Title
Persistence of STEM Major Students: The Impact of Parents and Peers on Major Satisfaction

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Persistence of STEM Major Students: The Impact
of Parents and Peers on Major Satisfaction

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Abstract

Choosing a college major sets most students on a particular trajectory of study that can have a lasting impact on their academic achievement and ultimate career choice. The United States trails behind other developed nations in their Student STEM achievement scores. STEM career fields often feature high-paying and high-demand job opportunities, but choosing a STEM field of study and subsequent career may be impacted by a variety of considerations. This study seeks to understand how proximal social influences, specifically the influence of parents and peers, may relate to STEM major choice and subsequent major satisfaction amongst college students, providing a unique perspective on promoting STEM engagement and potential strategies for promoting the STEM major experience. Using a sample of 214 second-year undergraduate STEM students, we find that parent influence on STEM major choice does indeed have a negative, direct association with satisfaction with one's major. This study examines the role that both parents and peers may serve in promoting STEM major satisfaction and provides suggestions for future research in this area.

Keywords: STEM, Parent Influence, College Major, Peer Social Support, Major Satisfaction, Emerging Adults

Persistence of STEM Major Students: The Impact of Parents and Peers on Major Satisfaction

When making the transition to college, one of the first decisions new students must make is to choose a college major. This major choice signals the beginning of a line of coursework for each student's college career. Students within different majors may have different expectations of their major and their post-graduation plans. These expectations may vary depending on each student's reasoning for choosing a particular major. Science, technology, engineering, and mathematics (STEM) is a growing and competitive field that has seen a marked rise in college major enrollment (Graf et al. 2018; Schaffhauser, 2018). STEM careers have both micro-level benefits to the individual (e.g., increased salary, Graf et al., 2018) as well as macro-level benefits from a global perspective (e.g., global competitiveness, Balingit & Van Dam, 2019), making it important to foster and encourage STEM majors as well as to promote retention of STEM majors. There are a variety of factors that may influence a student's decision to enroll in a STEM major, like perceived job options, major availability, and social input from trusted others (see Graf et al., 2018; Nicholls et al., 2007, Kniveton, 2004). Understanding some of the influencers on major choice may help to shed light on how students perceive their major, as well as the factors that promote retention of students within their chosen STEM major.

One potential source of influence on major choice are parents (Kniveton, 2004). Many college students would be considered emerging adults or late adolescents (Arnett, 2009). This developmental phase suggests that they are still highly influenced by their parents and may be, at least partially, dependent on their parents, whether emotionally or financially (Crone & Dahl, 2012; Gluckman & Hanson, 2006; Arnett, 2009). The ability for parents to influence a college student's major choice is one that has been relatively overlooked but may have significant

impacts on the student's perception of their major and academic performance. This comes during a time when adolescents may be grappling with the complexities of moving away from home and creating a separate sense of identity, while still being somewhat dependent on their parents (e.g., Priceonomics, 2017).

Normative adolescent development includes the process of separating from one's parents and building interpersonal relationships outside of one's family (a process known as separation and individuation; Blos, 1967; Kroger, 1985). As many college students begin exploring interpersonal relationships beyond those with family members, they may also be benefitted by peer relationships that provide a unique sense of social support in the college adjustment process. The role of parents and peers is important to consider as the influence and support they offer may impact academic outcomes, including major satisfaction.

This paper seeks to examine the interplay of these concepts by considering the association between increased parent influence on one's major choice and the academic outcome of major satisfaction among STEM college students. Additionally, we consider the role of peer social support both as a direct predictor of major satisfaction and as a moderating variable that strengthens the direct relationship of parent influence on major satisfaction. This study seeks to examine the role of parents and peers on academic outcomes of STEM students, thereby providing insight on promoting STEM major choice and retention.

Literature Review and Hypotheses

STEM: Micro-level benefits and Macro-level goals

An ongoing challenge for the United States is to promote student engagement in STEM fields to compete on the global stage. In the U.S., many adolescent students lag behind their peers in Asia and Europe in science education (Balingit & Van Dam, 2019) and results from the

Program for International Student Assessment (PISA), a measure assessing a variety of skills including math and science literacy among 15-year-olds, show that U.S. schools are not doing enough to prepare young people for the global economy (Balingit & Van Dam, 2019; Desilver, 2017). Promoting STEM education at various levels is important when we consider that STEM fields are quickly growing and are highly paid (Graf et al., 2018). STEM training in college is associated with higher earnings at all education levels and people in STEM occupations earn an average of $14,000 extra per year at every education level over other occupations (Carnevale et al., 2014). Additionally, this earning discrepancy exists regardless of whether an individual is working in a STEM occupation (Graf et al., 2018) suggesting there may be inherent value in STEM education regardless of career choice.

The importance of promoting engagement in STEM fields extends beyond the micro-level benefits to the individual student or employee and should also be considered at the macro-level as well. At the national, macro-level, engagement in STEM is necessary to ensure success on the international stage. STEM Education Data presented by NSF (2014) uses U.S. Bureau of Labor Statistics to project that during the 2010-2020 period, employment in Science and Engineering occupations will grow by 18.7% compared to 14.3% for all occupations. Despite the increased demand for STEM graduates, achievement in STEM fields is lacking in the U.S., as is retention in STEM college majors. On the PISA math test (2012), the U.S. average score of 15-year-olds was 481, falling below the Organization for Economic Co-operation and Development (OCED) average of 494, and was lower than the scores of 21 other OCED nations (NSF, 2014). Additionally, retention within a STEM major fluctuates. Of those students who enrolled in 4-year institutions in the 2003/2004 academic year with intentions to major in science and engineering, only 54.4% stayed in their intended field in Spring 2009 (NSF, 2014). The lowest

level of retention was in the physical/computer/mathematical sciences where only 43% of freshman in 2003/2004 remained in their intended field in 2009 (NSF, 2014).

While enrollment in STEM majors has seen an increase in recent years compared to other college majors (Schaffhauser, 2018), factors contributing to one's major selection are less clear. Individuals are influenced by a variety of factors that extend beyond a single setting or interaction, this likely extends to include those features that contribute to a college student's choice of college major. Research by Nicholls and colleagues (2007) suggests that there are differences between those students who choose STEM majors and those who choose non-STEM paths. These differences include scores on college prerequisites, like high school GPA and standardized test scores, both of which tend to be higher for STEM majors; non-STEM activities, like "partying" (p. 40), which was higher for non-STEM majors; and general reasons for attending college (Nicholls et al., 2007). While there may be inherent differences between those students who choose STEM majors and others, the influence of one's proximal environment should also be considered to promote retention strategies and student success.

Understanding how specific factors influence academic outcomes, such as STEM major satisfaction, is an important first step for promoting STEM major choice and supporting retention and long-term goals. STEM fields are a growing sector of the workforce and STEM education has positive outcomes for students in a variety of career fields. Satisfaction with one's college major choice, may promote students enrolled in STEM majors to remain in their field and provide them with tools for success. Understanding the mechanisms that promote major satisfaction may be a tool to encourage STEM participation at the individual level and on the international stage. There are numerous reasons one may choose a particular college major (e.g., subject interest, Malgwi et al., 2010; political view, test scores/GPA, Porter & Umbach, 2006).

Understanding the role of parents and peers may help educators scaffold the major/field experience for STEM college students. To understand the relationship of parents and peers on major satisfaction, it is necessary to understand the development of emerging adults, particularly the role of proximal social influences on behavior.

Adolescent Social Development

Adolescence is a stage of development that begins with puberty and ends when individuals transition into adult roles (Steinberg, 2016). While some believe that adolescence ends around age 18 (the "legal" onset of adulthood), most consider adolescence as persisting based on the biopsychosocial readiness of the individual to enter adulthood ("Age limits and adolescents," 2003). This suggests that adolescence may persist into the mid-twenties, a period also sometimes conceptualized as *emerging adulthood* (Crone & Dahl, 2012; Gluckman & Hanson, 2006; Arnett, 2009). For emerging adults, social relationships, particularly relationships with parents and peers, can impact a number of factors, including emotional competence (e.g., Laible, 2007), self-esteem (e.g., Laible et al., 2004), and feelings of loneliness (e.g., Kerns & Stevens, 1995).

The Role of Parents

During the late adolescent/emerging adulthood years, parents often remain an important guiding force for their children and qualities learned from parents may be carried with students (Steinberg, 2016) as they embark on their college career. Additionally, nearly half of parents of college students provide some financial assistance to their child (Priceonomics, 2017) with 39% of college students reporting that parents make the decisions related to college funding (Dickler, 2018). The role of parents may then extend well into emerging adulthood and have an impact on decisions made by their emerging adult college-going child. Specifically, we consider the role of

parents to influence their emerging adult child's STEM major choice. Before we specifically consider the effect of parents on college related decisions for their emerging adult child, it is important to consider the role of parents in one's learning environment.

One's ecological learning environment includes micro-, macro-, meso-, and exo- system level influences (Bronfenbrenner, 1977). For a child in nearly any developmental stage, perhaps the most immediate group to which one is exposed is the family group, including the microsystem of the parent-child relationship. When considering one's learning environment, the confluence of both specific and general family and social interactions may be expressed in a multitude of ways. For college major choice, this can include factors like personality traits, preferences, and pressure from social forces, like parents. And indeed, research among high-school aged children shows that parents are ranked as having the greatest influence on student's career choice, even more so than teachers or peers (Kniveton, 2004).

The specific role of parents and the family in one's college STEM-major choice has been only narrowly studied, but specific examinations suggest that there is a positive, direct effect of parental education on college STEM course taking (Svoboda et al., 2016) and that students from lower socioeconomic status are less likely to aspire to a STEM career (Saw et al., 2018). We see then that the influence of parents is not limited to direct involvement with the emerging adult child, but rather may suggest some nuanced or inadvertent influence that happens in the family context. While parents may have an overt or direct impact on college major, such as linking college tuition assistance with their child's major choice, their influence may also come as a consequence of general family functioning or communication.

Parents are one of the primary socializing forces for their children (Antonucci et al., 2012), and this impact does not necessarily end when the child leaves home for college. This

influence, whether direct or indirect, may be reflected in a variety of actions, including college major decisions. Attitudes, beliefs, and values learned in childhood are often carried into emerging adulthood and later life, suggesting that parenting practices can have long-lasting indirect influence on children's behavior (e.g., Rew et al., 2013).

Previous research suggests that parent occupation and socioeconomic status may also influence their child's major choice (Leppel et al., 2001; Ma, 2009). In those cases, parent influence is more covert and less direct and may begin early in childhood as parents are, at least in part, responsible for educational exposure, especially in the home (Dorie & Cardella, 2013). The ability for parents to act as role models for specific fields has been shown in families in which a parent or other family member is an engineer (Dorie et al., 2014; Dorie & Cardella, 2013). This effect may extend to parents in other STEM fields and indirectly provide children with scripts for future career choice and major selection.

Parents may influence their child's college major choice in a variety of ways. Regardless of the mechanisms through which parents influence major selection (direct influence vs. indirect influence), research suggests that social support, including support from parents, positively predicts satisfaction of college students (Yalçin, 2011). While this may not specifically examine the role of parent influence on major choice, when taken together with extant research on STEM major choice (e.g., Dorie et al., 2014) it suggests that parental influence may prime major choice. We seek to examine how the degree to which parents prime STEM major choice predicts overall major satisfaction

We posit that parent influence, whether direct or indirect, will impact how students perceive their STEM major, specifically self-reported satisfaction with their major choice. Many college students are entering a secondary socialization phase and are moving away from

relationships with their family to cultivate relationships with others, but parents remain a guiding force and qualities learned during primary socialization may be carried with students (Steinberg, 2016) as they embark on their college career. Parent influence on their children may provide students with a sense of parental support and may encourage college students to embrace their major. This study seeks to examine the relationship of increased parental influence on STEM major's academic outcomes by hypothesizing that:

H1: Increased parent influence on major choice will be positively directly related to major satisfaction among STEM majors in their 2rd year.

The Role of Peers

Parents are not the only proximal social force for a college student. When considering the social influences on a college student, peers play a growing role as they may provide emotional support, and positive peer interactions may impact parent/family influences (e.g., Laible, 2007), especially as many college students are building interpersonal relationships beyond the family.

To understand the influence of peers, it is important to consider the nature of late adolescence/emerging adulthood and the unique challenges and opportunities that are linked with this developmental stage. According to Bronfenbrenner (1977), one's ecological learning environment includes many systems of influence. While parents are one source of proximal interaction for a college student, peer interaction may also have a significant impact on one's college experience.

The period of emerging adulthood can place stress on the parent-child relationship as children continue to explore interpersonal relationships beyond the family in an effort to build an identity and form relationships distinct from their parents, a process known as separation and

individuation (Blos, 1967; Kroger, 1985). As emerging adults move away from their family in this developmentally normative process, they may depend on peers for increased social support.

Extant research suggests both parent and peer relationships have a significant impact on young adults generally (e.g., Guan & Fuligni, 2015) and college students' adjustment broadly (e.g., Dennis et al., 2005; Hirsch & Barton, 2011; Hurtado et al., 1996). Research examining specific aspects of support suggest that peer support may be more closely related to social adjustment than parent support (Hurtado et al., 1996) and that peers may be more able to provide the resources needed for the specific challenges that college students face (Rodriguez et al., 2003).

There is a limited but growing body of research examining the role of college environments in promoting students' persistence in STEM fields. This research on STEM major choice and persistence in that major suggests that collaborative learning environments, positive interactions with faculty and peers, and mentoring experiences can all impact persistence in one's STEM major (e.g., Astin & Astin, 1992; Colbeck et al., 2000; Szelényi et al., 2013). Persistence in one's STEM major is a positive academic outcome that may be related to academic achievement including major satisfaction. The impact of proximal social forces, including peers, on outcomes like major persistence may suggest that peers can impact overall satisfaction with one's STEM major choice.

The question of how peers impact major satisfaction has not been directly examined, but examinations of major persistence suggest that peer support may play a role in major choice satisfaction. Because it is developmentally normative to build interpersonal relationships beyond the family (Kroger, 1985), support from peers may directly and positively impact academic

outcomes, like major satisfaction, especially for emerging adult college students who may be away from their families for the first time. Therefore, we posit that:

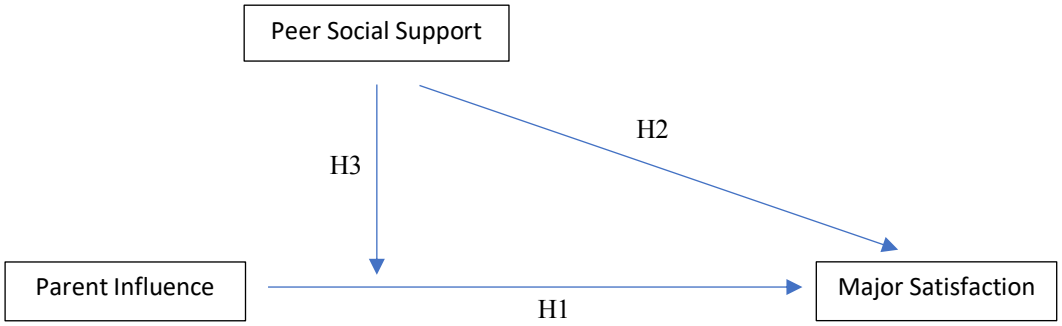
H2: Increased peer social support will be positively directly related to major satisfaction among STEM majors in their 2rd year.

Additionally, for these emerging adults, peer support may also strengthen the direct effect of parent influence on major choice and major satisfaction by providing increased support during a developmental period that is marked by seeking interpersonal relationships. In this way, peers may also bolster parental impact on major satisfaction by providing STEM major students increased social support. For emerging adults who are highly influenced by their parents and are moving away from the home and family, the support of peers may have a significant impact. We therefore hypothesize a moderating effect of peer social support that strengthens the direct effect of parent influence on major satisfaction:

H3: Peer social support will positively moderate the relationship of parent influence on major choice and major satisfaction, such that satisfaction with one's STEM major will be highest for those high in both parent influence and peer social support

When considered together, these hypotheses suggest that parents may play an important role in major choice and overall major satisfaction, but that peer social support may also significantly impact major satisfaction, both directly and by positively moderating the direct relationship of parent influence on major satisfaction. See Figure 1 for proposed relationships. This study addresses these relationships by examining cross-sectional data from a longitudinal data-set on college STEM majors.

Figure 1: Proposed hypotheses



Method

Participants

The paper utilizes a sub-sample of a larger longitudinal dataset (see, Hall et al., 2017) examining multiple cohorts of first-year college students transitioning to on-campus dorm living in a public university in the Western United States. The specific sub-sample used includes STEM majors who enrolled in the 2016-2017 academic year (class of 2020) at specific time points in their sophomore or second year (Fall 2017 and Winter 2018). These time points were used because they include the variables of interest and allow certain variables to be averaged to include a larger sample size. The sub-sample consists of 213 participants (24.4% male, 28.4% White/Caucasian, 1.4% Black or African American, 16.8% Mexican/Mexican American, 1.9% Latino/other, 21.4% East Asian, 12.1% Southeast Asian, 0.9% Pacific Islander, 6% Middle Eastern/South Asian, 10.7% Multiethnic)

Procedure

This study was conducted as part of a larger study examining students' psychosocial and academic functioning during the transition to college (Hall et al., 2017). The primary study was reviewed and approved by an institutional review board and students completed an online survey

at various timepoints during their college experience. The sub-sample examined here completed items specific to STEM education and efficacy along with general academic measures and measures related to peer and social groups, including discrimination, and perceived bias. Participants were compensated for daily responses ($2/day) up to $10 total for each 5-day week that daily reports were measured. This examination assesses two weeks of self-report, one week during Fall 2017 and the other during Winter 2018.

Measures

Parent influence on major choice

Parent influence on major choice was measured with a single item that asked respondents to indicate the degree to which their parents influenced their current major choice. Items were rated on a 5-point scale (1 = *Not at all/didn't care*, 2 = *a small amount*, 3 = *an average amount*, 4 = *a large amount*, 5 = *My parents chose my major for me*). It is important to note that all respondents entered college as STEM majors or intended STEM majors their freshman year. While their specific major may have changed from their freshman to sophomore years, all respondents in their second year still self-identify as STEM majors.

This item was included in the survey at three separate time points. The item *Parent Influence on Major Choice* was measured by averaging the two time points measured in their second year, Fall 2017 (N = 200, M = 2.19) and Winter 2018 (N = 239, M = 2.16). The third time point, Spring 2020, was measured during their fourth/senior year and was not included because of the low response rate. This item is likely to be stable over time, and so averaging Fall 2017 and Winter 2018 reports allows missing data to be accounted for and gives us one measure of parent influence as an Independent Variable (N = 262, M = 2.17, SD = 0.97).

Peer social support

Peer social support is measured using Eccles and Barber (1999) MSALT scale. This scale includes four items that examine frequency of peer interaction and support (e.g., "How often did you talk with your friends about problems you are having in school?"). Items were rated on a 4-point scale (1 = *Never*, 4 = *Often*). These items were measured every day for five days during Fall 2017 and Winter 2018. To account for missing data, the two reports were averaged, creating one variable of peer social support. Daily peer social support was calculated by averaging scores of items per day during the two weeks of data collection. Daily score was calculated by averaging at least three of the four items each day, to account for missing data. The *Peer Social Support* variable was calculated by averaging at least three daily peer social support scores for each week and then averaging the two weekly scores (N = 238, M = 2.71, SD = 0.74).

Major satisfaction

Major satisfaction is measured using Nauta's (2007) *Academic Major Satisfaction* scale. The scale includes 6 items that measure satisfaction with chosen major (e.g., "I feel good about the major I've selected") as well as intention to switch or change major (e.g. "I am strongly considering changing to another major" *reverse coded*). Items were rated on a 5-point scale (1 = *not sure*, 5 = *strongly agree*) and certain items were reverse coded such that a higher score indicates greater major satisfaction. These items were measured every day for five days during each week of data collection. Only Winter 2018 data are included in this analysis because it is the latest measurement point available prior to COVID-19. Daily major satisfaction was calculated by averaging scores of items per day during a one-week period in Winter 2018. Daily scores were calculated by averaging at least four of the six items each day, to account for missing

data. The *Major Satisfaction* variable was calculated by averaging at least three daily major satisfaction scores from Winter 2018 (N = 215, M = 3.54, SD = 0.65).

Results

To test Hypotheses 1 and 2, we first examined correlations between the variables of interest and the control variables of gender and GPA. Parent Influence on Major Choice was found to be significantly and negatively correlated with Major Satisfaction. This negative relationship suggests that H1 is not supported, and in fact the two variables are inversely related such that increased Parent Influence on Major Choice is related to decreased Major Satisfaction. Peer Social Support was not significantly correlated with Major Satisfaction, suggesting that H2 is not supported. For correlation information between all variables of interest and control variables, see Table 1.

Table 1: Correlation matrix of parent influence, peer support, major satisfaction, gender, and GPA.

	Parent Influence on Major Choice	**Peer Social Support**	**Major Satisfaction**	**Gender**	**GPA**
Parent Influence on Major Choice	1				
Peer Social Support	.089	1			
Major Satisfaction	-.224*	.025	1		
Gender	-.037	-.194**	.048	1	
GPA	-.094	-.019	.196**	.027	1

Note: Gender is coded such that, 1 = female and 2 = male

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

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

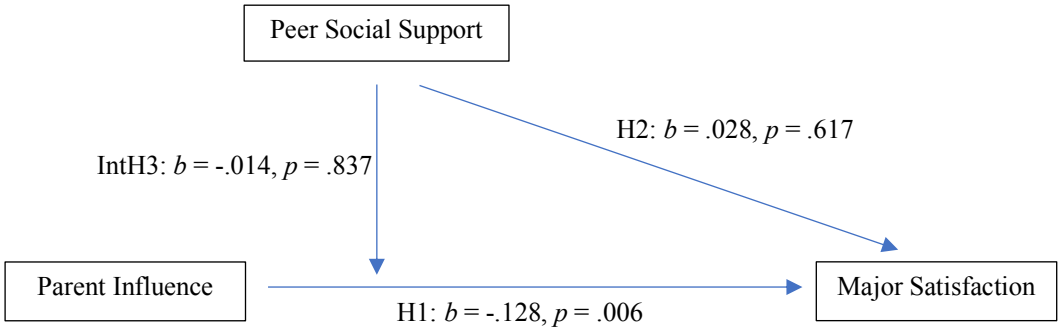
To further confirm the correlation findings and to control for other possible influences, linear regression modelling was conducted. We controlled for GPA and gender as previous

research has suggested that each of these variables may play a role in major choice (e.g., Porter & Umbach, 2006; Moakler & Kim, 2014). Results suggest the independent variable, *Parent Influence on Major Choice*, is directly and negatively related to *Major Satisfaction* scores, b= -.137, p = .003. These results bolster correlation findings; there is a significant and negative relationship between parent influence on one's STEM major choice and STEM major satisfaction.

A second linear regression model found no significant relationship between the independent variable, *Peer Social Support*, and *Major Satisfaction*, b= .028, p = .617. These results strengthen the correlation findings by finding no significant relationship between social support from one's peers and STEM major satisfaction, therefore H2 is not supported.

To test Hypothesis Three, examining the moderation effect of Peer Social Support on the direct effect of parent influence and STEM major satisfaction, we used Model 1 of the PROCESS macro for SPSS (Hayes, 2017). We chose this model because it allows us to test the proposed moderation of peer support on the direct relationship of *Parent Influence on Major* Choice on *Major Satisfaction* while controlling for gender and GPA. The model generates 95% confidence intervals following 5000 bootstrapped samples, intervals not including '0' are significant at $p < .05$. The overall model predicting *Major Satisfaction* was significant $R = 0.28$, $R^2 = .08$, F (5, 196) = 3.33, p = .007. Again, parent influence on major choice was significantly and negatively related to major satisfaction, b= -.128, p = .006. Peer Social Support was not found to be a statistically significant moderator of the direct relationship of Parent Influence on Major Satisfaction. The overall interaction is illustrated in Figure 2.

Figure 2: Direct effect of parent influence on major satisfaction. Direct effect of peer social support on major satisfaction and moderated effect



Discussion

Findings from this study demonstrate a direct relationship between Parent Influence on Major Choice and Major Satisfaction for STEM Majors in their second year of college. Peer Social Support was not found to have a significant direct relationship with Major Satisfaction, nor was it found to moderate the direct relationship of Parent Influence on Major Choice and Major Satisfaction.

The direct effect of parent influence suggests that parents play a role in perceptions about one's college major via major satisfaction. The findings were contrary to our hypotheses and suggest that increased parent influence is negatively related to major satisfaction among STEM college students. Open-ended data collected in the survey but not included the analysis due to small sample size, suggest that there may be a variety of ways that parents influence their children's major choice. In some cases, college students shared that parents influenced major choice by linking tuition assistance to a particular major (e.g., "They are paying for college"), thereby leaving students with few options for alternative majors. In this situation, the major choice was not the personal choice of the student, and may then leave the student with decreased major satisfaction. For emerging adults that are seeking to separate from their parents and form

their own sense of identity (Blos, 1967; Kroger, 1985), overt or direct parent influence might make these students regret their choice and resent a decision that was not entirely their own. The open-ended data responses also highlight the way indirect parent influence might lead a student to choose their STEM major. In one instance, a participant reported that seeing their parent(s) in a particular field encouraged them to pursue the same field. The student wrote about their parents, "They both have the same major and I think their job is quite fun." In this situation, the influence is more covert or indirect and the major choice was still in the hands of the student.

These differences in parent influence warrant a more nuanced examination to understand the relationship between *types* of parent influence and major satisfaction. It may be that, indeed, direct influence is related to decreased satisfaction but perhaps indirect influence is associated with increased major satisfaction. Regardless of why students are influenced by their parent, it seems that parents have the ability to shape their child's major trajectory. Major satisfaction is likely linked to a number of other positive outcomes such as GPA and self-efficacy (e.g., Nugent et al., 2015). Indeed, correlation data suggests a direct positive relationship between major satisfaction and GPA, suggesting that major satisfaction may be an important consideration for other positive outcomes, especially academic outcomes. Because it appears that parents do have a role in major satisfaction, future interventions should consider parents unique position in the success of their STEM majoring child. Understanding these nuances will be important for promoting STEM major participation and overall retention.

Because the transition to college and the individuation process encourages interpersonal relationships beyond the family, the impact of peers is important to consider. While there was no significant effect of peer support on major satisfaction either directly or indirectly (on the direct relationship of parent influence and major satisfaction), the role of peers cannot be overlooked.

Further examination of the distribution of *Peer Social Support* suggests that the variable may be skewed in that most respondents scored rather high in peer social support (M = 2.71, SD = 0.74, four-point scale measured 1 to 4). Additionally, our analysis may not be an accurate representation of peer support as we averaged scores to account for missing data. Non-response may be an indication of particularly low or high peer support on a given day and so averaging scores to account for missing data does not accurately represent peer support. Future analysis should instead either omit missing data points or include more time-points for a more accurate account. Future research should also consider differences in peer groups that may result from parent influence on college choices, including major choice. It may be that those students who are highly directly influenced by parents to choose a STEM major (e.g., major choice is linked to tuition or "forced" in some way) are more likely to have peers outside their major. For these students, their major choice may not represent their personal interests and so they may seek different peer groups than those STEM major students who were indirectly influenced by parents to choose a particular major. Overall, additional research is needed to truly understand the interplay of peer support and STEM major outcomes including major satisfaction.

This study has a number of strengths including a diverse, longitudinal sample. The variety of measures provides unique insight into considerations that students may have when choosing and maintaining a STEM major. There are, however, limitations that may impact the generalizability of this study. The variable examining *Parent Influence on Major Choice* is limited in that it does not assess how parents have influenced their child's major choice. While some parents influence their child's choice by actively guiding them to choose a particular major, other parents' influence may be less overt and may be a perceived expectation by the

college student. Future studies examining college major choice and persistence should consider different forms of parental influence and the ramifications of these differences.

Another limitation that is important to consider is that the measure of *Peer Social Support* does not specifically examine support by fellow STEM major students on STEM topics, but rather it examines support from peers more generally. Because these peers may be outside their major or non-STEM students, the impact of support may be more nuanced and dependent on the specific relationship of the respondent to their peer group.

This study fulfils a unique role by providing insight into STEM major influences and variables that can promote persistence within a particular field or major. The STEM field is a growing area with highly paid jobs that may provide abundant opportunities for students. American students have, in recent years, underperformed on the international stage, stunting our national STEM growth and international prowess. To encourage more students in STEM fields we must first understand how proximal social relationships might impact one's perception of a particular major and subsequent engagement with that major. Additional research in this field is needed to understand fully the interplay of these relationships and the direct impact it has on the student.

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