

EXPANDING SOCIAL COGNITIVE CAREER THEORY:
ACADEMIC SATISFACTION OF FEMALE STUDENTS OF COLOR IN STEM

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EXPANDING SOCIAL COGNITIVE CAREER THEORY:
ACADEMIC SATISFACTION OF FEMALE STUDENTS OF COLOR IN STEM

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and hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

This dissertation is dedicated to my beloved family, especially my parents, Seung Dong Park and Mi Suk Shin. Thanks to your unwavering support, trust, and prayers, I could find courage to embark on and persist in my academic journey. You have taught me to lead my life with gratitude, wisdom, and integrity—our family motto. These principles will continue to be my aspiration in life.

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Abstract

Underrepresentation of women and students of color has been a longstanding issue in science, technology, engineering, and mathematics (STEM). Although the gender gap has narrowed in several STEM fields in recent years, female students, especially those of color, continue to face challenges in thriving in their chosen fields. The present study examined factors that contribute to these students' academic satisfaction, based on the satisfaction model of Social Cognitive Career Theory. Perceived discrimination and proactive personality were selected as an environmental obstacle and a person input in the model, respectively, as they were postulated to be especially relevant to these students. In addition, critical consciousness was included as an additional socio-cognitive variable. Data from 585 female college students of color ($M_{\text{age}} = 21.42$, $SD_{\text{age}} = 3.25$; $n_{\text{Black}} = 174$, $n_{\text{Latina}} = 171$, $n_{\text{Asian}} = 240$) were collected through Qualtrics. Multigroup measurement invariance tests and multigroup structural equation modeling were conducted to examine the racial/ethnic differences in constructs and their interrelationships. The findings showed that the three samples were equivalent at the scalar level and the proposed model fit the data from the three samples well. Significant racial/ethnic differences in several latent means and structural paths were observed. Theoretical, clinical, and institutional implications are discussed in light of the findings. Limitations and future research directions are also discussed.

Chapter I

Introduction

Career is not a simple concept. When children answer the question, “What do you want to be when you grow up?” there can be many underlying factors that influence their responses. For example, a girl may have a strong aptitude for mathematics but low confidence due to receiving constant messages that math is a boys’ thing. A boy may have a strong interest in visual arts but is afraid of going down the starving artist route. Pressures from his parents to get a more socially respected job may also affect his career decision. In addition, seeing what “people who look like me” do in their everyday encounters can limit or broaden career prospects of children and adolescents. For example, a Black girl growing up seeing Black nurses but never a Black doctor may consider nursing as a possible career, but view medical school as something out of her reach. In short, multiple personal and environmental factors play into a person’s career development.

The effects of contextual barriers are perhaps most evident in the case of marginalized groups. In the fields of science, technology, engineering, and mathematics (STEM), women and individuals of color have been historically underrepresented, both in school and in workforce. Although the gaps have been reduced in certain subfields during the recent decades, there are still many areas within STEM that are overrepresented by non-Hispanic White men (National Science Foundation, 2020). As the demand for STEM workers are increasing, recruiting more women and students of color may help augment and prepare the future workforce in this area. To do so, it is crucial to understand factors that hinder or promote these students’ academic experiences,

especially since existing literature suggests that their experiences may be different from their traditionally majority counterparts' (Casad et al., 2019; Hill et al., 2010). A useful model to guide this investigative endeavor is Social Cognitive Career Theory (Lent et al., 1994).

Since its inception, Social Cognitive Career Theory (SCCT; Lent et al., 1994) has been incrementally expanded to allow for a more holistic understanding of a person's career development (Brown & Lent, 2019; Lent & Brown, 2019). Before the introduction of SCCT, career development was approached in a fragmented manner. For example, although the theories of person-environment (P-E) fit laid indisputably important groundwork for future models, they emphasized a limited number of personal (e.g., interests) and environmental characteristics (e.g., job descriptions; Holland, 1959). Bandura (1977, 1986) introduced the importance of self-efficacy and how it is affected by both personal and situational factors, but it was not until later that self-efficacy was studied in earnest in the context of career development (Betz & Hackett, 1981; Hackett & Betz, 1989). Recognizing these separate pieces of the puzzle as well as the need to consider them in a larger social context, Lent and colleagues (1994) proposed SCCT as an integrative approach to understanding career development.

Social Cognitive Career Theory has five models, one model for each of the four major career outcomes (i.e., interest, career choice, performance, and satisfaction; Lent & Brown, 2006; Lent et al., 1994) and a process model that focuses on career self-management (Lent & Brown, 2013). The five models are interlocked and share some common components, such as self-efficacy, outcome expectations, and personal goals. In addition, SCCT takes into consideration person inputs—the personal characteristics that

the person brings to the equation, such as gender, race/ethnicity, and personality—and contextual factors like environmental supports and obstacles (Lent, 2013; Lent & Brown, 1996; Lent et al., 1994; Lent, Brown, & Hackett, 2000). The present study focused on the satisfaction model (see Figure 1), as satisfaction is an important indicator of people’s overall well-being and can lead to persistence after initial entry to the field (Lent et al., 2016).

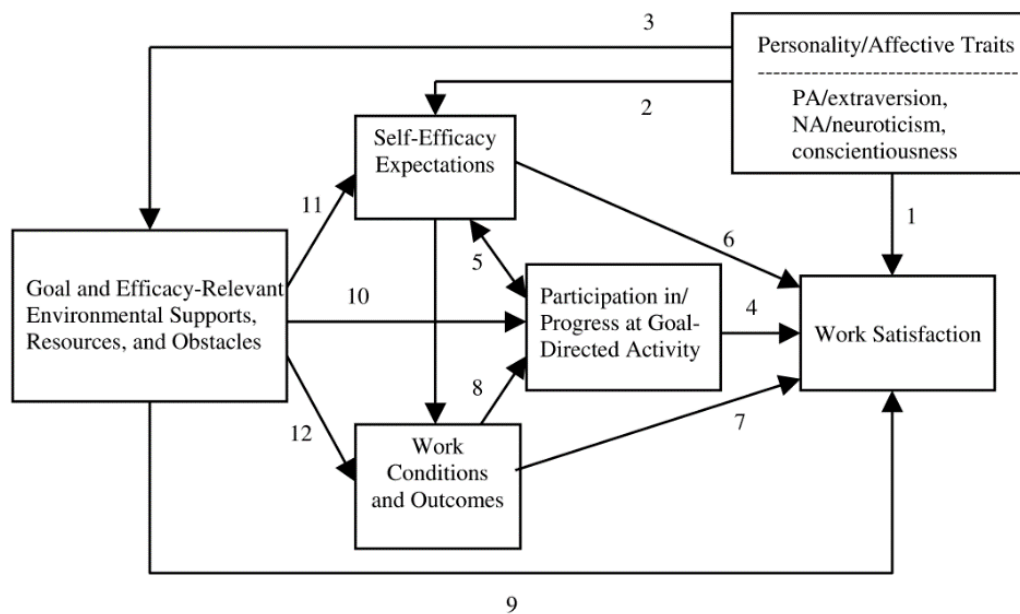


Figure 1. Satisfaction model of Social Cognitive Career Theory (Lent & Brown, 2006).

Although SCCT acknowledges the importance of distal and proximal contextual factors in career development (Lent et al., 2000), relatively little research thus far has focused on how specific contextual barriers interact with other components of the model—such as self-efficacy, outcome expectations, interests, and goals—to yield various career outcomes. The current study aimed to build on the foundation of the existing satisfaction model of SCCT by incorporating factors drawn from broader

psychology literature that are related to contextual barriers. More specifically, perceived discrimination, critical consciousness, and proactive personality were considered. These constructs were selected because they may be especially pertinent in understanding the study population—female students of color in STEM—who are daily exposed to an unaccommodating and unwelcoming academic environment (Hill et al., 2010).

First, perceived discrimination was considered. Historically, discrimination based on group memberships such as gender, race, age, ability status, religion, sexual orientation, and socioeconomic status has played a crucial role in determining the career development of many individuals, especially those with marginalized, oppressed group memberships. For instance, until the labor shortage during World War II necessitated the participation of women in paid work, the range of jobs a woman could hold was very limited (Matthews, 2000). Even now, women are disproportionately underrepresented in many STEM fields (NSF, 2020). Therefore, although research consistently shows little or no gender differences in objective ability (Hyde et al., 2008; Park & Rottinghaus, 2018), the career development processes of women and men in STEM are likely to be different. Felt experiences of micro-aggressions and discrimination can diminish women's self-efficacy and outcome expectations regarding careers in STEM fields (Hill et al., 2010).

While the aforementioned consequences of systemic discrimination are often deleterious, there are also factors that can serve as protective buffers against these situational challenges. One such factor is critical consciousness. Critical consciousness was first proposed by Freire (1970, 1973) as a pedagogical approach to help the oppressed group acquire not only functional literacy to read words but also critical literacy to read the sociopolitical world that surrounds them. Critical reflection on

systemic issues and social injustice can help empower members of the marginalized group to take action and initiate positive changes (Freire, 1973; Watts et al., 2011). Studies show that critical consciousness can help alleviate negative effects of discrimination, even in relation to career development (Diemer & Blustein, 2006). Therefore, this construct can be expected to help negate the impact of perceived discrimination on individuals' self-efficacy and goal pursuits. For instance, when a person is aware of institutional oppression that makes it harder for them to advance in their career, they can be empowered to seek ways to combat it, such as through joining forces with people under similar conditions.

A personality trait that can be especially relevant in career development is proactive personality, or a dispositional tendency to take initiatives to interact with the environment and bring about desired change (Bateman & Crant, 1993). This variable is not new to vocational psychology literature. In fact, it has been often studied in relation to various career outcomes, such as job performance, promotion, and satisfaction (Bakker et al., 2012; Li et al., 2010; Seibert et al., 2001). However, previous studies based on SCCT tended to use Big Five personality traits as the sole indicator of personality and have mostly overlooked this interesting personal characteristic. Therefore, examining proactive personality in the context of SCCT may illuminate its relevance to socio-cognitive variables and connect SCCT models to the broader vocational psychology literature.

Goals of the Present Study

The issues of contextual barriers such as discrimination are complex and often manifest differently against different groups. Despite the increasing call for more

diversity in vocational psychology literature, studies with people of color still only comprise a small portion of the research (Lee et al., 2017). Moreover, many of the studies that do target this population often treat people of color as a single group, instead of examining unique experiences of various racial/ethnic groups (Flores et al., 2019). Therefore, there is merit to studying different racial/ethnic groups simultaneously to examine their shared and unique experiences. The current study focused on female college students of color majoring in STEM, more specifically Black, Latina, and Asian female students. These students are often underrepresented in their fields and face marginalization as a result of their minority status in race/ethnicity and gender.

The present study also aimed to further expand the existing SCCT satisfaction model by incorporating three factors drawn from broader psychology literature: perceived discrimination, critical consciousness, and proactive personality. To this end, 585 female college students of color currently majoring in STEM were recruited through Qualtrics research panel, which gives researchers access to a nationwide pool of participants. The online self-report survey included questions on demographic information and measures of academic and barrier coping self-efficacy, goal progress, perceived discrimination, critical consciousness, proactive personality, and academic satisfaction. The collected data were analyzed to test multigroup measurement invariance and multigroup structural equation modeling.

Chapter II

Literature Review

This chapter provides an overview of the key theories and constructs related to the present study. First, the experiences of female students of color in STEM are discussed, focusing on their unique challenges and possible reasons behind their underrepresentation. Second, the history of and recent advances in Social Cognitive Career Theory (Lent & Brown, 2013; Lent et al., 1994), which provides the theoretical foundation of the research model, are introduced. Third, the key study constructs—perceived discrimination, critical consciousness, and proactive personality—are examined. Lastly, the research model that incorporates the three aforementioned constructs into the SCCT satisfaction model is introduced as a way to integrate these different areas of research.

Women of Color in STEM

Students of color are often underrepresented in higher education. For example, a recent census shows that among people in the United States aged 25 or above, 22.3% of Whites hold bachelor's degree, whereas only 16.3% of Blacks and 13.0% of Hispanics do (United States Census Bureau, 2019). This is not an isolated phenomenon; rather, it is a culmination of system-wide racial disparity in education. Studies show that many children of color enter kindergarten or first grade with lower levels of language and mathematic skills than their White peers. Once in school, this performance gap perpetuates due to lack of proper instructions or support, as well as school officials' prejudice and discrimination that limits these students' access to opportunities and resources (Farkas, 2003).

The racial disparity in higher education is particularly wide in STEM. Gender and racial/ethnic disparity in STEM was once unquestioningly accepted as a natural phenomenon. Even though this notion has been repeatedly challenged and refuted since then and it is now widely known that such disparity stems from contextual barriers and not from inherent differences in ability (e.g., Hyde et al., 2008), the gap in representation still persists. For instance, among the bachelor’s degree recipients in engineering in 2017, only 4% were Black, 11% were Hispanic, and 11% were Asian (National Science Foundation, 2020). Considering that Black or African Americans constitute 13%, Hispanic or Latinx 18%, and Asian 6% (United States Census Bureau, 2018) of the U.S. population, this shows that Black and Hispanic students are substantially underrepresented in STEM. Percentages of degree recipients of STEM fields in 2017 by race and sex are presented in Table 1.

Table 1

Percentages of Bachelor’s Degree Recipients in STEM in 2017 by Race and Sex (NSF, 2020)

Field	Black/African American		Latinx/Hispanic		Asian		White	
	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)
Engineering	0.95	2.82	2.43	8.26	2.88	8.10	11.74	46.48
Natural sciences	3.59	3.15	5.28	5.77	5.73	6.50	25.50	31.57
Biological sciences	7.68		12.62		14.42		55.07	
Earth, atmospheric, and ocean sciences	2.25		9.36		3.48		74.30	
Computer sciences	8.41		10.46		13.47		51.95	
Mathematics	4.01		9.02		10.44		52.48	
Chemistry	7.17		10.85		12.97		56.35	
Physics	3.15		8.92		6.60		65.80	
Field	Female (%)				Male (%)			
Engineering	21.52%				78.48%			
Natural sciences	45.82%				54.18%			
Biological sciences	61.54%				38.46%			

Earth, atmospheric, and ocean sciences	38.92%	61.08%
Computer sciences	19.14%	80.86%
Mathematics	41.67%	58.33%
Chemistry	49.41%	50.59%
Physics	20.43%	79.57%

In addition, STEM fields have also been traditionally characterized by unequal representation of gender (Lord et al., 2005). A study done in 1997 found that women were less likely than men to select lucrative college majors, many of which were STEM-related, such as engineering; agriculture and forestry; and mathematics and statistics (Davies & Guppy, 1997). Despite decades of remedial efforts since then, underrepresentation of women in STEM continues to this date. Even though 49% of bachelor's recipients in STEM as a whole are female, significant sex differences are still found in specific fields of science, such as engineering (22% female), physics (20% female), and computer sciences (19% female; NSF, 2020). The current study focused on STEM fields where women are underrepresented. Fields that have narrowed gender gaps in the number of students in recent years (e.g., chemistry) were still examined, as other indicators of underrepresentation of women persist to this date. For example, although 49.41% of bachelor's degree recipients in chemistry in 2017 were women, only 12% of faculty (and 8% of full professors) in chemistry were women in the 2016-17 academic year (Open Chemistry Collaborative in Diversity Equity, 2019). However, fields where women have begun to outnumber men, such as biology (NSF, 2020; see Table 1), were excluded.

The gender gap in STEM is noteworthy, because STEM is one of the fastest growing fields and a large, lucrative industrial sector. About 93% of STEM occupations have wages above national average and they showed growth rate of 10.5% between 2009

and 2015, which is about double the growth rate of non-STEM occupations, 5.2% (United States Bureau of Labor Statistics, 2017). However, the lack of workers has been a constant issue in this field. There has been speculation that low representation of people of color and women could be one of the contributing factors to this unmet demand for workforce (Beasley & Fischer, 2012). Therefore, increasing entry and retention of women of color in STEM fields is a pertinent issue not only from educational but also from organizational and industrial perspectives.

What could underlie the underrepresentation of women in STEM? Research has consistently found that there is little to no difference in girls' and boys' aptitude in STEM (Hyde et al., 2008). This suggests that the observed gender imbalance in STEM cannot be attributed to differences in objective abilities or intelligence. In fact, it has been suggested that socio-cognitive factors such as fixed mindset on girls' intelligence in STEM areas, stereotype threats, and low self-assessments in STEM-related abilities are key factors that negatively affect girls' and women's entry to and persistence in STEM. In addition, departmental culture that is unwelcoming to women and underrepresentation of female faculty can decrease female college students' sense of belonging, eventually causing them to transfer out of STEM majors (Hill et al., 2010). A study found that female students in STEM perceived their academic environment as more threatening than their male peers did (Casad et al., 2019), suggesting that there are meaningful gender differences in STEM students' academic experiences. Moreover, after they initially join STEM workforce, many women eventually leave due to poor working conditions, unwelcoming work culture, and need for better work-life balance—even when they are

still interested in, have confidence in their ability to succeed, and expect positive outcomes in their fields (Fouad & Singh, 2011; Hill et al., 2010).

Women of color are at an intersection of two cultural identities—race/ethnicity and female gender—that are both underrepresented in STEM. As mentioned before, students of color only comprise a small percentage of bachelor’s degree recipients in engineering. When gender is considered, the numbers become even smaller: In 2017, Black female students comprised 1%, Hispanic female students 2%, and Asian female students 3% of engineering graduates (NSF, 2020; see Table 1). These statistics show that female students of color are in an especially marginalized position within STEM. Macphee et al. (2013) found that students who held double STEM-minority statuses (ethnicity and SES) reported lower academic self-efficacy and performance compared to those who had one STEM-minority status. Female students of color, who similarly hold double STEM-minority statuses (race/ethnicity and gender), may also experience compounded effects of marginalization within their fields of choice. Parenthetically, it is important to note here that while cumulative effects of double jeopardy have been well documented, the score-keeping approach (i.e., “Whose group suffers most?”) often holds little value. Individuals at different intersectionality of social identities (e.g., female students of color, male students of color) experience qualitatively unique forms of oppression that cannot be simply quantified and compared (Purdie-Vaughns & Eibach, 2008).

Studies show that women of color in STEM experience unique challenges as they navigate their work and personal lives. For example, a qualitative study found that women of color in various stages of STEM academia struggled with balancing their

domestic reality—such as pregnancy and taking care of family members—with the “ideal worker norm,” or expectations of working long hours, having uninterrupted career trajectories, and always being available for work. They were constantly faced with hard choices, lacked role models, and struggled with fitting in to the workplace culture that was dominated by men (Kachchaf et al., 2015). These challenges can lower academic and job satisfaction among women of color and discourage them from pursuing their chosen careers.

It is important to note here that the situation of Asian female students in STEM might be different from other female students of color. Many Asians are encouraged from a young age to pursue career paths in STEM (Fouad et al., 2007), which are often held in high regards within their cultural communities. Sometimes, they are also steered toward STEM majors by school counselors or college advisors operating under unchecked biases (Kodama & Huynh, 2017). Also, Asian immigrants are a “hyper-selective” group characterized by overrepresentation of people with higher education. For example, in 2010, about half of Chinese immigrants age 25 or above held a bachelor’s degree or higher, which is higher than American national average of 28% or that of Mexican immigrants, 5% (Lee & Zhou, 2015). The cultural value in STEM careers and high family level of education may propel many Asian students to select STEM majors in college and persist in these fields after graduation.

However, there is considerable diversity in Asian students’ experiences in STEM. For example, although Asian women comprised about 47.6% of all bachelor’s degrees earned by Asian Americans in STEM in 2017, this number significantly drops in some specific fields, such as engineering (26.2%). In addition, these numbers show little

change from 2000, suggesting that the growth of Asian female representation in certain STEM fields has plateaued over the past two decades (NSF, 2020). This intersectionality between an overrepresented, quasi-majority status as Asian and minority status as women makes the experiences of Asian women in STEM unique and worth examining. Indeed, Asian women in STEM have been called an “invisible minority in a double bind” (Wu & Jing, 2011, p. 82) who are often overlooked in discourses on race and STEM.

Studies show that both person input (e.g., personality traits) and contextual variables (e.g., mentoring) can make it harder or easier for underrepresented students to persist and thrive in their chosen majors (Syed & Chemers, 2011). This suggests that a model that encompasses these two sets of variables and socio-cognitive variables that connect them will be an apropos framework to study academic experiences of female students of color in STEM. In this study, Social Cognitive Career Theory was adapted as such framework.

Social Cognitive Career Theory

Over the past several decades, the field of vocational psychology has witnessed a surge of interest in factors that influence an individual’s career development process. Prominent vocational psychologists proposed models emphasizing different constructs relevant to career development. Several models have adopted trait-factor, or P-E perspectives, highlighting the role stable traits—such as personal attributes that are largely determined by genetics or environmental characteristics—play in shaping a person’s career behaviors. Although they recognized the bidirectional nature of the relationship between the person and the environment, they failed to adequately account for the dynamic interplay between them (Lent et al., 1994). Recognizing the need to

integrate these distinct but conceptually related views to promote a more holistic understanding of career development, Lent et al. (1994) introduced Social Cognitive Career Theory (SCCT). Even after more than a quarter-century since its inception, SCCT remains as one of the most widely accepted and adopted models of career development (Brown & Lent, 2019; Lent & Brown, 2019). The current section provides a general overview of SCCT and its core components and introduces five interlocking models of SCCT: interest, career choice, performance, job satisfaction, and career self-management.

One of the main theoretical bases of SCCT is Bandura's (1986) social cognitive theory, especially the concept of triadic reciprocity. According to Bandura, 1) an individual's personal characteristics or attributes (e.g., cognitive processes, emotional experiences, physical qualities); 2) contextual or environmental factors that surround the individual; and 3) the individual's behaviors in the environment influence one another and create complex human experiences. This is an expansion from earlier trait-factor perspectives, going beyond simply looking at stable attributes and taking into consideration the complex interplay between person and environment. That is, Bandura acknowledged the importance of understanding how people think, feel, and act within a given social context; and how this in turn shapes the environment around them. Building on the foundation of this three-factor model, Lent et al. (1994) provide a more exhaustive model that is specific to career-related outcomes and examines how people's cognitive, emotional, and behavioral experiences interact with contextual factors in their career development.

Self-efficacy

Although SCCT encompasses multiple constructs, three social cognitive mechanisms—self-efficacy, outcome expectations, and goals—serve as the cornerstones. First, self-efficacy can be defined as an individual’s evaluation of their capacity to accomplish a certain task (Bandura, 1986). It is different from objective abilities in that it is not about how much capability people actually have, but about how much capability they *think* they have. That is, self-efficacy is a type of self-belief. It is distinguishable from self-esteem, which tends to be more general and cross-situational, in that it is more domain-specific (Bandura, 1986). For example, a person may have high self-efficacy for sports but low self-efficacy for drawing.

Another interesting aspect of self-efficacy is that it is not a static characteristic that remains stable over time. As Betz and Hackett (2006) emphasized, self-efficacy is a “cognitive appraisal or judgement of future performance capabilities, not a trait concept” (p. 6). In contrast, self-efficacy is prone to change as a result of the person’s interaction with the environment. Past accomplishments in a given domain (e.g., in the context of sports, scoring a winning goal in a match) and current physiological and affective states (e.g., having low anxiety) can help a person build positive or negative self-efficacy beliefs. Also, other social-cognitive factors such as vicarious learning (e.g., watching siblings play in varsity sports teams) and social persuasion (e.g., a coach suggesting to try out for a sports team) can lead to greater self-efficacy in a given behavioral domain (Bandura, 1997).

Although self-efficacy is moderately related to objective levels of actual competence (Lent et al., 1986), it is also determined through a person’s interactions with

the environment. Therefore, it is possible for a person to have low self-efficacy in a domain where he or she actually has high level of objective ability. Unsurprisingly, both ability and self-efficacy are needed for successful accomplishment of tasks (Lent & Brown, 1996).

Outcome Expectations

Similar to self-efficacy, outcome expectations are also a set of beliefs that people hold about themselves. More specifically, they are beliefs about likely consequences of a goal-directed behavior. The outcomes can be physical (e.g., “Will I lose money?”), social (e.g., “What will others think of me?”), and self-evaluative (e.g., “Will I do it well?”). These expectations can be based on a person’s prior experiences of successes and failures, as well as vicarious learning through observing outcomes of others’ goal-directed behaviors. Because people have inherent tendency to approach pleasure and avoid pain, beliefs about possible outcomes and subjective probabilities can influence their course of action (Bandura, 1986).

Outcome expectations are closely related to self-efficacy. Oftentimes, people hold more positive outcome expectations when they have high self-efficacy in the given domain. In other words, people tend to have more optimistic views about future outcomes if they perceive themselves to be capable of achieving success. Bandura (1986) noted that both sets of beliefs drive a person’s decision to engage in a task. However, he emphasized that self-efficacy is more important of the two. That is, a person may attempt a task in spite of poor outcome expectations, if their level of self-efficacy is high enough to accept the risk. In contrast, Lent (2013) suggested that there are also cases in which

negative outcome expectations outweigh a person's self-efficacy beliefs, resulting in disengagement from tasks and goals.

Goals

The third core construct of SCCT is personal goals, or goals people set for themselves. Personal goals can be divided into two types, choice goals (i.e., the type of activity to pursue) and performance goals (i.e., the level of performance or excellence to aim for; Bandura, 1986). Whereas self-efficacy and outcome expectations are related to people's evaluations of feasibility of a task, goals focus on what they want or hope for. In other words, goals help people set a direction for future actions and motivate them to actually execute these actions.

Social Cognitive Career Theory posits that all three constructs are interconnected. Self-efficacy and outcome expectations can help people decide on a career goal, as people tend to choose a career path that they expect to be doable (self-efficacy) and yield positive outcomes (outcome expectations). In return, the successful progress towards the goal can further reinforce self-efficacy beliefs and strengthen outcome expectations. However, the opposite is also possible; failures or lack of progress can prompt individuals to re-evaluate and lower their sense of efficacy and expectations of future (Lent, 2013).

Models of SCCT

In addition to these three core constructions, SCCT also incorporates various factors that form four interconnected models of the "big four" (Lent & Brown, 2013, p. 558) outcomes: interest, career choice, performance, and job satisfaction. Lent et al. (1994) defined vocational interests as "patterns of likes, dislikes, and indifferences

regarding career-relevant activities and occupations” (p. 88). Super (1949) emphasized that these patterns are determined by the interaction of personal and environmental factors. In other words, vocational interests are affected by both person inputs—personal characteristics such as gender, race/ethnicity, personality traits, and ability status—and contextual factors. A person may have inherent interests in certain areas, which may be affected by their objective abilities, self-efficacy, past performances, and social approvals (Super, 1949). Their interests may be further reinforced or curbed as they interact with the environment. For example, environmental barriers can hinder the development of initial interests in certain fields (e.g., lack of role models causing girls to lose interest in engineering, a traditionally male-dominated field). These contextual factors play an especially important role during developmental years, when children and adolescents are constructing their self-concepts (Lent et al., 1994).

Social Cognitive Career Theory posits that these personal and contextual factors have indirect effects on vocational interests through self-efficacy and outcome expectations, as shown in Figure 2. In turn, interests can lead to goal setting, which then prompts specific actions towards the goal, ultimately resulting in performance outcomes. These actual outcomes can feed back into self-efficacy and outcome expectations, creating a cycle (Lent et al., 1994). For example, receiving praise for math ability may increase an adolescent’s self-efficacy in math. Also, learning about how occupations in STEM fields tend to be more lucrative than other occupations can increase outcome expectations for such occupations. This sense of self-efficacy and positive outcome expectations can then increase interest for STEM occupations, leading them to set a goal to enter STEM workforce.

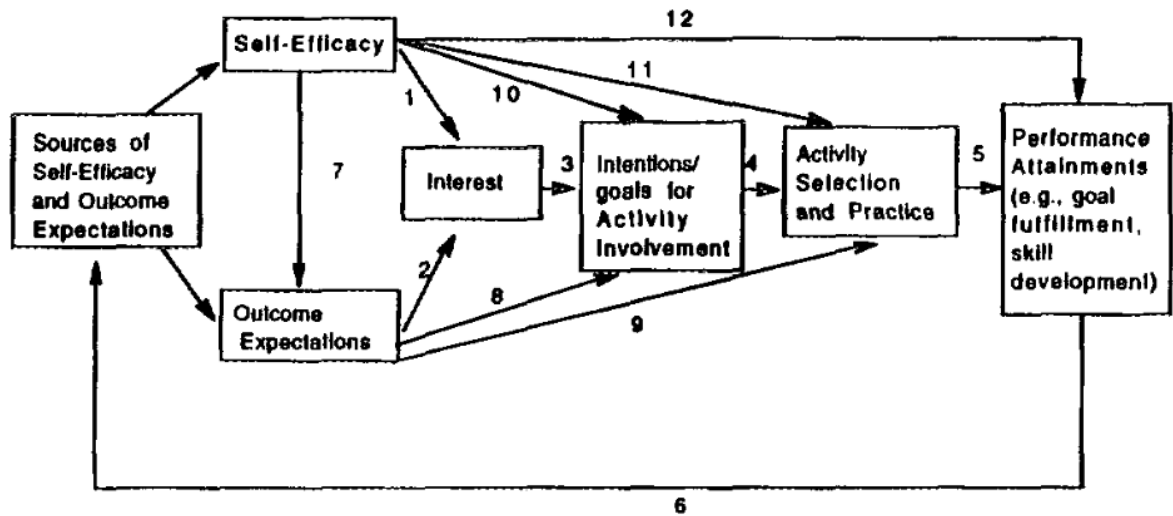


Figure 2. Original Social Cognitive Career Theory (Lent et al., 1994).

Setting a goal can, in turn, propel individuals to take specific actions (e.g., majoring in engineering in college) that yield certain outcomes (e.g., successfully graduating with an engineering major). A recent meta-analysis with 143 studies found that the interest and choice model of SCCT fit the data well, with most paths showing significant effects in expected directions. However, it is also notable that there were some meaningful differences in parameters among samples with different proportions of gender and race/ethnicity. For example, the negative relationship between barriers and supports was stronger among women, whereas the negative relationship between barriers and self-efficacy was stronger among men. Similarly, the negative relationship between barriers and supports was stronger among people of color whereas that between barriers and self-efficacy and outcome expectations was stronger among Whites (Lent et al., 2018). These

moderating effects of gender and race/ethnicity suggest the need for more studies focusing on specific populations.

Other important outcomes often considered in studies based on SCCT are job and academic satisfaction. Satisfaction is a more recent addition to SCCT (Lent & Brown, 2006) that expanded the previous models to include well-being as an outcome measure of career development. SCCT posits that a person is more likely to experience job satisfaction if they have high self-efficacy and high hopes for future outcomes, as well as working towards personally important goals. In addition to these traditional constructs of SCCT, the satisfaction model also acknowledges the importance of individuals' personality traits and work conditions (see Figure 1). Just as certain personality traits like extraversion are found to be related to the overall sense of well-being and happiness (Furnham, 2007), they are also associated with job satisfaction. More specifically, a meta-analysis found that across multiple studies, extraversion and neuroticism were consistently related to job satisfaction (Judge, Heller, & Mount, 2002). In addition, work conditions—such as workplace culture, supportive management, and safe working environment—contribute to workers' job satisfaction (Lent, 2013).

Previous models of SCCT focused on the *content* of career development. In 2013, Lent and Brown introduced a *process* model of SCCT, named the social cognitive model of career self-management. This model builds on the concepts of resilience and career adaptability and addresses adaptive career behaviors and factors that promote them. Lent and Brown (2013) organized adaptive career behaviors by career-life period and life role, based on Super's life span, life space theory (Super et al., 1996) and several other related works. Before, the content models of SCCT provided information on the *what* of career

development, or factors that help predict interest, goals, performance, and job satisfaction in a given field (e.g., STEM fields). The self-management model helps answer the question of *how* individuals navigate and manage their career development across fields. In light of the fourth industrial revolution, which is marked by high volatility (Hirschi, 2018) and demands for protean (Hall, 1996) and boundaryless careers (Arthur & Rousseau, 1996), it can be said that this model is perhaps more applicable to the current world of work than the previous content models of SCCT.

Since its conceptualization in 1994, SCCT has continued to evolve through incorporating constructs that were not examined in previous models, such as job satisfaction and adaptive career behaviors. However, there are still missing pieces; for example, although research shows that gender and race/ethnicity may serve as moderators in various parameters of SCCT (Lent et al., 2018), relatively little research has focused on exploring possible ways in which gender and race/ethnicity (personal inputs) interact with contextual factors like discrimination, as well as what constructs may serve as protective factors in this link. In addition, study on the role of personality has largely been limited to the Big Five personality traits, although there are other important personality factors, such as proactive personality, that seem to have particular relevance to career development. Examining new constructs in tandem with existing factors within SCCT model will help provide directions for future expansion of the model, as well as a more holistic understanding of individuals' career development.

Perceived Discrimination

Some of the main contextual factors considered in SCCT are environmental supports and barriers (Lent et al., 2000). These environmental factors can be both

objective and subjective. Despite decades-long efforts of remediation, there are still systemic discriminations that affect the career development of all individuals. Broadly, discrimination can be defined as differential treatment based on group membership. Some of the most common forms of discrimination include racism, sexism, heterosexualism, ageism, ableism, classism, and religious persecution (Whitley & Kite, 2016). Because discriminations are created and maintained in social contexts, both the privileged and the oppressed experience effects of discriminations, either in a favorable or aversive way.

The effect of systemic discrimination on individuals is mediated by their perception. In fact, it is not uncommon for people to display personal/group discrimination discrepancy. That is, some people may perceive that they, as individuals, are not subjected to discrimination that their affiliated group is experiencing as a whole (Taylor et al., 1990). For instance, an African American may recognize that African Americans as a group receive significant discrimination, but believe that they personally are less affected by it. Whether this belief is objectively true or not, it shows that people can have different perceptions about discrimination based on their felt experiences.

Perceptions of discrimination can influence a person's identification with his or her ethnic/racial group. A study with Latinx American college students found an interaction effect of group identification and prejudice/discrimination. Participants' level of identification with their ethnic group was assessed both before and after an experiment session, in which they were asked to read an article on prejudice and discrimination against either Latinx Americans (in-group) or the Inuit (out-group). Participants' level of ethnic group identification did not change in out-group prejudice/discrimination condition, but it changed significantly in in-group prejudice/discrimination condition.

That is, those who reported high group identification pre-experiment endorsed even higher identification after reading about prejudice and discrimination towards their in-group, whereas those who showed low group identification in the beginning reported even lower identification (McCoy & Major, 2003). In short, there appears to be relationship between saliency of discrimination and ethnic/racial identities, such that experiences of discrimination can strengthen the existing tendency.

Relatedly, the degree to which people recognize or detect discrimination may differ based on the strength of their group affinity. Operario and Fiske (2001) found that individuals who affiliate more strongly with their ethnic group were more likely to detect cues of discrimination. In this study, participants, who were all persons of color, were randomly assigned to two conditions. In low-ambiguity condition, they reviewed survey responses from a White confederate who answered in anti-diversity manner. Then the White confederate entered the room and showed behavioral discomfort (e.g., avoiding eye contact, physically distancing themselves from the participant). In high-ambiguity condition, the White confederate's responses were made in pro-diversity manner, but they still exhibited the signs of behavioral discomfort upon meeting the participant in person. After the confederate left, participants completed an evaluation of the confederate. The results showed that participants who reported stronger affiliation with their ethnic group picked up both subtle (behavioral discomfort) and obvious cues of discrimination (survey responses), but those who endorsed weaker affiliation only reacted to obvious cues of discrimination (Operario & Fiske, 2001).

The above study shows the importance of examining not only objective discrimination but also perceived discrimination, or individuals' perceptions of

discrimination against them. In fact, this construct has shown significant outcomes for individuals. For example, a meta-analysis by Pascoe and Richman (2009) found that perceived discrimination significantly contributed to physiological and psychological stress responses and unhealthy behaviors, which in turn had adverse effects on both mental and physical health of individuals. Therefore, the researchers argued that perceived discrimination is a specific form of stress (Pascoe & Richman, 2009). Relatedly, an experiment study found that when African American participants were asked to reflect on racial discrimination, they indicated greater number of unhealthy ingroup-prototypical behaviors (i.e., unhealthy behaviors that were considered “Black” behaviors, such as eating fried foods) as self-characteristic than those in the control group, who reflect on a neutral topic (the weather; Smart Richman et al., 2016). In addition, perceived discrimination showed association with depression and anxiety among African American, Asian American, and Latinx American college students, which was moderated by impostor feelings (Cokley et al., 2017). Taken together, it appears that the perception of discrimination is a chronic stressor that can have tangible impacts on a person’s physical and psychological well-being.

In addition, there is often social cost to claiming discrimination. Members of marginalized groups who claim discrimination are often labeled as “complainers” or accused of having an ulterior motive for personal gain. Also, people tend to be less receptive to confrontation of discrimination from members of an out-group than that from their in-group. For example, a wealthy person is less likely to listen to arguments about classism if those arguments come from a person from the working class and not another member of the privileged class. Furthermore, sometimes even members of the same

oppressed groups respond negatively to other members claiming discrimination (Whitley & Kite, 2016). For instance, working class individuals who speak against classism might be criticized by other members of the working class for being disruptive. These social and in-group costs of claiming discrimination can invalidate people's experiences and make it more difficult for them to take an active stance against perceived discrimination.

As noted earlier, SCCT recognizes the importance of social barriers and supports (Lent et al., 2000; Swanson & Woitke, 1997). Perceived discrimination is an important contextual obstacle that is especially pertinent in career development of individuals with oppressed identities, given that workplace discrimination and stereotyping are still widespread concerns (Banerjee, 2008). These barriers can affect individuals' beliefs about their ability to succeed in their career, as well as their outcome expectations and progress towards goals.

Critical Consciousness

Reflection on the social inequalities that are still rampant in the present society inevitably leads to the question of possible solutions. What could serve as a protective factor against the deleterious effects of discrimination and stereotyping? What could empower people to take action against oppression? One possible solution is critical consciousness. Critical consciousness refers to marginalized and oppressed individuals' ability to critically analyze and act upon their sociopolitical environment (Freire, 1970, 1973; Watts et al., 2011), rejecting the views of the oppressors and redefining themselves in an affirmative way (Watts et al., 1999). The term was first introduced by Paulo Freire, who wanted to help the disenfranchised poor in Brazil not only acquire functional literacy but also critical literacy to reflect on social inequality and take action to make

amendments (Freire, 1970). From critical consciousness perspective, education needs to go beyond the simple transmission of knowledge and equip people with ability to critically think and challenge the status quo (Watts et al., 1999).

When people are able to “read the world”— hidden agendas, residual traces of history of oppression, and systems that perpetuate the power differences—this awareness can empower them to initiate social changes and move towards a more equalitarian society. As such, critical consciousness has been referred to as an “antidote for oppression” (Watts et al., 1999, p. 255). This is relevant to the idea of radical healing, a construct that was recently re-introduced to the psychological discourse in response to the growing call for liberation psychology. In this framework, critical consciousness plays a key role in helping people of color deconstruct beliefs based on White supremacy and take proactive approaches to resisting and challenging racism and other forms of systemic oppression (French et al., 2020).

Just as how Freire (1970) envisioned critical consciousness as a pedagogical method, it is something that can be taught and learned. Participating in a “culture circle” where attendees analyze and identify societal problems, discuss what they could do to precipitate change process, and support each other through the process can help increase their critical consciousness (Diemer et al., 2006; Freire, 1970). Several intervention programs have been developed and tested to cultivate critical consciousness. For example, Bryant (2000) applied this pedagogical method to challenge racism and sexism among Black female adolescents, which resulted in a greater sense of self and connectedness. Balcazar et al. (2001) introduced similar intervention to challenge social injustice with urban African American participants and found that perceived family

support was associated with both reflection and action components of critical consciousness. These studies suggest that intentional learning experiences and interventions can help promote critical consciousness and mitigate the negative effects of discrimination.

Critical consciousness is relevant to career development. Without the critical awareness of the systemic forces that contribute to and perpetuate the gaps among social groups, people are left to believe in “myths” about work and career. In his seminal book *Pedagogy of the Oppressed*, Freire (1970) wrote:

It is accomplished by the oppressors’ depositing myths indispensable to the preservation of the status quo: for example... the myth that all persons are free to work where they wish... the myth that anyone who is industrious can become an entrepreneur... the myth of the industriousness of the oppressors and the laziness and dishonesty of the oppressed.... All these myths, the internalization of which is essential to the subjugation of the oppressed, are presented to them... via the mass “communications” media.... (pp. 139-140).

However, critical consciousness has not been studied in the context of vocational psychology until recently, most notably through the introduction of Psychology of Working Theory (PWT; Duffy et al., 2016). Briefly put, PWT is a framework of understanding predictors and outcomes of decent work, which is conceptualized as consisting of safe working conditions; allowance of adequate free time; appreciation of

family and social values; adequate compensation; and access to adequate healthcare. In this theory, critical consciousness is postulated to moderate the negative effects of experiences of marginalization and economic constraints on work volition, career adaptability, and decent work (Duffy et al., 2016).

Although studies based on PWT tend to focus on workers, critical consciousness has also been studied with students. For instance, Diemer and Blustein (2006) found that urban adolescents who endorsed higher levels of critical analysis of sociopolitical world had clearer sense of vocational identity, and those who perceived greater capacity to act upon sociopolitical world had stronger work role salience and career commitment. The researchers argued that such findings suggest that critical consciousness may serve as an internal resource that helps adolescents analyze and act upon systemic social inequalities and stay connected to their vocational future. These findings suggest that critical consciousness can facilitate career development of individuals with marginalized group identities. However, thus far, only little research has been done in examining this construct in the context of SCCT. One of the studies that did consider critical consciousness within the SCCT framework is Olle and Fouad's (2015) work on goals/intent to participate in career exploration among high school students, in which the majority of participants identified as Hispanic or Latinx. They found that critical consciousness positively predicted goals/intent. However, contrary to their initial expectations, positive effects of outcome expectations were reduced in the context of high critical consciousness, showing that more research is needed to understand the role of critical consciousness within the SCCT framework.

The present study examined if critical consciousness is associated with individuals' academic and barrier coping self-efficacy and goal progress (Olle & Fouad, 2015), which in turn were expected to contribute to their academic satisfaction. Additionally, subjective experiences of discrimination may lead to critical reflection on social injustice. Medina (2013) found a significant positive relationship between critical consciousness and experiences of racial/ethnic micro-aggressions among Latinx high school students and Heberle et al. (2020) suggested that experiences of marginalization may lead to the subsequent development of critical consciousness. Therefore, perceived discrimination and proactive personality—which is discussed below—were expected to predict critical consciousness in the present study.

Proactive Personality

Personality is an important person input that has many implications for various aspects of career development. In the SCCT literature, personality has often been equaled to Big Five personality traits. For example, Big Five personality traits were used in testing the role of personality in the interest model (Schaub & Tokar, 2004) and performance model (Cupani & Pautassi, 2013) of SCCT. While the Big Five provides a helpful framework for understanding personality and conscientiousness, neuroticism, and extraversion have been found to have significant relevance to career development (Judge et al., 1999; Tokar et al., 1998), there are also other personality variables that are related to but are distinct from these five traits.

One personality variable that can be especially applicable to career development is proactive personality. Proactive personality can be conceptualized as the dispositional tendency to initiate actions regardless of situational barriers. People who show high

levels of proactive personality take initiatives to change their current conditions rather than passively conforming to the situation (Bateman & Crant, 1993). Studies show that it is a trait distinct from Big Five personality traits. For example, Major et al. (2006) found that proactive personality was related to nine facets of Big Five personality traits, with at least one facet from each trait. Nonetheless, the composite of these nine facets only accounted for 26% of variance in proactive personality. Similarly, a meta-analysis found that Big Five personality traits explained 49.3% of variance in proactive personality (Spitzmuller et al., 2015), suggesting that while proactive personality shares some commonality with Big Five traits, it can be considered a construct meaningfully different from them. In addition, it has been postulated that proactive personality is not as fixed as Big Five personality traits and could be more amenable to development (Duffy et al., 2016).

Proactive personality has been frequently studied in vocational psychology literature in relation to various career outcomes. For instance, a study found that workers with high proactive personality were more likely to engage in job crafting, show higher work engagement, and demonstrate high job performance, as reported by colleagues (Bakker et al., 2012). Proactive personality was also found to be a predictor of innovation, political knowledge, and career initiative, which in turn led to salary increase and promotions (Seibert et al., 2001). In some cases, the relationship between proactive personality and career outcomes, such as supervisor-rated overall job performance, was stronger than that of Big Five personality traits (Fuller, Jr. & Marler, 2009). In another meta-analysis, the effects of proactive personality on job and task performance remained significant even after controlling for Big Five personality traits and general mental ability

(Spitzmuller et al., 2015). Li et al. (2010) also found that proactive personality increased the quality of relationship with supervisors, which in turn led to higher job satisfaction. Research on the relationship between proactive personality and academic-related variables are limited, but one study with college students showed that proactive personality positively predicted academic self-efficacy measured 3 months later (Lin et al., 2014). Taken together, proactive personality appears to be a salient predictor of many important career and academic outcomes.

In addition to previously discussed critical consciousness, proactive personality is theorized to moderate the effect that experiences of marginalization and economic constraints have on work volition, career adaptability, and decent work in PWT. According to PWT, proactive personality is an especially germane variable to study with marginalized population, whose environment is less conducive to vocational success (Duffy et al., 2016). However, this construct has not yet been studied in the context of SCCT. Examining how proactive personality relates to various socio-cognitive variables of SCCT may help understand its relevance to career development better and also expand the current model of SCCT in a meaningful way. More specifically, it may serve as a bridge connecting SCCT literature to the broader vocational psychology and industrial and organizational psychology literatures.

In the present study, proactive personality is expected to contribute to academic satisfaction both directly and indirectly through critical consciousness and self-efficacy. Although little research has examined proactive personality in relation to academic satisfaction, its association with job satisfaction has been well established (Li et al., 2010), with one study finding that such relationship was mediated by self-efficacy (Li et

al., 2017). As mentioned earlier, proactive personality also predicted academic self-efficacy among college students (Lin et al., 2014). No study has yet tested the relationship between proactive personality and critical consciousness, but relevant studies point to a possible association. For example, proactive personality demonstrated a positive relationship with social entrepreneurial intentions (i.e., running organizations to solve social issues) among African American and Hispanic college students (Prieto, 2011). Those who are prone to take initiatives to change the environment may be more willing to participate in critical action. Therefore, proactive personality was postulated to predict greater critical consciousness in the present study.

Tying It All Together

SCCT posits that various socio-cognitive factors interact with each other and with personal and contextual variables to contribute to a person's career development. Although SCCT has established a solid framework for understanding the relationships among these constructs, many of the previous studies based on SCCT focused on a limited number of contextual (e.g., broadly defined contextual barriers) and personality variables (e.g., Big Five personality traits). The present study attempted to bring in well-studied constructs from the broader psychology literature to examine them in the context of SCCT: perceived discrimination, critical consciousness, and proactive personality. Studying these important personal and contextual variables in tandem with the core socio-cognitive variables—self-efficacy, outcome expectations, and goal progress—may help illuminate how they contribute to academic satisfaction of students, especially of those who have been historically marginalized and underrepresented in STEM.

As previously discussed, female students of color in STEM are a unique group of students who are at an intersection of two STEM-minority identities. A meta-analysis (Lent et al., 2018) found that although SCCT choice model fit data from both women and men and people of color and Whites, there were some meaningful differences in parameters. For instance, the relationship between contextual barriers and self-efficacy was stronger among men and Whites than women and people of color (Lent et al., 2018). However, no similar study has yet been done with the satisfaction model (Brown & Lent, 2019). Moreover, although there have been studies that applied SCCT models to people of color as a whole or to a specific racial/ethnic group (which still only comprise a small portion of vocational psychology literature; Flores et al., 2019; Lee et al., 2017), not many studies have examined different racial/ethnic groups simultaneously and unpacked the variations within the large umbrella of “racial/ethnic minority.” Therefore, studying racial/ethnic differences in the interplay among personal, contextual, and socio-cognitive constructs among female students of color in STEM may contribute to a more holistic understanding of these students’ academic experiences. The proposed research model with predicted pathways is presented in Figure 3. The specific research hypotheses were as follows:

Hypothesis 1: The measurement model with study variables will show configural, metric, and scalar invariance across three samples.

Hypothesis 2: The multigroup structural model will fit the data from female students of color in STEM to an acceptable level.

Hypothesis 2a: Self-efficacy will have positive effect on academic satisfaction both directly and indirectly via outcome expectations and goal progress.

Hypothesis 2b: Perceived discrimination will positively predict three components of critical consciousness (perceived inequality, egalitarianism, and sociopolitical participation).

Hypothesis 2c: Proactive personality will have positive effect on academic satisfaction both directly and indirectly via critical consciousness and self-efficacy (academic and barrier coping).

Hypothesis 2d: Critical consciousness will have a positive indirect effect on academic satisfaction via self-efficacy and goal progress.

Hypothesis 2e: Perceived discrimination will have a negative indirect effect on academic satisfaction via self-efficacy, outcome expectations, and goal progress.

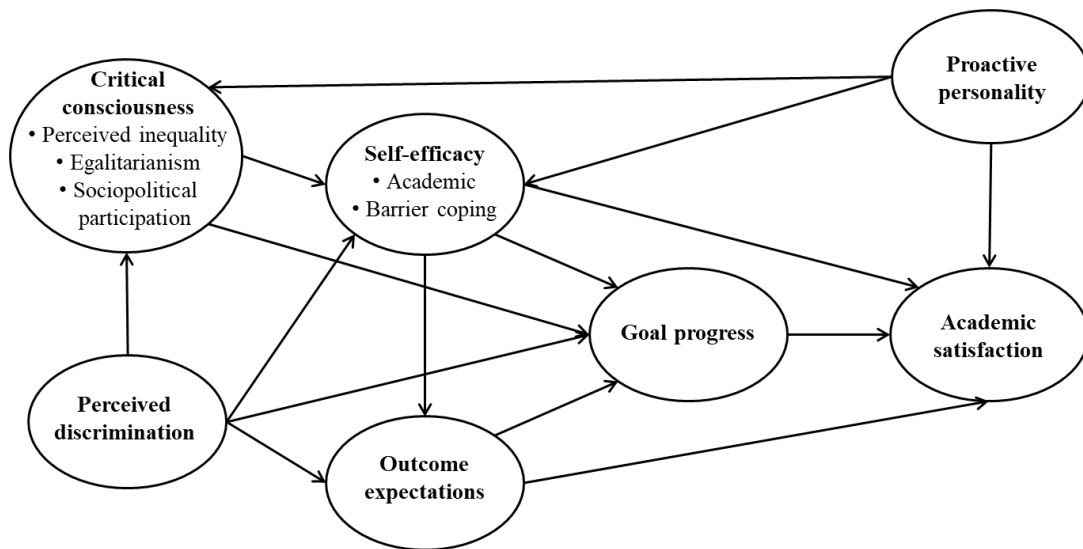


Figure 3. Proposed research model.

Racial/ethnic differences in latent means and structural paths were also explored. Although no specific hypothesis could be made due to scarcity of existing literature, the latent means of three samples were compared to each other. In addition, racial/ethnic differences were explored with direct and indirect paths in the structural model.

Chapter III

Method

The present chapter provides an overview of the study procedure. First, the target sample, recruitment strategy, and data collection procedure are discussed, with the informed consent form presented in Appendix A. Next, the final sample and participant characteristics are described. Third, instruments included in the survey are introduced and internal reliability of each measure is reported. The full questionnaire can be found in Appendix B. Lastly, data analysis plan is outlined.

Participants and Study Procedure

Female college students of color majoring in STEM were recruited for the study. In particular, the present study focused on three racial/ethnic groups: African American or Black (shortened to “Black” from here on), Asian (“Asian”), and Hispanic or Latinx (“Latina”). The a priori sample size analysis with anticipated effect size of 0.3, desired statistical power level of 0.8, and probability level of 0.05 yielded minimum sample size of 190 (Soper, 2019). Therefore, the goal was to recruit about 200 students per racial/ethnic group, 600 participants in total.

The eligibility criteria for the study included that the participant identifies with female gender, identifies as Black, Latina, or Asian, currently attends a university in the U.S. as an undergraduate, and majors in STEM. Participants who endorsed other race/ethnicity in addition to three racial/ethnic groups of focus (i.e., a person who identifies as both White and Black) were included in the study. Likewise, participants who had non-STEM double major in addition to a STEM major were considered eligible.

However, biological science, medicine, and nursing were excluded from the list of qualifying STEM majors, as women outnumber men in these fields (NSF, 2020).

The survey reached 10,338 individuals from October 2019 to January 2020, 8,966 of whom provided consent and accessed the survey. Among them, 1,044 passed the initial screening for eligibility (i.e. gender, race/ethnicity, STEM major, and enrollment status). Subsequently, 425 cases in which participants reported no qualifying STEM major (e.g., majoring in only biology), dropped out of the survey, were flagged as “speeder” by the survey program, failed the validity test (see under Measures), responded in careless manner (e.g., uniformly answering all items) were removed. From the remaining 619 cases, 26 participants who identified with two or more of the three racial/ethnic groups of focus (e.g., those who identified as both Black and Asian) were excluded, in order to avoid double coding and allow for multigroup comparisons. Additional eight cases that were identified as multivariate outliers based on Cook’s distance were also removed. The final sample included 585 participants.

Students attending colleges in 43 states across the United States participated in the study. Participant characteristics by racial/ethnic group are presented in Table 2. As shown, the average age was 21.415 ($SD = 3.246$) and average GPA was 3.478 ($SD = 0.427$). The most commonly endorsed sexual orientations were heterosexual (72.82%) and bisexual (17.78%). About 32.65% of participants were in their first year and 26.50% were sophomores. Among the participants, 174 (29.74%) identified as Black or African American, 171 (29.23%) as Hispanic or Latina, and 240 (41.03%) as Asian. The most common majors were computer and informational sciences (29.74%), followed by

engineering (23.59%) and chemistry (21.20%). The majority of participants (81.71%) were enrolled in four-year programs, whereas about 17.44% were in two-year programs.

Table 2

Participant Characteristics by Sample

	All (<i>N</i> = 585)	Black (<i>n</i> = 174)	Latina (<i>n</i> = 171)	Asian (<i>n</i> = 240)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
Age	21.415 (3.246)	21.764 (3.093)	21.977 (3.753)	20.763 (2.840)
GPA	3.478 (0.427)	3.445 (0.456)	3.466 (0.385)	3.509 (0.433)
	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Sexual orientation				
Heterosexual	426 (72.82)	122 (70.11)	122 (71.35)	182 (75.83)
Lesbian	23 (3.93)	10 (5.75)	8 (4.68)	5 (2.08)
Gay	2 (0.34)	2 (1.15)	0 (0.00)	0 (0.00)
Bisexual	104 (17.78)	27 (15.52)	37 (21.64)	40 (16.67)
Queer	9 (1.54)	4 (2.30)	2 (1.17)	3 (1.25)
Other	21 (3.59)	9 (5.17)	2 (1.17)	10 (4.17)
Year in school				
First year	191 (32.65)	53 (30.46)	56 (32.75)	82 (34.17)
Sophomore	155 (26.50)	60 (34.48)	40 (23.39)	55 (22.92)
Junior	130 (22.22)	34 (19.54)	40 (23.39)	56 (23.33)
Senior	95 (16.24)	23 (13.22)	32 (18.71)	40 (16.67)
Year 5+	14 (2.39)	4 (2.30)	3 (1.75)	7 (2.92)
Race/ethnicity				
White	88 (15.04)	16 (9.20)	47 (27.49)	25 (10.42)
Black or African American	174 (29.74)	174 (100.00)	0 (0.00)	0 (0.00)
Hispanic or Latinx	171 (29.23)	0 (0.00)	171 (100.00)	0 (0.00)
Asian	240 (41.03)	0 (0.00)	0 (0.00)	240 (100.00)
Native American	11 (1.88)	5 (2.87)	5 (2.92)	1 (0.42)
Native Hawaiian or Pacific Islander	4 (0.68)	0 (0.00)	2 (1.17)	2 (0.83)
Other	2 (0.34)	1 (0.57)	1 (0.58)	0 (0.00)
Major				
Chemistry	124 (21.20)	37 (21.26)	41 (23.98)	46 (19.17)
Computer and informational sciences	174 (29.74)	65 (37.36)	34 (19.88)	75 (31.25)
Engineering	138 (23.59)	23 (13.22)	46 (26.90)	69 (28.75)
Earth, atmospheric, and ocean sciences	61 (10.43)	20 (11.49)	21 (12.28)	20 (8.33)
Life sciences	38 (6.50)	16 (9.20)	9 (5.26)	13 (5.42)

Materials research	12 (2.05)	4 (2.30)	5 (2.92)	3 (1.25)
Mathematics	118 (20.17)	40 (22.99)	36 (21.05)	42 (17.50)
Physics	28 (4.79)	16 (9.20)	11 (6.43)	1 (0.42)
Medical and healthcare	59 (10.09)	19 (10.92)	20 (11.70)	20 (8.33)
Other STEM major	19 (3.25)	2 (1.15)	7 (4.09)	10 (4.17)
Other non-STEM major	29 (4.96)	5 (2.87)	10 (5.85)	14 (5.83)
Program				
Two-year	102 (17.44)	36 (20.69)	37 (21.64)	29 (12.08)
Four-year	478 (81.71)	138 (79.31)	132 (77.19)	208 (86.67)
Other	5 (0.85)	0 (0.00)	2 (1.17)	3 (1.25)

Participants were recruited through Qualtrics, an online research platform. Online data collection has become increasingly more common in psychological research, partially due to the demand for higher statistical power (Sassenberg & Ditrich, 2019). Goodman et al. (2013) examined data collected through Amazon Mechanical Turk (MTurk) and found them to be reliable, although some differences in participant characteristics compared to community and student samples were noted. Qualtrics is also commonly utilized by researchers in psychology, more so than other similar platforms such as Survey Monkey (Carpenter et al., 2019). Therefore, Qualtrics was selected as the platform for collecting data for the present study.

The data were collected using an online self-report questionnaire and participants were asked to provide virtual informed consent prior to accessing the questionnaire. The informed consent form included a brief description of the study, what is expected of participants, potential risks and benefits, and contact information of the researcher and IRB office (see Appendix A). The survey was expected to take about 15-20 minutes to complete. Participants were compensated through Qualtrics based on previously agreed-

upon method, which could be in forms of cash, redeemable points, or other types of virtual payment.

Measures

Demographic and Career Planning Questionnaire

Questions about participants' age, gender, sexual orientation, race/ethnicity, college enrollment status, major(s), duration of program, location of college/university, year in college, and self-reported grade point average were included in the questionnaire. See Appendix B for the full list of questions.

Self-efficacy

Self-efficacy was assessed using the 11-item measure from the SCCT Battery used by Lent, Singley et al. (2005) and Lent et al. (2003), which comprises two subscales. Items used here were modified to be domain specific (i.e., refer to STEM major specifically; see example item below). Four items are from Lent, Brown, and Larkin's (1986) Academic Milestone Self-Efficacy Scale (e.g., "How much confidence do you have in your ability to excel in your STEM major over the next semester?") and seven items are from the Barrier Coping Self-Efficacy Scale (e.g., "cope with a lack of support from professors or your advisor"; Lent et al., 2001). Each item is rated on a 10-point Likert scale, ranging from 0=*No confidence* to 9=*Complete confidence*. The scales demonstrated significant correlations with other SCCT variables such as outcome expectations, interests, and goals (Lent, Brown et al., 2005). In the current study, the Cronbach's alphas for Academic Milestone Self-Efficacy Scale and Barrier Coping Self-Efficacy Scale were .912 and .897, respectively. The two types of self-efficacy were treated as correlated, yet separate, constructs.

Outcome Expectations

Outcome expectations were measured using the modified version of the 10-item scale used in Lent, Brown et al. (2005) as a part of SCCT Battery. The items measure participants' degrees of agreement with positive outcomes related to earning a STEM degree (e.g., "earn an attractive salary"). Each item is rated on a 10-point Likert scale, ranging from 0=*Strongly disagree* to 9=*Strongly agree*. The scale showed significant correlations with other SCCT variables such as interests and goals (Lent, Brown et al., 2005). Cronbach's alpha with the current sample was .910.

Goal Progress

Participants' perceived progress towards their academic goals was assessed using the seven-item academic goal progress scale used by Lent, Singley et al. (2005), modified to be domain specific to STEM (e.g., "learning and understanding the material in each of your STEM courses"). Each item is rated on a five-point Likert scale, ranging from 1=*No progress at all* to 5=*Excellent progress*. Cronbach's alpha for the scale in Lent, Singley et al. (2005) was .84-.86. In their model, this scale was predicted by environmental support and resources and self-efficacy expectations and in turn predicted academic satisfaction. Cronbach's alpha in the current study was .891.

Perceived Discrimination

Perceived discrimination was assessed with a nine-item Daily Discrimination subscale of the Perceived Discrimination Scale (Williams, et al., 1997). Items (e.g., "you are treated with less courtesy than other people") are rated on a four-point Likert scale. The original scale ranged from 1=*Often* to 4=*Never* and scores were later reversed and summed. To make the scale more consistent with other scales used in the present study,

the scale was reversed to range from *1=Never* to *4=Often*, so that higher scores would indicate higher levels of perceived discrimination. The scale significantly predicted self-reported ill health, bed-days, well-being, and psychological distress (Williams et al., 1997). With the current sample, the Cronbach's alpha of the scale was .890.

Critical Consciousness

Critical Consciousness Scale (CCS; Diemer et al., 2017) was used to gauge participants' level of critical consciousness. The CCS is a 22-item measure with three subscales, Critical Reflection: Perceived Inequality (eight items; e.g., "Certain racial or ethnic groups have fewer chances to get good jobs"), Critical Reflection: Egalitarianism (five items; e.g., "It would be good if groups could be equal"), and Critical Action: Sociopolitical Participation (nine items; e.g., "Participated in a civil rights group or organization"). Critical Reflection items are rated on a 6-point Likert scale, ranging from *1=Strongly disagree* to *6=Strongly agree*. Critical action items are rated on a 5-point Likert scale, ranging from *1=Never did this* to *5=At least once a week*. All three subscales showed good internal consistency in the present study; Perceived Inequality had Cronbach's alpha of .922, Egalitarianism .853, and Sociopolitical Participation .912. Based on Diemer and colleagues' (2017) recommendation, the three components were treated as related, yet separate, constructs in the present study.

Proactive Personality

Bateman and Crant's (1993) 17-item Proactive Personality Scale was used to measure proactive personality. Items (e.g., "I am constantly on the lookout for new ways to improve my life") are rated on a seven-point Likert scale, ranging from *1=Strongly disagree* to *7=Strongly agree*. The original scale development study found it to be

positively related to Big Five conscientiousness and extraversion, need for achievement, and need for dominance. In the original development article, the Cronbach's alpha was .89 and 3-month test-retest reliability was .72 (Bateman & Crant, 1993). In the current study, the Cronbach's alpha was .919.

Academic Satisfaction

Academic satisfaction was measured with the seven-item scale used in Lent, Singley et al. (2005). Each item (e.g., "I enjoy the level of intellectual stimulation in my courses") is rated on a five-point Likert scale, ranging from *1=Strongly disagree* to *5=Strongly agree*. In Lent, Singley et al.'s (2005) study, the scale was predicted by self-efficacy expectations and outcome expectations, and in turn predicted general life satisfaction. The Cronbach's alpha with the current sample was .886.

Validity Check

To guard against careless responses, a random responding item adapted from Kung et al. (2018; "For this question, please select 'false' to demonstrate your attention") was included. Participants who responded 'true' were excluded from the analysis.

Data Analysis

The collected data were analyzed using SPSS 23.0 and Mplus 8.4 to test the research hypotheses. First, for each measure, Cronbach's α and descriptive statistics such as mean, standard deviation, skewness, and kurtosis were calculated. Also, the bivariate correlations among the variables were tested. These values were computed for both the whole aggregated sample and each racial/ethnic subsample separately.

Prior to testing the measurement model, item parcels were created. Because the sum of items is less likely to violate multivariate normality than multiple single items,

item parceling reduces the risk of multivariate normality violation. Similarly, item parceling also decreases the risk of flawed individual items distorting overall results. In addition, item parceling enables model analysis with a smaller sample size through reducing the number of parameters to be estimated (Russell et al., 1998).

Item parcels were created following Rogers and Schmitt's (2004) factor algorithm method, because all latent factors in the present model were unidimensional. First, a one-factor model was fitted to a variable and items were ranked in the order of their factor loadings. Next, parcels took turn picking up items with the highest to the lowest loadings, alternating the direction each round. This method ensures that parcels are created with comparable loadings. Through this method, three parcels per latent factor were created; Matsunaga (2008) recommended creating three parcels per latent factor to ensure model fit while safeguarding against estimation bias.

Following Anderson and Gerbing's (1988) two-step modeling approach, a measurement model was first assessed to see if any structural model with acceptable fit exists. The measurement model was fitted both to the whole sample and to each group separately. The following fit indices were used to assess the model fit: root-mean-square error of approximation (RMSEA), comparative fit index (CFI), and Tucker-Lewis index (TLI). Following Browne and Cudeck's (1993) and Hu and Bentler's (1999) recommendations, RMSEA values less than .08 were considered a fair fit, and values less than .05 as an acceptable fit; and CFI and TLI values larger than .90 were considered acceptable fit and values greater than .95 a good fit.

Next, measurement invariance of the measurement model was examined across the Black, Latina, and Asian samples, following three steps. The less restrictive

invariance needs to be established, at least partially, to proceed to the next step. First, configural invariance—also known as weak factor invariance—was tested by fitting the same factor structure to all groups. This test assumes that the same number of factors and the same pattern of free and fixed factor loadings apply to all groups. Achievement of configural invariance suggests that the basic organization of factors is the same across groups. Second, metric invariance, or strong factor invariance, was tested. In addition to the factor structure, now factor loadings of like items were constrained to equality across groups. For example, the factor loading of the first item of academic satisfaction was assumed to be the same across Black, Latina, and Asian samples. Attainment of metric invariance suggests that all items contribute to latent factors to the same degree across groups. Lastly, scalar invariance was tested to assess the equivalence of item intercepts by constraining them. Achievement of scalar invariance shows that item means can be assumed to be equal across groups (Byrne, 2012; Putnick & Bornstein, 2016; Vandenberg & Lance, 2000).

Chi-square difference test has been traditionally used as an indicator of significant change in two nested models. However, chi-square tests can be overly sensitive to small changes, especially in large samples (Putnick & Bornstein, 2016). As such, alternative criteria for assessing change in nested models have been proposed by various researchers. In the present study, a model change was considered significant if it results in greater than .015 change in RMSEA, -.01 change in CFI, or -.02 change in TLI (Chen, 2007; Cheung & Rensvold, 2002; Vandenberg & Lance, 2000). If the model change was above these cutoffs, the more constrained model was rejected in favor of the less restricted model.

Once scalar invariance was achieved, latent means were compared among the three groups by constraining referent group's factor means and variances and freely estimating those of the other two groups. The Black sample served as the first referent group and the Latina as the second referent group. Wald test was used to assess the significance of the latent mean differences across groups. Following Putnick and Bornstein's (2016) recommendation, Cohen's *d* values were also calculated to allow for future meta comparison across studies.

Next, the structural model with proposed paths (see Figure 3) was assessed, based on results from the tests of measurement invariance and latent mean differences. When the model showed fit that was not above cutoffs for acceptable fit, modification indices were examined for possible modifications to the model. The application of modifications was minimized and evaluated on theoretical basis. Once the model was finalized, multigroup invariance of each path was tested. Next, significant direct and indirect paths were examined for each group.

Chapter IV

Results

Descriptive Statistics and Bivariate Correlations

The means, standard deviation, skewness and kurtosis, and Cronbach's alpha of each study variable and bivariate correlations are presented in Table 3. Academic satisfaction showed significantly positive correlations with academic self-efficacy ($r = .507, p < .001$), barrier coping self-efficacy ($r = .547, p < .001$), outcome expectations ($r = .549, p < .001$), goal progress ($r = .661, p < .001$), egalitarianism ($r = .265, p < .001$), and proactive personality ($r = .519, p < .001$), and negative correlation with perceived discrimination ($r = -.085, p = .039$). These values were also calculated and presented for Black, Latina, and Asian samples separately in Tables 4-6. All skewness and kurtosis values of study variables were within the normal range (Byrne, 2010).

Item Parceling and Assessment of Measurement Model

Based on Matsunaga's (2008) recommendation, three parcels were created per latent factor, following factor algorithm method (Rogers & Schmitt, 2004). The factor loadings of parcels in the measurement model are presented in Table 7. Standardized factor loadings ranged from .769 to .929 across factors and were all significant at $p < .001$, suggesting successful creation of item parcels. Correlations among factors are also presented in Table 7. Academic self-efficacy and barrier coping self-efficacy showed strong correlation, $r = .739, p < .001$, suggesting that these two types of self-efficacy share much of the covariance in their residuals.

Table 3

Descriptive Statistics, Internal Reliability, and Bivariate Correlations of Study Variables (All Participants, N = 585)

	1	2	3	4	5	6	7	8	9	10
1	-									
2	.663***	-								
3	.544***	.581***	-							
4	.541***	.643***	.553***	-						
5	-.057	-.074	-.020	-.075	-					
6	.155***	.039	.105*	.024	.273***	-				
7	.268***	.199***	.318***	.195***	-.056	.259***	-			
8	-.060	.036	.031	.121**	.412***	.182***	-.082*	-		
9	.408***	.497***	.574***	.483***	.062	.089*	.262***	.144***	-	
10	.507***	.547***	.549***	.661***	-.085*	.074	.265***	.015	.519***	-
<i>M</i>	34.272	44.697	72.121	26.868	20.125	33.361	25.906	19.055	89.839	28.074
<i>SD</i>	9.321	11.591	13.309	5.094	6.349	9.076	4.226	8.597	16.137	4.912
Skewness	-.992	-.584	-1.028	-.635	.151	-.614	-.967	.775	-.461	-.731
Kurtosis	.569	.223	1.866	.274	-.552	.237	.254	-.325	-.284	.697
α	.912	.897	.910	.891	.890	.922	.853	.912	.919	.886

Note. 1 = academic self-efficacy; 2 = barrier coping self-efficacy; 3 = outcome expectations; 4 = goal progress; 5 = perceived discrimination; 6 = perceived inequality; 7 = egalitarianism; 8 = sociopolitical participation; 9 = proactive personality; 10 = academic satisfaction.

* $p < .05$, ** $p < 0.01$, *** $p < .001$.

Table 4

Descriptive Statistics, Internal Reliability, and Bivariate Correlations of Study Variables (Black, n = 174)

	1	2	3	4	5	6	7	8	9	10
1	-									
2	.757***	-								
3	.610***	.661***	-							
4	.572***	.620***	.600***	-						
5	.008	-.038	-.029	-.065	-					
6	.149	.141	.152*	.074	.269***	-				
7	.345***	.370***	.361***	.263***	-.072	.342***	-			
8	.029	.088	.060	.157*	.353***	.161*	-.140	-		
9	.570***	.608***	.653***	.589***	.003	.091	.383***	.044	-	
10	.529***	.582***	.622***	.658***	-.115	.137	.400***	.029	.549***	-
<i>M</i>	34.937	47.414	74.868	28.379	20.598	34.040	25.989	21.029	94.218	29.379
<i>SD</i>	9.216	11.960	12.831	4.509	6.986	9.038	4.364	9.223	14.491	4.326
Skewness	-.991	-.825	-1.345	-.946	.059	-.788	-1.347	.531	-.878	-.820
Kurtosis	.381	.287	2.805	1.498	-.892	.452	1.458	-.692	.863	.662
α	.918	.922	.919	.857	.909	.910	.839	.909	.901	.861

Note. 1 = academic self-efficacy; 2 = barrier coping self-efficacy; 3 = outcome expectations; 4 = goal progress; 5 = perceived discrimination; 6 = perceived inequality; 7 = egalitarianism; 8 = sociopolitical participation; 9 = proactive personality; 10 = academic satisfaction.

* $p < .05$, ** $p < 0.01$, *** $p < .001$.

Table 5

Descriptive Statistics, Internal Reliability, and Bivariate Correlations of Study Variables (Latina, n = 171)

	1	2	3	4	5	6	7	8	9	10
1	-									
2	.607***	-								
3	.537***	.545***	-							
4	.483***	.597***	.482***	-						
5	-.017	-.139	-.051	-.098	-					
6	.206**	-.010	.111	-.023	.438***	-				
7	.191*	.160*	.265***	.144	-.074	.254**	-			
8	-.110	-.038	-.084	.095	.395***	.183*	-.117	-		
9	.357***	.463***	.579***	.409***	.001	.072	.242**	.117	-	
10	.473***	.518***	.516***	.640***	-.098	.097	.194*	-.013	.524***	-
<i>M</i>	33.298	44.041	71.860	26.497	21.392	33.509	25.784	20.240	91.187	27.737
<i>SD</i>	10.086	10.935	13.415	5.048	6.278	8.973	4.377	8.690	16.826	4.878
Skewness	-.958	-.554	-.830	-.607	-.032	-.536	-.712	.576	-.553	-.822
Kurtosis	.265	-.128	.422	.282	-.440	.346	-.820	-.667	-.162	1.562
α	.925	.874	.903	.891	.886	.919	.852	.908	.924	.880

Note. 1 = academic self-efficacy; 2 = barrier coping self-efficacy; 3 = outcome expectations; 4 = goal progress; 5 = perceived discrimination; 6 = perceived inequality; 7 = egalitarianism; 8 = sociopolitical participation; 9 = proactive personality; 10 = academic satisfaction.

* $p < .05$, ** $p < 0.01$, *** $p < .001$.

Table 6

Descriptive Statistics and Bivariate Correlations of Study Variables (Asian, n = 240)

	1	2	3	4	5	6	7	8	9	10
1	-									
2	.650***	-								
3	.512***	.527***	-							
4	.586***	.667***	.548***	-						
5	-.138*	-.100	-.028	-.116	-					
6	.120	-.023	.052	.001	.142*	-				
7	.271***	.091	.334***	.194**	-.022	.201**	-			
8	-.096	-.028	.027	.038	.434***	.178**	.000	-		
9	.369***	.419***	.497***	.437***	.083	.073	.211**	.131*	-	
10	.532***	.520***	.505***	.649***	-.098	.004	.237***	-.055	.469***	-
<i>M</i>	34.483	43.196	70.317	26.038	18.879	32.763	25.933	16.779	85.704	27.367
<i>SD</i>	8.799	11.480	13.298	5.303	5.680	9.174	4.028	7.500	15.826	5.163
Skewness	-.991	-.526	-1.027	-.445	.272	-.553	-.855	1.119	-.166	-.564
Kurtosis	.948	.692	2.758	-.063	-.162	.121	.184	.600	-.508	.181
α	.900	.888	.907	.903	.870	.933	.867	.906	.916	.896

Note. 1 = academic self-efficacy; 2 = barrier coping self-efficacy; 3 = outcome expectations; 4 = goal progress; 5 = perceived discrimination; 6 = perceived inequality; 7 = egalitarianism; 8 = sociopolitical participation; 9 = proactive personality; 10 = academic satisfaction.

* $p < .05$, ** $p < 0.01$, *** $p < .001$.

Table 7

Factor Loadings and Correlations of the Measurement Model (N = 585)

Factor	<i>B</i> (<i>SE</i>)	β (<i>SE</i>)	<i>p</i>
Academic self-efficacy			
Parcel 1	1.000 (0.000)	.885 (.013)	< .001
Parcel 2	1.862 (0.063)	.914 (.011)	< .001
Parcel 3	1.702 (0.073)	.773 (.019)	< .001
Barrier coping self-efficacy			
Parcel 1	1.000 (0.000)	.847 (.014)	< .001
Parcel 2	0.746 (0.027)	.891 (.012)	< .001
Parcel 3	0.776 (0.029)	.882 (.012)	< .001
Academic self-efficacy	6.158 (0.496)	.739 (.023)	< .001
Outcome expectations			
Parcel 1	1.000 (0.000)	.897 (.011)	< .001
Parcel 2	1.010 (0.035)	.870 (.013)	< .001
Parcel 3	1.303 (0.044)	.873 (.013)	< .001
Academic self-efficacy	4.392 (0.396)	.600 (.031)	< .001
Barrier coping self-efficacy	10.765 (0.937)	.645 (.028)	< .001
Goal progress			
Parcel 1	1.000 (0.000)	.848 (.015)	< .001
Parcel 2	0.774 (0.032)	.849 (.015)	< .001
Parcel 3	0.717 (0.029)	.863 (.014)	< .001
Academic self-efficacy	2.320 (0.209)	.630 (.030)	< .001
Barrier coping self-efficacy	5.867 (0.507)	.699 (.026)	< .001
Outcome expectations	4.505 (0.413)	.611 (.031)	< .001
Perceived discrimination			
Parcel 1	1.000 (0.000)	.890 (.012)	< .001
Parcel 2	0.989 (0.033)	.900 (.012)	< .001
Parcel 3	0.977 (0.035)	.861 (.014)	< .001
Academic self-efficacy	-0.195 (0.178)	-.050 (.045)	.270
Barrier coping self-efficacy	-0.715 (0.407)	-.080 (.045)	.076
Outcome expectations	-0.157 (0.354)	-.020 (.045)	.658
Goal progress	-0.318 (0.181)	-.081 (.046)	.076

Perceived inequality			
Parcel 1	1.000 (0.000)	.884 (.012)	< .001
Parcel 2	1.021 (0.032)	.916 (.010)	< .001
Parcel 3	0.744 (0.024)	.896 (.011)	< .001
Academic self-efficacy	0.867 (0.275)	.144 (.044)	.001
Barrier coping self-efficacy	0.500 (0.621)	.036 (.045)	.419
Outcome expectations	1.355 (0.547)	.112 (.044)	.012
Goal progress	0.148 (0.277)	.024 (.046)	.593
Perceived discrimination	1.955 (0.305)	.303 (.041)	< .001
Egalitarianism			
Parcel 1	1.000 (0.000)	.796 (.019)	< .001
Parcel 2	1.363 (0.069)	.769 (.021)	< .001
Parcel 3	2.092 (0.092)	.928 (.015)	< .001
Academic self-efficacy	0.458 (0.082)	.268 (.043)	< .001
Barrier coping self-efficacy	0.850 (0.186)	.218 (.044)	< .001
Outcome expectations	1.131 (0.171)	.331 (.042)	< .001
Goal progress	0.337 (0.083)	.196 (.045)	< .001
Perceived discrimination	-0.098 (0.083)	-.054 (.045)	.236
Perceived inequality	0.815 (0.135)	.289 (.042)	< .001
Sociopolitical participation			
Parcel 1	1.000 (0.000)	.919 (.010)	< .001
Parcel 2	0.873 (0.027)	.885 (.012)	< .001
Parcel 3	0.917 (0.028)	.898 (.011)	< .001
Academic self-efficacy	-0.163 (0.257)	-.029 (.045)	.525
Barrier coping self-efficacy	0.468 (0.583)	.036 (.045)	.421
Outcome expectations	0.391 (0.511)	.034 (.045)	.443
Goal progress	0.812 (0.263)	.142 (.045)	.001
Perceived discrimination	2.693 (0.302)	.444 (.037)	< .001
Perceived inequality	1.867 (0.426)	.199 (.043)	< .001
Egalitarianism	-0.207 (0.120)	-.078 (.045)	.082
Proactive personality			
Parcel 1	1.000 (0.000)	.929 (.008)	< .001
Parcel 2	0.997 (0.026)	.920 (.008)	< .001
Parcel 3	1.094 (0.029)	.911 (.009)	< .001

Academic self-efficacy	4.670 (0.492)	.475 (.035)	< .001
Barrier coping self-efficacy	12.172 (1.171)	.543 (.033)	< .001
Outcome expectations	12.307 (1.049)	.626 (.029)	< .001
Goal progress	5.263 (0.517)	.532 (.034)	< .001
Perceived discrimination	0.632 (0.469)	.060 (.044)	.175
Perceived inequality	1.525 (0.721)	.094 (.044)	.032
Egalitarianism	1.174 (0.220)	.256 (.043)	< .001
Sociopolitical participation	2.490 (0.684)	.163 (.043)	< .001
Academic satisfaction			
Parcel 1	1.000 (0.000)	.854 (.015)	< .001
Parcel 2	0.683 (0.027)	.869 (.014)	< .001
Parcel 3	0.656 (0.029)	.808 (.018)	< .001
Academic self-efficacy	2.178 (0.206)	.578 (.033)	< .001
Barrier coping self-efficacy	5.209 (0.485)	.606 (.031)	< .001
Outcome expectations	4.636 (0.421)	.615 (.031)	< .001
Goal progress	2.790 (0.234)	.735 (.025)	< .001
Perceived discrimination	-0.395 (0.187)	-.098 (.046)	.032
Perceived inequality	0.489 (0.285)	.079 (.045)	.083
Egalitarianism	0.499 (0.087)	.284 (.043)	< .001
Sociopolitical participation	0.087 (0.267)	.015 (.046)	.743
Proactive personality	5.656 (0.538)	.558 (.033)	< .001

The measurement model with these item parcels fit the data well, $\chi^2 (360) = 734.284, p < .001$, RMSEA = .042, 90% CI [.038, .047], CFI = .974, TLI = .968, SRMR = .032. The lower bound of 90% CI for RMSEA was less than .05 and the upper bound did not exceed .10, so the close-fit hypothesis was not rejected and the poor-fit hypothesis was rejected. In summary, the proposed measurement model showed good overall fit. The measurement model was also fitted to each of the three samples. The results are summarized in Table 8. The model showed acceptable fits with Black and Latina samples and a good fit with the Asian sample.

Table 8

Model Fit Indices for the Measurement Model (N = 585)

	χ^2	<i>df</i>	<i>p</i>	RMSEA [90% CI]	CFI	TLI	SRMR
All	734.284	360	< .001	.042 [.038, .047]	.974	.968	.032
Black	567.940	360	< .001	.058 [.048, .066]	.952	.942	.042
Latina	556.377	360	< .001	.056 [.047, .066]	.952	.942	.048
Asian	566.280	360	< .001	.049 [.041, .057]	.964	.956	.040

Measurement Invariance and Latent Mean Differences

Having established the measurement model, measurement invariance of the model across three samples was examined next. First, configural invariance was tested. Factor means and variances were fixed at 0 and 1, respectively, and item intercepts and factor loadings were freely estimated. As shown in Table 9, this model fit the data well. Next, metric invariance was tested by constraining factor loadings to equality across three groups. This model too showed good overall fit (see Table 9). Although the chi-square difference test was significant, $\Delta\chi^2(60) = 87.213, p = .012$, changes in other fit indices were small, $\Delta\text{RMSEA} = -.001, \Delta\text{CFI} = -.002, \Delta\text{TLI} < -.001$. Therefore, metric invariance model was accepted. Lastly, scalar invariance model was fitted by additionally constraining item intercepts to equality across three samples. The resulting model showed acceptable model fit (see Table 9). The chi-square difference test was significant, $\Delta\chi^2(60) = 183.522, p < .001$, but again, changes in other fit indices were below cutoff, $\Delta\text{RMSEA} = .004, \Delta\text{CFI} = -.009, \Delta\text{TLI} = -.007$. Therefore, scalar invariance model was accepted.

Table 9

Model Fit Indices for Configural, Metric, and Scalar Invariance Models (N = 585)

	χ^2	<i>df</i>	<i>p</i>	RMSEA [90% CI]	CFI	TLI	SRMR
Configural	1619.205	1080	< .001	.051 [.045, .056]	.962	.954	.042
Metric	1706.418	1140	< .001	.050 [.045, .055]	.960	.954	.075
Scalar	1889.940	1200	< .001	.054 [.050, .059]	.951	.947	.096

Establishment of scalar invariance allowed comparison of latent means across groups. First, the Black sample was selected as the referent group and had its factor means and variances fixed at 0 and 1, respectively, and the means and variances of the Latina and Asian samples were freely estimated. As in the scalar invariance model, factor loadings and item intercepts were all constrained to equality across three samples. The resulting model showed good fit, $\chi^2(1160) = 1775.259$, $p < .001$, RMSEA = .052, 90% CI [.047, .057], CFI = .956, TLI = .951, SRMR = .053. The unstandardized and standardized mean estimates and effect sizes are summarized in Table 10. Compared to the Black sample, the Latina sample endorsed lower levels of academic self-efficacy, barrier coping self-efficacy, outcome expectations, goal progress, and academic satisfaction. However, the effect sizes, as computed by Cohen's *d* values, tended to be small, ranging from .020 to .100. The Asian sample reported lower levels of barrier coping self-efficacy, outcome expectations, goal progress, perceived discrimination, sociopolitical participation, proactive personality, and academic satisfaction than the Black sample. The effect sizes were relatively larger but still remained small, ranging from .130 to .282.

Table 10

Latent Mean Differences between Black and Latina and Asian, with Black as Referent Group

Latent Factors	Latina (<i>n</i> = 171)				Asian (<i>n</i> = 240)			
	<i>A</i> (<i>SE</i>)	α (<i>SE</i>)	<i>p</i>	Cohen's <i>d</i>	<i>A</i> (<i>SE</i>)	α (<i>SE</i>)	<i>p</i>	Cohen's <i>d</i>
Academic self-efficacy	-.250 (.120)	-.227 (.109)	.037	.100	-.169 (.105)	-.173 (.107)	.107	-.023
Barrier coping self-efficacy	-.287 (.109)	-.321 (.122)	.008	.058	-.381 (.104)	-.399 (.109)	< .001	.130
Outcome expectations	-.246 (.117)	-.235 (.112)	.035	.020	-.384 (.109)	-.369 (.104)	< .001	.136
Goal progress	-.451 (.127)	-.394 (.111)	< .001	.073	-.583 (.123)	-.481 (.100)	< .001	.160
Perceived discrimination	.134 (.106)	.150 (.119)	.208	-.201	-.242 (.096)	-.305 (.122)	.012	.207
Perceived inequality	-.059 (.112)	-.059 (.113)	.600	-.016	-.148 (.105)	-.145 (.102)	.157	.066
Egalitarianism	-.056 (.115)	-.054 (.113)	.630	.028	-.011 (.103)	-.012 (.110)	.913	-.007
Sociopolitical participation	-.083 (.108)	-.089 (.116)	.441	-.137	-.473 (.099)	-.587 (.122)	< .001	.282
Proactive personality	-.210 (.122)	-.181 (.105)	.085	-.082	-.609 (.113)	-.557 (.102)	< .001	.259
Academic satisfaction	-.402 (.125)	-.361 (.112)	.001	.069	-.506 (.120)	-.420 (.098)	< .001	.140

To compare means between the Latina and Asian samples, the model was run again with the Latina as the referent group. The unstandardized and standardized mean estimates and effect sizes of this comparison are summarized in Table 11. As shown, the Asian sample showed lower levels of perceived discrimination, sociopolitical participation, and proactive personality than the Latina sample. The effect sizes here were relatively larger than in previous comparisons, ranging from .336 to .426.

Table 11

Latent Mean Differences between Latina and Asian, with Latina as Referent Group

Latent Factors	<i>A</i> (<i>SE</i>)	α (<i>SE</i>)	<i>p</i>	Cohen's <i>d</i>
Academic self-efficacy	.074 (.101)	.083 (.114)	.462	-.125
Barrier coping self-efficacy	-.106 (.109)	-.099 (.102)	.332	.075
Outcome expectations	-.132 (.105)	-.132 (.106)	.211	.116
Goal progress	-.115 (.108)	-.109 (.102)	.288	.089
Perceived discrimination	-.422 (.104)	-.475 (.116)	< .001	.420
Perceived inequality	-.09 (.105)	-.087 (.102)	.392	.082
Egalitarianism	.043 (.100)	.048 (.110)	.664	-.035
Sociopolitical participation	-.416 (.101)	-.484 (.117)	< .001	.426
Proactive personality	-.345 (.103)	-.365 (.109)	.001	.336
Academic satisfaction	-.093 (.111)	-.086 (.102)	.402	.074

Multigroup Structural Equation Modeling

Direct Effects

Having established the measurement model, the proposed research model was tested through multigroup structural equation modeling. Based on the results of measurement invariance tests, factor loadings and item intercepts were constrained to equality across groups. Latent factor means and variances were fixed at 0 and 1, respectively, for the Black sample, which served as the referent group. Means of the factors that were found to be variant across groups—academic self-efficacy, barrier

coping self-efficacy, outcome expectations, goal progress, perceived discrimination, sociopolitical participation, proactive personality, and academic satisfaction—were freely estimated for the Latina and Asian samples.

The resulting model showed fair fit, $\chi^2(1211) = 1967.479, p < .001$, RMSEA = .057, 90% CI [.052, .061], CFI = .946, TLI = .942, SRMR = .087. After examining modification indices, residuals of proactive personality and outcome expectations were allowed to covary. The final model showed acceptable model fit, $\chi^2(1208) = 1884.466, p < .001$, RMSEA = .054, 90% CI [.049, .058], CFI = .952, TLI = .948, SRMR = .080. The model explained large variance in academic satisfaction, $R^2_{\text{Black}} = .589, R^2_{\text{Latina}} = .577$, and $R^2_{\text{Asian}} = .622$, as well as all socio-cognitive variables, across the three samples. Effect sizes for three components of critical consciousness ranged from small to moderate (see Table 12).

Next, differences in each path across samples were examined by constraining the path to equality. If the constraint resulted in significant chi-square difference, the path was considered to significantly differ across groups. The results are summarized in Table 13, along with standardized estimates, standard error, and level of significance of direct paths and correlations by sample. As shown, significant sample-level differences were found for paths from perceived discrimination to perceived inequality ($\Delta\chi^2(2) = 6.965, p = .031$), proactive personality to egalitarianism ($\Delta\chi^2(2) = 8.964, p = .011$), and proactive personality to academic self-efficacy ($\Delta\chi^2(2) = 6.790, p = .034$). Correlations between residuals of academic self-efficacy and barrier coping self-efficacy ($\Delta\chi^2(2) = 6.302, p = .043$) and residuals of proactive personality and outcome expectations ($\Delta\chi^2(2) = 7.916, p = .019$) also significantly differed across samples.

Table 12

Variances of Endogenous Factors Explained by the Model

Factor	Black (<i>n</i> = 174)		Latina (<i>n</i> = 171)		Asian (<i>n</i> = 240)	
	<i>R</i> ² (<i>SE</i>)	<i>p</i>	<i>R</i> ² (<i>SE</i>)	<i>p</i>	<i>R</i> ² (<i>SE</i>)	<i>p</i>
Academic self-efficacy	.435 (.056)	< .001	.277 (.061)	< .001	.270 (.052)	< .001
Barrier coping self-efficacy	.463 (.055)	< .001	.256 (.057)	< .001	.268 (.051)	< .001
Outcome expectations	.438 (.060)	< .001	.369 (.058)	< .001	.371 (.052)	< .001
Goal progress	.550 (.054)	< .001	.539 (.052)	< .001	.618 (.040)	< .001
Perceived inequality	.079 (.039)	.044	.199 (.055)	< .001	.044 (.029)	.132
Egalitarianism	.212 (.062)	.001	.072 (.039)	.065	.031 (.022)	.170
Sociopolitical participation	.156 (.048)	.001	.205 (.057)	< .001	.214 (.052)	< .001
Academic satisfaction	.589 (.050)	< .001	.577 (.049)	< .001	.622 (.041)	< .001

Table 13

Chi-square Difference Tests of Direct Paths and Correlations and Standardized Estimates by Sample

Path	$\Delta\chi^2$	Δdf	<i>p</i>	Black (<i>n</i> = 174)		Latina (<i>n</i> = 171)		Asian (<i>n</i> = 240)	
				β (<i>SE</i>)	<i>p</i>	β (<i>SE</i>)	<i>p</i>	β (<i>SE</i>)	<i>p</i>
Proactive personality → Perceived inequality	0.279	2	.870	.114 (.085)	.182	.088 (.070)	.206	.062 (.063)	.322
Perceived discrimination → Perceived inequality	6.965	2	.031	.256 (.068)	< .001	.437 (.062)	< .001	.194 (.074)	.008
Proactive personality → Egalitarianism	8.964	2	.011	.455 (.067)	< .001	.261 (.073)	< .001	.173 (.062)	.006
Perceived discrimination → Egalitarianism	0.078	2	.962	-.070 (.068)	.302	-.063 (.082)	.439	-.048 (.075)	.518
Proactive personality → Sociopolitical participation	0.314	2	.855	.060 (.084)	.472	.119 (.071)	.093	.089 (.062)	.150

Perceived discrimination → Sociopolitical participation	0.588	2	.745	.390 (.061)	< .001	.438 (.064)	< .001	.445 (.058)	< .001
Perceived inequality → Academic self-efficacy	3.842	2	.146	.037 (.077)	.628	.287 (.097)	.003	.064 (.062)	.304
Egalitarianism → Academic self-efficacy	3.750	2	.153	.079 (.089)	.373	-.025 (.084)	.765	.178 (.064)	.006
Sociopolitical participation → Academic self-efficacy	4.063	2	.131	.026 (.066)	.690	-.199 (.084)	.017	-.099 (.081)	.224
Perceived discrimination → Academic self-efficacy	2.507	2	.286	-.001 (.066)	.987	-.038 (.099)	.699	-.171 (.080)	.031
Proactive personality → Academic self-efficacy	6.790	2	.034	.611 (.062)	< .001	.434 (.066)	< .001	.420 (.056)	< .001
Perceived inequality → Barrier coping self-efficacy	0.619	2	.734	.022 (.076)	.778	.022 (.100)	.825	-.048 (.063)	.450
Egalitarianism → Barrier coping self-efficacy	2.569	2	.277	.177 (.088)	.044	.008 (.083)	.922	.021 (.066)	.745
Sociopolitical participation → Barrier coping self-efficacy	2.728	2	.256	.096 (.064)	.134	-.063 (.085)	.453	-.020 (.083)	.806
Perceived discrimination → Barrier coping self-efficacy	0.550	2	.760	-.072 (.064)	.264	-.111 (.097)	.256	-.166 (.081)	.040
Proactive personality → Barrier coping self-efficacy	2.676	2	.262	.567 (.064)	< .001	.488 (.062)	< .001	.499 (.053)	< .001
Academic self-efficacy → Outcome expectations	3.004	2	.223	.049 (.119)	.679	.283 (.081)	< .001	.233 (.093)	.012
Barrier coping self-efficacy → Outcome expectations	0.865	2	.649	.369 (.110)	.001	.203 (.094)	.030	.280 (.090)	.002
Perceived discrimination → Outcome expectations	0.516	2	.773	-.021 (.058)	.713	-.024 (.070)	.729	.035 (.066)	.601
Academic self-efficacy → Goal progress	0.569	2	.752	.240 (.136)	.077	.209 (.096)	.029	.277 (.090)	.002

Barrier coping self-efficacy → Goal progress	2.378	2	.305	.218 (.147)	.137	.412 (.100)	< .001	.378 (.088)	< .001
Perceived inequality → Goal progress	0.600	2	.741	-.039 (.073)	.590	-.120 (.089)	.180	-.034 (.050)	.504
Egalitarianism → Goal progress	0.174	2	.917	.045 (.085)	.598	.043 (.069)	.536	.008 (.055)	.888
Sociopolitical participation → Goal progress	1.018	2	.601	.140 (.063)	.027	.236 (.071)	.001	.138 (.065)	.034
Outcome expectations → Goal progress	0.617	2	.735	.314 (.102)	.002	.195 (.088)	.027	.220 (.067)	.001
Perceived discrimination → Goal progress	0.082	2	.960	-.085 (.064)	.183	-.100 (.083)	.229	-.103 (.064)	.108
Proactive personality → Academic satisfaction	1.504	2	.471	.061 (.107)	.571	.227 (.082)	.006	.173 (.063)	.006
Academic self-efficacy → Academic satisfaction	4.845	2	.089	-.113 (.135)	.403	.129 (.088)	.140	.227 (.092)	.014
Barrier coping self-efficacy → Academic satisfaction	1.718	2	.424	.157 (.138)	.258	.003 (.111)	.976	-.067 (.097)	.490
Goal progress → Academic satisfaction	0.098	2	.952	.438 (.096)	< .001	.476 (.085)	< .001	.497 (.090)	< .001
Outcome expectations → Academic satisfaction	2.287	2	.319	.307 (.115)	.007	.090 (.099)	.364	.103 (.076)	.173
Perceived inequality WITH Egalitarianism	5.876	2	.053	.433 (.072)	< .001	.352 (.076)	< .001	.204 (.064)	.001
Perceived inequality WITH Sociopolitical participation	1.279	2	.528	.060 (.075)	.420	-.005 (.091)	.954	.127 (.074)	.087
Egalitarianism WITH Sociopolitical participation	2.751	2	.253	-.162 (.078)	.038	-.136 (.079)	.084	.013 (.082)	.873
Academic self-efficacy WITH Barrier coping self-efficacy	6.302	2	.043	.731 (.047)	< .001	.540 (.064)	< .001	.669 (.045)	< .001
Proactive personality WITH Perceived discrimination	1.052	2	.591	.001 (.077)	.991	-.005 (.079)	.953	.095 (.076)	.213

Proactive personality WITH Outcome expectations	7.916	2	.019	.652 (.062)	< .001	.499 (.071)	< .001	.384 (.069)	< .001
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Note. Arrow denotes direction of path; WITH denotes correlation between residuals.

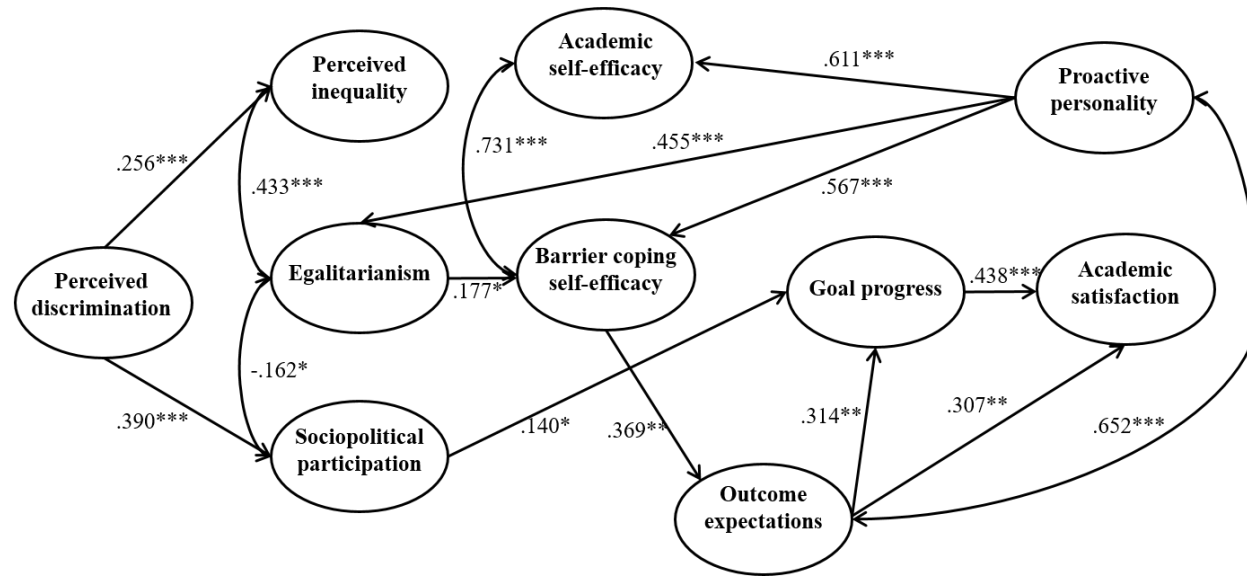


Figure 4. Structural model with Black sample ($n = 174$). Only latent factors and significant paths are shown for clarity of presentation.

All estimates are standardized. Curves between factors denote correlations between residuals; * $p < .05$, ** $p < .01$, *** $p < .001$.

Figures 4-6 depict structural models by sample. For ease of presentation, only significant paths are shown in the figures (for comprehensive list of path estimates by sample, see Table 13). First, components of critical consciousness were examined. In all samples, perceived inequality and sociopolitical participation were predicted by perceived discrimination, whereas egalitarianism was predicted by proactive personality. In all samples, perceived inequality and sociopolitical participation were predicted by perceived discrimination, whereas egalitarianism was predicted by proactive personality.

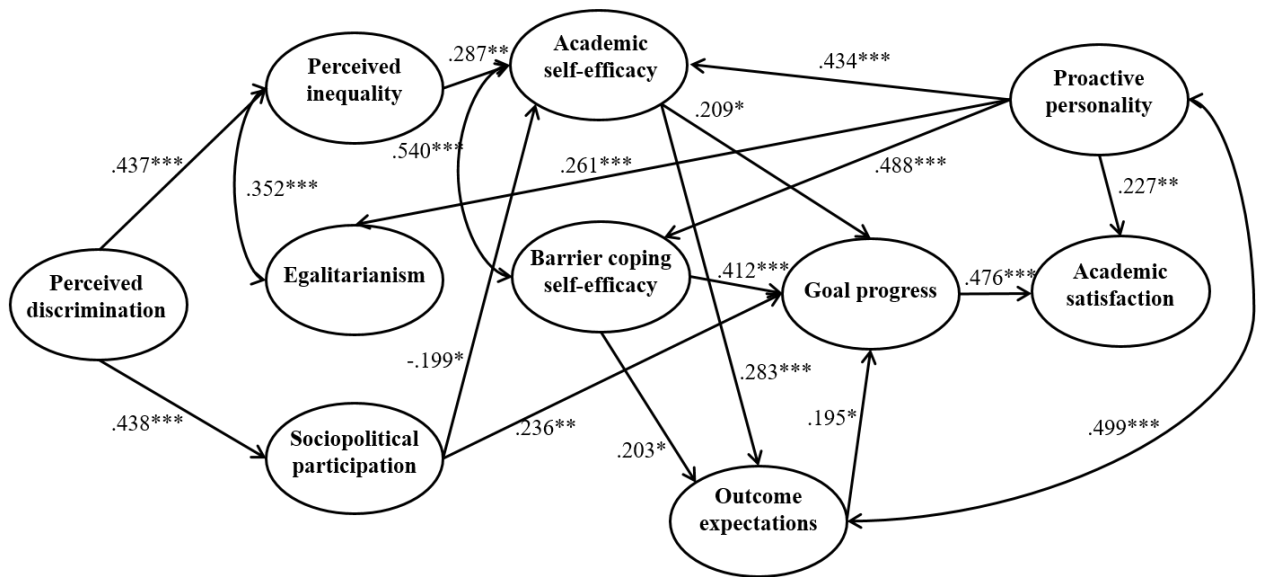


Figure 5. Structural model with Latina sample ($n = 171$). Only latent factors and significant paths are shown for clarity of presentation. All estimates are standardized. Curves between factors denote correlations between residuals; * $p < .05$, ** $p < .01$, *** $p < .001$.

Sources of self-efficacy showed some differences across samples. Proactive personality was the only predictor of academic self-efficacy and barrier coping self-efficacy that was significant in all samples. None of the components of critical consciousness regressed onto academic self-efficacy in the Black sample. In the Latina

sample, perceived inequality positively predicted ($\beta = .287, p = .003$) and sociopolitical participation negatively predicted academic self-efficacy ($\beta = -.199, p = .017$). In the Asian sample, egalitarianism positively predicted ($\beta = .178, p = .006$) and perceived discrimination negatively predicted academic self-efficacy ($\beta = -.171, p = .031$). As for barrier coping self-efficacy, egalitarianism showed positive association only in the Black sample ($\beta = .177, p = .044$) and perceived discrimination negative association only in the Asian sample ($\beta = -.166, p = .040$).

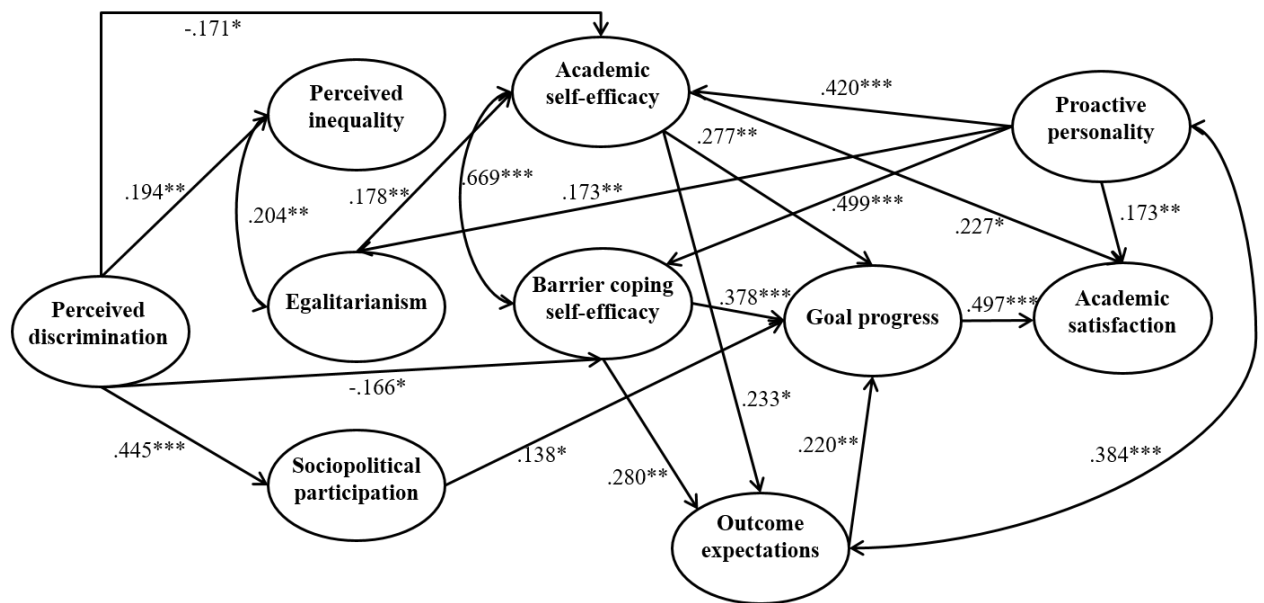


Figure 6. Structural model with Asian sample ($n = 240$). Only latent factors and significant paths are shown for clarity of presentation. All estimates are standardized. Curves between factors denote correlations between residuals; * $p < .05$, ** $p < .01$, *** $p < .001$.

Next, predictors of outcome expectations and goal progress were considered. Barrier coping self-efficacy positively regressed onto outcome expectations across all

samples. In contrast, academic self-efficacy showed positive relationship in the Latina ($\beta = .283, p < .001$) and Asian samples ($\beta = .233, p = .012$), but not in the Black sample ($\beta = .049, p = .679$). Perceived discrimination did not show significant association with outcome expectations in any of the samples. As for goal progress, both academic and barrier coping self-efficacy predicted it in the Latina and Asian samples, but not in the Black sample. Among the components of critical consciousness, neither perceived inequality nor egalitarianism showed significant relationships with goal progress in any of the samples. In contrast, sociopolitical participation was significantly regressed onto goal progress across all samples. Likewise, outcome expectations were positively related to goal progress in all samples.

Among the hypothesized predictors of academic satisfaction, only goal progress emerged as a positive, direct predictor across all samples. Proactive personality showed a positive direct effect on academic satisfaction in the Latina ($\beta = .227, p = .006$) and Asian samples ($\beta = .173, p = .006$). Academic self-efficacy also positively predicted academic satisfaction in the Asian sample ($\beta = .227, p = .014$). Outcome expectations positively regressed onto academic satisfaction in the Black sample only ($\beta = .307, p = .007$).

Next, covariance between residuals were examined. Residual of perceived inequality was positively correlated with that of egalitarianism, but not of sociopolitical participation, in all samples. Unexpectedly, residuals of egalitarianism and sociopolitical participation were negatively correlated in the Black sample ($r = -.162, p = .038$). The correlation was not significant in the Latina ($r = -.136, p = .084$) and Asian samples ($r = .013, p = .873$). The correlations between residuals of academic self-efficacy and

barrier coping self-efficacy and between residuals of proactive personality and outcome expectations were positive and significant in all samples.

Indirect Effects

Having tested the direct paths among the latent factors, indirect effects on academic satisfaction involving the significant direct paths were examined. The results by sample are presented in Tables 14-16. Note that some of the indirect paths are nested in others. In the Black sample, higher sociopolitical participation was associated with greater goal process, which then contributed to academic satisfaction ($\beta = .062, p = .044$). Those who scored higher on proactive personality tended to report higher levels of barrier coping self-efficacy, which then led to greater outcome expectations. This, in turn, was related to higher academic self-efficacy both directly ($\beta = .064, p = .039$) and indirectly through goal progress ($\beta = .029, p = .046$; see Table 14).

Table 14

Parameter Estimates for the Indirect Effects in Black Sample (n = 174)

Parameter	<i>B (SE)</i>	β (<i>SE</i>)	95% CI
Perceived discrimination → Sociopolitical participation → Goal progress → Academic satisfaction	.037 (.020)	.024 (.013)	[-.001, .049]
Egalitarianism → Barrier coping self- efficacy → Outcome expectations → Academic satisfaction	.028 (.019)	.020 (.014)	[-.007, .047]
Egalitarianism → Barrier coping self- efficacy → Outcome expectations → Goal progress → Academic satisfaction	.012 (.009)	.009 (.006)	[-.003, .021]
Sociopolitical participation → Goal progress → Academic satisfaction	.088 (.045)*	.062 (.031)*	[.002, .122]
Barrier coping self-efficacy → Outcome expectations → Academic satisfaction	.130 (.063)*	.113 (.053)*	[.009, .218]

Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.058 (.029)*	.051 (.025)*	[.002, .100]
Proactive personality → Egalitarianism → Barrier coping self-efficacy → Outcome expectations → Academic satisfaction	.014 (.010)	.009 (.006)	[-.004, .022]
Proactive personality → Egalitarianism → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.006 (.005)	.004 (.003)	[-.002, .010]
Proactive personality → Barrier coping self-efficacy → Outcome expectations → Academic satisfaction	.100 (.050)*	.064 (.031)*	[.003, .125]
Proactive personality → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.045 (.023)	.029 (.014)*	[.001, .057]
Outcome expectations → Goal progress → Academic satisfaction	.161 (.065)*	.138 (.053)**	[.034, .241]

Note. CI = confidence interval; * $p < .05$, ** $p < 0.01$, *** $p < .001$.

In the Latina sample, perceived discrimination led to greater sociopolitical participation, which was subsequently linked to greater goal progress and academic satisfaction ($\beta = .049, p = .010$). Academic self-efficacy ($\beta = .099, p = .039$) and barrier coping self-efficacy ($\beta = .196, p = .001$) both predicted greater academic satisfaction via goal progress. In addition, the indirect link from proactive personality to barrier coping self-efficacy to goal progress to academic satisfaction was significant ($\beta = .095, p = .004$; see Table 15).

Table 15

Parameter Estimates for the Indirect Effects in Latina Sample (n = 171)

Parameter	<i>B</i> (<i>SE</i>)	β (<i>SE</i>)	95% CI
Perceived discrimination → Perceived inequality → Academic self-efficacy → Goal progress → Academic satisfaction	.019 (.012)	.012 (.008)	[-.003, .028]
Perceived discrimination → Sociopolitical participation → Goal progress → Academic satisfaction	.075 (.030)*	.049 (.019)*	[.012, .086]
Perceived discrimination → Sociopolitical participation → Academic self-efficacy → Goal progress → Academic satisfaction	-.013 (.009)	-.009 (.006)	[-.020, .003]
Perceived inequality → Academic self-efficacy → Goal progress → Academic satisfaction	.039 (.024)	.028 (.017)	[-.005, .062]
Sociopolitical participation → Goal progress → Academic satisfaction	.154 (.054)**	.112 (.039)**	[.037, .188]
Sociopolitical participation → Academic self-efficacy → Goal progress → Academic satisfaction	-.027 (.018)	-.020 (.013)	[-.045, .006]
Academic self-efficacy → Goal progress → Academic satisfaction	.130 (.064)*	.099 (.048)*	[.005, .193]
Academic self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.034 (.020)	.026 (.015)	[-.003, .056]
Barrier coping self-efficacy → Goal progress → Academic satisfaction	.260 (.086)**	.196 (.061)**	[.075, .316]
Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.025 (.017)	.019 (.012)	[-.005, .043]
Proactive personality → Academic self-efficacy → Goal progress → Academic satisfaction	.066 (.035)	.043 (.022)	[<.000, .086]
Proactive personality → Academic self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.018 (.011)	.011 (.007)	[-.002, .025]
Proactive personality → Barrier coping self-efficacy → Goal progress → Academic satisfaction	.147 (.053)**	.095 (.033)**	[.031, .160]
Proactive personality → Barrier coping self-efficacy → Outcome	.014 (.010)	.009 (.006)	[-.003, .021]

expectations → Goal progress → Academic satisfaction			
Outcome expectations → Goal progress → Academic satisfaction	.113 (.057)*	.093 (.045)*	[.005, .181]

Note. CI = confidence interval; * $p < .05$, ** $p < 0.01$, *** $p < .001$.

Lastly, indirect effects in the Asian sample were examined. Sociopolitical participation ($\beta = .069, p = .041$), academic self-efficacy ($\beta = .137, p = .006$), and barrier coping self-efficacy ($\beta = .188, p = .001$) all indirectly contributed to academic satisfaction via goal progress. Proactive personality led to greater academic self-efficacy, which then contributed to greater goal progress and then academic satisfaction ($\beta = .058, p = .011$). The path from proactive personality to barrier coping self-efficacy, and then to greater outcome expectations to goal progress to academic satisfaction, was also significant ($\beta = .015, p = .039$; see Table 16). The other nested indirect paths to academic satisfaction that were significant (such as the indirect path from outcome expectations to goal progress to academic satisfaction, which was significant across all samples) are marked accordingly in Tables 14-16.

Table 16

Parameter Estimates for the Indirect Effects in Asian Sample (n = 240)

Parameter	<i>B</i> (<i>SE</i>)	β (<i>SE</i>)	95% CI
Perceived discrimination → Academic self-efficacy → Academic satisfaction	-.063 (.039)	-.039 (.024)	[-.086, .008]
Perceived discrimination → Academic self-efficacy → Goal progress → Academic satisfaction	-.038 (.023)	-.024 (.014)	[-.051, .004]
Perceived discrimination → Academic self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	-.007 (.005)	-.004 (.003)	[-.010, .002]

Perceived discrimination → Barrier coping self-efficacy → Goal progress → Academic satisfaction	-.051 (.030)	-.031 (.018)	[-.066, .004]
Perceived discrimination → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	-.008 (.006)	-.005 (.003)	[-.012, .002]
Perceived discrimination → Sociopolitical participation → Goal progress → Academic satisfaction	.050 (.026)	.031 (.016)	[<.001, .061]
Egalitarianism → Barrier coping self-efficacy → Goal progress → Academic satisfaction	.006 (.020)	.004 (.012)	[-.020, .028]
Egalitarianism → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.001 (.003)	.001 (.002)	[-.003, .005]
Sociopolitical participation → Goal progress → Academic satisfaction	.099 (.049)*	.069 (.034)*	[.003, .134]
Academic self-efficacy → Goal progress → Academic satisfaction	.191 (.072)**	.137 (.050)**	[.040, .235]
Academic self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.035 (.019)	.025 (.014)	[-.001, .052]
Barrier coping self-efficacy → Goal progress → Academic satisfaction	.261 (.084)**	.188 (.058)**	[.074, .301]
Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.042 (.021)*	.030 (.014)*	[.002, .059]
Proactive personality → Academic self-efficacy → Academic satisfaction	.155 (.068)*	.095 (.041)*	[.016, .175]
Proactive personality → Academic self-efficacy → Goal progress → Academic satisfaction	.094 (.038)*	.058 (.023)*	[.013, .102]
Proactive personality → Academic self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.017 (.010)	.011 (.006)	[-.001, .022]
Proactive personality → Barrier coping self-efficacy → Goal progress → Academic satisfaction	.153 (.053)**	.094 (.031)**	[.033, .155]
Proactive personality → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	.025 (.012)*	.015 (.007)*	[.001, .030]

Proactive personality → Egalitarianism → Barrier coping self-efficacy → Goal progress → Academic satisfaction	.001 (.003)	.001 (.002)	[-.004, .005]
Proactive personality → Egalitarianism → Barrier coping self-efficacy → Outcome expectations → Goal progress → Academic satisfaction	<.001 (.001)	<.001 (<.001)	[-.001, .001]
Outcome expectations → Goal progress → Academic satisfaction	.141 (.052)**	.109 (.038)**	[.034, .185]

Note. CI = confidence interval; * $p < .05$, ** $p < 0.01$, *** $p < .001$.

Chapter V

Discussion

The present study examined Lent and Brown's (2006) SCCT satisfaction model with Black, Latina, and Asian female students majoring in STEM. In addition to the traditional socio-cognitive variables—self-efficacy, outcome expectations, and goal progress—the present study also incorporated critical consciousness, perceived discrimination, and proactive personality into the model. The measurement and structural models were compared across the three samples to explore racial/ethnic differences. The current findings were largely consistent with the hypotheses and revealed meaningful between-group differences across the three samples. In this section, the main findings are discussed in relation to the existing literature. First, results from measurement invariance and latent mean difference tests are examined. Next, direct and indirect paths in the structural model are discussed, focusing on unique patterns found in each group. Theoretical and practical implications based on present findings are introduced, followed by discussion of limitations and directions for future research.

Measurement Invariance and Latent Mean Differences

The tests of measurement invariance with Black, Latina, and Asian samples achieved configural, metric, and scalar invariance, supporting Hypothesis 1. This suggests that the pattern of factor structures, item loadings, and item intercepts can be considered the same across groups, allowing for subsequent comparisons of latent means and regression paths. However, as items were aggregated into parcels in the current model, these results cannot serve as measurement invariance tests of individual

instruments. Examination of measurement invariance of each instrument with all items as separate indicators is warranted to adequately test its cross-cultural validity.

The comparison of latent means showed that the Black sample reported higher levels of academic self-efficacy than the Latina sample. Black students also indicated higher barrier coping self-efficacy, outcome expectations, goal progress, and academic satisfaction than Latina and Asian students. Latina and Asian students' scores did not differ significantly on these constructs. These higher scores of the Black sample may suggest that Black female students' overall academic experiences are more positive than their Latina or Asian peers'. A study on optimism found that African American adolescents scored highest in optimism among four racial/ethnic groups (the other three groups were Caucasian, Hispanic/Latinx, and Native American; Webber & Smokowski, 2018). Therefore, internal resources such as higher optimism may underlie Black students' high scores on these measures. This could be an important strength that counselors can build upon when working with these students.

Asian students endorsed less perceived discrimination than Latina or Black students, which is partially consistent with a previous study that found Asian American students reporting lower perceived discrimination than African American students but not Latinx American students (Cokley et al., 2017). Since the participants were not recruited based on their majors or gender in Cokley et al.'s (2017) study, the significant difference between the Latina and Asian students found in the present study could be due to the specificity of the sample (i.e., female students majoring in STEM). Asian students' relatively lower level of perceived discrimination could be attributable to the fact that the measure of perceived discrimination used in the present study was developed with Black

and White samples. As the discriminations manifest differently against different racial/ethnic groups, the present scale could have failed to adequately capture experiences of Asian students.

Another possible explanation could be Asians' relatively greater representation in STEM fields and the prescription of "positive" stereotypes regarding their ability to perform well in these fields (McGee et al., 2017). However, these students' lower barrier coping self-efficacy and academic satisfaction may indicate that this apparent protective feature of "model minority" does not necessarily translate into Asian students' internal experiences. They also scored lower on proactive personality and sociopolitical participation than the other groups. These findings seem to align with other studies that found Asians to score lower on Extraversion (Abe & Zane, 1990), a Big Five personality trait that shares some features with proactive personality (Bateman & Crant, 1993), and civic engagement (Finlay et al., 2011).

Another possible explanation for Asian students' relatively low latent means is cultural variation in response tendency. Research shows that Asians tend to give moderate answers and refrain from rating on either extreme end of a spectrum (Chen et al., 1995). As the average of many items tended to be higher than the median point in this study, this tendency to avoid extreme answers could have brought down the means of these variables in the Asian sample. However, given that the scalar invariance—where item intercepts were constrained to equality across samples—was achieved and there were still other constructs with no significant latent mean differences, it is likely that these differences could be accurate reflections of characteristics of Asian female students in STEM.

Direct and Indirect Paths to Academic Satisfaction

Socio-cognitive Constructs

Overall, the structural model fit the data from the three samples well and many of the proposed regression paths were found significant (Hypothesis 2). Hypothesis 2a was partially supported; consistent with the original SCCT satisfaction model (Lent & Brown, 2013), self-efficacy and outcome expectations indirectly contributed to academic satisfaction via goal progress. This suggests that self-efficacy and favorable outcome expectations promote goal pursuit, which then contributes to more satisfying academic experiences (Brown & Lent, 2019) among female students of color in STEM. This is consistent with other studies that found the applicability of the SCCT satisfaction model to diverse college student samples, such as Asian American college students (Hui et al., 2013; Truong & Miller, 2018) and Mexican American college students (Ojeda et al., 2011). However, it is also important to note that the direct effect of academic self-efficacy on academic satisfaction was found only in the Asian sample and that of outcome expectations only in the Black sample. These findings suggest that there are still meaningful group level differences in the well-established relationships among the core variables of SCCT.

Critical Consciousness and Perceived Discrimination

Hypothesis 2b, which postulated relationships between perceived discrimination and three components of critical consciousness, was partially supported. In all groups, perceived discrimination led to greater perceived inequality and sociopolitical participation. Experiences of discrimination are associated with increased critical consciousness among adolescents (Heberle et al., 2020). Such experiences have also been

found to diminish belief in a fair society among Latinx and Asian young adults during the transition from high school to post-secondary plans (Ballard, 2016). As young adults of color experience discrimination, they may gain greater awareness of social inequality and develop interest in activism. The college years, during which students enter adulthood and navigate unfamiliar environments—often away from their usual network of social support—could be an especially important period for such development. This could be particularly salient for women, who tend to show a stronger negative relationship between social supports and barriers than men (Lent et al., 2018).

It is interesting that no significant link between perceived discrimination and egalitarian beliefs was observed in any of the three groups. It appears that subjective experiences of discrimination do not necessarily lead to egalitarian beliefs. Future study on this apparent lack of relationship is needed. A possible explanation is that education plays a role in the development of egalitarian beliefs among members of an oppressed group, such as women. A cohort study found that education contributes to a shift in attitudes toward gender equality among women, especially those in older cohorts (Pampel, 2011). Also, women's studies courses have been found to increase egalitarianism, awareness of discrimination, and social activism—in other words, all three components of critical consciousness (Stake & Hoffman, 2001). Therefore, critical learning moments might be needed for students to translate their subjective experiences of oppression into egalitarian beliefs. Another possible underlying moderator is deliberate reflection. Erentaitė et al. (2019) found that adolescents who engaged in more rational and deliberate processing of self-relevant information tended to endorse more pro-equality and pro-diversity values over time. This suggests that deliberate processing of

subjective experiences may help foster egalitarian beliefs. Finding the missing link between perceived discrimination and egalitarianism could be important, especially given the positive relationship found between egalitarianism and barrier coping self-efficacy.

Critical Consciousness and Proactive Personality

Hypothesis 2c, which posited relationship between proactive personality and critical consciousness, was partially supported. Proactive personality positively predicted egalitarianism across all three samples. Although no study to date has examined the relationship between proactive personality and egalitarianism directly, this finding was expected, based on related research. For instance, proactive personality demonstrated positive relation with social entrepreneurial intentions (Prieto, 2011), or goals to organize to address societal and community concerns. Also, openness to experience, which shares some characteristics with proactive personality (Major et al., 2006), was related to more positive attitudes toward racial diversity (Cokley et al., 2010), suggesting that female students of color who are open to initiating social change may hold more egalitarian beliefs.

Unexpectedly, no significant relationship between proactive personality and sociopolitical participation was observed in any of the groups. Because proactive personality is marked by the tendency to act upon one's environment (Bateman & Crant, 1993), it was expected that it would propel students to take sociopolitical actions. Combined with the previously discussed finding, it appears that whereas those who are proactive are more likely to hold egalitarian beliefs—and therefore have a desire for more egalitarian, equal society—they may experience barriers in acting on these beliefs. McCormick et al. (2019) found that the relationship between proactive personality and

proactive behavior was moderated by situational factors (leadership and organizational climate). Therefore, there could be situational barriers, such as unwelcoming campus climate, that suppress proactive personality of female students of color in STEM. Another possible explanation is low level of political efficacy, an aspect of critical consciousness (Watts et al., 2011) that was not included in the current study. That is, female students of color in STEM may lack confidence in their ability to enact sociopolitical change, which could hold them back from exercising their proactive personality.

Furthermore, in the Black sample, egalitarianism and sociopolitical participation showed a negative correlation (the correlation was nonsignificant in the other two samples, but marginally negative in the Latina sample). This negative relationship was also observed in the initial development study of Critical Consciousness Scale (Diemer et al., 2017). Diemer et al. (2017) postulated that this may be due to the complex and nuanced relationship between critical relationship and critical action. It is possible that nature of critical action matters. For instance, a study found that anger towards social injustice was positively linked to interpersonal anti-racism action but negatively associated with communal/political action (Bañales et al., 2019). Given that the current measure only assessed critical action at the sociopolitical level, a different relationship may emerge if a measure of critical action at interpersonal level is introduced to the model. More specifically, the strength of the relationship between proactive personality and critical action might be stronger at interpersonal level, especially given women's higher social and emotional abilities (Groves, 2005) that may help them navigate difficult dialogues.

Predictors of Self-efficacy and Goal Progress

Proactive personality predicted both academic and barrier coping self-efficacy across all three groups (Hypothesis 2c), consistent with previous literature that found positive relationship between proactive personality and academic self-efficacy (Lin et al., 2014). Among the Latina and Asian students, it also had a direct effect on academic satisfaction. Like the Big Five personality traits that are often studied in the context of SCCT (e.g., conscientiousness, extroversion; Cupani & Pautassi, 2013; Schaub & Tokar, 2004), proactive personality also appears to be a personality characteristic relevant to academic experiences, perhaps particularly among female students of color, many of whom find themselves in an environment not conducive to their academic success. This finding is consistent with studies that found link between proactive personality and career-related outcomes, such as job satisfaction (Thomas et al., 2010). In addition, based on modification indices, the correlation between proactive personality and outcome expectations was added to the model. The moderate correlations found with the three samples ($r_s = .384 - .652$) suggest that these two constructs may share certain underlying features, such as optimism. Future research on this relationship is warranted.

The relationship between critical consciousness and self-efficacy differed by samples (Hypothesis 2d). Egalitarianism was associated with higher barrier coping self-efficacy in the Black and Asian samples. Perceived inequality showed a significant association with academic self-efficacy in the Latina sample and egalitarianism was linked to higher academic self-efficacy in the Asian sample. The lack of significant relationship between critical reflection (i.e., perceived inequality and egalitarianism) and academic self-efficacy in the Black sample is consistent with previous research that found

non-significant relationship between critical reflection and beliefs about academic competence among Black youths (Tyler et al., 2019). It appears that critical reflection does not necessarily increase Black female students' beliefs in their ability to succeed in STEM. The findings show that the relationship between critical reflection and self-efficacy varies by racial/ethnic groups. This suggests that there could be meaningful differences in how female students from different racial/ethnic backgrounds engage in critical reflection, especially in the context of their academic experiences.

Unlike critical reflection, critical action—sociopolitical participation—led to greater goal progress in all three samples. This may suggest that female students of color who participate in advocacy actions and are active agents of social change are more likely to feel motivated to work towards their academic goals. High levels of critical agency and critical behavior have been associated with greater academic achievement (McWhirter & McWhirter, 2016). Another study found that sociopolitical development, which included critical consciousness, predicted greater autonomous motivation (Luginbuhl et al., 2016). It could be that involvement in social change empowers individuals in their personal lives and vice versa. However, the cross-sectional nature of the present study does not allow for determination of direction of causality. Therefore, longitudinal study is needed to examine the interplay between critical consciousness and personal development over time.

Additionally, different relationships among the three components of critical consciousness and other study variables suggest that these components capture related yet distinct aspects of critical consciousness. This finding provides support for Diemer et al.'s (2017) suggestion not to aggregate scores of the three subscales of Critical

Consciousness Scale and rather consider them as separate variables. Overall, all three components of critical consciousness showed positive relationships with other variables in the model, suggesting their relevance in promoting satisfying academic experiences among female students of color in STEM.

Unique Patterns in the Black Sample

The least number of significant paths were found with the Black sample, suggesting that a more parsimonious model with fewer variables may be a better representation of their academic experiences. For instance, perceived inequality and academic self-efficacy did not contribute to academic satisfaction either directly or indirectly, signifying that these two variables could be removed from the model. In contrast, barrier coping self-efficacy indirectly contributed to academic satisfaction through outcome expectations and goal progress, as hypothesized. This suggests that for Black female students in STEM, barrier coping self-efficacy is more important than academic self-efficacy in having satisfying academic experiences. Given that egalitarianism also regressed onto barrier coping self-efficacy but not academic self-efficacy, it appears that the former is more relevant in predicting Black students' academic satisfaction. This could be because Black students report relatively higher levels of perceived discrimination, compared to Asian students in the present study and both Asian and Latinx students in a previous study (Cokley et al., 2017). Because they experience greater environmental obstacles, beliefs in their ability to navigate these challenges might be particularly important for Black female students in STEM.

In addition, whereas outcome expectations only indirectly contributed to academic satisfaction via goal progress in the other two groups, it also had direct effect

among Black students. This may indicate that outcome expectations are an important predictor of academic satisfaction, above and beyond its shared variance with goal progress, for Black students. In fact, it has been long postulated that outcome expectations could be especially pertinent to the career development African Americans, because of the reality of racism and discrimination (Brown, 1995). In addition, outcome expectations have also been found to positively predict interests and choice goals among African American students (Dickinson et al., 2017). In summary, the findings of the present study suggest the importance of outcome expectations in academic experiences (and ultimately career development) of these students.

Unique Patterns in the Latina Sample

Among the Latina students, an interesting pattern was found between critical consciousness and academic self-efficacy. That is, whereas perceived inequality regressed positively onto academic self-efficacy, another component of critical consciousness, sociopolitical participation, showed a negative relationship. The positive relationship between perceived inequality and academic self-efficacy is in line with previous study that found positive correlation between critical consciousness and career decision self-efficacy (Olle & Fouad, 2015). Relatedly, McWhirter and McWhirter (2016) found that critical agency—one of the factors of their critical consciousness scale, which included items on awareness of inequality—was positively linked to plans to attend a 4-year college among Latinx youths. In sum, Latina students who engage in critical reflection on systemic inequality appear to harness this awareness to have greater confidence in their academic ability.

The negative relationship between sociopolitical participation and academic self-efficacy was somewhat unexpected. This is especially perplexing, given the positive link found between sociopolitical participation and goal progress. In McWhirter and McWhirter's (2016) study, critical behavior—a factor of their critical consciousness scale that seems to correspond with sociopolitical participation scale used in the present study—showed no relation to postsecondary educational plans. Therefore, it appears that the behavioral component of critical consciousness does not contribute to—or even negatively affect—Latina students' beliefs about their academic competency. Latina students who are on the frontline of social change seem to experience diminished sense of academic self-efficacy, although they are making progress on their academic goals, and may benefit from targeted interventions to address this discrepancy.

Unique Patterns in the Asian Sample

Among the Asian female students in STEM, perceived discrimination emerged as an especially relevant factor. Unlike with other two groups, among Asian students, perceived discrimination regressed negatively onto academic self-efficacy and barrier coping self-efficacy (Hypothesis 2e), which aligns with a previous research that also found negative relationship between perceived barriers and self-efficacy in math and science among Asian American college students (Kantamneni et al., 2017). The negative relationship between perceived discrimination and barrier coping self-efficacy is especially worrying, as it implies that Asian female students in STEM may fall into a negative cycle where perception of discrimination lowers their beliefs in their ability to cope with such challenges, which can then make them even more vulnerable to experiences of discrimination.

Although the indirect effect of perceived discrimination on academic satisfaction through academic or barrier coping self-efficacy was not significant, both types of self-efficacy indirectly contributed to academic satisfaction via goal progress. This may indicate that although Asian students report the lowest level of perceived discrimination among the three groups, it has more direct negative effect on their academic experiences, especially in relation to their sense of self-efficacy. Given that academic self-efficacy showed not only indirect (via goal progress), but also direct effects on academic satisfaction among Asian students, addressing the negative impact of discrimination on their self-efficacy might be especially important.

Clinical Significance

Statistical significance does not necessarily indicate clinical significance. That is, even when an effect is statistically significant, it could be relatively small to hold much practical significance. Therefore, r-squared values were examined for endogenous factors. About 60% of variance in academic satisfaction, the main variable of interest in the present study, was explained across samples. This large effect size (Cohen, 1988) suggests that the present model can be considered to hold clinical significance in explaining academic satisfaction among Black, Latina, and Asian female students in STEM. The model also explained large variances of socio-cognitive factors (i.e. academic self-efficacy, barrier coping self-efficacy, outcome expectations, and goal progress) across three groups, suggesting that their respective predictors play meaningful roles in understanding them.

Theoretical Implications

The present study holds significance in that it attempted to expand the existing SCCT satisfaction model with a unique population. This comes at an apropos time, as SCCT recently celebrated its 25th anniversary (Brown & Lent, 2019; Lent & Brown, 2019) and there has been an increasing call for more research with people of color and issues relevant to their experiences (Flores et al., 2019). The present study shows that the SCCT satisfaction model (Lent & Brown, 2006) largely fits the data collected from Black, Latina, and Asian female college students in STEM. As expected, the core socio-cognitive components—self-efficacy, outcome expectations, and goal progress—contributed to academic satisfaction, suggesting the applicability of the model to this unique population.

In addition, the present study incorporated perceived discrimination as a specific form of environmental barrier. Also, in lieu of frequently studied Big Five personality traits, proactive personality was incorporated. Perceived discrimination and proactive personality were selected because they were postulated to be especially relevant to female students of color in STEM, who oftentimes face the need to navigate an unfavorable environment that is not conducive to their academic success. Relatedly, critical consciousness was also introduced as an additional socio-cognitive variable and a potential mediator between perceived discrimination and proactive personality and traditional socio-cognitive variables of SCCT. The results showed that these variables did play important roles in the proposed model. Therefore, researchers are encouraged to consider these variables in future studies based on the SCCT satisfaction model. It would be especially interesting to apply this expanded model to experiences of other women of

color, including those in non-STEM fields, STEM graduate programs (the representations of female students and students of color tend to decrease at master's and doctoral levels; NSF, 2020), and STEM workforce. Examining gender differences may also help investigate the complex intersectionality of identities.

It is important to note here that while the proposed model based on the SCCT satisfaction model showed generally good fit across samples, meaningful racial/ethnic differences were observed. As discussed previously, certain paths were significant in some groups but not in others. The strength of several paths also differed across samples. These findings suggest a compelling need to take racial/ethnic differences into consideration and treat each racial/ethnic group as separate, independent groups, instead of aggregating them all under the umbrella of “racial/ethnic minority.” Such effort may guard against errors of overgeneralization and also help establish cross-cultural validity of the theory in question.

Practical Implications

Clinical Implications

The present findings show that different factors interact to increase or decrease academic satisfaction of female students of color in STEM. In a way, this means that there are multiple points of intervention to help these students, who hold double minority statuses in STEM, to experience more positive academic journeys. Group differences in regression paths indicate that certain interventions might be more relevant or effective for students from a specific racial/ethnic background. For example, barrier coping self-efficacy was found to be more salient than academic self-efficacy among Black female students in STEM. Therefore, interventions targeting to empower these students to

manage systemic barriers may be particularly important, especially given that they may experience greater discrimination upon graduation. For example, Brown et al. (2016) found that African American scientists reported greater experiences of microaggression than African American college students in STEM, suggesting the need to help prepare these students before they enter the workforce.

To this end, counselors are encouraged to help Black female students in STEM rebuild their self-definition based on their cultural values and take pride in their racial/ethnic heritage. An intervention as brief as a 15-minute writing exercise on values has been found to lead to greater academic performance and lower racial-stereotype activation among African American adolescents (Cohen et al., 2006). Indeed, research shows that a strong, positive ethnic identity can buffer against deleterious effects of discrimination (Wong et al., 2003).

Outcome expectations were found to have both direct and indirect effects on academic satisfaction only among Black female students, emerging as a particularly important construct for this population. A study with RIASEC interests found that among three learning experiences, verbal persuasion (the other predictors were performance accomplishments and vicarious learning) was the strongest predictor of outcome expectations in Realistic model (Dickinson et al., 2017), which is particularly relevant for STEM. Therefore, counselors may help promote positive outcome expectations in Black female students in STEM by providing verbal encouragements to them.

Latina students who were more actively involved in sociopolitical activism reported lower academic self-efficacy, despite making higher goal progress. This is worrisome, given how participation in activism has been previously found to yield

positive outcomes such as greater hedonic, eudaimonic, and social well-being (Klar & Kasser, 2009); and improved learning outcomes (Rosas, 2010). Latina students in STEM appears to experience difficulties enjoying these benefits of sociopolitical participation. Findings of a qualitative study with urban youths (Taines, 2012) may provide a tentative explanation. The study found that whereas participation in school activism helped empower students who initially reported low-level alienation, the majority of students who endorsed high-level alienation expressed a sense of helplessness following school activism, as they felt like they were not being heard by the school (Taines, 2012). Therefore, it is possible that when Latina students in STEM—who may already feel alienated from their departments—engage in activism but experience unsatisfactory results, they may feel discouraged about their ability to be successful in school.

The discrepancy in the relationships between critical action and academic self-efficacy (negative) and academic goal progress (positive) suggest that Latina students may experience difficulty attributing their academic achievements to internal factors, such as their abilities (i.e., internal locus of control; Rotter, 1966). This may suggest that extra support is needed for Latina students who are actively engaging in sociopolitical movements. Counselors could help these students recognize and own their academic success, which may increase their overall sense of efficacy and agency, further fueling their sociopolitical participation. Furthermore, the positive link between sociopolitical participation and goal progress was observed across all three groups. Therefore, counselors are encouraged to help female students of color explore how sociopolitical agency and academic agency are interrelated. Increase in one area of agency is likely to promote agency in another area, creating a synergetic effect.

Among Asian female students in STEM, deleterious effects of perceived discrimination were found to be more prevalent than in the other two groups. Even though Asian students are often called the model minority, they experience substantial amount of discrimination, especially if they are women (McGee et al., 2017). Their relatively lower level of barrier coping efficacy suggests that Asian female students in STEM might be ill-equipped to deal with negative effects of daily discrimination. Furthermore, perceived discrimination was negatively associated with both academic and barrier coping self-efficacy among Asian students, a pattern not found in the other two groups. Therefore, Asian female students in STEM may need additional support in managing experiences of discrimination to mitigate their negative impact on their self-efficacy.

Counselors could help Asian female students build resilience through practicing effective coping strategies, utilizing available resources, and building life skills (Fergus & Zimmerman, 2005). In addition, proactive personality could be an especially important point of intervention for Asian female students in STEM, as it was linked to higher levels of academic self-efficacy, barrier coping self-efficacy, as well as academic satisfaction. However, Asian students scored lowest in this measure among the three groups. As noted earlier, proactive personality is theorized to be more amenable to change than Big Five personality traits (Duffy et al., 2016). These students may find it helpful to explore barriers they experience in approaching their environment in a more proactive manner (e.g., cultural norms regarding conformity; Kim & Markus, 1999; Kim et al., 2005).

Institutional Implications

Interventions must happen not only at individual student level but also at broader institutional level. Research shows that the institutional atmosphere and support greatly influence academic experiences of students of color. A recent review of critical consciousness in children and adolescents found that one of the most robust contributors of critical reflection and critical motivation was school climate (Heberle et al., 2020). A case study (Conchas, 2001) with an urban high school in California showed that Latinx students in the general school program felt like they were invisible and looked over by teachers. This sense of marginalization led to low academic motivation and achievement among these students. On the other hand, those in the Graphics Academy (a magnet program specializing in computer-assisted graphic technology) and an Advanced Placement program reported a sense of isolation from other Latinx students. The competitive nature of the programs also led them to feel like they had to be “aggressive” and outdo one another to succeed. In contrast, those in the Medical Academy enjoyed a more positive learning environment, where they felt like everyone in the program—teachers and other students across race, gender, and social class—were a “family” working toward a common goal. This collaborative and inclusive atmosphere fostered a sense of belongingness and facilitated academic achievement among Latinx students. Therefore, fostering an academic culture that recognizes and celebrates diversity, discourages excessive competition, and promotes collaboration toward common goal could be a key to improving academic experiences of students of color.

The results of the present study largely support the protective function of critical consciousness in academic experiences of female students of color in STEM. Several

programs have been developed with the aim of promoting critical consciousness among students. For example, a five-week, culturally responsive educational program based on SCCT and critical consciousness was found to increase entrepreneurial self-efficacy, entrepreneurial skills, critical behavior, technology optimism, and technology innovation among community college students from diverse backgrounds (Cadenas et al., 2020). Implementing such interventions early on, for example as a part of orientation for first year students, may contribute to academic satisfaction and persistence among students of color in STEM. They can also be added onto existing programs such as the McNair program that target underrepresented students in STEM, which has been found to help increase academic self-efficacy among women and students of color over time (Macphee et al., 2013).

In addition, institutions are encouraged to examine the nature of messages they are sending to their students. Bañales et al. (2019) found that when students received critically conscious messages from schools (i.e., messages that acknowledged the reality of racism), as opposed to color-blind messages (i.e., messages that deny the reality of racism), they were more likely to engage in anti-racism interpersonal and communal/political actions. Therefore, critical consciousness should be promoted not only at individual level but also at institutional level.

Limitations and Directions for Future Research

To allow enough power for structural equation modeling, all students within the broad categories of Black, Latinx, and Asian racial/ethnic identities were grouped together in this study. Although this is a step further than previous studies that lumped all persons of color in a single, undifferentiated group (often to compare them to White

counterparts), it is incumbent on researchers to acknowledge the heterogeneity of these broad racial/ethnic groups. For example, South Asian students are bestowed the model minority stereotype to a lesser degree than their East Asian peers due to their darker skin tone, which is also compounded by a post-9/11 increase in discrimination (McGee et al., 2017). Relatedly, it has been long noted that meaningful differences exist among numerous groups within the broad Hispanic/Latinx category, which stem in part from their different immigration history and demographics (Torres, 2004). Therefore, examination of SCCT models and relevant variables such as perceived discrimination, critical consciousness, and proactive personality need to happen at a narrower ethnic group level.

The data for the present study were collected through Qualtrics, an online survey platform. Although this platform has been widely utilized in psychological research and is expected to provide reliable data (Carpenter et al., 2019), there is a possibility that the participants recruited through an online platform might differ from participants recruited through the community on some important measures (Goodman et al., 2013). Therefore, caution is needed in generalizing the present findings to all female students of color in STEM in the United States. Future study, preferably with participants recruited through a more traditional recruitment strategy, is needed to replicate the findings of the present study.

Additionally, there are other variables that were outside the scope of the current study but could still be relevant to SCCT. For example, cognitive emotional self-regulation was found to predict intent to persist in a science career, especially among underrepresented students of color in STEM (Park et al., 2019), and mediated the

relationship between relative deprivation in equal opportunities and career-related self-efficacy among Korean female college students (Suh & Flores, 2017). Therefore, self-regulation could be a pertinent variable to consider in academic satisfaction of female students of color. Racial/ethnic identity is also a potentially important variable to study in tandem with many of the variables included in the present study, such as perceived discrimination, barrier coping self-efficacy, and critical consciousness. Also, the inclusion of critical consciousness and proactive personality suggests a possible integration of SCCT and PWT, another widely studied model within vocational literature (Duffy et al., 2016). Consideration of these additional variables and model may suggest a way to expand the current SCCT literature in a meaningful way. In addition, given the role spirituality plays in sociopolitical development, especially among African Americans (Watts et al., 1999), related variables may also warrant attention.

Furthermore, there has been an increasing call to incorporate structural, system-level variables in addition to individual-level variables that have traditionally been the focus of psychological literature (French et al., 2020). The contextual variable (perceived discrimination) of the current study still remains at the person level. Considering higher level variables such as institutional support and barriers (e.g., fellowships and funding specifically designated to female students of color in STEM) and diversity of faculty and student body could have provided important insight into how academic experiences of female students of color are nested within a larger system.

Another limitation of the present study lies in its cross-sectional nature. Although the directions of regression paths in the structural model were informed by literature, conclusions about causality were precluded in the current study. Therefore, a longitudinal

study is needed to test if the relationships are really in the hypothesized directions. It would be especially helpful to track female students of color in STEM throughout their years at college, starting in their first year and until they drop out, transfer out to non-STEM majors, or graduate.

Conclusion

Female students of color in STEM are at a unique intersectionality of gender and race/ethnicity, which often puts them at a challenging space. Although the recent decades have witnessed meaningful advances, such as narrowing of gender gap in certain fields like biology and chemistry (NSF, 2020), research shows that many of these students still experience various obstacles (Casad et al., 2019; Hill et al., 2010), which can diminish their sense of fulfillment and satisfaction in academics. The present study aimed to examine different factors that contribute to academic satisfaction of female college students of color in STEM, based on the SCCT satisfaction model (Lent & Brown, 2006). Perceived discrimination was selected as an environmental obstacle and proactive personality as a person input. In addition to traditional socio-cognitive variables of SCCT (self-efficacy, outcome expectations, and goal progress), critical consciousness was incorporated into the model as well.

The results showed that the SCCT satisfaction model was generally applicable to all three samples: Black, Latina, and Asian female students in STEM. Meaningful racial/ethnic differences were found in several latent means of the study constructs and relationships among these constructs. The present findings suggest multiple points of intervention—both at individual and institutional levels—and how such efforts can be tailored to specific needs of each racial/ethnic group. In particular, critical consciousness may have a strong implication for counselors working with female students of color in

STEM, as well as other groups with oppressed identities. Critical consciousness, dubbed as an “antidote for oppression” (Watts et al., 1999, p. 255), shows that individuals can be agents, rather than passive recipients, in their interactions with the environment that hinders them from flourishing. If the environment can change through multiple individuals developing and acting upon their critical consciousness, both within and outside academia, the following generations of students will receive much more positive and empowering messages to pursue a career and life path they truly want.

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Appendix A

Consent Form to Participate in Research Study

Researcher's Name: Chan Jeong Park, M.A.

Advisor: Patrick J. Rottinghaus, Ph.D.

Project Title: Expanding the Social Cognitive Career Theory: Female Students of Color in STEM

I am Chan Jeong Park, a doctoral student in the Counseling Psychology program at the University of Missouri–Columbia. I would like to invite you to participate in a research study examining factors that influence academic satisfaction of female students of color in STEM.

Participation is voluntary. Submission of this form indicates that you consent to participate. If you choose to participate in the study, you will be asked to complete an online survey that will take approximately 15-20 minutes of your time. The survey includes questions about various aspects of your academic experiences. You may discontinue your participation at any time without giving a reason. Compensation will be in the amount agreed upon with the panel that recruited you to participate in this study.

The collected data will be stored in a secured online storage system and only the researchers will be given access to them. Your responses will be de-identified and kept anonymous within reasonable limits. I will take all reasonable steps to ensure your identity is protected.

If you have any questions about the study, please feel free to contact Chan Jeong Park at cjpark@mail.missouri.edu or (702) 972-1399. If you have any questions regarding your rights as a participant, you may contact the University of Missouri- Columbia Institutional Review Board (IRB) at (573) 882-3181 or irb@missouri.edu.

Thank you for taking the time to participate in this research,

Chan Jeong Park, M.A.
Department of Educational, School and Counseling Psychology
University of Missouri–Columbia

____ Yes, I consent to participate in the study.

____ No, I do not consent and I will not participate in the study.

Appendix B
Questionnaire

Demographics

1. Please indicate your age in years: _____
2. What is your gender? Male / Female / Transgender/Transitioning /
Other (Please specify: _____)
3. Do you consider yourself to be: Straight / Lesbian / Gay / Bisexual / Queer /
Other (Please specify: _____)
4. How would you describe your race/ethnicity or nationality? Check all that apply:
White / Black or African American / Hispanic or Latinx / Asian American / Asian
international / Native American / Native Hawaiian or Pacific Islander /
Other (Please specify: _____)
5. Are you currently enrolled in college classes in the United States? Yes / No
6. What do you major in college? Check all that apply:
Chemistry / Computer and Informational Sciences / Engineering / Earth,
Atmospheric, and Ocean Sciences / Life Sciences / Materials Research /
Mathematics / Physics / Medical & Healthcare
 a. Specific major(s): _____
7. Duration of your degree-granting program: Two-year / Four-year
8. Location of your college/university:
AK / AL / AR / AZ / CA / CO / CT / DE / FL / GA / HI / IA / ID / IL / IN / KS /
KY / LA / MA / MD / ME / MI / MN / MO / MS / MT / NC / ND / NE / NH / NJ
/ NM / NV / NY / OH / OK / OR / PA / RI / SC / SD / TN / TX / UT / VA / VT /
WA / WI / WV / WY
9. Year in college: First year / Sophomore / Junior / Senior / Other
10. What is your average GPA? _____ / _____

Academic Self-Efficacy Scale (Lent, Singley et al., 2005)

Part I. Instructions: The following is a list of major steps along the way to completing an undergraduate degree. Please indicate how much confidence you have in your ability to complete each of these steps in relation to the academic major that you are most likely to pursue. Use the scale below to indicate your degree of confidence.

How much confidence do you have in your ability to complete the following tasks as a college student (STEM refers to Science, Technology, Engineering, and Mathematics)?

How much confidence do you have in your ability to complete the following tasks as a college student?	No Confidence			Some Confidence			Complete Confidence			
1. Remain enrolled in your STEM major over the next semester	0	1	2	3	4	5	6	7	8	9
2. Remain enrolled in your STEM major over the next two semesters	0	1	2	3	4	5	6	7	8	9
3. Excel in your STEM major over the next semester	0	1	2	3	4	5	6	7	8	9
4. Excel in your STEM major over the next two semesters	0	1	2	3	4	5	6	7	8	9
5. Complete the upper level required courses in your STEM major with overall grade point average of B or better	0	1	2	3	4	5	6	7	8	9

Part II. Instructions: Here we are interested in knowing how well you believe you could cope with each of the following barriers or problems that students could possibly face in pursuing an undergraduate degree. Please indicate your confidence in your ability to cope with, or solve, each of the following problem situations. Use the scale below to indicate your degree of confidence.

How much confidence do you have in your ability to:	No Confidence			Some Confidence			Complete Confidence			
1. Cope with a lack of support from STEM professors or your advisor	0	1	2	3	4	5	6	7	8	9
2. Complete a STEM degree despite financial pressures	0	1	2	3	4	5	6	7	8	9
3. Continue on in your STEM major even if you did not feel well-liked by your classmates or professors	0	1	2	3	4	5	6	7	8	9
4. Find ways to overcome communication problems with professors or teaching assistants in your STEM courses	0	1	2	3	4	5	6	7	8	9

5. Balance the pressures of studying with the desire to have free time for fun and other activities	0	1	2	3	4	5	6	7	8	9
6. Continue on in your STEM major even if you felt that, socially, the environment in these classes was not very welcoming to you	0	1	2	3	4	5	6	7	8	9
7. Find ways to study effectively for your STEM courses despite having competing demands for your time	0	1	2	3	4	5	6	7	8	9

Goal Progress (Lent, Singley et al., 2005)

Instructions: Now we would like for you to rate the following academic goals in terms of how much progress you are making toward each one at this point in time. That is, indicate how effectively you feel you are meeting or working toward each goal at present. Using the scale provided, please rate how much progress you feel you are making.

How much progress do you think you are making toward each of the following goals at this point in time?	No Progress at All	A Little Progress	Fair Progress	Good Progress	Excellent Progress
1. Excelling at your STEM major	1	2	3	4	5
2. Completing all STEM course assignments effectively	1	2	3	4	5
3. Studying effectively for all of your exams in STEM courses	1	2	3	4	5
4. Remaining enrolled in your STEM major	1	2	3	4	5
5. Completing academic requirements of your STEM major satisfactorily	1	2	3	4	5
6. Achieving/maintaining high grades in all of your STEM courses	1	2	3	4	5
7. Learning and understanding the material in each of your STEM courses	1	2	3	4	5

STEM Outcome Expectations (Lent et al., 2003)

Instructions: Using the scale below, please indicate the extent to which you agree or disagree with each of the following statements.

Graduating with a bachelor's degree in a Science, Technology, Engineering, and Math (STEM) major will likely allow me to:	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree					
1. ... receive a good job offer	0	1	2	3	4	5	6	7	8	9
2. ... earn an attractive salary	0	1	2	3	4	5	6	7	8	9
3. ... get respect from other people	0	1	2	3	4	5	6	7	8	9
4. ... do work that I would find satisfying	0	1	2	3	4	5	6	7	8	9
5. ... increase my sense of self-worth	0	1	2	3	4	5	6	7	8	9
6. ... have a career that is valued by my family	0	1	2	3	4	5	6	7	8	9
7. ... do work that can "make a difference" in people's lives	0	1	2	3	4	5	6	7	8	9
8. ... go into a field with high employment demand	0	1	2	3	4	5	6	7	8	9
9. ... do exciting work	0	1	2	3	4	5	6	7	8	9
10. ... have the right type and amount of contact with other people (i.e. "right" for me)	0	1	2	3	4	5	6	7	8	9

Perceived Discrimination Scale (Williams et al., 1997)

Instructions: How often in your daily life have you been discriminated against in each of the following ways **because of such things as your race, ethnicity, gender, age, religion, physical appearance, sexual orientation, or other characteristics?**

	Never	Rarely	Sometimes	Often
1. You are treated with less courtesy than other people.	1	2	3	4
2. You are treated with less respect than other people.	1	2	3	4
3. You receive poorer service than other people at restaurants or stores.	1	2	3	4
4. People act as if they think you are not smart.	1	2	3	4
5. People act as if they are afraid of you.	1	2	3	4
6. People act as if they think you are dishonest.	1	2	3	4
7. People act as if they think you are not as good as they are.	1	2	3	4
8. You are called names or insulted.	1	2	3	4
9. You are threatened or harassed.	1	2	3	4

Critical Consciousness Scale (Diemer et al., 2017)

Part I. Instructions: Please respond to the following statements by rating how much you agree or disagree with each statement.

	Strongly Disagree	Mostly Disagree	Slightly Disagree	Slightly Agree	Mostly Agree	Strongly Agree
1. Certain racial or ethnic groups have fewer chances to get a good high school education	1	2	3	4	5	6
2. Poor children have fewer chances to get a good high school education	1	2	3	4	5	6
3. Certain racial or ethnic groups have fewer chances to get good jobs	1	2	3	4	5	6
4. Women have fewer chances to get good jobs	1	2	3	4	5	6
5. Poor people have fewer chances to get good jobs	1	2	3	4	5	6
6. Certain racial or ethnic groups have fewer chances to get ahead	1	2	3	4	5	6
7. Women have fewer chances to get ahead	1	2	3	4	5	6
8. Poor people have fewer chances to get ahead	1	2	3	4	5	6
9. It is a good thing that certain groups are at the top and other groups are at the bottom	1	2	3	4	5	6
10. It would be good if groups could be equal	1	2	3	4	5	6
11. Group equality should be our ideal	1	2	3	4	5	6

12. All groups should be given an equal chance in life	1	2	3	4	5	6
13. We would have fewer problems if we treated people more equally	1	2	3	4	5	6

Part 2. Instructions: Please respond to the following statements by rating how often you were involved in each activity in the last year.

	Never did this	Once or twice last year	Once every few months	At least once a month	At least once a week
14. Participated in a civil rights group or organization	1	2	3	4	5
15. Participated in a political party, club, or organization	1	2	3	4	5
16. Wrote a letter to a school or community newspaper or publication about a social or political issue	1	2	3	4	5
17. Contacted a public official by phone, mail, or email to tell him/her how you felt about a particular social or political issue	1	2	3	4	5
18. Joined in a protest march, political demonstration, or political meeting	1	2	3	4	5
19. Worked on a political campaign	1	2	3	4	5
20. Participated in a discussion about a social or political issue	1	2	3	4	5
21. Signed an email or written petition about a social or political issue	1	2	3	4	5
22. Participated in a human rights, gay rights, or women's rights organization or group	1	2	3	4	5

Proactive Personality (Bateman & Crant, 1993)

Instructions: Using the scale below, please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Mostly Disagree	Slightly Disagree	Neither Agree Nor Disagree	Slightly Agree	Mostly Disagree	Strongly Agree
1. I am constantly on the lookout for new ways to improve my life	1	2	3	4	5	6	7
2. I feel driven to make a difference in my community, and may be the world	1	2	3	4	5	6	7
3. I tend to let others take the initiative to start new projects	1	2	3	4	5	6	7
4. Wherever I have been, I have been a powerful force for constructive change	1	2	3	4	5	6	7
5. I enjoy facing and overcoming obstacles to my ideas	1	2	3	4	5	6	7
6. Nothing is more exciting than seeing my ideas turn into reality	1	2	3	4	5	6	7
7. If I see something I don't like, I fix it	1	2	3	4	5	6	7
8. No matter what the odds, if I believe in something I will make it happen	1	2	3	4	5	6	7
9. I love being a champion for my ideas, even against others' opposition	1	2	3	4	5	6	7
10. I excel at identifying opportunities	1	2	3	4	5	6	7
11. I am always looking for better ways to do things	1	2	3	4	5	6	7
12. If I believe in an idea, no obstacle will prevent me from making it happen	1	2	3	4	5	6	7
13. I love to challenge the <i>status quo</i>	1	2	3	4	5	6	7
14. When I have a problem, I tackle it head-on	1	2	3	4	5	6	7

15. I am great at turning problems into opportunities	1	2	3	4	5	6	7
16. I can spot a good opportunity long before others can	1	2	3	4	5	6	7
17. If I see someone in trouble, I help out in any way I can	1	2	3	4	5	6	7

Academic Satisfaction (Lent, Singley et al., 2005)

Instructions: Using the scale below, indicate your level of agreement with each of the following statements.

At the present time...	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. I feel satisfied with the decision to major in my STEM field	1	2	3	4	5
2. I am comfortable with the educational atmosphere in my STEM field	1	2	3	4	5
3. For the most part, I am enjoying my STEM coursework	1	2	3	4	5
4. I am generally satisfied with my academic life	1	2	3	4	5
5. I enjoy the level of intellectual stimulation in my STEM courses	1	2	3	4	5
6. I feel enthusiastic about the subject matter in my STEM major	1	2	3	4	5
7. I like how much I have been learning in my STEM classes.	1	2	3	4	5

Random Responding Items (Kung et al., 2018)

Instructions: For this question, please select 'false' to demonstrate your attention.

- (1) True
- (2) False

VITA

Chan Jeong “CJ” Park was born in Busan, South Korea. She graduated from a small international school in Shenzhen, China, as a part of graduating class of 12 students from seven different countries. She earned her Bachelor’s in Social Sciences from the University of Hong Kong, with major in Psychology and minor in Counseling. Her bachelor’s thesis was on motivation to learning math among secondary school students. She returned to South Korea upon graduation and earned Master’s degree in Counseling Psychology at Ewha Womans University, under the mentorship of Dr. Sung-Kyung Yoo. Her master’s thesis focused on meaning in life, emotional regulation, and religiosity. She came to the U.S. and earned her Ph.D. in Counseling Psychology at University of Missouri-Columbia, under the mentorship of Dr. Patrick Rottinghaus. Her main research interests lie in multicultural issues in vocational and positive psychology. She is especially interested in lived experiences of women of color.