Changes in Life Goals over College:

A Comparison between Male and Female STEM Majors

Abstract

Informed by goal congruity theory and emerging adulthood theory, this study examined changes over time and gender differences in the importance that college STEM majors placed on three life goals that have been hypothesized to explain the differential retention of men and women in STEM: Marriage-Family, Career-Status, and the desire to have a positive Social Impact. 251 students (51% women; 76% White) completed three surveys, one year apart. Participants rated the importance of different life goals at each time point. Changes in importance ratings over time were moderated by gender. Men and women did not differ in the importance placed on the three life goals early in college. Men's ratings for Marriage-Family and Social Impact goals decreased over time, but women's ratings did not significantly change. For both genders, ratings of Career-Status goals decreased over time. Secondary analyses suggest that gender differences in Marriage-Family and Social Impact goals emerge midway through college for STEM majors. Findings suggest that women who are retained in STEM majors place a high value on Marriage-Family and Social Impact goals, similar to non-STEM majors, but may be able to better visualize a future STEM career that affords these goals. Explanations for gender differences in STEM interest based on goal congruity theory should consider that the importance of different life goals may change over college.

KEY WORDS: STEM education, Gender differences, Communal Goals; Goal Congruity Theory, Emerging Adulthood

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Life goals are long-term aspirations and reflect anticipated future roles (Roberts & Robins, 2000). Social role theory (Eagly, 1997; Eagly & Wood, 2012) and goal congruity theory (Diekman et al., 2017) propose that long term communal goals related to marriage, parenting, and helping others are important determinants of college women's career interests and explain why fewer women compared to men are interested in male-dominated STEM (science, technology, engineering and mathematics) majors and careers. We know less about the life goals of women retained in STEM and the nature of gender differences, if any, within STEM majors. Moreover, the college years and immediately afterward fall into the period of the emerging adulthood (Arnett, 2000), and are viewed as a time of considerable growth, exploration, and change in social roles and goals, especially in the areas of career, family, and relationships (Ferriman et al., 2009). Consistent with this, the US Census Bureau (Martinez & Gayfield, 2019) reports that only a small percentage of people with a degree in STEM are in fact employed in a STEM-related occupation later in life, and perhaps this is due to changing goals over college and beyond (Cech, & Blair-Loy, 2019; Ferriman et al., 2009). Little attention has been paid within the goal congruity framework to goal development over time. To address these gaps, this study examines gender differences among STEM majors in the importance they place on different life goals and if goal importance changes over time. Theoretically, this study further develops goal congruity theory by proposing that goal priorities are associated not only with a person's major/career choice and gender, but also their developmental status.

Goal Congruity Theory

Goal congruity theory, according to Diekman and Steinberg (2013), proposes that "social roles produce gender-differentiated goals and that these goals then influence the kinds of work and family roles that women and men are attracted to or avoid" (p. 488). Generally, this framework proposes that because communal goals are valued highly by women (more so than men), goal congruity occurs for most women when their major and career choices allow them to fulfill communal goals. STEM careers are generally not perceived as affording communal goals, which accounts for why fewer women enter and persist in STEM fields compared to men (Diekman et al., 2017).

However, many women do in fact persist in STEM majors, and it is not clear if the gender difference in communal goal importance, which is a critical component of this theory, is recreated among STEM majors. It has been proposed that counter to their peers, women who continue in STEM anticipate that their future STEM careers will allow then to fulfill valued communal goals (Diekman et al., 2011; Diekman et al., 2017), suggesting that gender differences in communal goal importance could be recreated within STEM majors. An alternative explanation is that women who persist in STEM in fact do *not* value communal goals to the same degree as other women and are more similar in this regard to men in STEM majors. Consequently, no gender difference in communal goals would be expected. In support of this, previous work (Author et al., 2015) found that women in STEM majors who were in their first two years of college reported greater interest in stereotypically masculine careers that provided higher salaries over those that had a family-friendly work environment or supported pro-social helping goals. While examining these alternative predictions, we further expand goal congruity theory by applying a developmental lens using the emerging adulthood theory (Arnett, 2000).

Emerging Adulthood

As proposed by Arnett (2000), emerging adulthood (ages of 18-25 years) is a distinct period of development sandwiched between adolescence and young adulthood and characterized by identity exploration. Although the responsibilities for adulthood are in view, they are often not yet fully assumed[1]. Thus, the salience of different social roles changes over the course of college years and as a result, the importance placed on the associated life goals is not static and changes over college as well. The college years are an important time of continued development with respect to life goals, especially in areas of education, careers, and personal relationships (Arnett, 2000; Chang et al., 2015; Dietrich et al., 2013; Shulman & Nurmi, 2010).

The importance placed on life goals is an interplay between normative expectations depending on a person's developmental status (e.g., entering vs. graduating from college) and sociocultural environments (Shulman & Nurmi, 2010). For example, the importance placed on marriage and family goals for students early in college may be less compared to when they are in their early to mid-twenties, an age when many young adults look to establish long-term romantic relationships. Additionally, upon graduation, students are expected to become financially independent from parents and the reality of needing a job in the future may be more urgent. Due to biological risks to the baby and declining fertility in their 30's (American College of Obstetrics & Gynecology, 2020), it might be expected that goals related to starting a family would increase for women over time compared to men. More broadly, Baltes (1997) proposes that many highly rated goals diminish in importance over time for young adults due to limitations in personal and social resources. In one of the few studies to examine longitudinal changes in the importance of different life goals over college, Roberts et al. (2004) found that 67% of their sample evidenced a reliable change in one or more of the seven goal domains they assessed.

Other research from a variety of perspectives support examining changes in life goals over college for STEM majors. Life goals as construed here are similar to the goal component in the possible selves construct (Markus & Nurius, 1986) and thus important for future psychological wellbeing. However, possible selves also include fears and threats. Expectancy value theory (Wigfield & Eccles, 2000) also identifies expectations for success at long-term goals as a factor in achievement-related decisions. Other research supports the idea that succeeding at life goals is associated with wellbeing. Encountering obstacles to goal attainment may lead to adaptation and change (Messrsmith & Schukenberg, 2010; Salmela-Aro, 2010; Shulman & Nurmi, 2010). Failure to adjust goals when obstacles are encountered is associated with poorer social-emotional outcomes (Havinghurst, 1948; Salmela-Aro, 2010; Shulman & Nurmi, 2010).

Importantly, this study examines changes in goal priorities over the college years for students who are retained in STEM majors and investigates potential gender differences in the pattern of change. Thus, this study contributes to goal congruity theory by investigating changes in the importance of life goals over time for college STEM majors and examining if there are gender differences within STEM majors as to the importance they place on life goals. In this study, gender differences in the importance placed on these long-term goals are examined at three time points over college for STEM majors, thus providing a robust examination of gender differences and change. We focus on life goals that have been identified as partially explaining the gender gap in college STEM majors (two communal and one agentic): marriage and family, making a positive social impact, and career status (salary, prestige).

Life Goals and Women's Participation in STEM Majors

Recent work by Diekman and colleagues (2017) suggests that when considering the

gender gap in STEM fields, it is important to separate communal goals associated with family and marriage from those of helping others. Thus, although communal goals can refer to a range of people-oriented values, in this paper we use the term *social impact goals* to more narrowly refer to goals related to helping others or benefiting society and separate it from *marriage and family goals.*

Social impact goals. Several studies by Diekman and her colleagues (Diekman et al., 2010, 2011, 2017) find that although both men and women value goals associated with helping others, women consistently rate these goals higher than men. Their goal congruity model proposes that STEM careers are typically seen by women as not affording social impact goals and as a result, many math and science capable women fail to enter STEM majors to begin with or quickly change majors at the start of college. Support for this theory comes from a series of studies that have found that a) STEM careers and majors are less likely to be perceived as affording helping goals compared to other careers and majors; b) endorsement of social impact goals is related to lower levels of interest in STEM careers; c) when STEM careers are perceived as affording social impact goals or being a collaborative endeavor, women's interest increases; and d) girls and women engaged in STEM fields often seek to use science in socially relevant ways, for example addressing environmental issues or creating technology to improve the lives of people with disabilities (Allen et al., 2018; Ceci et al., 2009; Diekman et al., 2010, 2011; Ferriman et al., 2009; Thorn, 2001; Van Leuvan, 2004). Additional research from the expectancy value perspective reports that adolescents' altruistic explanations for their career choices (e.g., desire to help others) and altruistic self-schemas (based on responses to open-ended possible selves questions) distinguished between those who were interested in life sciences (in which women are better represented) versus physical sciences (which are dominated by men; Wegemer

& Eccles, 2019), presumably because life sciences are more aptly seen as affording altruistic goals.

Marriage and family goals. Marriage and family goals are especially relevant for young adults during and immediately after college, compared to earlier points in their lives. Women who pursue time intensive majors and careers may be concerned that they do so at the expense of these goals. The conflict between educational and romantic relationship goals of college women is historically well documented (e.g., Gilmartin, 2005; Holland & Eisenhart, 1990). Holland and Eisenhart (1990) note that when academic pursuits are not successful, women often place greater emphasis on romantic relationships. Agentic goals, such as pursuing a STEM career, can also be adversely affected when traditional gender roles are activated in romantic relationships (Park et al., 2011; Rudman & Heppen, 2003). Park et al. (2011) reported that the activation of a romantic goal was associated with women doing worse on math tests and having less positive attitudes, identification, and interest in STEM. Their research suggests that the negative effects of romantic goal activation on one day can actually carry over to the next day's math performance. Thus, women who try to succeed in a male-dominated career and pursue romantic relationships may experience role conflict that could undermine their pursuit of a STEM major.

Career status goals. Life goals related to careers are also more important during emerging adulthood compared to earlier points in students' lives. Many researchers have concluded that men place a greater value on work and salary than women (Ceci et al., 2009; Ferriman et al., 2009; Hakim 2006). In support of this, agentic goals associated with careers and income are often found to be rated more highly by men than women (Ceci et al., 2009; Guadagno & Cialdini, 2007; Hakim, 2006), although this gender difference is smaller than that for communal goals (Diekman et al., 2011). The provider role, typically ascribed to men, has

been described as a "critical gender boundary" (Loscocco & Spitze, 2007, p. 935).

It should be noted that gender differences in the importance placed on social impact, marriage-family, and career goals are not consistently found (Author et al. 2016; 2015; 2010; Dunlap, et al., 2019; Ferriman et al., 2009; Roberts & Robins, 2000)**.** For example, Roberts and Robins (2000) found no gender differences in 6 of 8 work-related goals in their study of college students. Ferriman et al. (2009) reported no gender differences in the importance that 25-year-old science and math graduate students placed on having children and making a contribution toward the greater good of society. Author et al. (2010) found that college-aged men and women entering into STEM majors did not differ in their *ratings* of the importance of family, marriage, and career goals. However, *men,* on average, prioritized family goals higher than women when asked to pick their most important life goal. Other studies (e.g., Harrington et al., 2010) indicate that men also seek work that is flexible and allows for family time. Both men and women often indicate that they would sacrifice other goals for the sake of a romantic partner (Author et al., 2016; Hammersla & Frease-McMahan, 1990; Mosher & Danoff-Burg, 2007). Together, the research reviewed suggests that gender differences in the importance placed on social impact, marriage-family, and career goals by STEM majors needs further exploration.

In summary, based on goal congruity theory and the emerging adulthood framework, it is expected that the importance of specific life goals will vary relative to each other, change over time, and differ for men and women majoring in STEM. Previous studies focusing on STEM majors have not taken into account the timing of when goal importance is assessed relative to students' progress through college, and this study addresses this gap.

The Current Study

Theoretically, this study contributes to goal congruity theory by proposing that goal

priorities are affected not only by a person's major/career choice and gender, but also their developmental status during the period of emerging adulthood. This study examines two research questions: 1) Does the importance that college STEM majors place on different life goals change over the college years?; 2) Are there gender differences in the importance placed on different life goals, and if so, do they emerge, decrease, or remain the same over college? Three life goals that are especially relevant during college and for the retention of women in STEM are examined (marriage-family, career-status, and the desire to have a positive impact on society) at three time points during college.

To address these questions, two overlapping sets of analyses were conducted. The main analyses consisted of all participants with three time points of data. These data provide a rigorous examination of change over time. However, not all students were the same year in school at each time points (i.e., at time 1 participants included students in years 1 through 4 of college). A clearer interpretation of how life goals change over college would be evident if the students were all at the same year in college at each time point. Including year in college in the analyses that required three time points of surveys presented significant issues with respect to power and homogeneity of variance (e.g., n's as small as 14, but as large as 48 for some cells when gender is also factored into the analyses). To generate a better description of change over time, the secondary analyses included all participants with at least two time points. These students were likely to continue in a STEM major since they had done so for two years of data collection. Requiring participants to only have two time-points of data instead of three allowed us to represent the larger sample better, increasing the generalizability of the findings.

Method

Participants

The sample in the current study was part of a NSF-funded longitudinal research project awarded to the first author that examined life goals and gender roles of STEM college students. The current study focused on data collected over three years at a large comprehensive public institution in the Southeastern U.S. Participants were recruited from non-introductory undergraduate courses typically taken by STEM majors in computer science, mathematics, engineering, physics, geology, biology, and chemistry. At the first time point, 1565 students completed a survey in class. The survey included a question asking if students were interested in participating in follow-up surveys in the following year for which they would be paid $20. More than seventy percent of participants expressed an interest (71.3%). These students were re-contacted, approximately a year later to see if they were still interested in participating in follow-up surveys. The number of students who could be followed was constrained by the grant funds available for project (NSF award # xxxxxx) and the research design of the larger project which called for participants to be split between males and females, as well as be in a STEM major discipline. (It should be noted that in reporting the results the terms male and female are used to be consistent with the gender term selected by participants.) Additional students were recruited at Time 2 (using the same procedures used for Time 1) to meet the sampling objectives of the project as proposed to NSF and to adjust for attrition. At Time 2, 584 (341 female) students participated, and 76% of these had Time 1 data as well. At Time 3, 413 (227 female) students participated and 69%% (286 cases) of these had Time 2 data. The primary reason for attrition was that students failed to respond to emails asking them to participate in a follow-up survey.

Sample for the main analyses. Due to the longitudinal design of these analyses, participants must have completed surveys at each of the three time points to be included. A total of 251 students (51% female) completed three surveys. The racial make-up of the participants included 76.1% non-Hispanic White, 11.6% African American or Black, 2.4% Asian, 2.4% Hispanic-White and 7.5% were either multi-racial or another race. At the first time point, participants were primarily first (30.7%) and second year (37.1%) students but the sample included upper level students as well (19.1% third year, and 13.1% in the fourth year or more). With respect to age, at the first time point, 21.6% were 18 years or younger, 34.4% were 19 years, 22.8% were 20 years, 11.2% were 21 years, and the remainder were 22 years or older. At the first time point, students indicated their major by selecting from a list that was provided. The percentages of females within each of the STEM major categories were biology (47.7%), engineering (32.8%), physical sciences (9.4%, chemistry or physics), computer science (4.7%), and math (3.9%). For males, the percentages were: biology (24.4%), engineering (53.7%), physical sciences (13.0%), computer science (11.4%), and math (9.8%). The percentages add up to more than 100% because dual majors could select more than one option.

Sample for the secondary analyses. The secondary analyses include participants who completed at least two surveys and were STEM majors (N = 414). The demographic make-up of this group was similar to the group who completed all three surveys. There were slightly more females (55.6%), but the racial make-up was similar: 80.0% non-Hispanic White, 10.1% African American or Black, 2.2% Asian, 1.2% Hispanic-White, and 6.5% were either multi-racial or indicated another race. Majors for females included: engineering (48.6%), computer science (3.0%), biology (37.4%), math (2.6%), physical sciences (3.4%), STEM double majors (5.0%),

and other (3.6%). Majors for males included: engineering (45.7%), computer science (8.2%), biology (27.7%), math (4.3%), physical sciences (5.4%), and STEM double majors (9.2%).

Procedure

There were three time points for data collection. The first data collection time point was at the start of the fall semester and in-person. The second and the third data collection time points were each approximately one year apart from the previous data collection point, both administered through an anonymous secure online Qualtrics survey. After obtaining the approval from the Institutional Review Board and the permission of course instructors, members of the research team went to regular STEM class sessions to administer the questionnaire (Time 1). The researchers gave a brief overview of the purpose of the study and asked students to read the consent information on the first page of the questionnaire. Students wishing to participate in the study stayed after class to fill out the questionnaire at their own pace. Most students were able to complete the questionnaire in 15 minutes. The questionnaire included several measures related to gender roles, life goals, and career interests; however, only the measures included in this study are described here.

One year later, students who expressed an interest in completing follow-up questionnaires were contacted and asked if they would complete a questionnaire for a payment of $20. Those who were still enrolled in a STEM major and agreed to participate completed the survey through a confidential Qualtrics link (Time 2). One year later, we repeated the same procedure for the third data collection time point (Time 3).

Measures

The importance of life goals was measured by a series of ratings on 18 long-term goals (Author et al., 2011; Roberts & Robins, 2000; Roberts et al., 2004)**.** The measure is comparable

to the one used by Roberts, Robins, and colleagues (2004; 2000) who have shown that changes in importance ratings over time were associated with changes in personality traits. Directions stated, "In the future, how important is it for you to...," followed by a list of life goals. Students then rated the importance of different life goals on a 7-point scale from 1 = not very important to 7 = very important.

Previous factor analytic work with this data (Author & Author, 2015) identified four factors (eigen values $\geq$ 1) associated with these 18 items accounting for 62.3% of the variance. Social Impact (3 items, e.g., "Having a positive impact on the world around me.") accounted for 16.3% of the variance and was similar to Roberts and Robins (2000) *social goals* factor derived in their own factor analytic work (also see Roberts et al., 2004). Marriage-Family (4 items, e.g., "Find the right person to marry") accounted for 16.5% of the variance and was similar to the Roberts and Robin (2000) *relationship goals* factor. Career-Status (3 items e.g., "Have a high status occupation with a great deal of power and influence") accounted for 14.8% of the variance and was similar to the Roberts and Robins (2000) *economic goals*. The fourth factor, leisure time, accounted for 14.6% of the variance but was not included in the study because it was not theoretically relevant. Table 1 lists the life goals falling under each category. Thus, the assignment of items to each goal is theoretically aligned with previous research (Ceci et al., 2009; Diekman et al., 2010, 2011), consistent with similar factor analytic work (Roberts & Robins, 2000) and validated with our own factor analytic work (Author & Author, 2015).

The score on each goal was the average of all items on that particular goal, ranging from one to seven with a higher value indicating high importance. The reliability coefficients (alpha) for each of the three goal scales from Time 1 to Time 3, respectively were: Marriage-Family

.742, .756, and .793; Social Impact .788, .831, and .772; and Career-Status .652, .688, and .638, respectively.

Participants also reported their gender, age, year in school, and race, choosing from categories provided on the questionnaire.

Results

All analyses were conducted using SPSS package Version 24 (IBM, 2016). Findings are organized around the two research questions and addressed through a mixed design ANOVA: 2 (Gender) x 3 (Time point 1-3; within subjects factor) x 3 (Goals: Marriage-Family, Social Impact, and Career-Status; within subjects factor). Life goal importance ratings were the dependent variables. Bonferroni and Games-Howell corrections were used to examine significant effects. Means and standard deviations are presented in Table 2. It should be noted that the only interpretable ANOVA effects involve those with Goals.

The main effect of Goals was statistically significant, $F(2, 248) = 60.06$, $p < .001$, Wilk's $\lambda = .67$, $\eta_p^2 = .33$. The Career-Status goal was rated lower than both the Social Impact and Marriage-Family Goals, *p's* < .001. The average ratings for Social Impact and Marriage-Family were not significantly different.

Changes in Goal Importance Over Time

The Time x Goals interaction was significant, $F(4, 246) = 8.69$, $p < .001$, Wilk's $\lambda = .88$, $\eta_p^2 = .12$. To decompose this interaction, time point differences were examined for each goal separately. Students rated Social Impact higher at Time 1 ($M = 6.10$, $SD = .892$) than at Time 3 ($M = 5.93$, $SD = 1.038$), $p = .005$, but there were no differences between any of the other time points. Marriage-Family was rated similarly across all three time points. Career-Status was rated differently at each time point, with the highest ratings at Time 1 ($M = 5.54$, $SD = .945$), followed

by Time 2 (M = 5.36, SD = 1.003), and the lowest at Time 3 (M= 5.09, SD = 1.054), all p's $\leq$ .001. Thus, a different pattern of change emerged across the three life goals, with Social Impact and Career-Status decreasing over time and Marriage-Family evidencing no change. However, these results are qualified by a three-way interaction that included gender.

Gender Differences in Goal Importance Over Time

The Time x Goals x Gender interaction was statistically significant, $F(4, 246) = 3.51$, p = .008, Wilk's λ = .95, $\eta_p^2 =$ .054. (Means are in Table 2.) To decompose this interaction, comparisons were first made across time points for each of the three life goals separately for males and females. For males, Social Impact was lower at Time 3 than at Time 1, p = .007, and no other comparisons were significant. Men rated Marriage-Family lower at Time 3 than at both Time 1 (p = .044) and Time 2 (p = .003). As for Career-Status, men's ratings were lower at Time 3 than at both Time 1 (p < .001) and Time 2 (p = .002). By contrast, females rated Social Impact and Marriage-Family goals similarly over time, and there were no significant changes. Ratings of Career-Status decreased at every time point (Time 1 > Time 2 > Time 3, all p's $\leq$.003). To summarize, the decline in ratings for Social Impact noted in the two-way interaction was primarily due to differences in male ratings over time. Additionally, males as a group valued Marriage-Family less over time whereas females did not. Career-Status showed a similar decline over time for both males and females.

Because the second research question concerns gender differences in life goals over time, additional comparisons between males and females on their ratings of three life goals were conducted separately for each time point. At Time 1, males and females only significantly differed on the Marriage-Family goal (Female > Male, p = .006). At Time 2, males and females differed on Marriage-Family (Female > Male, p = .014) and Social Impact goals (Female >

Male, $p = .031$). A similar pattern remained at Time 3 with females higher on Marriage-Family ($p < .001$) and Social Impact ($p = .01$). There were no significant gender differences for Career-Status at any time point.

To summarize, as a group, the STEM majors in the sample placed less value on Career-Status goals than Marriage-Family and Social Impact goals. Over time, however, gender differences in the value placed on different goals emerged, with female STEM majors consistently rating Marriage-Family goals higher than males across all time points and differences in the Social Impact goals emerging at Time 2. Interestingly, the importance that both males and females placed on Career-Status goals diminished over time.

Secondary Analyses

The results presented so far support the hypothesis that the importance of some life goals changes from the start of college to graduation and that gender differences may emerge over time. A clearer interpretation of how life goals change over college would be evident if the students were all at the same year in college at each time point. As noted earlier, small sample sizes for different grade levels and gender limited the ability to consider grade level in the main analyses. To generate a more reliable depiction of the change over time, the secondary analyses included all participants with at least two time points of data (N = 414). Using this sample, there were 100 or more participants for each of the first through fifth years in college. (After year 5 the sample sizes were much smaller, and so these years were excluded.)

Mean importance ratings (Table 3) were plotted for each of the three life goals separately for each gender (Figure 1a-c). It should be noted that no participant had data for all school years represented, but every participant included in this analyses had at least two time points of data. Although statistical analyses could not be conducted to examine the full pattern across the five

years in college, *t-test* comparisons between genders at each time point for each goal were conducted. These tests supported the interpretation provided above with respect to the emergence of gender differences, but additional insights were gained. Gender differences in Marriage-Family goals and Social Impact Goals did not emerge until the third year in college. For Social Impact the results were: Year 3 $t(279) = 2.10$, $p = .037$, $d = 0.247$; Year 4 $t(214) = 2.35$, $p = .029$, $d = 0.563$; and Year 5 $t(81.31) = 3.17$, $p = .002$, $d = 0.590$. For Marriage-Family goals the results were: Year 3 $t(280) = 2.63$, $p = .009$, $d = 0.321$; Year 4 $t(191.20) = 4.77$, $p < .001$, $d = 0.310$; and Year 5 $t(93.85) = 3.22$, $p = .002$, $d = 0.588$. (The degrees of freedom for t-tests were adjusted in some tests due to lack of homogeneity.) There were no differences in Career-Status ratings at any of the years.

Discussion

Theoretically, this study demonstrates that there is value in examining goal congruity explanations for the gender gap in STEM interest through the lens of emerging adulthood framework. Empirical and theoretical work based on goal congruity theory has identified gender differences in the importance of communal goals as a major contributing factor to the gender gap in STEM interest (Diekman et al., 2017, 2011, 2010). The current study contributes to this theory by suggesting that women who remain in STEM also highly value communal goals and that gender differences among STEM majors in the importance placed on these goals may emerge over the college years. Changes were examined in the importance that college STEM majors place on three long-term life goals that have been identified as partially explaining the gender gap in STEM: Marriage-Family, Career-Status, and Social Impact. The results showed a different pattern of change among the three life goals and that gender moderates this pattern. Before considering the theoretical implications of this work, we first discuss the results for each

of the three life goals separately. Then the implications of the findings are considered more broadly, both theoretically and practically, and we finally note the limitations of the research. Within the discussion of each life goal, we first note the pattern for the sample as a whole (the first research question) and then examine if gender moderated these findings (the second research question).

For the sample as a whole, it appeared that Marriage-Family goals did not change over the college years. However, when gender was considered, a different pattern emerged. Marriage-Family goals were valued more highly by women compared to men, and their importance for women remained fairly stable over college; whereas for men a decrease in their value was evident by the third year of the study. These results are supportive of previous research that indicates that romantic relationships are more highly valued by women than men (Gilmartin, 2005; Holland & Eisenhart, 1990). It is noteworthy, however, that in the secondary analyses gender differences did not emerge until the third year of college, and this finding might explain inconsistencies across studies of gender differences.

The pattern of results for Social Impact goals was somewhat different. For the sample as a whole, these goals were rated more highly at Time 1 than Time 3. Gender moderated this pattern, with the decrease in importance ratings being evident for men, but not for women. Additional comparisons indicated that men and women did not differ in their importance ratings on this life goal until the second time point. The secondary analyses supported the idea that gender differences might emerge over college, as differences were not significant until the third year of college. Together, these results are broadly consistent with previous research suggesting that women in STEM fields value Social Impact goals more than their male counterparts (Diekman et al., 2017; 2011; 2010); however, they also support an intriguing idea that the gender

difference for STEM majors emerges over the college years, perhaps due to a decline in the importance men place on these goals.

Findings for Career-Status goals evidenced a markedly different pattern than the other life goals in the study. For the sample as a whole, Career-Status goals were rated lower than the other two goals, and their importance declined across each time point. The decline over time was generally seen for both men and women, although the change from Time 1 to Time 2 was only significant for men. In contrast to the findings for Marriage-Family and Social Impact goals, there were no gender differences in the importance ratings in either the main analysis or the secondary analyses. This is inconsistent with some previous research (Ceci et al., 2009; Guadagno & Cialdini, 2007; Hakim, 2006) but is supportive of other research that has not found gender differences in college students' ratings of career-related goals (Author et al., 2010; Ferriman et al., 2009; Roberts & Robins, 2000). An important difference in this study compared to previous research is that men and women were in similar majors (all STEM) and as a result, they may have similar career expectations and values.

Together, the findings from this study describe the values and motivations of men and women who pursue a STEM major over at least three years of college. Importantly, the findings suggest that the importance of some goals declines over time, and that the pattern of change depends on the gender of the STEM major. Although previous research has found that values and goals change over the lifespan (e.g., Krings et al., 2008; Messersmith & Schulenberg, 2010; Milfont et al., 2016), the current study suggests that shifts may occur over a relatively short period of time during college, consistent with Roberts et al. (2004). Unfortunately, Roberts et al. did not examine gender or major in their analyses. The current research suggests that male and female STEM majors have similar goal priorities as they start college, and that the importance

placed on career goals remains equivalent over time. However, the importance placed on communal goals that are associated with women's retention in STEM may show an increasing gender difference over time.

With consideration to previous research and theory on life goals during emerging adulthood, the general decline in the mean importance of life goals in this sample is similar to that found in other large samples and can be interpreted as part of a developmental process during college as students narrowing down commitments to goals based on their abilities and interests (Baltes, 1997). Nevertheless, previous research also indicates that individual personality characteristics are related to increases in goal importance over the college years (Roberts et al., 2004). For example, Roberts et al. (2004) found that extraversion, agreeableness, and conscientiousness personality characteristics are associated with increases in social impact, relationship, and career-economic goals over college. In addition to these characteristics, we add gender as a potential moderator of change in goals over time.

It is interesting that in our sample men seem to be primarily responsible for the declines in ratings over time and that men and women did not differ in Career-Status goals. Despite the decline in men's ratings, it is important to recognize that, on average, their ratings remain high, above a 5 on the 7-point scale. In addition, this study only examined three life goals from many possible goals that have been studied in previous research (e.g., aesthetic, political, and religious goals). Related to this point and the lack of gender differences for Career-Status goals, it might be the case that there are other aspects of career goals that might be more important to men than women. For example, providing for one's family (Loscocco & Spitze, 2007) or the importance of making scientific discoveries and being held in regard by others in a chosen field, which are aspects of science identity (Chang et al., 2011) and is found to be lower for women than men in

STEM (Rainey et al., 2018).

Theoretically, this research does not contradict goal congruity theory explanation of the gender gap in STEM majors (Diekman et al., 2017), but does offer an extension with respect to STEM majors. Although women who drop out of or never enter STEM majors may be motivated by social impact goals, it seems that women who stay in STEM also place a high value on these goals. The difference between these two groups of women may be that those who stay in STEM majors are able to visualize a pathway in STEM to helping others, rather valuing social impact goals per se. Relative to men, women across a wide range of majors place greater importance on helping others.

As noted in the introduction, a high percentage of STEM majors are not employed in STEM fields later in life (Martinez & Gayfield, 2019), and it is likely that communal goals affect post-college plans. It will be important for future research to consider how the progression through college affects the value men and women place on life goals and consider how goals develop and change post-college.

Additionally, the longitudinal findings from this study and the emerging adulthood perspective suggest that it is important to consider how the developmental tasks associated with different ages from adolescence through college and young adulthood affect the importance placed on different goals and whether gender differences should be expected at all ages based on these developmental tasks. The current study suggests that gender differences may be more evident as STEM majors get closer to graduation. At the start of college, developmental tasks such as becoming less reliant on parents, finding a major, and fitting in with a social group may be similar for men and women. As time goes on, gender differences in life goals may increase because gendered societal expectations related to careers and romantic relationships also change.

Thus, goal congruity theory explanations for STEM career choices can be advanced by considering that the influence of gendered social norms may increase over college and beyond.

Practice Implications

From a practical standpoint, educators who provide career planning for students may find it useful to know that STEM students are more concerned about Marriage-Family and Social Impact goals than Career-Status goals associated with income, power, and prestige. Moreover, the importance of Career-Status goals declines as students progress through their degrees. College career counselors may also consider the Marriage-Family and Social Impact goals are valued by women more than men, but that the gender differences in these goals may be more relevant after students are midway through their majors. With respect to the content taught in STEM courses, this research supports the importance of connecting course material and careers to actions that might benefit society for women in STEM. More broadly, this research demonstrates the importance of considering the normative tasks for students of different ages when considering factors that influence career choices.

Limitations and Future Directions

It is important to mention some limitations of the current study that might affect its generalizability. The secondary analyses help support a developmental and emerging adulthood interpretation findings of the study and included a greater representation of the study's participants. However, it is recognized that these analyses would have been more impactful if all students were tracked over five years. Because participants in this study must have taken surveys for at least two years, we believe that these results are a good representation of those retained STEM majors. Moreover, the findings support the interpretation of the main analyses.

It is also noted that the secondary analyses involved 15 *t*-tests, which raises issues with

respect to Type I error. With $p < .05$ as a significance level, we would expect less than 1 significant effect from this set of analyses, however, six significant effects were found, exceeding chance expectations. Only considering effects with $p < .01$ would affect the Year 3 and Year 4 for Social Impact goal results, but no other differences. This adjustment does not alter the overall interpretation of the findings as suggesting gender difference in the importance of life goals changes over college. Nevertheless, the secondary analyses lack the rigor of a tightly controlled study in which grade level is systematically varied along with time point, and we note the need for replication.

As with all studies, the demographic make-up of the sample may constrain its generalizability. The study was based in the U.S. and the findings might not hold up in non-Western cultures with different gender role expectations. The racial make-up was predominately White, reflecting both the demographics of the university from which the sample was drawn and the national demographic characteristics of STEM majors in the U.S. To achieve a more diverse sample, researchers will have to purposefully select their participants, perhaps including students from minority serving institutions.

Additionally, we were not able to consider the type of STEM major in the analyses due to small sample sizes in some majors. This is relevant because it has been hypothesized that the greater number of women majoring in biology (reaching parity with men) may be due to careers in in this field being seen as more likely to afford communal goals. Consistent with this hypothesis, Author et al. (2015) reported that female biology majors preferred people-oriented jobs over thing-oriented jobs, but non-biology STEM majors were equally interested in people- and thing-oriented jobs. In the current study, about half the women in the main analyses were majoring in biology at the first time point. As a result, gender differences observed cannot be

attributed to a confound between gender and major choice. Nevertheless, the field would benefit from research that systematically examines a variety of STEM majors.

Finally, the sample only included students from one institution in the Southeast U.S. who were willing to be contacted and participate at two or three time points. It's possible that these criteria have resulted in a biased sample and thus limits the generalizability of the findings. Generally, students who completed less than the three surveys simply did not reply to our emails and other requests. We are unable to ascertain if non-responders were still majoring in STEM. It is important to recall, that the focus of this research is to describe students who are retained in a STEM major, not those who drop out. So, despite this limitation, the study provides a valid assessment of this group of students.

Conclusion

The goals of this study were to examine changes in the importance STEM majors place on difference life goals and to clarify whether gender differences in the three goals studied are present in STEM majors early in college or emerge later. It contributes to goal congruity theory by providing evidence that the importance placed on some life goals may change over the college years and that gender differences among STEM majors may emerge over time. Importantly, results also suggest that female STEM majors are similar to other non-STEM majors in prioritizing communal goals over Career-Status goals. Together, the findings suggest that future research on life goals should consider the emerging adulthood perspective and attend to how far along students are in their college program when interpreting their findings. Future research should also consider how the importance placed on different life goals is associated with career and personal plans.

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Figure 1a
Importance of Social Impact Goals

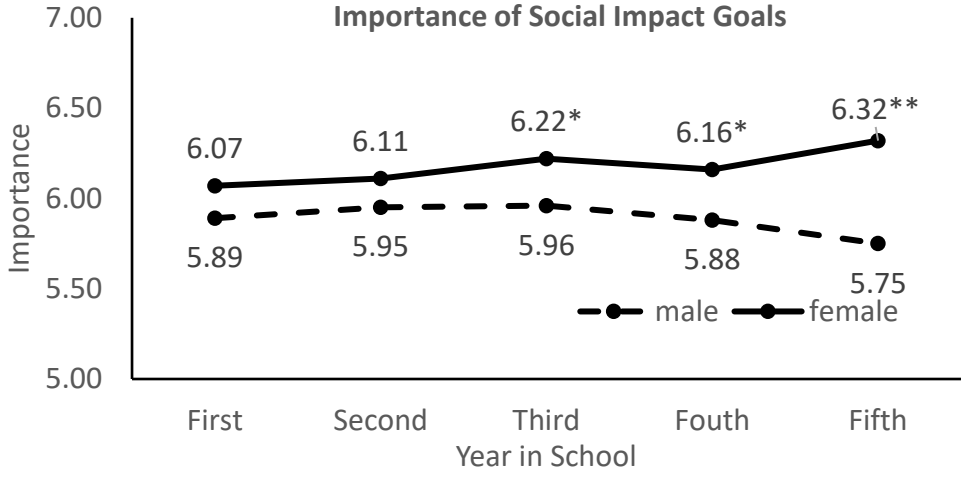

Figure 1b
Importance of Marriage-Family Goals

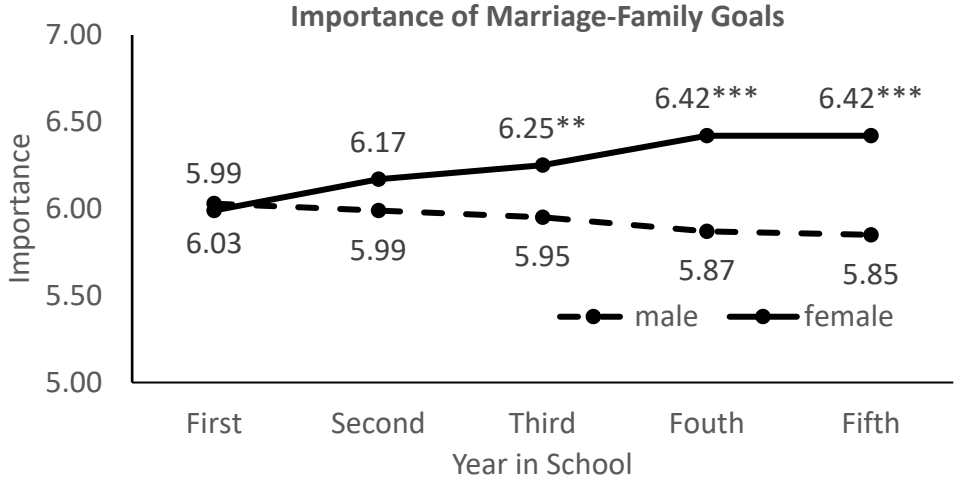

Figure 1c
Importance of Career Status Goals

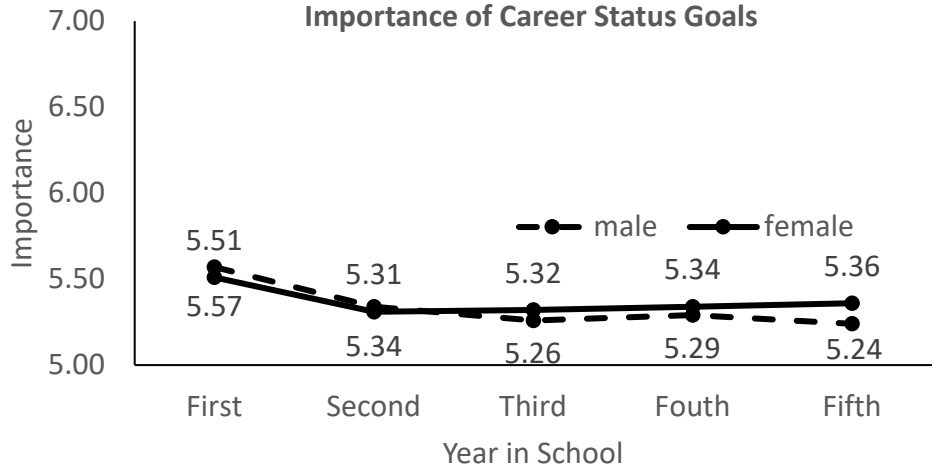

Figure Captions

Figures 1a – 1c. Importance ratings for Social Impact, Marriage-Family, and Career-Status goals for first through fifth year college students. Importance ratings range from 1 to 7, with higher scores indicating greater importance. Gender differences were significant for Social Impact and Marriage-Family goals for years 3 – 5: *$p < .05$; ** $p < .01$; ***$p < .001$.

Table 1

Life Goals Measure

Social Impact

1. Make a difference in the world by helping people
2. Have a positive impact on the world around me
3. Have leisure time to enjoy my own interests

Marriage-Family

1. Find the right person to marry
2. Have children
3. Take care of my family
4. Have close family ties

Career-Status

1. Have a good career and be successful in my line of work
2. Have a high standard of living and wealth
3. Have a high status occupation with a great deal of power and influence

Note. Participants rated the importance of each item on a 7-point scale from 1 = not very important to 7 = very important

Table 2

Means (Standard Deviations) for Goals at Each Time Point by Gender

	Social Impact		Marriage-Family		Career-Status	
	Male	Female	Male	Female	Male	Female
Time 1	5.98 (0.983)	6.21 (0.784)	5.94 (0.900)	6.29 (0.813)	5.42 (1.018)	5.66 (0.856)
Time 2	5.88 (1.059)	6.17 (1.020)	6.00 (0.941)	6.32 (0.871)	5.35 (1.005)	5.36 (1.005)
Time 3	5.75 (1.121)	6.10 (0.921)	5.77 (1.175)	6.36 (0.771)	5.08 (1.120)	5.11 (0.991)

Note. N for males is 123 and *N* for females is 128. Scores ranged from 1 to 7, with 7 indicating higher importance.

Table 3

Secondary Analyses: Descriptive Statistic for Life Goal Importance at each Year in School by Gender

			Year in School				
Goal	**Gender**	**Stat.**	**First**	**Second**	**Third**	**Fourth**	**Fifth**
Social Impact	Male	M	5.89	5.95	5.96*	5.88*	5.75**
		(SD)	(1.07)	(1.02)	(1.04)	(1.07)	(1.21)
		N	47	116	151	112	55
	Female	M	6.07	6.11	6.22	6.16	6.32
		(SD)	(0.93)	(0.94)	(0.98)	(0.88)	(0.76)
		N	82	144	153	120	74
Marriage-Family	Male	M	6.03	5.99	5.95**	5.87***	5.85**
		(SD)	(1.02)	(0.92)	(0.95)	(1.00)	(1.05)
		N	47	116	152	114	56
	Female	M	5.99	6.17	6.25	6.42	6.42
		(SD)	(1.05)	(0.81)	(0.99)	(0.79)	(0.77)
		N	83	145	154	121	75
Career-Status	Male	M	5.57	5.34	5.26	5.29	5.24
		(SD)	(0.90)	(1.12)	(1.13)	(1.02)	(1.25)
		N	47	115	149	112	56
	Female	M	5.51	5.31	5.32	5.34	5.36
		(SD)	(0.91)	(0.95)	(1.00)	(1.00)	(1.07)
		N	82	145	154	121	74

Note. Importance ratings range from 1 to 7, with higher scores indicating greater Importance.
* $p < .05$; ** $p < .01$; *** $p < .001$ for *t-test* on gender differences