H2D. Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater person-environment fit at Time 2 [*normative beliefs*]	Not Supported
	H2E. Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater self-efficacy in their ability to succeed in their job at Time 2 [*control beliefs*]	Not Supported
	H2F. Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report greater commitment to engineering as a career at Time 2 [*behavioral beliefs*]	Not Supported
	H2G. Women reflecting on engineering jobs in communal/people-oriented ways, as compared women reflecting on engineering jobs in agentic/thing-oriented ways, will report decreased frequency of turnover considerations at Time 2 [*behavioral intentions*]	Not Supported

Note. Support is based on whether there were significant differences found for all included participants across the communal vs. agentic condition. Significance was based on a p-value equal to or smaller than $p = .05$. Sub-group analyses and supplementary analyses can be found in the appendices and are discussed below.

Table 8

Communal Condition Qualitative Theme Counts and Examples

Theme	*N* (%) "Collaboration" Prompt	*N* (%) Help" Prompt	"Collaboration" Prompt Response Example	"Help" Prompt Response Example
People-Focused/ Communal Response	166 (54.95%)	162 (53.64%)	"I met with my ***project team*** for one of my projects. ***We discussed*** the issues we were facing for two of the deliverables."*	"I'm working on an expansion for the local animal shelter - and when it expands, I think the new portion of the building will help them have events to educate and fundraise, which would ***help people*** find their companions."*
			"My ***group met*** to figure out way we can be more efficient. ***We will*** be putting together templates for every kind of deliverable that ***we create***."*	"I'm working on activities that ensure that our company meets regulations intended to ***keep people safe*** when using our medical device. It doesn't necessarily ***help people*** today, but it will help when or product is out on the market."
Thing-Focused Response	71 (23.51%)	76 (25.17%)	"Reviewed **documents** and tested **product**."*	"It will help establish ways to measure and predict different ***tire conditions.***"*
			"Developed a **solution** to a document issue, created list of questions on a document, found a missing **package**."*	"It will allow for new materials to be used ***for medical devices,*** which could mean higher quality and more durable ***devices***."*

(table continues)

Theme	*N* (%) “Collaboration” Prompt	*N* (%) Help” Prompt	“Collaboration” Prompt Response Example	“Help” Prompt Response Example
Self-Focused Response	N/A (0.00%)	18 (5.96%)	N/A	“It helps ***me*** know how to communicate effectively and assign tasks.”*
Unable to Provide Example	49 (16.23%)	32 (10.60%)	“I didn't really collaborate with others today.”	"I do not know if anything I did today had an impact.”
No Response	16 (5.30%)	14 (4.64%)	“I stayed home with a sick child Today.”	“Today is Saturday.”

Note. *N* = Total number of responses for each response theme. These counts are based on a review of the 302 responses for both prompts are reported here. People-Focused Response = responses that focused on communal or people-oriented themes as intended by prompt. Thing-Focused Response = responses that focused on thing-oriented themes (i.e., product, task, process) not intended by prompt. Self-Focused Response = responses that focused on agentic themes (i.e., achievement, benefit to self). Unable to Provide Example = responses that indicated they were unable to think of response that answered the prompt. *No Response* = responses that indicated that they did not work the day they were responding (i.e., weekend, sick, holiday).

* = Bold and Italics added for emphasis by researcher.

APPENDIX B

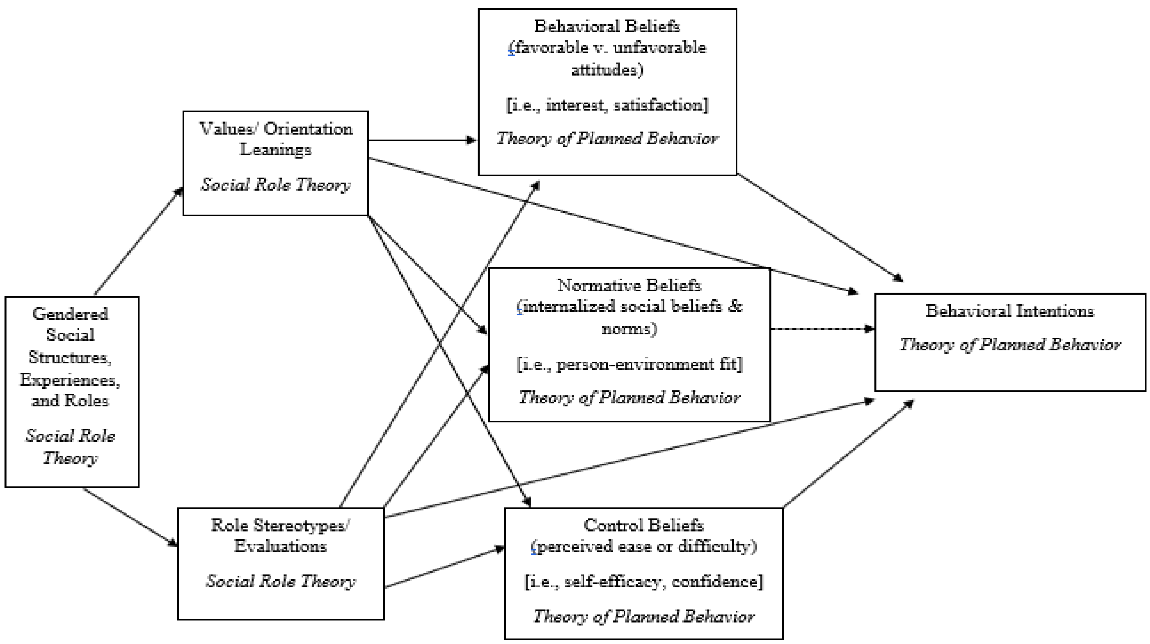

Figure 1. Theoretical basis for intervention.

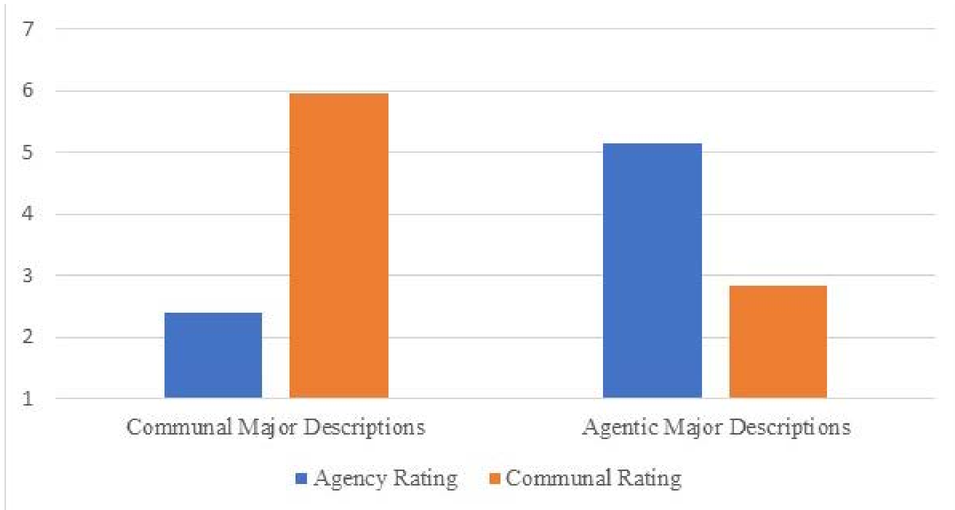

Figure 2. Study One major descriptions qualitative content analysis.

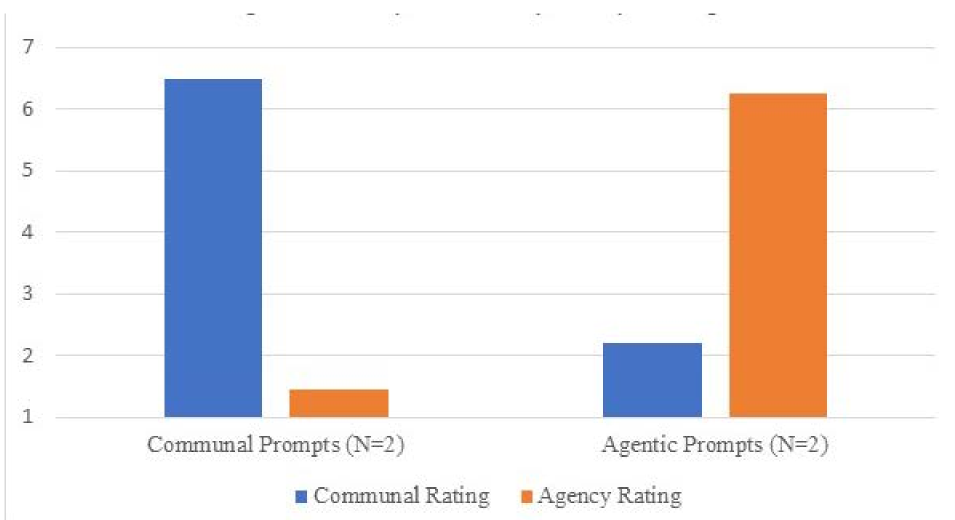

Figure 3. Study Two daily diary prompts ratings.

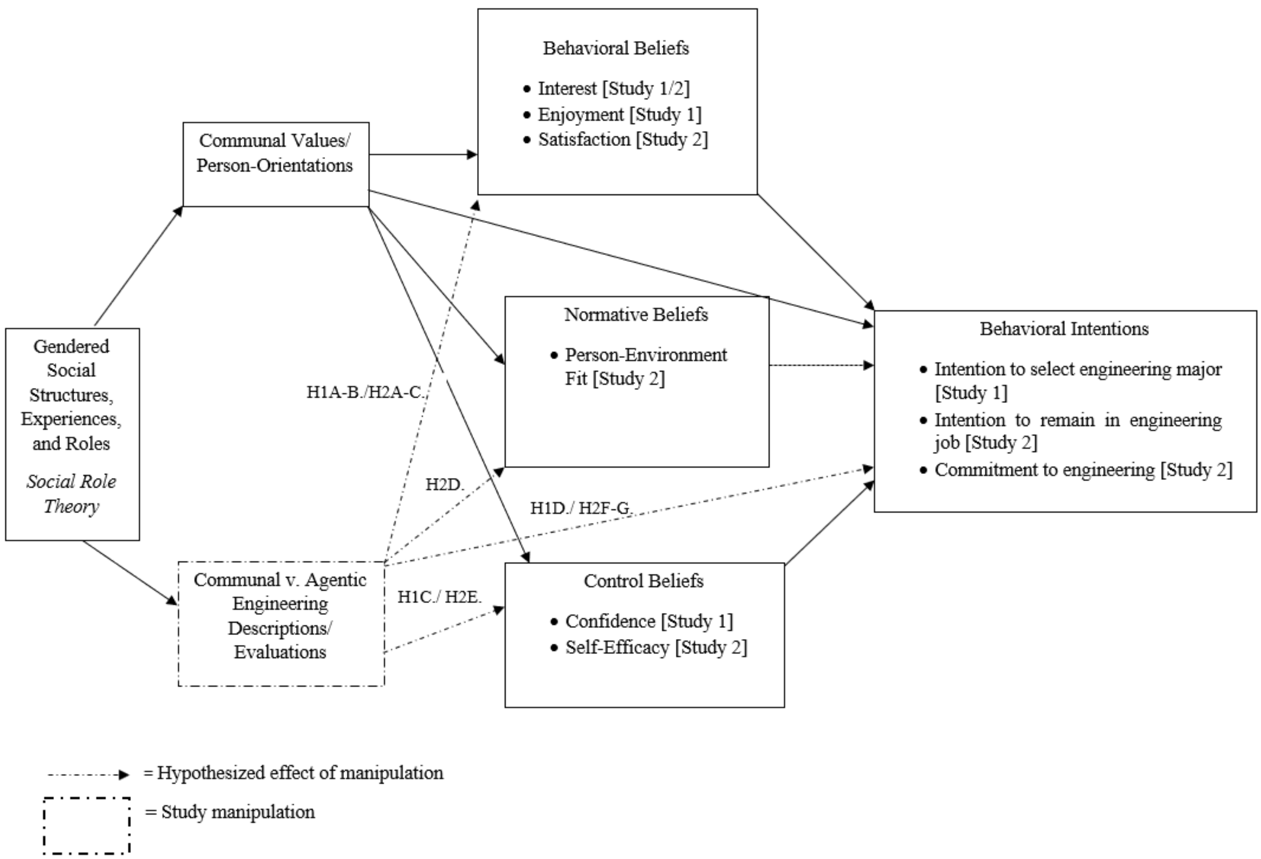

Figure 4. Theoretical basis for intervention with study variables.

APPENDIX C

Study One Agentic Major Descriptions

Introduction

If you are interested in fast-paced, challenging work that comes with a hefty salary, then working towards a degree in engineering may be the perfect chance to show off your skills!

There are several major paths you can choose in an engineering program.

Please review the information on the following engineering disciplines and then answer several questions regarding the discipline.

Aerospace Engineering

Aerospace engineering is a field that involves designing, developing, and producing powerful aircraft and spacecraft. It is a very financially rewarding field within engineering.

Agricultural Engineering

Agricultural engineering allows a person to use their skills to work on water and waste issues, improving the efficiency of the farming of foods and livestock, water farming, designing farming equipment, or genetically designing corn or cows.

Broadly, these engineers are recognized for their individual work to conserve, maintain, and improve natural resources and the environment.

Biological Engineering

A biological engineer uses their skills to solve many biologically based problems. They study the environment and how to conserve soil, water, and other natural resources, or how to design new equipment or methods used in medicine or consumer goods. There is great opportunity for self-direction and financial reward.

Biomedical Engineering

Biomedical engineers work independently to analyze and design solutions that are used in medical practices. Biomedical engineers are also responsible for research and development of medical innovations like artificial organs and prosthesis as well as medical equipment like MRIs and microscopic surgical machines which compete with past technology.
Biomedical engineers install, maintain and repair or provide technical support for medical machines and equipment to make sure that they are always running at peak efficiency. They also ensure that personnel in charge of the machine know how to use and care for it.

A biomedical engineer uses their skill to solve novel life science and healthcare problems using the practical application of science and math. Biomedical engineers make well-respected products in healthcare

Chemical Engineering

Chemical engineering is a well-respected profession that utilizes their knowledge of the physical world to manipulate the interactions of individual atoms and molecules.

Their talents and skills are generally employed in the research and development of new materials and are critical to numerous fields including nanotechnology, energy storage, and computing. They are also responsible for many processes that take raw materials and chemically transform them into products like gasoline, medicine, and other goods.

They often work independently to solve challenging problems, chemical engineers are guaranteed to remain key leaders in securing our prosperity on this planet.

Civil Engineering

Civil engineers are recognized for using their skills in road, bridge, buildings and water supply system design and construction. They often work independently, but at times direct construction workers.

These professionals successfully ensure that every structure built is environmentally compliant and can withstand earthquakes and hurricanes. This is especially true in places where these natural calamities often strike.

Civil engineers work wherever there is a need for expanding new structures or transportation systems and geotechnical engineering.

Construction Management Engineering

Construction engineers successfully design and execute processes for building and maintaining infrastructure in a competitive industry.

Some construction engineers focus on the design aspect, while others focus on the actual build phase of each project. Responsibilities may include directing, planning, and overseeing the construction operations of a project, conducting site layout, organizing the work, designing both temporary and permanent structures, checking and modifying plans and specifications for constructability and efficiency.

Computer Engineering

Computer Engineers work independently to develop and improve the software programs and hardware that make computers run effectively for organizations. Computer Engineers may specialize in either software or hardware.

Hardware Engineers develop the hardware of computers, including the motherboards, graphics and audio cards and drives that are later programmed by Software Engineers. These systems are critical in the functioning of businesses which makes these professionals in very high demand and is financially rewarding.

From operating system software, such as Windows and Linux, to individual computer programs, such as Photoshop and Microsoft Office, Software Engineers use their skills to turn piles of hardware into fully functional computers.

Electrical Engineering

Electrical engineers specialize in power supply and generation. They work independently to design, develop, test and supervise electrical equipment manufacturing. They have also been trained to handle responsibilities like wiring and lighting installations in buildings, automobiles and aircraft.

Moreover, electrical engineers are recognized for taking part in development and research. Many kinds of electronic equipment from portable music players to GPS devices pass through an electronic engineer’s skilled hands. They come up with means to use electrical power to operate a certain product or to successfully improve its functions.

Environmental Engineering

Environmental engineering is a competitive field that uses their skills and science and engineering principles to work on environmental challenges. The quality of air, water, and soil is their primary focus.

They seek solutions to water-borne disease, recycling challenges, and air pollution. They may also concentrate on acid rain, climate change, and causes of ozone depletion leading to immense political recognition.

They work independently to create advanced air and water treatment technologies, and look for sustainable energy sources. They also are recognized for addressing legal and business connections to environmental problems.

Industrial Engineering

Industrial engineering is recognized for successfully optimizing complex processes or systems by reducing wastefulness in production. Industrial engineers design, analyze, and manage complex systems such as manufacturing systems, supply chain networks, and service systems. These systems typically consist of a combination of information, material, and equipment.

In such systems industrial engineers work independently to determine how to optimize the system for maximum efficiency, effectiveness, or some other objective of interest to the stakeholders of the system.

To achieve these objectives, an industrial engineer draws upon their skills and mastery of mathematics, along with engineering, management, and behavioral sciences to function as a problem-solver, innovator, designer, and system integrator.

Materials Engineering

Materials Engineers are recognized for the study, discovery, and successful creation of new physical materials for the purposes of research and quality control.

These created materials are used in everything from medical industries, automotive industries, aerospace industries, and manufacturing industries for many different purposes and products.

There is a heavy focus on independent work, attention to detail, critical thinking, and problem-solving skills.

Mechanical Engineering

Mechanical engineering is the study of motion, energy and force. Mechanical engineers apply their skill to control these elements by using a combination of material, human and economic resources to successfully develop mechanical solutions.

The most common job functions include designing products, researching new ideas and solutions to improve or expand older ideas and solutions, designing and building the machines, and managing the operations of a large system, such as a manufacturing facility or a power plant.

Mechanical engineers must be comfortable making decisions and working independently. They decide the size, material and shape of every part of a machine or mechanical device. Some decisions are critical, such as those concerning the features of an industrial machine or a consumer product.

Nuclear Engineering

Nuclear engineering is the most integrated of the engineering disciplines and very well-respected. The many components of nuclear systems (medical imaging, nuclear fission reactors, ultrasensitive contraband detectors, and fusion reactors) must all be understood as well as how they relate to one another.

A Nuclear Engineer must understand the fundamentals of nuclear processes. This includes their production, interactions, and radiation measurements. This understanding allows them to independently design nuclear-based systems with a focus on energy and security impacts.

Program Description for Engineering Majors

1. An ability to identity, formulate and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. An ability to apply engineering design to produce products

3. An ability to communicate effectively

4. An ability to recognize responsibilities in engineering situations and make informed judgments

5. An ability to function effectively in an organization, establish goals, plan tasks, and meet objectives

6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

APPENDIX D

Study One Communal Major Descriptions

Introduction

If you are interested in collaborative, impactful work that helps improve people's lives and society broadly, then working towards a degree in engineering may be the perfect chance to show off your passion!

There are several major paths you can choose in an engineering program.

Please review the information on the following engineering disciplines and then answer several questions regarding the discipline.

Aerospace Engineering

Aerospace engineering involves working with a team to design, develop, and produce aircraft that help people travel the world and spacecraft that helps society learn about our universe.

Agricultural Engineering

Agricultural engineering ranges from helping solve water and waste issues in communities, improving the efficiency of the farming of foods and livestock for growing populations, water farming to help protect our natural resources, designing farming equipment to help local farmers to genetically designing corn or cows.

Broadly, these engineers help conserve, maintain, and improve natural resources and the environment leading to numerous benefits for our society.

Biological Engineering

A biological engineer works collaboratively to solve many biological based problems that society faces. They study the environment and ways to help conserve soil, water, and other natural resources, or how to design new equipment or methods used in medicine or consumer goods that aim to promote health and wellness. There is great opportunity to make a difference.

Biomedical Engineering

Biomedical engineers work collaboratively to analyze and design solutions that will improve patient care. Biomedical engineers are also responsible for research and development of medical innovations like artificial organs and prosthesis as well as medical equipment like MRIs and microscopic surgical machines which have saved numerous lives.

Biomedical engineers install, maintain and repair or provide technical support for medical machines and equipment to make sure that they are always running at peak efficiency and won't compromise patients' lives. They also ensure that personnel in charge of the machine know how to use and care for it.

A biomedical engineer helps solve novel life science and healthcare problems using the practical application of science and math. Biomedical engineers make a global impact by saving lives by improving the quality of healthcare.

Chemical Engineering

Chemical engineers utilize their knowledge of the physical world to manipulate the interactions of individual atoms and molecules that make up everything in the world.

Their talents are generally employed in the research and development of new materials that help numerous people in fields including nanotechnology, energy storage, and computing. They are also responsible for many processes that take raw materials and chemically transform them into products like gasoline, medicine, and other goods that touch people’s lives daily.

They often work alongside other engineers in interdisciplinary teams to solve humanity's greatest problems, chemical engineers are guaranteed to be important in securing our well-being on this planet.

Civil Engineering

Civil engineers help make communities safe by specializing in road, bridge, buildings and water supply system design and construction. They collaborate with construction teams and work with other engineers.

These professionals ensure that every structure built is environmentally compliant and can withstand earthquakes and hurricanes to help protect people. This is especially true in places where these natural calamities often strike.

Civil engineers work wherever there is a need for expanding new structures or transportation systems and geotechnical engineering and help build safe communities.

Construction Management Engineering

Construction engineers help create communities by designing and executing processes for building and maintaining infrastructure that allow people to live and travel the world safely. Some construction engineers focus on the design aspect, while others focus on the actual build phase of each project. Responsibilities may include working with a team to plan and oversee the construction operations of a project, conducting site layout, collaborating with the work crew, designing both temporary and permanent structures, and checking and modifying plans and specifications to ensure people’s safety.

Computer Engineering

Computer Engineers work with teams to help develop and improve the software programs and hardware that make computers run in ways that improve people’s ability to work and live. Computer Engineers may specialize in either software or hardware.

Hardware Engineers develop the hardware of computers including the motherboards, graphics and audio cards and drives that are later programmed by Software Engineers. These systems are critical in helping the functioning of individual’s lives and work.

From operating system software, such as Windows and Linux, to individual computer programs, such as Photoshop and Microsoft Office, Software Engineers turn piles of hardware into fully functional computers that help people explore the world and connect across the globe.

Electrical Engineering

Electrical engineers specialize in power supply and generation. They collaborate to design, develop, test and supervise electrical equipment manufacturing. They have also been trained to handle responsibilities like wiring and lighting installations in buildings, automobiles, and aircraft that people use around the world.

Moreover, electrical engineers help with development and research. Many kinds of electronic equipment for people's fun and function such as portable music players to GPS devices pass through an electronic engineer's hands. They come up with means to use electrical power to operate a certain product or improve its functions ensuring the safety of people.

Environmental Engineering

Environmental engineers use science and engineering principles to help protect and improve our environment. The quality of people's most important resources air, water, and soil is their primary focus.

They seek solutions to water-borne disease, recycling challenges, and air pollution to maintain people and resource's wellness. They may also concentrate on global issues, acid rain, climate change, and causes of ozone depletion to help keep our planet healthy.

They create advanced air and water treatment technologies, and look for sustainable energy sources. They work with others to address legal and business connections to environmental problems.

Industrial Engineering

Industrial engineers help to optimize processes or systems by reducing wastefulness in our world. Industrial engineers design, analyze, and manage complex human-integrated systems such as manufacturing systems, supply chain networks, and service systems that touch the lives of numerous people. These systems typically consist of a combination of people, information, material, and equipment.

In such systems industrial engineers work in teams to determine how to optimize systems for maximum efficiency, effectiveness, safety, or some other objective that helps the people who use the system.

To achieve these objectives, an industrial engineer draws upon knowledge of mathematics, along with engineering, management, and behavioral sciences to function as a problem-solver, helper, coordinator, and person-centered scientist.

Materials Engineering

Materials Engineering focuses on the study, discovery, and creation of new physical materials for the purposes of research, quality control, or to increase material's safety for people's use.

These created materials are used in everything from medical industries to help people's wellness, automotive and aerospace industries that allow people to safely travel the country or galaxy, and manufacturing industries.

There is a heavy focus on collaboration, attention to detail, critical thinking, and problem-solving.

Mechanical Engineering

Mechanical engineering is the study of motion, energy and force. Mechanical engineers seek to control these elements by using a combination of material, human and economic resources to develop mechanical solutions that help society.

The most common jobs include designing products that help improve people's lives, researching new ideas and solutions or improve or expand older ideas and solutions to help society, designing and building the machines, and managing the operations of a large system, such as a manufacturing facility or a power plant.

Mechanical engineers must be comfortable making decisions. They decide the size, material and shape of every part of a machine or mechanical device. Some decisions are critical to human life, such as those concerning the safety features of an industrial machine or a consumer product.

Nuclear Engineering

Nuclear engineering is one of the most collaborative of the engineering disciplines. The components of nuclear systems must all be understood as well as how they relate to one another to ensure this promising technology benefits society in numerous ways while still protecting our communities.

A nuclear engineer must work with a team to use nuclear processes to help solve societal challenges. This includes production, interactions, and radiation measurements. This understanding allows them to design nuclear-based systems with a focus on the social, health, energy, and security impact.

Program Description for Engineering Majors

1. An ability to identity, formulate and solve complex engineering problems that help society by applying principles of engineering, science, and mathematics

2. An ability to apply engineering design to produce solutions that meet specified needs with consideration for public health, safety, and welfare, as well as ensuring the care and concern for relevant global, cultural, social, environmental and economic factors.

3. An ability to communicate effectively with a range of people

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider how to make a positive impact with engineering solutions in global, economic, environmental, and societal contexts

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals collectively, plan and delegate tasks, and work towards a better tomorrow

6. An ability to develop and conduct appropriate experimentation, and use engineering judgment to draw conclusions that help people travel the world and space

APPENDIX E

Table 9

Communal and Agentic Themes for Qualitative Analysis

	Topic	Example Words and Phrases
Communal	Service	serve + service + save + saving + safe + protect + create + safety + serving
	Community	community + communities + support
	Society	society + world + social
	People	people + persons + patient + person + personnel + customer + colleague + patients + staff
	Others	others
	Helping	help + helping + make a difference + impact + impactful + improve
	Connecting	team + collaborate + collaborative + connect +interdisciplinary + work with + coordinate + partner
	Humanity	humanity + life + lives + health + wellness + well-being + human + humans
	Caring	care + caring
Agentic	Financial	money + lucrative + financial + paid + salary + reward
	Recognition	recognition + recognize + recognized + respected + well-respected
	Achievement	achieve + achievement + driven + accomplish + accomplished
	Status	status + leaders + key + high demand + leader + elite + leadership + leading + driving + excellence + lead + manage + power + powerful + champion + prestigious + prestige + direct
	Success	success + successful + successfully + prosperity
	Self	individual + self + pride
	Mastery	master + mastery + responsible + responsibilities + knowledge + direct + directing + specialize + expertise + expert
	Independence	independent + independently + self-directed + self-direction + making decisions + responsible for/to + self-motivated
	Skill	skill + skills + competence + competency + aptitude + ability
	Competition	challenging + challenge + competitive + compete
	Things	machines + products + materials

APPENDIX F

Table 10

Study One Intraclass Correlation Coefficient

		95% Confidence Interval		*F* Test with True Value 0			
	Interclass Correlation[a]	Lower Bound	Upper Bound	Value	*df*1	*df*2	*p*-value
Communal Average Measures	.95[b]	.91	.97	18.61	27	135	.00
Agentic Average Measures	.83[b]	.72	.911	5.95	28	140	.00

Note. Two-way mixed effects model where both people effects and measures effects are random.

[a]Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[b]The estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

APPENDIX G

Table 11

T-Test Results Study One Comparing Group Attributes

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
Prior Consid. of Eng. (*N* = 72; 62)	1.33	.48	1.34	.48	-.16	.17	.07	132	.95
Serious. Consid. of Eng. (*N* = 24; 21)	4.67	1.69	4.57	2.06	-1.22	1.03	-.17	43	.87
Communal Values (*N* = 71; 62)	5.30	1.13	5.22	1.32	-.48	.30	-.44	131	.66
Agentic Values (*N* = 71; 62)	4.95	.98	4.73	1.06	-.58	.12	-1.28	131	.20
Person-Orientation (*N* = 71; 62)	4.92	.85	4.92	.89	-.30	.30	.02	131	.99
Thing Orientation (*N* = 71; 62)	2.21	1.56	2.45	1.58	-.30	.78	.88	131	.38
Self-Efficacy (*N* = 70; 62)	2.75	1.54	3.12	1.43	-.15	.88	1.41	130	.16

(*table continues*)

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
Age									
(*N* = 70; 60)	18.50	.58	18.48	.54	-.21	.18	-.17	128	.87
Ethnicity									
(*N* = 69; 61)	1.70	1.37	1.48	1.07	-.65	.21	-1.01	128	.31
Science Class Count									
(*N* = 66; 58)	6.00	2.47	6.09	2.49	-.80	.97	.19	122	.85
Math Class Count									
(*N* = 67; 59)	5.55	.86	5.47	1.19	-.44	.29	-.42	124	.67

Note. *M* = Mean. *SD* = Standard Deviation. *N* = The number of participants in the agentic group; the number of participants in the communal group. *df* = degrees of freedom. Prior Consid. Of Eng. = Prior consideration of Engineering on a dichotomous scale. Serious. Consid. Of Eng. = Seriousness of their consideration of engineering on a scale of 1 (Not at all seriously) to 7 (Extremely seriously). Science and Math Class Count = Total number of self-reported classes previously taken.

APPENDIX H

Table 12

Study One Study Variables Correlational Matrix

		Condition	Interest	Confidence	Enjoyment	Agentic Values	Communal Values	Person Orientation	Thing Orientation	Selection
Condition	*r*	1								
	Sig. (2-tailed)									
	N	134								
Interest	*r*	$-.171^{*}$	1							
	Sig. (2-tailed)	0.049								
	N	134	134							
Confidence	*r*	$-.172^{*}$	$.713^{**}$	1						
	Sig. (2-tailed)	0.047	0.000							
	N	134	134	134						
Enjoyment	*r*	-0.113	$.869^{**}$	$.805^{**}$	1					
	Sig. (2-tailed)	0.195	0.000	0.000						
	N	134	134	134	134					
Agentic Values	*r*	0.112	0.123	0.126	0.156	1				
	Sig. (2-tailed)	0.201	0.160	0.149	0.073					
	N	133	133	133	133	133				

(*table continues*)

		Condition	Interest	Confidence	Enjoyment	Agentic Values	Communal Values	Person Orientation	Thing Orientation	Selection
Communal	*r*	0.039	-0.017	0.055	-0.007	.307**	1			
Values	Sig. (2-tailed)	0.659	0.850	0.533	0.939	0.000				
	N	133	133	133	133	133	133			
Person	*r*	-0.002	0.120	0.107	0.131	.193*	.471**	1		
Orientation	Sig.	0.986	0.171	0.219	0.134	0.026	0.000			
	N	133	133	133	133	133	133	133		
Thing	*r*	-0.077	.615**	.558**	.691**	0.074	-0.100	0.040	1	
Orientation	Sig.	0.381	0.000	0.000	0.000	0.395	0.254	0.646		
	N	133	133	133	133	133	133	133	133	
Intention to	*r*	-.385**	.817**	.842**	.894**	.209*	0.044	0.065	.707**	1
Select	Sig.	0.000	0.000	0.000	0.000	0.033	0.654	0.508	0.000	
	N	105	105	105	105	105	105	105	105	105

Note. Condition 1 = Agentic; Condition 0 = Communal.

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

APPENDIX I

Table 13

T-Test Results Study One Average Outcomes in Agentic vs. Communal Conditions

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
Interest									
(*N* = 72; 62)	2.46	1.21	2.67	1.16	-.19	.62	1.04	132	.30
Enjoyment									
(*N* = 72; 62)	2.24	1.06	2.32	.99	-.27	.44	.47	132	.64
Confidence									
(*N* = 72; 62)	2.21	1.07	2.35	1.09	-.23	.51	.77	132	.44
Intention to Select									
(*N* = 72; 62)	1.78	.85	1.79	.75	-.26	.29	.12	132	.91

Note. *M* = Mean. *SD* = Standard Deviation. *df* = degrees of freedom. The outcomes scores range from 1 to 7 and are averaged across 14 engineering majors.

APPENDIX J

Table 14

T-Test Results Study One Intention to Select With Imputed Values in Agentic vs. Communal Conditions

	Agentic Group		Communal Group		95% Confidence Interval of the Difference					
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value	*d*
Intention to Select (*N* = 71; 62)	2.13	1.67	2.44	1.83	-0.29	0.91	1.02	1.31	0.31	-0.18

Note. *M* = Mean. *SD* = Standard Deviation. *df* = degrees of freedom. *d* = Cohen's d effect size. Intention to select is based on only data from '1' to '7'on the scale, and the 1's for the communal condition were imputed to correct for an error in the survey that did not present this question is they indicated that they would not consider engineering at the end of the survey. A negative d-value indicates a greater value in the communal condition.

APPENDIX K

Table 15

Study One T-Test Results Overall Outcomes in Agentic vs. Communal Conditions With and Without Prior Consideration of Engineering

	Agentic Group		Communal Group		95% Confidence Interval of the Difference					
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value	*d*
With Prior Consideration of Engineering										
Interest										
(*N* = 24; 21)	4.25	1.96	4.52	1.44	-.77	1.32	.53	43	.60	.16
Enjoyment										
(*N* = 24; 21)	3.92	2.13	4.14	2.62	-.92	1.38	.40	43	.23	.09
Confidence										
(*N* = 24; 21)	3.42	2.04	3.95	1.53	-.56	1.63	.98	43	.33	.29
Intention to Select										
(*N* = 19; 17)	4.11	2.03	4.29	1.93	-1.16	1.53	.29	34	.78	.09

(*table continues*)

	Agentic Group		Communal Group		95% Confidence Interval of the Difference					
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value	*d*
Without Prior Consideration of Engineering										
Interest (*N* = 48; 41)	2.29	1.32	3.02	1.41	.16	1.31	2.53	87	.01	.53
Enjoyment (*N* = 48; 41)	1.88	.98	2.32	1.21	-.02	.90	1.90	87	.06	.40
Confidence (*N* = 48; 41)	1.73	.89	2.27	1.25	.09	.99	2.37	87	.02	.50
Intention to Select (*N* = 17; 15)	2.24	.43	3.20	1.01	.41	1.52	3.57	30	.00	1.24

Note. *M* = Mean. *SD* = Standard Deviation. *df* = degrees of freedom. *d* = Cohen's d effect size. The outcomes scores range from 1 to 7 and represent a single overall score.

Table 16

T-Test Results Study One Average Outcomes in Agentic vs. Communal Conditions With and Without Prior Consideration of Engineering

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
With Prior Consideration of Engineering									
Interest (*N* = 24; 21)	3.31	1.16	3.14	.98	-0.82	0.48	-0.53	43	0.60
Enjoyment (*N* = 24; 21)	3.07	1.15	2.88	.93	-0.82	0.45	-0.60	43	0.55
Confidence (*N* = 24; 21)	3.01	1.22	3.10	1.05	-0.60	0.77	0.25	43	0.81
Intention to Select (*N* = 24; 21)	2.41	1.03	2.25	.90	-0.75	0.42	-0.56	43	0.56
Without Prior Consideration of Engineering									
Interest (*N* = 48; 41)	2.03	1.01	2.43	1.78	-0.06	0.86	1.73	87	0.09
Enjoyment (*N* = 48; 41)	1.82	.73	2.03	.90	-0.13	0.55	1.23	87	0.22
Confidence (*N* = 48; 41)	1.81	.71	1.97	.90	-0.17	0.50	0.97	87	0.34
Intention to Select (*N* = 48; 41)	1.46	.50	1.56	.54	-0.12	0.32	0.90	87	0.37

Note. *M* = Mean. *SD* = Standard Deviation. *df* = degrees of freedom. The outcomes scores range from 1 to 7 and are averaged across the 14 engineering majors.

APPENDIX L

Table 17

Study Two Intraclass Correlation Coefficient

		95% Confidence Interval		*F* Test with True Value 0			
	Interclass Correlation	Lower Bound	Upper Bound	Value	*df*1	*df*2	*p*-value
Communal Average Measures	0.99[b]	0.94	1.00	108.50	2	8	0.00
Agentic Average Measures	0.99 [b]	0.93	1.00	87.77	2	8	0.00

Note. Two-way mixed effects model where both people effects and measures effects are random.

[a]Type C intraclass correlation coefficients using a consistency definition. The between-measure variance is excluded from the denominator variance.

[b]The estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.

APPENDIX M

Table 18

T-Test Results Study Two Comparing Group Attributes at Time 1

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
Turnover Freq. (*N* = 20; 27)	1.60	0.88	1.67	1.30	-0.75	0.61	-0.20	45	0.84
Commit. (*N* = 26; 37)	4.04	0.87	3.84	0.80	-0.22	0.63	0.95	61	0.35
Career Sat (*N* = 26; 37)	6.12	0.99	6.14	1.06	-0.55	0.51	-0.08	61	0.94
Job Sat (*N* = 26; 37)	5.23	1.51	5.51	1.37	-1.01	0.45	-0.78	61	0.44
Job Interest (*N* = 26; 37)	5.85	1.08	5.97	1.07	-0.68	0.42	-0.46	61	0.65
PE Fit Org. (*N* = 26; 37)	4.99	1.06	5.16	0.98	-0.69	0.34	-0.68	61	0.50
Self-Efficacy (*N* = 26; 37)	6.20	0.70	6.19	0.69	-0.35	0.36	0.05	61	0.66

(*table continues*)

	Agentic Group		Communal Group		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*-value	*df*	*p*-value
Communal Values									
(*N* = 26; 37)	5.18	1.07	5.09	0.82	-0.39	0.56	0.36	61	0.72
Agentic Values									
(*N* = 26; 37)	4.48	0.93	4.88	0.75	-0.82	0.05	-1.88	61	0.07
Person-Orientation									
(*N* = 26; 37)	4.56	0.87	4.50	0.82	-0.36	0.50	0.34	61	0.74
Thing Orientation									
(*N* = 26; 37)	4.32	1.67	4.25	1.31	-.68	.83	.20	61	.84
Age									
(*N* = 26; 37)	38.19	11.19	37.00	10.18	-4.23	6.62	.44	61	.66

Note. *M* = Mean. *SD* = Standard Deviation. *N* = The number of participants in the agentic group; the number of participants in the communal group. *df* = degrees of freedom. Turnover Freq = How often they consider leaving their current job on a 7-point likert scale. Commit = commitment to engineering as a career on a 7-point anchored scale. Career Sat = Career Satisfaction on a 7-point anchored scale. Job Sat = Job Satisfaction on a 7-point anchored scale; PE Fit Org = Person-Environment in the Organization on a 7-point anchored scale.

APPENDIX N

Table 19

T-test Results Study Two Comparing Engaged vs. Unengaged Participant Attributes at Time 1

	5 < Days Engaged		5 > Days Engaged		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*	*df*	*p*-value
Turnover Freq.									
(*N* = 14; 33)	1.86	1.23	1.55	1.09	-0.42	1.04	0.86	45	0.39
Commit.									
(*N* = 20; 43)	3.80	1.06	3.98	0.71	-0.48	1.10	-0.79	61	0.44
Career Sat									
(*N* = 20; 43)	6.00	1.17	6.19	0.96	-0.74	0.37	-0.67	61	0.51
Job Sat									
(*N* = 20; 43)	5.15	1.60	5.51	1.33	-1.13	0.41	-0.94	61	0.35
Job Interest									
(*N* = 20; 43)	5.80	1.24	5.98	0.99	-1.20	0.48	-0.61	61	0.55
PE Fit Org.									
(*N* = 20; 43)	5.13	1.05	5.07	1.00	-0.82	0.47	0.23	61	0.82
Self-Efficacy									
(*N* = 20; 43)	6.05	0.82	6.26	0.61	-0.58	0.16	-1.13	61	0.26

(*table continues*)

	5 < Days Engaged		5 > Days Engaged		95% Confidence Interval of the Difference				
	M	*SD*	*M*	*SD*	Lower	Upper	*t*	*df*	*p*-value
Communal Values									
(*N* = 20; 43)	5.35	0.94	4.76	0.91	-0.17	0.83	1.32	61	0.19
Agentic Values									
(*N* = 20; 43)	4.76	0.91	4.70	0.82	-0.40	0.52	0.26	61	0.80
Person-Orientation									
(*N* = 20; 43)	4.64	0.98	4.47	0.77	-0.28	0.63	0.76	61	0.45
Thing Orientation									
(*N* = 20; 43)	4.13	1.45	4.35	1.47	-1.01	0.57	-0.55	61	0.58
Age									
(*N* = 20; 43)	36.85	10.71	37.79	10.57	-6.68	4.80	-0.33	61	0.74

Note. *M* = Mean. *SD* = Standard Deviation. *N* = The number of participants in the agentic group; the number of participants in the communal group. *df* = degrees of freedom. Turnover Freq = How often they consider leaving their current job on a 7-point likert scale. Commit = commitment to engineering as a career on a 7-point anchored scale. Career Sat = Career Satisfaction on a 7-point anchored scale. Job Sat = Job Satisfaction on a 7-point anchored scale; PE Fit Org = Person-Environment in the Organization on a 7-point anchored scale.

APPENDIX O

Table 20

Study Two Study Variables Correlational Matrix

		Turnover Frequency Time 1	Career Commit Time 1	Career Sat Time 1	Job Sat Time 1	Job Interest Time 1	PE Fit Time 1	Self-Efficacy Time 1	Turnover Frequency Time 2
Turnover Frequency	*r*	1							
Time 1	Sig.								
	N	47							
Career Commit	*r*	-.395**	1						
Time 1	Sig.	0.006							
	N	47	63						
Career Sat	*R*	-.356*	.335**	1					
Time 1	Sig.	0.014	0.007						
	N	47	63	63					
Job Sat	*R*	-.494**	.561**	.320*	1				
Time 1	Sig.	0.000	0.000	0.011					
	N	47	63	63	63				
Job Interest	*R*	-.326*	.266*	.319*	.415**	1			
Time 1	Sig.	0.025	0.035	0.011	0.001				
	N	47	63	63	63	63			

(*table continues*)

		Turnover Frequency Time 1	Career Commit Time 1	Career Sat Time 1	Job Sat Time 1	Job Interest Time 1	PE Fit Time 1	Self-Efficacy Time 1	Turnover Frequency Time 2
PE Fit	*R*	-.468**	.431**	.453**	.495**	.492**	1		
Time 1	Sig.	0.001	0.000	0.000	0.000	0.000			
	N	47	63	63	63	63	63		
Self-Efficacy	*R*	-0.262	.393**	.482**	.341**	.305*	.408**	1	
Time 1	Sig.	0.076	0.001	0.000	0.006	0.015	0.001		
	N	47	63	63	63	63	63	63	
Turnover Frequency	*R*	.846**	-.407**	-.397**	-.381**	-0.262	-.398**	-.303*	1
Time 2	Sig.	0.000	0.006	0.007	0.010	0.083	0.007	0.043	
	N	43	45	45	45	45	45	45	45
Career Commit	*R*	-.364*	.681**	.290*	.452**	.328**	.265*	.436**	-.434**
Time 2	Sig.	0.012	0.000	0.021	0.000	0.009	0.036	0.000	0.003
	N	47	63	63	63	63	63	63	45
Career Sat	*R*	-.409**	.398**	.765**	.276*	.309*	.330**	.482**	-.608**
Time 2	Sig.	0.004	0.001	0.000	0.029	0.014	0.008	0.000	0.000
	N	47	63	63	63	63	63	63	45
Job Sat	*R*	-.535**	.400**	.425**	.786**	.482**	.590**	.358**	-.503**
Time 2	Sig.	0.000	0.001	0.001	0.000	0.000	0.000	0.004	0.000
	N	47	63	63	63	63	63	63	45
Job Interest	*R*	-.434**	.448**	.543**	.581**	.664**	.492**	.444**	-.504**
Time 2	Sig.	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	N	47	63	63	63	63	63	63	45

(*table continues*)

		Turnover Frequency Time 1	Career Commit Time 1	Career Sat Time 1	Job Sat Time 1	Job Interest Time 1	PE Fit Time 1	Self-Efficacy Time 1	Turnover Frequency Time 2
PE Fit	*R*	-.624**	.501**	.539**	.550**	.428**	.804**	.322*	-.539**
Time 2	Sig.	0.000	0.000	0.000	0.000	0.001	0.000	0.011	0.000
	N	47	62	62	62	62	62	62	45
Self-Efficacy	*R*	-0.186	0.222	.337**	0.198	0.119	0.094	.716**	-.374*
Time 2	Sig.	0.211	0.082	0.007	0.122	0.358	0.467	0.000	0.011
	N	47	62	62	62	62	62	62	45
Communal Values	*R*	-0.010	-0.036	0.134	-0.096	0.230	0.246	-0.039	0.054
	Sig.	0.947	0.780	0.294	0.455	0.070	0.052	0.759	0.727
	N	47	63	63	63	63	63	63	45
Agentic Values	*R*	0.174	-0.015	0.124	-0.136	-0.002	0.092	.256*	0.163
	Sig.	0.241	0.910	0.334	0.287	0.985	0.472	0.043	0.284
	N	47	63	63	63	63	63	63	45
Person-Orientation	*R*	0.075	0.055	0.068	-0.030	0.160	0.193	0.045	0.163
	Sig.	0.616	0.671	0.599	0.813	0.211	0.130	0.728	0.285
	N	47	63	63	63	63	63	63	45
Thing-Orientation	*R*	0.170	0.059	0.086	-0.107	-0.104	-0.029	0.012	.308*
	Sig.	0.254	0.648	0.502	0.402	0.418	0.823	0.926	0.039
	N	47	63	63	63	63	63	63	45
Condition	*R*	0.029	-0.120	0.010	0.099	0.059	0.086	-0.006	-0.090
	Sig.	0.844	0.348	0.941	0.441	0.646	0.501	0.964	0.558
	N	47	63	63	63	63	63	63	45

(*table continues*)

		Career Commit Time 2	Career Sat Time 2	Job Sat Time 2	Job Interest Time 2	PE Fit Time 2	Self-Efficacy Time 2	Communal Values	Agentic Values	Person-Orientation
Career Commit	*R*	1								
Time 2	Sig.									
	N	63								
Career Sat	*R*	.402**	1							
Time 2	Sig.	0.001								
	N	63	63							
Job Sat	*R*	.519**	.434**	1						
Time 2	Sig.	0.000	0.000							
	N	63	63	63						
Job Interest	*R*	.591**	.608**	.751**	1					
Time 2	Sig.	0.000	0.000	0.000						
	N	63	63	63	63					
PE Fit	*R*	.358**	.419**	.594**	.478**	1				
Time 2	Sig.	0.004	0.001	0.000	0.000					
	N	62	62	62	62	62				
Self-Efficacy	*R*	.392**	.506**	0.222	.351**	0.118	1			
Time 2	Sig.	0.002	0.000	0.084	0.005	0.361				
	N	62	62	62	62	62	62			
Communal Values	*R*	-0.153	0.104	-0.085	0.041	0.160	-0.088	1		
	Sig.	0.231	0.416	0.506	0.748	0.215	0.499			
	N	63	63	63	63	62	62	63		

(*table continues*)

		Career Commit Time 2	Career Sat Time 2	Job Sat Time 2	Job Interest Time 2	PE Fit Time 2	Self-Efficacy Time 2	Communal Values	Agentic Values	Person-Orientation
Agentic Values	*R*	0.085	0.161	-0.098	-0.040	0.021	0.241	0.185	1	
	Sig.	0.508	0.207	0.446	0.754	0.872	0.059	0.146		
	N	63	63	63	63	62	62	63	63	
Person-Orientation	*R*	0.045	0.104	0.011	0.139	0.081	0.038	.554**	0.181	1
	Sig.	0.728	0.419	0.934	0.279	0.534	0.771	0.000	0.155	
	N	63	63	63	63	62	62	63	63	63
Thing-Orientation	*R*	-0.101	0.019	-0.119	-0.096	0.056	-0.181	-0.042	-0.093	0.034
	Sig.	0.433	0.880	0.354	0.455	0.667	0.159	0.745	0.469	0.791
	N	63	63	63	63	62	62	63	63	63
Condition	*R*	-0.146	0.058	0.113	0.011	0.174	0.043	-0.046	0.233	-0.043
	Sig.	0.253	0.653	0.377	0.931	0.176	0.742	0.722	0.066	0.738
	N	63	63	63	63	62	62	63	63	63

Note. Career Commit = Career Commitment. Career Sat = Career Satisfaction. Job Sat = Job Satisfaction. PE Fit = Person Environment Fit. Con = Condition; 0 = Agentic; 1 = Communal

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

APPENDIX P

Table 21

Study Two Paired Samples T-Test for Communal Condition Time 1 vs. Time 2

	Time 1	Time 2		95% Confidence Interval of the Difference				
	M (*SD*)	*M* (*SD*)	Std. Error Mean	Lower	Upper	*t*	*df*	*p*-value
Frequency of Turnover Time 1 v. Time 2 (*N* = 19)	1.58 (1.26)	1.53 (1.02)	0.12	-0.20	0.31	0.44	18	0.67
Commitment Time 1 vs. Time 2 (*N* = 27)	3.85 (.66)	3.93 (.78)	0.12	-0.32	0.17	-0.63	26	0.54
Career Satisfaction Time 1 vs. Time 2 (*N* = 27)	6.19 (.96)	6.22 (.80)	0.12	-0.29	0.22	-0.30	26	0.77
Job Satisfaction Time 1 v. Time 2 (*N* = 27)	5.70 (1.14)	5.63 (1.31)	0.18	-0.30	0.45	0.40	26	0.69
Job Interest Time 1 v. Time 2 (*N* = 27)	6.15 (.86)	5.63 (1.21)	0.14	0.22	0.82	3.58	26	0.00

(*table continues*)

	Time 1	Time 2		95% Confidence Interval of the Difference				
	M (*SD*)	*M* (*SD*)	Std. Error Mean	Lower	Upper	*t*	*df*	*p*-value
PE Fit Time 1 v. Time 2 (*N* = 27)	5.12 (1.06)	5.17 (1.03)	0.13	-0.31	0.21	-0.39	26	0.70
Self-Efficacy Time 1 v. Time 2 (*N* = 27)	6.28 (.61)	6.25 (.67)	0.09	-0.17	0.22	0.25	26	0.81

Note. *N* = Number of data points. *M* = Mean. *SD* = Standard Deviation. df = degrees of freedom. Frequency of Turnover = How often they consider leaving their current job on a 7-point likert scale. PE Fit Org = Person-Environment in the Organization on a 7-point anchored scale.

APPENDIX Q

Table 22

Study Two Paired Samples T-Test for Agentic Condition Time 1 vs. Time 2

	Time 1	Time 2		95% Confidence Interval of the Difference				
	M (*SD*)	*M* (*SD*)	Std. Error Mean	Lower	Upper	*t*	*df*	*p*-value
Frequency of Turnover Time 1 v. Time 2 (*N* = 11)	1.55 (.93)	1.73 (1.19)	0.23	-0.69	0.32	-0.80	10	0.44
Commitment Time 1 vs. Time 2 (*N* = 16)	4.19 (.75)	3.88 (1.03)	0.15	-0.01	0.63	2.08	15	0.06
Career Satisfaction Time 1 vs. Time 2 (*N* = 16)	6.19 (.98)	6.13 (.81)	0.21	-0.39	0.52	0.29	15	0.77
Job Satisfaction Time 1 v. Time 2 (*N* = 16)	5.19 (1.60)	4.81 (1.60)	0.20	-0.05	0.80	1.86	15	0.08
Job Interest Time 1 v. Time 2 (*N* = 16)	5.69 (1.14)	5.25 (1.24)	0.33	-0.26	1.14	1.33	15	0.20

(*table continues*)

	Time 1	Time 2		95% Confidence Interval of the Difference				
	M (*SD*)	*M* (*SD*)	Std. Error Mean	Lower	Upper	*t*	*df*	*p*-value
PE Fit Time 1 v. Time 2 (*N* = 16)	4.99 (.91)	4.99 (.98)	0.13	-0.28	0.28	0.00	15	1.00
Self-Efficacy Time 1 v. Time 2 (*N* = 16)	6.23 (.63)	6.18 (.60)	0.13	-0.23	0.32	0.36	15	0.72

Note. *N* = Number of data points. *M* = Mean. SD = Standard Deviation. df = degrees of freedom. Frequency of Turnover = How often they consider leaving their current job on a 7-point likert scale. PE Fit Org = Person-Environment in the Organization on a 7-point anchored scale.

APPENDIX R

Table 23

Study Two Independent Sample T-Test Comparing Conditions for Women who Previously Considered Leaving Engineering and Those who had not Previously Considered Leaving Engineering

	Agentic	Communal	95% Confidence Interval of the Difference					
	M (*SD*)	*M* (*SD*)	Lower	Upper	*t*	*df*	*p*-value	*d*
		Previously Considered Leaving Engineering						
Turnover Frequency (*N* =11; 19)	1.53 (1.02)	1.73 (1.02)	-0.64	1.04	0.49	28	0.63	0.20
Commit (*N* =13; 20)	3.69 (1.03)	3.80 (0.77)	-0.75	0.53	-0.34	31	0.73	0.12
Career Sat (*N* =13; 20)	6.00 (0.82)	6.10 (0.85)	-0.71	0.51	-0.33	31	0.74	0.12
Job Sat (*N* =13; 20)	4.62 (1.71)	5.60 (1.39)	-2.09	0.12	-1.82	31	0.08	0.63
Job Interest (*N* =13; 20)	5.00 (1.23)	5.55 (1.28)	-1.46	0.36	-1.23	31	0.23	0.44
PE Fit (*N* =13; 20)	4.87 (1.06)	4.97 (1.04)	-0.86	0.67	-0.25	31	0.80	0.10
Self-Efficacy (*N* =13; 20)	6.19 (0.60)	6.23 (0.60)	-0.47	0.40	-0.18	31	0.86	0.07

(*table continues*)

	Agentic	Communal	95% Confidence Interval of the Difference					
	M (*SD*)	*M* (*SD*)	Lower	Upper	*t*	*df*	*p*-value	*d*
			Never Previously Considered Leaving Engineering					
Turnover Frequency	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Commit (*N*= 3; 7)	4.67 (0.58)	4.29 (0.77)	-0.76	1.52	0.77	8	0.46	-0.56
Career Sat (*N*= 3; 7)	6.67 (0.58)	6.57 (0.55)	-0.77	0.96	0.25	8	0.81	-0.18
Job Sat (*N*= 3; 7)	5.67 (0.58)	5.71 (1.11)	-1.65	1.55	-0.07	8	0.95	0.05
Job Interest (*N*= 3; 7)	6.33 (0.58)	5.86 (1.07)	-1.07	2.02	0.71	8	0.50	-0.55
PE Fit (*N*= 3; 7)	5.50 (0.17)	5.74 (0.83)	-1.39	0.91	-0.48	8	0.65	0.40
Self-Efficacy (*N*= 3; 7)	6.12 (0.76)	6.32 (0.90)	-1.57	1.18	-0.33	8	0.75	0.24

Notes. *N* = Number of data points agentic; communal. *M* = Mean. SD = Standard Deviation. df = degrees of freedom. *d* = Cohen's d effect size such that a positive value indicates a greater value for the communal group as compared to the agentic group. Commit = Commitment to engineering as a career on a 7-point anchored scale. Turnover Frequency = How often they consider leaving their current job on a 7-point likert scale. PE Fit Org = Person-Environment in the Organization on a 7-point anchored scale.