

The Impact of Student Faculty Interaction and Intergroup Contact on
Cognitive and Sociocultural Gains in College Seniors as Measured by the
College Student Experiences Questionnaire

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The Impact of Student Faculty Interaction and Intergroup Contact on Cognitive and Sociocultural Gains in College Seniors as Measured by the College Student Experiences Questionnaire

By

M. Christopher MacDonald

Abstract

The rising costs of attending college have students, families, and other stakeholders calling for evidence of gains that result from earning a degree (Burrows, 1999; Jongbloed, Enders & Salerno, 2008; Julian, 2012). They expect that graduates to achieve cognitive gains in communication, critical thinking, and the ability to work independently and in teams (SHEEO, 2005). Additionally, the global marketplace has created the need for graduates to achieve sociocultural gains; they need to understand different cultures and successfully interact with diverse peoples (Gurin, 1999; Leville, 2006).

Research has shown that different experiences influence cognitive and sociocultural gains including student faculty interaction (SFI) and intergroup contact (IGC) (Cole, 2007; Kuh & Hu, 2001; Thompson, 2001; Umbach & Porter, 2002). However, cognitive and sociocultural gains have typically been explored independently. Moreover, researchers have not examined the demographic factors that, combined with SFI and IGC, promote such gains.

The purpose of this study was to determine if SFI, IGC, and demographic factors (sex, race or academic major) explain variance in cognitive and sociocultural gains among college seniors. The sample included seniors who completed the College Student Experiences Questionnaire (CSEQ) Fourth edition.

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The results of the hierarchical linear regression revealed that SFI and IGC have a significant influence on both cognitive and sociocultural gains. However, the impact of these predictors is not experienced by every student uniformly; a student's sex, race and academic major matters.

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Chapter One

Introduction

A college education has been a sign of status for many years and recently characterized as a necessity for success in America. In 2009, 70% of high school graduates enrolled in either a two-year or four-year post-secondary institution (National Center for Educational Statistics, 2010). In 2012, more than 33% of Americans 25 years of age or older had earned at least a bachelor's degree (Aud, Wilkinson-Flicker, Kristapovich, Rahbun, Wang & Zhang, 2013). In one recent poll, the percentage of Americans who believe a college education is necessary to realize success climbed from 31% to 55% between 2000 and 2009 (Immerwahr, Johnson, Ott & Rochkind, 2010).

Arguably, financial interests are driving the increase in college enrollment. Less than 5% of 25-64 year old Americans with at least a bachelor's degree were unemployed in 2012 (Aud, et al., 2013). During their lifetime, adults with a four-year college degree are estimated to earn one million dollars more than a high school graduate and nearly three times more than those without a high school diploma (Julian, 2012).

Despite the advantages of a college degree the cost of attendance is prohibitive for many. The price to earn a degree has sharply outpaced the ability of average Americans to pay for college. Between 1982 and 2006, college tuition and fees increased 439%. In that same time period, the median family income increased just 147% (National Center for Public Policy and Higher Education, 2008). As a consequence, more students and families have sought out loans to pay for college. Between 1997 and 2008, the amount of money borrowed to attend college has more than doubled (Baum & Payea, 2008). On average, college graduates and/or their families owe \$26,000 upon graduation (The Institute for College Access and Success, 2012).

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Increases in tuition are largely attributable to diminished support from the state. Between 2002 and 2007, state contributions to higher education declined 7.7% on average, with five states reducing allocations more than 20% (State Higher Education Executive Officers, 2008). In general, state appropriations are not keeping pace with increases in enrollment. State dollars per FTE (full time enrolled student) decreased to the lowest point in 25 years in 2011 (NCES, 2012)

As costs increase, and the long-term financial obligations of students and families swell, demands regarding accountability have intensified (SHEEO, 2005). State legislators and potential employers of college graduates have growing expectations with respect to outcomes associated with enrollment in and graduation from college (Burrows, 1999; Jongbloed, Enders & Salerno, 2008). To start, legislators expect efficiency and evidence that students are achieving outcomes that support state interests. State interests lie in two primary areas; first, the financial outlay that states provide is still a significant portion of institutional budgets, and second, the advancement and development of the state economy is linked to a college educated workforce (Alexander, 2000).

Business leaders and corporate entities also have growing expectations of higher education. As postsecondary institutions solicit additional revenue streams to supplement shrinking state allocations, the business community has become a vocal partner in higher education. Business leaders have articulated specific skill sets and attributes they believe are necessary for employees to succeed in the modern economy. These include sensitivity to diversity, interpersonal skills, and problem solving skills (Giroux, 2003; Leville, 2006). Legislators and business leaders are especially interested in the success of students in fields that have national and international implications.

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The skill development of students in the fields of science, math, engineering, and technology (STEM), as well the consistently popular business and finance majors are of particular interest (Stine & Matthews, 2009; Rowson, 2008). The United States is falling behind in the production of STEM graduates despite the growth in related industries. The attrition rate is high in STEM programs, and there are significant issues with the number of STEM graduates from underrepresented populations (Fairweather, 2008; George, Neale, Van Horne & Malcom, 2001). Business is consistently a popular major of study, and expands in complexity as the financial and business markets globalize. In a report commissioned by the American Association of Colleges and Universities (AAC&U), more than 800 business leaders confirmed that demands for success have put an emphasis on critical thinking skills, cultural competencies and the ability to interact with multicultural entities (2005).

Accountability, then, has taken on multiple meanings for postsecondary leaders. For purposes of this study, I grouped the outcomes that stakeholders seek in college graduates into two categories. The first includes cognitive gains. Cognitive gains were defined as writing clearly and effectively, presenting ideas effectively when speaking, thinking analytically and logically, synthesizing ideas, and learning on one's own.

Extensive research has been done on factors that influence cognitive gains among college students. There is a significant body of evidence on the role of race in cognitive gains, for example (Antonio, Chang, Hakuta, Kenny, Levin & Milem, 2004; Myerson, Rank, Raines & Schnitzler, 1998; Terenzini, Cabrera, Colbeck, Biorklund & Parente, 2001; Toutkoushian & Smart, 2001; Umbach & Porter, 2002). There is also existing research on gender as a predictor of cognitive growth (Anaya, 1996; Anaya, 1999; Baxter-Magolda, 1989; Flowers & Pascarella,

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2003). A number of studies have shown that academic major is also a predictor of cognitive gains in college students (Anaya, 1996; Hartnet & Centra, 1977; Umbach & Porter, 2002).

Sociocultural gains are the second category of desirable outcomes for college graduates. Sociocultural gains are defined in this study as gains in knowledge about other parts of the world, awareness of different philosophies and cultures, and the ability to get along with people different than oneself (Gurin, 1999; Rogers & McGovern, 2002; van Laar, Sidanius, Robinowitz & Sinclair, 1999).

Demographic characteristics play a role in sociocultural gains, just as in cognitive growth. There is research into race as a predictor of sociocultural gains (Gaines, 1997; Hui, McCusker & Triandis, 1990; Negy, Shreve, Jensen & Uddin, 2003). An array of studies has investigated the association between gender and sociocultural growth (Lottes & Kuriloff, 1994; Sidanius, Sinclair & Pratto, 2006;). Academic major as a predictor of sociocultural gains has been examined thoroughly as well (Dambrun, Kamiejski, Haddadi & Duarte, 2009; Guimond, Dambrun, Michinov & Duarte, 2003; Umbach & Porter, 2002).

Scholars have documented a wide variety of influences on the development of students as a consequence of attending college (Astin, 1993b; Terenzini, Springer, Yaeger, Pascarella & Nora, 1996). Student faculty interaction and intergroup contact are two predictors of gains among college students. Student faculty interaction (SFI) experiences are encounters that students have with faculty both in and outside the classroom (Endo & Harpel, 1982; Thompson, 2001). These experiences include advising, participating in research, and socializing outside of class (Kuh & Hu, 2001; Thompson, 2001). Intergroup contact (IGC) includes curricular and co-curricular experiences that students have with peers and faculty who are different from themselves in terms of race, gender, religion, and sexual orientation, among other characteristics

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(Cole, 2007; Herek & Capitanio, 1996; Pettigrew, 1998). These experiences include social interaction, classroom interaction, friendships, roommate situations, and organizational involvement (Chavous, 2005; Levin, van Laar & Sidanius, 2003).

The longer a student persists in college, the greater the opportunities for cognitive and sociocultural gains. Research has shown that SFI is a strong predictor of student persistence (Centra & Rock, 1971; Chang, 2005). Other factors that significantly impact persistence include academic achievement, feeling a sense of integration and belonging, and satisfaction with the educational experience. SFI has been shown to be a strong predictor of each of these factors (Astin, 1993a; Chang, 2005; Kim & Sax, 2007; Hausman et al., 2007; Mayo, 1995). Cognitive and sociocultural gains are also impacted by level and quality of interaction between college students and faculty.

Significant interaction between students and faculty has a stronger relationship to cognitive gains than factors of student background, including class level and advanced degree plans (Lundberg & Shreiner, 2004). When interactions between students and faculty focus on intellectual matters, students can experience strong cognitive gains (Pascarella & Terenzini, 1978). Both the setting and context of the interaction with faculty play roles in the gains that student's experience.

The college campus is widely believed to be an environment that promotes thought provoking questions and reflection, and strong SFI has an impact on the sociocultural gains of students as they develop ideas about people and culture (Kim, 2010; Lacy, 1978). Students achieve significant sociocultural gains through interaction with faculty from specific academic disciplines that focus on social conditions and human development, resulting in gains in racial understanding and the ability to get along with those from other cultures (Sax, Bryant & Harper,

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2005). Interacting with diverse peoples and different cultures is the foundation from which the benefits of IGC stem.

Since Allport first wrote on intergroup contact (1954), the impact of IGC on prejudice reduction in college students has been thoroughly studied (Chang, 2002; Levin et al., 2003; Pascarella et al., 1996). As college students have become more diverse, however, research into the significance of their exposure to difference has extended beyond prejudice reduction. For instance, vocational preparation has become a variable of interest that addresses the need for college graduates who can work with different cultures in a global economy (Kuh & Hu, 2001). Additionally, an active citizenry engaged in social movements and political activities is an outcome associated with IGC among college students (Gurin, et al., 2002). Students exposed to ethnically and culturally diverse peers have positive feelings towards campus climate, a stronger sense of satisfaction, and are more likely to persist at the institution (Chang, 2001).

The growing diversity of students, faculty and staff on college campuses has resulted in an increase in IGC, which in turn, influences students' cognitive and sociocultural gains. Interacting with peers from different races has a positive impact on critical thinking skills (Pascarella, 2001). Students who experience IGC on campus also report gains in general knowledge, personal development and complex thinking skills (Antonio et al., 2004; Toutkoushian & Smart, 2001). When college students interact with people unlike themselves, they experience sociocultural development along with significant cognitive gains.

Despite the growth in diversity on college campuses, students often self-segregate, defaulting to interaction with peers with whom they most easily identify. But when students interact with peers and others from different groups, their positive orientation to peers from other groups significantly improves (Chavous, 2005).

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Institutions have responded to the increased demand for cognitive and sociocultural gains by conducting extensive assessment programs. Many participate in national studies that provide data on gains including cognitive and sociocultural development. For example, the Higher Education Research Institute (HERI) at the University of California, Los Angeles, administers surveys through the Cooperative Institutional Research Program (CIRP). CIRP surveys include studies on freshman and seniors. Hundreds of colleges and universities participate in these annual surveys.

Another national instrument is the College Student Experience Questionnaire (CSEQ) (Pace & Kuh, 1998). The CSEQ is used to assess students' attainment of select gains. The instrument has more than 150 items that measure college student experiences in three areas: college activities, the college environment, and estimate of gains (Gonyea, Kish, Kuh, Muthiah & Thomas, 2003). The CSEQ is designed to study the quality of effort a student applies in the use of college resources and opportunities, a key component of student engagement and satisfaction (Pace & Kuh, 1998). Institutions use CSEQ results to assess program effectiveness, student involvement and student learning.

Statement of the Problem

In summary, college benefits those who attend and ultimately graduate (Immerwahr, Johnson, Ott & Rochkind, 2010; NCES, 2010). The cost to attend college, however, has outpaced inflation rates, and as a result, the growth of personal debt for those who attend has increased dramatically (Baum & Payea, 2008; NCPPHE, 2008). The combination of increased costs and the proven intrinsic personal and financial benefits of attending college has created a demand for greater accountability of higher education as an enterprise (Burrows, 1999; SHEEO, 2005). Students and their families, state legislators, and business leaders demand that colleges

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and universities deliver experiences that lead to positive outcomes (Alexander, 2000; Giroux, 2003; Leville, 2006).

These outcomes include cognitive and sociocultural gains. Cognitive gains include critical thinking and reasoning skills (Perry, 1970; Piaget, 1958). Sociocultural gains include positive interactions with people of difference, and awareness of diverse philosophies and cultures (Gurin, 1999; Spencer-Rogers & McGovern, 2002; van Laar, Sidanius, Robinowitz & Sinclair, 1999).

There are a number of demographic factors that play a significant role in gains experienced by college students. Race, gender and academic major are student characteristics that predict cognitive and sociocultural gains (Anaya, 1996; Antonio, et al, 2004; Dambrun, 2009; Gaines, 1997; Guimond, 2003; Flowers & Pascarella, 2003; Hartnet & Centra, 1977; Hui, et al., 1990; Negy, et al., 2003; Myerson, et al., 1998; Terenzini, et al., 2001; Toutkoushian & Smart, 2001; Umbach & Porter, 2002). However, there are additional factors that impact the desirable gains that college students can achieve.

Two such factors are student faculty interaction and intergroup contact. When students interact with faculty inside and outside the classroom for both social and academic reasons, they usually experience greater cognitive and sociocultural gains (Sax, et al., 2005; Endo & Harpel, 1982; Thompson, 2001). IGC is also a strong predictor of cognitive and sociocultural development. As the diversity of college students increases, the potential for IGC experiences also increases. Experiences with people who are culturally, or ethnically different or from underrepresented groups are a strong predictor of gains (Antonio et al., 2004; Toutkoushian & Smart, 2001)

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Of the potential outcomes of attending and ultimately graduating from college, both cognitive and sociocultural gains have received a significant amount of attention, especially from employers (Wiseman, 2013). The emphasis on these outcomes solidified each as a dependent variable in this study. Identifying the experiences that college students have that are most likely to be predictors of those gains created a focus on both SFI and IGC as the independent variables.

Extensive research has been conducted on the significance that student faculty interaction and intergroup contact has on cognitive gains and there is a wide body of work on the association of SFI and IGC on sociocultural gains. However, scholars have studied these factors in isolation, with primary focus on specific demographic groups and institutional type. There is no research that investigates whether these two measures have significant impact on outcomes when studied together while controlling for race, gender, and academic major. This study serves to address this gap in the literature.

Purpose of the Study

The purpose of this study was to determine if there are significant relationships between the experiences and outcomes of college seniors. Specifically, I investigated how intergroup contact and student faculty interaction impact self-rated cognitive and sociocultural gains when controlling for demographic characteristics including sex, race, and academic major.

The sample was drawn from the population of college seniors who completed the College Student Experience Questionnaire, 4th edition (CSEQ) from 2007 through 2010 (Pace & Kuh, 1998). Respondents included 2000 undergraduate students who self-identified as seniors when completing the CSEQ and who were enrolled full time. Data were analyzed using hierarchical multiple linear regression.

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Research Questions

The research questions for this study were:

1. Controlling for race, gender and academic major, to what degree do student faculty interaction and intergroup contact influence cognitive gains in college seniors?
2. Controlling for race, gender and academic major, to what degree do student faculty interaction and intergroup contact influence sociocultural gains in college seniors?

Significance of the Study

This study had significance for future practice, research and policy. Academic deans, student affairs administrators, and academic advisors could benefit from this study. My results provided academic deans with information on the relationship between SFI and cognitive gains among students. They may use the data to review expectations they have for faculty office hours and levels of faculty involvement with students.

Professional administrators in student affairs may also benefit from this study.

Administrators in career services offices may use the results to guide students about what types of experiences will lead to cognitive and sociocultural gains hence best prepare them to enter the job market. In addition, administrators in multicultural centers might utilize the findings to assess the different IGC experiences in their programmatic offerings. They might design programs that promote experiences that were shown to be strong predictors of sociocultural gains. Academic advisors could provide advisees with information on how to maximize cognitive development from their college experience.

This study also has significance for future research. While I did not use institutional information as a variable, this study could be replicated and include institutional size and classification as control variables. Some research has shown that institutional type influences

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student faculty interaction and student satisfaction (Kuh & Hu, 2001) but more research on this topic is merited.

Future research might also use the results of this study to create qualitative studies on the influence of intergroup contact and student faculty interaction on cognitive and sociocultural gains. My study utilized a quantitative methodology and a qualitative study might provide insight into how and why SFI and IGC experiences influence cognitive and sociocultural gains in college students.

Studies have shown that student faculty interaction is connected to impact, socialization, and achievement (Lamport, 1993). The results of my study may be used to explore effective curriculum design that maximizes cognitive and sociocultural gains. Curricular design is one method by which faculty instruct students, and further research using the results of my study may show which forms of curricular design impede or attenuate cognitive and sociocultural gains.

Moreover, policy development may be impacted by the results of this research. Policymakers responsible for tenure policies, enrollment policy and organizational funding may use the results of this study. Decisions on tenure are based on a number of factors including faculty performance. Deans may use the findings on student faculty interaction experiences that influence student cognitive and sociocultural gains to promulgate policy on areas of faculty performance that address SFI and IGC. This study might prove helpful to policymakers responsible for enrollment goals. The results can be used to advance policies that promote diversity among entering cohorts to increase the potential for intergroup contact associated with cognitive and sociocultural gains. Finally, policymakers responsible for student organization funding might incentivize requests to encourage programs that involve faculty interaction or intergroup contact.

Delimitations

Reflective of all research, this study began with delimitations. The first dealt with the instrument. The study was limited by the items contained in the CSEQ. It is possible that those items did not adequately measure IGC or SFI, or cognitive and sociocultural gains. If the items did not fully measure these factors, the results would be less compelling.

The CSEQ presents a second delimitation. The instrument measures the frequency of student experiences but does not measure the quality of those experiences. It is possible that a significantly negative or positive experience might be reflected in the response of the student but the instrument does not account for that possibility.

A third delimitation is the scope of experiences used in the study. This study used only a limited number of experiences rated on the CSEQ. The instrument contains additional experiences college students might engage in while enrolled. Using more experiential areas may have provided a different picture on predictors of cognitive and sociocultural gains.

Nonetheless, this study was important because identifying the college experiences that promote cognitive and sociocultural gains addresses the concerns of stakeholders interested in the outcomes of attending college. These gains are considered essential skills for graduates to be successful.

Organization of the Study

The present study is organized in five chapters. Chapter One introduced the study, the research questions and the significance of the study. Chapter Two reviews relevant literature with respect to the variables of interest. Chapter Three describes the methodology of the study. Chapter Four details the results of the research, while the fifth chapter discusses the results and their implications for future practice, research and policy.

Chapter Two

Review of the Literature

My study was designed to address a gap in the literature regarding the cognitive and sociocultural gains of college students. This chapter explores two factors that predict cognitive and sociocultural gains: student faculty interaction and intergroup contact. First, the literature on how student faculty interaction (SFI) and intergroup contact (IGC) impact cognitive gains is reviewed. Second, the impact of SFI and IGC on sociocultural gains is examined. The elements of race, sex and academic major are included in the examination of both SFI and IGC.

Cognitive Gains

The assessment of outcomes associated with attending college has grown in importance. Educational leaders must provide evidence that matriculation results in developing the outcomes sought by students, families, legislators and business leaders (Immerwahr, 2010; SHEEO, 2005). Outcomes include highly valued skills broadly referred to as cognitive processes (Klein, Kuh, Chun, Hamilton & Shavelson, 2005).

Research has shown that assessing cognitive gains should reflect results from a multitude of experiences. These include traditional classroom experiences as well as educational experiences outside the classroom (Astin, 1984; Kuh, 2001; Pascarella, 1991). In addition, academic success or GPA can be a viable proxy for cognitive gains (Anaya, 1999b). Two factors that impact cognitive gains are student faculty interaction and intergroup contact.

Student Faculty Interaction and Cognitive Gains

The relationship between student and teacher is a storied one. The exponential growth of enrollment in higher education has created different challenges to that relationship. Ideally, students are ensconced in an engaging relationship with their instructor, a dynamic that benefits

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intellectual growth. As teaching methods have evolved to include small and large scale lecture, experiential and service learning, independent study and cooperative learning, the impact of a faculty member who is engaged with students cannot be understated (Lindholm, Astin, Sax & Korn, 2002).

The demands on faculty have changed, however. The expectations to produce scholarly research, engage in development activities, and teach larger class loads leave many faculty members struggling to meet expanded job demands (Jacobs & Winslow, 2004). On average, faculty members tend to spend more time on administration, writing, and committee work than teaching and advising students (Hurtado, Eagan, Pryor, Whang & Tran, 2012). Further complicating matters is a growing focus on the student faculty ratio, and the implied impact that higher ratios have on the quality of student faculty interaction, a challenge in an era of mass education.

Research has shown faculty interaction can be an important factor in student achievement (Anaya, 2001a; Centra & Rock, 1971; Endo & Harpel, 1982; Ishiyama, 2002; Kuh & Hu, 2001). For purposes of this study, student faculty interaction was defined as any occasion where a student and faculty member have interaction beyond general lecture, inside or outside the classroom. A number of examples of SFI have been shown to impact cognitive gains.

Significant interaction with faculty provides a greater sense of identification and integration with the institution, positively impacts persistence, and can bolster intentions to attempt graduate studies (Kuh & Hu, 2001; Pascarella, 1980; Tinto, 1975). Having full time faculty versus graduate assistant instructors has a positive impact on knowledge acquisition and intellectual growth (Toutkoushian & Smart, 2001). Positive consequences of SFI are easily seen in the data on student satisfaction, persistence and success, and university leaders are rapidly

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developing programs that offer opportunities for faculty to develop relationships with students (Kim & Sax, 2009a). Two examples include undergraduate research programs and faculty led project work.

Undergraduate research programs provide faculty an opportunity to mentor students through original research projects. Hunter, Laursen and Seymour (2007) found that faculty and students believe there are significant cognitive gains as a result of interaction including gains in communication skills, analytical skills and intellectual skills. A quarter (25%) of faculty and 22% of students believe that critical thinking and problem solving skills are positively impacted as a result of collaborating on undergraduate research (Hunter et al., 2007). Ishiyama's study (2002) showed similar results when students reported an increase in analytical development as a positive consequence of being involved with faculty in collaborative projects.

As the relationships between faculty and students become more formalized, alternative avenues of SFI impact student achievement. Studies have yielded conflicting results on whether in class or out-of-class, formal or informal interaction has the most impact on student achievement. On one hand, students who discuss career plans or an academic paper with a faculty member outside the classroom are more likely to achieve greater academic success (Anaya, 2001a). Informal interactions with no academic connection do not proffer as strong a connection to student gains, however, so the type of interactions seems to matter. On the other hand, personal contact between students and faculty outside the classroom has a significant connection to intellectual development and academic success among college students (Mayo, Murgui'a & Padilla 1995). Interestingly, formal social interaction with faculty outside the classroom has a greater impact on academic success than relationships students have with peers through their social life.

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Students satisfied with the nature of their relationships with faculty may experience significant gains in areas like problem solving and intellectual skill development (Eimers, 2001). Moreover, interaction between faculty and students outside the classroom can be a more significant predictor of student learning than student background, socioeconomic status, or institutional type (Lundberg & Schreiner, 2004). Not all types of interaction are significant predictors, however. Discussing class material outside the classroom with faculty does not necessarily increase student learning over discussing course material inside the classroom, for example (Umbach & Wawrzynski, 2005).

Race and sex play a significant role in the cognitive gains associated with SFI. Much of this research focuses on the mentoring needs of students to promote satisfaction, persistence, and degree aspirations (Cole, 2010; Endo & Harpel, 1982; Hausmann, Schofield & Woods, 2007; Hurtado, 2001; Kim & Sax, 2009b). In the limited research that focuses on different cognitive gains, groups of students can benefit from different forms of SFI. Prior research and this study utilize the term “minority” and “diversity” interchangeably to represent racial and ethnic groups including African American, Hispanic/Latino, Asian/Pacific Islander and other non-Caucasian groups.

To start, racial or ethnic minority students experience more significant cognitive gains when high levels of SFI are with same race or other minority faculty (Mayo et al., 1995). African American and Latino students may experience greater academic success, increased complex thinking skills and a host of other gains when a strong connection to a faculty member is established (Anaya & Cole, 2001; Lundberg & Schreiner, 2004). Alternatively, white students may experience higher academic success and increases in critical thinking when they engage with faculty outside of the classroom (Kim, 2010).

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There are different types and levels of SFI that influence students, as well. When involved with faculty in research, Latino students may experience negative outcomes, while Caucasian and Asian students experience positive gains in critical thinking skills (Kim & Sax, 2009a). African American students have shown more positive development in critical thinking and academic success when they experience high levels of SFI (Kim & Sax, 2009b). In addition, minority students can achieve growth in critical thinking when faculty interaction and campus environment are taken into account, but this effect can be a negative one for Asian students when racial climates on campus are perceived difficult to navigate (Chang, 2005; Eimers, 2001).

In terms of sex, women can feel marginalized and experience less cognitive benefit when SFI is high. Since the majority of faculty members are men, this may be due to traditional gender roles that surface and are reinforced by the experiences female students have with male faculty (Kuh & Hu, 2001). Whether the SFI occurs in class, on a project or during research work, female students are less likely to experience cognitive gains in intellectual development, critical thinking and communication skills than their male counterparts (Cole, 2007; Sax, et al., 2005) except in one instance. When faculty members express higher expectations female students seem to achieve more significant growth in critical thinking than males (Kim & Sax, 2009a).

Studies on the impact of academic major on SFI and cognitive gains are extremely limited. A recent study did identify differences in performance on tests for critical thinking and writing skills in college seniors, but did not include SFI as a predictor (Steedle & Bradley, 2012). A number of studies use major as a control but do not include major in the final discussion (Cole, 2010; Kim & Sax, 2009a; Toutkoushian & Smart, 2001; Umbach & Wawrzynski, 2005). In some studies, academic major is among characteristics that researchers are concerned will create

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problems (Chang et al., 2006). Most studies use academic major dummy coded into smaller groups that fit the theoretical model of the study or minimized the number of variables (Anaya & Cole, 2001; Ishiyama, 2002; Kuh & Hu, 2001). Other studies target a specific major or major group as a focus of attention (Cole & Espinoza, 2008; Hodes Research, 2008).

In studies that include field of study, science and technology majors have shown stronger gains in cognitive development including writing and analytical skills despite having less SFI than humanities and social science majors (Kuh & Hu, 2001). The science and technology majors achieve no gains in writing ability, likely because their academic areas have fewer writing assignments than other majors. Even with limited opportunities, humanities and social science majors who participate with faculty members in a research project achieve significantly stronger analytical skills than students who do not experience collaborative work with faculty (Ishiyama, 2002).

STEM majors have more opportunities to work with faculty on research projects than most students. That type of SFI can lead to strong mentoring relationships between faculty and students, and consequently impacts academic success of STEM students (Cole & Espinoza, 2008). Likewise, in a 2008 study, Business majors reported that SFI impacted gains in a number of cognitive areas including synthesizing perspectives (Hodes Research, 2008).

Although the literature provides conflicting results on the nature of SFI and cognitive gains, it is clear that a relationship between the two exists. Whether inside the classroom through formalized interactions via research projects, or outside the classroom through informal or social engagement, substantive interaction between faculty and students can impact critical thinking, communication and analytical skill development in college students. SFI is just one of the factors that impact these cognitive gains, however.

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Intergroup Contact and Cognitive Gains

Diversity on campus is a prominent issue (Chang, 2001; Gurin, et al., 2002) in higher education. There is more opportunity than ever before for people from diverse backgrounds to interact given the increased enrollment of minority students (NCES, 2007). A more diverse population on campus increases the chance for significant IGC. For purposes of this study, intergroup contact was defined as the interaction between people of diverse ethnic, religious and cultural background.

Students experience an increase in educational and developmental outcomes as a result of a diverse campus culture (Astin, 1993a; Chang, Denson, Saenz & Misa, 2006; Gurin et al., 2002; Hurtado, Dey, Gurin & Gurin, 2003). Upon entering college, students from different racial and ethnic backgrounds have differing opinions on contemporary issues, proffering an opportunity for learning opportunities not available on a highly homogenous campus (Chang, 2001; Gurin, 1999). Minority student opinions, thoughts and experiences increase the cognitive development of majority students, a desirable learning outcome (Antonio et al., 2004).

Students challenged to consider differing points of view experience gains in cognitive development (Piaget, 1975). Contemporary research has built upon these established assumptions. A diverse college community, with people from different backgrounds who have different ideas and experiences, facilitates learning outcomes more than a homogenous environment (Gurin et al., 2002; Hurtado et al., 2003). Students achieve these cognitive gains through informal interactions outside the classroom and formal interactions in structured courses or academic engagements.

The impact of IGC is in part influenced by the courses that college students take. Courses on cultural and ethnic diversity present opportunities for exposure to different cultures

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and philosophies and challenge embedded ideas about marginalized groups (Gurin, 1999; Gurin et al, 2002; Hurtado, et al., 2001). The exposure to multicultural issues conducted in diversity courses is a compelling element of IGC (Hogan & Mallot, 2005). There are contradicting studies on critical skill development and diversity courses, however. Students who take diversity courses experience gains in cognitive areas, including cognitive skill development and critical thinking (Hurtado, 2001). Unfortunately, such development is likely limited to those students who electively take diversity courses (Bowman, 2009) as opposed to those enrolled because such a course is a degree requirement.

Like SFI, IGC impacts students differently when considering both race and gender. The impact of informal interaction is more positive for African American students when in the classroom. Other minorities and white students can experience significant outcomes through both the formal setting of the classroom and informal settings outside of class (Gurin et al., 2002). White students may value different points of view when African Americans participate in the conversation and present arguments contrary to their own (Antonio et al., 2004).

Cognitive benefits recorded by students increase proportionately with the level of campus diversity and IGC. Each racial or ethnic group experiences these gains, but African American students and women report more growth than do other groups on highly diverse campuses (Chang, et al., 2006). Likewise, different institutional types can create different opportunities for interaction. Students at large, research driven universities are likely to have less IGC than those at liberal arts colleges, and this can impact white, female students who are more responsive to diverse interactions (Hu & Kuh, 2003; Umbach & Kuh, 2006).

Distinctive curricular and co-curricular choices made by male and female students impact cognitive gains. Diversity courses provide students with a significant amount of IGC, and

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females are more likely than males to be open to different points of view and experience development in critical thinking (Laird, 2005; Pascarella, 2001). Enrolling in multiple diversity courses can lead to significant cognitive improvement for white students, however not necessarily for men versus women (Bowman, 2009).

An extensive search produced a very limited number of studies on the impact of IGC and academic major on cognitive gains. Among Business majors, white students may grow in intellectual skills as a result of having a minority faculty member as an instructor or advisor (Hodes Research, 2008). When science and technology students experience negative IGC, they often expect similar treatment to continue while enrolled in college, and are less successful academically (Chavous, Harris, Rivas, Helaire & Green, 2004). Contrary to the research that shows that IGC positively impacts cognitive gains in college students, STEM majors may experience less academic success as a result of such interaction (Cole & Espinoza, 2009). These conflicting findings suggest that more research is merited to explore the role of IGC, and academic major in cognitive development.

Sociocultural Gains

College graduates enter a highly competitive workforce with growing demands to navigate a global environment (Bowman, 2009; Hurtado, 2001; Leveille, 2005). Working with people from diverse cultures is rapidly becoming a prerequisite to success. Employers want graduates who grasp global and cultural issues, and can work with others in a diverse group (AAC&U, 2005). Researchers have identified the types of environments that influence sociocultural gains in college students (Chang, 2001; Chang, 2002; Gurin, et al 2001; Guimond, 1997). Student faculty interaction (SFI) and intergroup contact (IGC) play an important role in these environments.

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Student Faculty Interaction and Sociocultural Gains

Students who engage frequently with faculty experience significant gains in a myriad of cognitive areas (Cole, 2010; Endo & Harpel, 1982; Kuh & Hu, 2001a; Lundberg & Schreiner, 2004; Thompson, 2001). However, there is limited research on the sociocultural benefits of SFI among college students. The experiences students have with faculty that create opportunities for cultural gains can take place in or outside the classroom, and be formal or informal in nature.

For instance, enrollment in diversity courses results in sociocultural outcomes for some college students (Bowman, 2009; Gurin et al., 2004; Kim, 2010). Arguably, a combination of positive SFI with a minority professor and enrollment in a diversity course can precipitate considerable sociocultural development for students. Students who enroll in diversity courses can experience a number of gains, including social engagement and the ability to communicate and identify with people of different backgrounds (Cole, 2007; Nelson-Laird et al., 2005). More than 60% of universities around the country have a diversity course requirement or are currently considering the requirement (Humphreys, 2000) and minority professors frequently are approached to teach these courses (Larke & Larke, 2009). However, there are few minority faculty on campus to deliver diversity courses or courses in any discipline for that matter. In spite of initiatives to increase minorities in the professorate, 79% of college professors are white. African American faculty numbers are second, representing a mere 7%. Asian and Hispanic faculty numbers are fewer, at 6% and 5% respectively (NCES, 2011).

The benefits of having minority faculty are well noted in spite of their limited presence on campus. Students who interact with minority faculty can gain more from exposure to faculty from different cultures than from interacting with a Caucasian instructor (Hall & Rivera-Torres, 2011). White collegians often have biased perceptions of minorities; through interactions with

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intelligent and accomplished minority faculty those biases are challenged (Alexander & Moore, 2008).

Minority faculty members also recognize the impact their presence has on students. In one qualitative study on the demands and implications of teaching a diversity course, five of the six professors interviewed were minorities (Larke & Larke, 2009). They felt they had an impact in delivering material to students, including promoting a stronger understanding of other cultures and people (Larke & Larke, 2009).

Student race and gender can influence the effects of SFI on sociocultural gains both positively and negatively (Sax et al., 2005; Kim, 2005). For example, assisting faculty with research projects can lead to positive growth in social awareness, with the exception of Latino students who may experience a negative effect. Likewise, when faculty expectations of performance increase as result of SFI, African American students do not always experience improvement in social awareness (Kim & Sax, 2007).

There are few studies that address gains in either cultural awareness or the ability to get along with other people for Latino, Asian and African American students. Unlike Caucasian students, minority students do not always experience an increase in awareness or racial tolerance as a consequence of informal SFI (Kim, 2010; Toutkoushian & Smart, 2001). These students are often more comfortable developing relationships with minority faculty and might feel uncomfortable and unconnected with white faculty (Anaya, 2001a; Hausmann, et al., 2007; Mayo, et al., 1995). Such a dynamic is likely responsible for the majority of studies that find significant increases in cultural awareness and appreciation among white students but not minority students (Kim, 2010). Minority faculty may believe their primary role is to positively

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impact white students and any preexisting stereotypes they have about race and intellect (Chiteji, 2008).

There is no clear indicator that gender is consequential in the interaction of SFI and sociocultural gains. Both male and female students can experience gains in cultural appreciation and social awareness as a result of strong SFI (Kim, 2010). However, one study showed that only male students who interact with faculty outside of class are likely to achieve any gains in cultural awareness and promotion of racial understanding (Sax et al., 2005). There are few studies that utilize gender as a variable, however so more research is needed.

An extensive search revealed only a limited number of studies on the role that academic major and SFI play in sociocultural gains. When surveyed, 77% of students in one Business school believed taking classes from a minority professor better prepared them to succeed in a diverse work environment (Hodes Research, 2008). Minority faculty often engage students in different ways, challenge traditional thinking and provide contextual differences that majority faculty do not (Hurtado, 2001; Umbach, 2006). They are more likely to engage with students outside the classroom at diversity and cultural events, creating more opportunities for beneficial engagement. Again, however, more research is warranted to explore the connections between major, SFI and cultural awareness and the ability to get along diverse peoples.

Intergroup Contact and Sociocultural Gains

Intergroup contact is central to sociocultural gains. Exposure to different cultures, races and ethnicities is a foundational element in a number of social psychology theories, including intergroup contact theory (Allport, 1954). Starting with *The Nature of Prejudice* (1954), Allport showed that when certain conditions are met, including institutional support and equal status, intergroup contact directly correlates to one sociocultural gain, prejudice reduction. This formula

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has been studied in a number of environments, including the college campus (Byrnes, 1990; Chavous, 2005; Van Laar et al, 2005; Levin, 2003; Miller, 2004; Tropp, 2003).

The majority of research shows that students who engage with individuals from different ethnicities and cultures, through formal or informal means, can experience significant improvement in their awareness of peoples and cultures, and possibly improve their ability to get along with others (Astin, 1993a; Chang et al, 2006; Villalpando, 2002). Over the last 30 years, as racial minority enrollment in college has grown, research has revealed how diverse campus populations and IGC impact sociocultural gains (Bowman, 2009; Chang et al, 2006; Gurin et al, 2002; Jackman, & Muha, 1984).

Contemporary college students have the opportunity to interact with different cultures and ethnicities in a variety of settings. There is some debate as to whether institutional efforts to recruit and retain a diverse student body directly benefit students, however. Some studies suggest that merely having diverse enrollment does not automatically create significant or meaningful intergroup contact (Odell, Korgen & Wang, 2005). Moreover, minority students impacted by racially motivated and hostile intergroup contact with faculty or student peers, often retreat to groups or perceived safe spaces to mitigate these negative experiences (Harper & Quaye, 2007). In contrast, other research using pre- and post-tests over a four-year period, with a sample of nearly 20,000 undergraduate students showed that students can benefit simply from attending a highly diverse campus (Chang et al., 2006).

It is important, therefore, to identify what experiences are connected with IGC and sociocultural gains. To start, diversity courses are implicitly connected to IGC, primarily in that they expose students to the study of race, ethnicity, multicultural and gender issues. The design of a diversity course creates opportunities for learners to become acquainted with diverse

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cultures and people (Chang, 2002). Taking a single course can have as great an impact on awareness as taking two or more such classes (Gurin et al., 2004).

The method of instruction is also important: when the material contradicts students' beliefs, they can become resistant and experience no change (Bowman, 2011). There is evidence that taking a single course and not engaging in additional activities can result only in temporary benefits. Students need to engage in additional experiences to achieve long-term gains (Hogan & Mallot, 2005).

Classroom settings are inherently formal, and that formality can intimidate students and stymie significant interactions. However, campus diversity can lead to meaningful out of class IGC that benefits students (Gurin, 1999; Hurtado et al., 2003; Chang et al., 2006). Students in cross-racial and cross-cultural relationships out of class are the most impacted in terms of their beliefs and cultural awareness (Chang et al., 2006; Van Laar et al., 2005).

The residential experience also can be a significant experience for college students and impacts openness to diversity (Pascarella et al., 1996; Pike, 2009). The roommate relationship is an important one for the student transitioning to the college environment. It involves a level of engagement not found in other areas of the collegiate experience: conversation, sharing of ideas and personal histories without formality or constraints. Students involved in cross-racial roommate arrangements are often more comfortable interacting with different races, including interactions outside their roommate pairing (Gaither & Sommers, 2012; Sidanius et al., 2006; Stearns, Buchmann & Bonneau, 2009). For instance, when the campus roommate is African American, students from other races may increase their awareness towards that group. An African American or Latino roommate may not only create positive feelings and cultural awareness of that group, but of the other races as well (Gaither & Sommers, 2013; van Laar et

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al., 2005). There may be an exception, however; having an Asian-American roommate may not create positive feelings or awareness for other races or ethnicities (van Laar et al., 2005).

Roommates are important because students select and cement their relationships in their sophomore and junior years based on the attitudes they hold at the conclusion of their first year in college (Levin et al., 2003). When upper division students have long standing roommates from different races or cultures, stereotypes can be debunked altogether (van Laar et al., 2005; Levin et al., 2003). In instances where the residential community is multiethnic, the appreciation for diversity can extend past the race of the roommate resulting in further IGC and gains in cultural and ethnic awareness (Antonio, 2004b). The opposite can also be true. Roommate experiences are intimate and cross racial roommate pairings may result in less positive feelings towards different race roommates (Trail, Shelton & West, 2009) especially for roommates from underrepresented groups who are paired with a white student. Likewise, roommate dynamics may be influenced by institution type but research has only been conducted at predominantly white institutions where Caucasian students are the majority. The impact of cross-race roommates at historically black colleges and universities or Hispanic serving institutions had not yet been investigated (Gaither & Sommer, 2013; Levin et al., 2003; van Laar et al., 2005)

Research on the benefits of a racially diverse campus illustrates the relationships between diversity, IGC and sociocultural gains (Antonio, 2004; Chang et al., 2006; Miller et al., 2004). However, not every student experiences those improvements equally, or at all. The de facto segregation in K-12 education in the United States creates the likelihood that the college campus is more diverse than a college student's previous experience (Gurin et al., 2002; Hurtado et al., 2003). As diverse as the college campus has become, the voluntary segregation students often establish on campus can stymie the benefits of a diverse community (Villalpando, 2003).

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Students who maintain friendships within their race or ethnicity exclusively may not experience the same level of sociocultural gains as students who create and sustain relationships with a diverse group of peers. This is especially true for white students. Likewise, having cross-racial friendships is potentially the only example of IGC that has any impact on openness to diversity for African American students (Levin, et al., 2003; Odell et al., 2005). Even if those relationships are not close friendships, having significant IGC influences cultural knowledge for some minority students (Antonio, 1998; Antonio, 2004b).

The growing international student enrollment in American colleges has created opportunities for intergroup contact beyond domestic diversity (NCES, 2007). Despite exposure to international or intercultural students, many domestic students maintain marked levels of anxiety and hostility towards foreign students (Spencer-Rodgers & McGovern, 2002). There is concern among domestic students that the resources used to educate international students are sources of support not available to them (Redden, 2013). Anxiety driven by communication difficulties and perceived threats to native cultures can prove too significant for IGC to positively impact or otherwise change attitudes. This is true regardless of sex and most ethnic backgrounds of domestic students (Spencer-Rodgers & McGovern, 2002).

There is a lack of research on the effects of IGC on sociocultural gains by gender; most of the focus is on race or ethnicity (Bowman, 2009; Chang, 2001; Gaither & Sommers, 2013; Gurin, et al., 2002). Some studies controlled for gender, but their research methods failed to confirm gender as a significant factor in sociocultural gains (Denson & Chang, 2008)

Neither has academic major been a meaningful factor of study for IGC and sociocultural gains. There has been research on social dominance or the type of student who enrolls in certain majors and the impact on levels of prejudice. Studies that categorize academic major along a

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continuum of social dominance do so to recognize that people enroll in areas of study that affirm their orientation towards hierarchy and that particular academic disciplines carry higher prestige and status (Guimond, et al., 2003). Hierarchy enhancing (HE) versus hierarchy attenuating (HA) majors differentially attract students who believe in the promotion of or at least adherence to a veritable caste-system in place in modern culture (Sidanius, Pratto, Martin & Stallworth, 1991).

In conclusion, the literature shows that there are significant influences on the cognitive gains of college students. When students experience significant levels of SFI, both inside and outside the classroom, they can achieve higher levels of cognitive development. Working closely with faculty on research projects positively impacts analytical thinking and synthesizing ideas (Hunter et al., 2007; Ishiyama, 2002; Kim & Sax, 2007). Spending time with faculty outside the classroom can lead to positive gains in individual pursuit of knowledge and presenting one's ideas (Anaya, 2001; Eimers, 2001; Lundberg & Schreiner, 2004; Mayo et al., 1995). Students can experience cognitive gains as a consequence of IGC as well. The increase in diverse populations on campus creates opportunities for students to engage with people from different backgrounds, resulting in improved critical thinking (Antonio et al, 2004; Chang et al, 2006; Gurin et al., 2002). Students who take diversity courses show gains in analytical and critical thinking, fostered by engagement with ideas and points of view different than their own (Bowman, 2009; Hurtado et al., 2001).

SFI and IGC can also lead to sociocultural gains in college students. Cultural awareness, understanding of others and getting along with people from different backgrounds can be a result of being taught by minority faculty and participating in diversity courses (Cole, 2007; Hurtado, et al., 2001; Larke & Larke, 2009; Nelson-Laird et al, 2005;). Having significant intercultural friendships or socializing with diverse peoples can impact the knowledge students gain about

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other parts of the world or getting along with people different than oneself (Chavous, 2005; Gaither & Sommers, 2012; Hogan & Mallot, 2005; Hurtado, et al, 2001; Kim & Sax, 2007; Levin, et al., 2003).

However, there are some gaps in the research on these gains. First, there are demographic factors to consider that are widely ignored in work on cognitive and sociocultural gains. Race, gender, and college major may influence the level of cognitive or sociocultural improvements but more work is needed to examine the influence of these demographic factors. Second, SFI has been explored with respect to cognitive gains and sociocultural gains, and IGC has been included in the studies on these two outcomes, but each outcome has largely been studied in isolation. More work is needed that examines both types of outcomes and the role that SFI and IGC play in student achievement of each. This study sought to address these gaps in the literature by examining the influence of demographic factors, SFI, and IGC on both cognitive and sociocultural gains among students.

Chapter Three

Methodology

The purpose of this study was to determine if there are significant relationships between the experiences and outcomes of college seniors. Specifically, I investigated how intergroup contact and student faculty interaction impact self-rated cognitive and sociocultural gains when controlling for certain demographic characteristics. The research questions for this study were:

1. Controlling for race, gender and academic major, to what degree do student faculty interaction and intergroup contact influence cognitive gains in college seniors?
2. Controlling for race, gender and academic major, to what degree do student faculty interaction and intergroup contact influence sociocultural gains in college seniors?

This chapter details the methodology used to conduct the study. I offer a description of the sampling process and sample details. I describe the CSEQ and discuss the validity and reliability of the instrument and select indexes of the instrument. Lastly, the procedures for data collection and analysis are explained.

Sample Selection

This study employed data from the College Student Experiences Questionnaire (CSEQ) Fourth edition (Pace & Kuh, 1998). The CSEQ is administered to students at participating institutions of higher education throughout the country. Respondents include all academic classifications (e.g., first year, sophomore, etc.). Participating schools are able to access results

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reflecting their institution as well as scores of a comparison group via a comprehensive national dataset.

As this study focused on the experiences and outcomes of college seniors, only participants who responded as “senior” on the instrument were selected for the study. I concentrated on the experiences of college seniors because I assumed that seniors would have had more opportunities for SFI, IGC, and to achieve cognitive and sociocultural gains. The data for this study came from seniors who completed the CSEQ in one of four administrations of the instrument between 2007 and 2010.

Institutions that participate in the administration of the CSEQ distribute, collect and then return the completed surveys to the Center for Postsecondary Research at Indiana University. Institutions can choose either an online version or a paper version of the CSEQ. The population for my study was comprised of 6,172 senior college students who participated in the study during the identified time period: 1,570 seniors in 2007 (24 schools, 6974 total respondents), 1,583 in 2008 (17 schools, 4557 respondents), 1,805 in 2009 (15 schools, 4885 respondents), and 1,214 in 2010 (15 schools, 4112 respondents). I requested a slice of the dataset that included responses from 2,000 of these respondents. The cost for the data slice was the primary reason for requesting a sample of 2,000. The CSEQ includes an item that asks respondents if they agree to their responses being used in research. Only those who responded in the affirmative to that item were included in the sample.

Instrument

Designed by Robert Pace in the 1970s, the College Student Experiences Questionnaire (CSEQ) underwent its fourth iteration in 1998. It was devised to assess the collegiate experience and the current CSEQ is comprised of eight sections and 166 items. The instrument gauges the

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following areas of the collegiate student experience: college activities, environment, and estimate of gains (Gonyea, Kish, Kuh, Muthiah & Thomas, 2003). The eight sections of the CSEQ include (a) Background Information, (b) College Activities, (c) Conversations, (d) Reading/Writing, (e) Opinions About Your College or University, (f) The College Environment, (g) Estimate of Gains, and (h) Additional Questions. The CSEQ is administered annually to students at participating institutions that use the data to assess the experiences of students on their campus.

The first section of the CSEQ elicits Background Information. Included in the 18- item section are questions on sex, race/ethnicity, classification, and academic major. Other items ask participants about their parents' academic background, whether they are a transfer student, time spent on out-of-class academic work, and their residential status.

The second section consists of 93 items in 11 subsections that address participants' College Activities. The subsections delve into respondents' involvement with and use of college resources including the college library, faculty, clubs and organizations, campus facilities, and student acquaintances. They also include items on involvement with music or theatre, use of course materials, and technology use. The response options for each item are "very often", "often", "occasionally", and "never".

The third section asks participants about their Conversations with others outside the classroom. This section is divided into two subsections, topics of conversation and information in conversations. The topics subsection consists of 10 items that ask participants to reflect on the frequency with which they have had conversations regarding politics, the arts, the economy, and current events. The information items ask participants to judge the regularity of conversations in which they related acquired knowledge, referred to an instructor's comments, or persuaded

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someone else to change his/her mind. The response options for each item are “very often”, “often”, “occasionally”, and “never”.

The extent of time spent Reading and Writing are the focus of the two items in the fourth section of the CSEQ. Participants are asked how many books or other publications they read in the past year. The second question asks the number of exams and papers they have written in the current academic year. Each question provides a scale ranging from “none” to “more than 20”.

The fifth section of the instrument asks participants their Opinions About Your College or University. Comprised of two items, the first asks how the student likes college, to which the respondent can answer on a scale from “I am enthusiastic about it”, “I like it”, “I am more or less neutral about it”, to “I don’t like it”. The second question asks if respondents would choose to attend their current institution if they had a chance to start over. The response options for this question are “Yes, definitely”, “Probably yes”, “Probably no”, or “No, definitely”.

The CSEQ focuses on student development in the sixth section titled The College Environment. Consisting of two subsections with seven and three items respectively, the first subsection asks participants to rate the emphasis their institution places in areas including understanding and appreciating diversity, vocational and occupational competency, and information technology skills. Participants rate the level of emphasis on a scale that ranges from one (“weak emphasis”) to seven (“strong emphasis”). The second subsection has three items that ask participants to rate the quality of relationships they have with other students, administrators and faculty. The scale for relationships with students ranges from seven (“friendly, supportive, sense of belonging”) to one (“competitive, uninvolved, sense of alienation”). The options for relationships with administrative personnel and offices range from seven (“helpful, considerate, flexible”) to one (“rigid, impersonal, bound by regulations”). The responses for the question

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relationships with faculty members range from seven (“approachable, helpful, understanding, encouraging”) to one (“remote, discouraging, unsympathetic”).

Estimate of Gains is the seventh section of the CSEQ. Participants respond to 25 items about the understanding, knowledge, learning and skills they have gained as a result of their college experience. Additional items ask about developing values, understanding of self, and individual learning. Each item asks participants to estimate their gains along a range from “very little” to “very much.” The final section is entitled Additional Questions. Administrators at participating institutions design the items in this section, asking about specifics on the student experience at their institution.

The items for this study were taken from different sections of the CSEQ, and are listed in Table 1, including the response options for each item. From the “Background Information” section, I used demographic information about sex, race/ethnicity, classification and academic major. From the “College Activities” section, I drew items from three separate subsections.

Items selected from the Student Acquaintances subsection addressed interactions with both faculty and fellow students. The items that dealt with interaction with fellow students provided data on experiences with diversity, or intergroup contact. Respondents reported on the extent of their exposure to and conversations with students from different cultural or ethnic backgrounds, as well as with international students. They also assessed the frequency of discussions they had with fellow students of a different religious background.

I used items from the Faculty Experiences subsection to garner data on student faculty interaction. Respondents reported how often they discussed term papers or career plans with faculty, and how often they had conversations or socialized with faculty outside the classroom. Respondents also revealed how often they worked with a faculty member outside the classroom.

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Table 1

CSEQ Variables, Descriptions, Variable Names and Codes

| Variable | Descriptions | Variable Name | Code |
|----------------|---|---------------|--|
| Sex | Sex of participants | SEX_RC | 1=male 0=female |
| Race | Caucasian participants | RACEC | 1=Caucasian 0=Black/African American 0=Latino/Hispanic 0=Asian/Pacific Islander 0=Multiple/Other |
| | Black/African American participants | RACEAA | 1=Black/African American 0=Caucasian 0=Latino/Hispanic 0=Asian/Pacific Islander 0=Multiple/Other |
| | Latino/Hispanic participants | RACEHLAT | 1=Latino/Hispanic 0=Caucasian 0=Black/African American 0=Asian/Pacific Islander 0=Multiple/Other |
| | Asian/Pacific Islander participants | RACEAPR | 1=Asian/Pacific Islander 0=Caucasian 0=Black/African American 0=Latino/Hispanic 0=Multiple/Other |
| | Multiple or Other race participants | RACEOTH | 1=Multiple/Other 0=Caucasian 0=Black/African American 0=Latino/Hispanic 0=Asian/Pacific Islander |
| Academic Major | Hierarchy enhancing majors | BUS_MAJOR | 1=Business 0=All other majors |
| | Science, Math, Engineering and Technology (STEM) majors | STEM_MAJOR | 1=Computer and information sciences, Engineering, Mathematics, Physical Sciences, 0=All other majors |
| | Humanities/social Sciences | HUM_MAJOR | 1=Communication, education, ethnic/cultural/area studies, foreign languages |

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Table 1 (continued)

CSEQ Variables, Descriptions, Variable Names and Codes

| Variable | Descriptions | Variable Name | Code |
|-----------------------------|--|---------------|---|
| | | | and literature, history, humanities, liberal /general studies, multidisciplinary studies, social sciences, visual and performing arts 0=All other majors |
| | Other/multiple majors | OTH_MAJOR | 1=Agriculture, health and related fields, parks/recreation/leisure studies/sports management, pre-professional, public administration, undecided, more than one major 0=All other majors |
| Student Faculty Interaction | (SFICOMP) | | |
| | Discussed ideas for a term paper or other class project with a faculty member | FAC3 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Discussed your career plans and ambitions with a faculty member | FAC4 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Socialized with a faculty member outside of class | FAC6 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Participated with other students in a discussion with one or more faculty members outside of class | FAC7 | 1=Never 2=Occasionally 3=Often 4=Very Often |

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Table 1 (continued)

CSEQ Variables, Descriptions, Variable Names and Codes

| Variable | Descriptions | Variable Name | Code |
|-----------------------|---|---------------|--|
| Intergroup Contact | Worked with a faculty member on a research project | FAC10 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Talked with a faculty member, counselor, or other staff member about personal concerns (IGCCOMP) | PERS8 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Became acquainted with students whose race or ethnic background was different than yours | STACQ4 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Became acquainted with students from another country | STACQ5 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Had serious discussions with students whose religious beliefs were very different from yours | STACQ8 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Had serious discussion with students whose race or ethnic background was different than yours | STACQ9 | 1=Never 2=Occasionally 3=Often 4=Very Often |
| | Had serious discussions with students from a country different from yours | STACQ10 | 1=Never 2=Occasionally 3=Often 4=Very Often |

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Table 1 (continued)

CSEQ Variables, Descriptions, Variable Names and Codes

| Variable | Descriptions | Variable Name | Code |
|---------------------|---|---------------|---|
| Cognitive Gains | (SCSRGCOMP) | | |
| | Writing clearly and effectively | GNWRITE | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Presenting ideas and information effectively when speaking to others | GNSPEAK | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Thinking analytically and logically | GNANALY | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Putting ideas together, seeing relationships, similarities, and differences between ideas | GNSYNTH | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Learning on your own, pursuing ideas, and finding information you need | GNINQ | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| Sociocultural Gains | (SCSRGCOMP) | | |
| | Gaining knowledge about other parts of the world and other people | GNWORLD | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Becoming aware of different philosophies, cultures, and ways of life | GNPHILS | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |
| | Developing the ability to get along with different kinds of people | GNOTHERS | 1=Very Little 2=Some 3=Quite a Bit 4=Very Much |

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I used a final question from the Personal Experiences section that asked respondents how often they spoke with a faculty member, counselor or staff member about personal concerns. The remaining items were taken from three subsections of the “Estimate of Gains” section and provided data on how student experiences impacted the cognitive and sociocultural gains of respondents. I used five of the seven measures of intellectual skills; gains in writing and speaking skills, abilities in analytical thinking, and synthesizing ideas were included. The fifth item asked the student to rate his/her gain in inquiry skills. These five were the most relevant to my study.

I used three of the eleven items from the General Education and Personal Development subsections to obtain data on sociocultural gains. These items reflect attitudes towards issues of racial, ethnic and cultural diversity. For the purpose of this study, sociocultural gains served as a proxy for sociocultural diversity, a term that typically includes socioeconomic status, religion, language and all manners of difference among peoples (Arnesen, Birzea, Dumont, Essomba, Furch, Vallianatos & Ferrer, 2008; Santrock, 2008;). Respondents reported their gains in knowledge of other parts of the world and different philosophies from the General Education subsection. From the Personal Development subsection, respondents assessed their gains in getting along with different kinds of people. The items chosen best reflected the focus of my study.

Reliability and Validity

The Center for Postsecondary Research at Indiana University has conducted reliability and validity analysis of the CSEQ. An instrument is considered reliable if the responses it generates are consistent through multiple collections of data (McMillan & Schumacher, 1997; Vogt, 1999). The CSEQ has been administered for many years with consistent results suggesting

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it is reliable. Numerous colleges and universities have administered the instrument for institutional purposes, and researchers have used the instrument for studies on educational outcomes related to institutional mission, student effort and student involvement (Davis & Murrell, 1993; Kuh & Hu, 2001; Terenzini, Springer, Yaeger, Pascarella & Nora, 1996).

The validity of an instrument refers to whether the instrument produces data about the phenomenon that the researcher intended to measure (Vogt, 1999). Construct and content validity are two measures of validity related to the CSEQ. Construct validity is ascertained by discovering if measures in the CSEQ are consistent with existing research on the same theoretical construct. Responses in QE scales are consistent with research on personal experiences, student acquaintances and estimate of gains (Gonyea, et al, 2003).

The content validity of a measure establishes an empirical relationship between the items and content area, that is, a measure of the degree to which the items study what is intended (Pedhazur & Schmelkin, 1991). Cronbach's alpha is a measure of internal validity used for items that have more than two answers, like those that associated with Likert scales. With a range of 0 to 1.0, a Cronbach alpha score above .70 indicates a strong relationship between items in an index (Gonyea & et al, 2003; Vogt, 1997). For this study, the items were taken from three sections of the CSEQ. The alphas for the items used ranged from 0.88 to 0.91, which implies high reliability. The reliability scores for Faculty Experiences was 0.88, and for Student Acquaintances it was 0.91. From the Estimate of Gains section items were taken from the Gains in Intellectual Skills, Gains in Personal Development, and Gains in General Education. The reliability scores were 0.81, 0.83, and 0.81 respectively (Gonyea, et al, 2003). Overall, the CSEQ is a valid instrument (Gonyea, et al., 2003). In 1994, the National Center for Educational

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Statistics created a report on various instruments, including the CSEQ, and noted that it carried strong psychometric properties (NCES, 1994).

Since I did not use all the items from each section of the CSEQ to create my composite scores, I calculated alphas for the items I used. The items used to create the composite score for SFI had an alpha of .82. The reliability score for items used to comprise the IGC score was .88. The alpha for the cognitive gains composite was .85, and the sociocultural gains composite had an alpha score of .70. The size of the sample mitigates any concern that the sociocultural gain score is at the low end of the recommended threshold for strong reliability.

Each of the items chosen to reflect cognitive and sociocultural gains were selected from indices within the CSEQ designated to reflect related gains and experiences, specifically, intellectual, diversity and personal development, and general education gains. The alpha scores of the composites indicate that the items hang together well despite the fact that not all of the items within a given section of the CSEQ were included in that composite.

Data Collection

I obtained approval to conduct this study through the Institutional Review Board for Research Involving Human Subjects (IRB) at my institution. Once I received approval, data collection and analysis commenced.

The College Student Experiences Questionnaire Research Program at the Indiana University Center for Postsecondary Research and Planning provided the data. I submitted a research proposal that outlined the purpose of research, including the research questions, sample demographic specifications, and items to be used in the study. The dataset was sent to me electronically after the CSEQ Research Program approved my proposal. All identifying information about the participants was deleted from the record prior to my receiving the data.

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Data Analysis

Data analysis consisted of two specific procedures. First, the data were prepared. Second, the data were analyzed using hierarchical linear regression. Each process was essential to facilitate appropriate analysis of the data for this study.

Preparing the Data

A number of steps were taken in preparing data for statistical analysis. Identifying missing cases was the first step. There are different methods on how to address missing data including exclusion of each case where data is missing or different forms of imputation (Scheffer, 2002). For this study, cases with missing data in demographic questions or questions on experiences used in the study were excluded from analysis since those data were essential to the study. During the recoding process of each variable, missing values were replaced with “99”. The statistical software package, SPSS, used in analyzing the data treated the denotation of “99” as missing and did not include it in the analysis. No cases with missing data were included in creating dummy coded variables or composite variables.

Despite efforts to minimize the loss of cases from the original sample (N = 2000), 193 cases were deleted. There were 50 cases removed for missing responses on race or ethnicity, and an additional 28 cases removed for lack of response to the question of sex. Twelve more cases were deleted for missing responses to the question on major: “other” and multiple majors were used to create a separate group for analysis. The number of missing cases excluded from analysis increased when I created composite scores for the independent and dependent variables. The student faculty interaction (SFI) and intergroup contact composite (IGC) scores added 32 and 67 missing cases respectively. There were 110 and 109 cases were missing data related to

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cognitive and sociocultural gains. However, cases with missing data were not exclusive, rendering a total of 193 cases deleted from the original sample (see Table 2).

Next, I recoded variables for analysis. The demographic questions on sex, race/ethnicity and major were recoded. The variable on sex (SEX_RC) was recoded so that male responses were coded as “0” and female responses as “1”; I elected to use the term “sex” instead of “gender” because that is the terminology utilized in the CSEQ. The nine race/ethnicity groups were collapsed into major racial groups: Caucasian, Black/African American, Asian/Pacific Islander, Latino/Hispanic, and Multiple/Other. Participants who identified as Mexican-American, Puerto Rican, or Other Hispanic were grouped into Latino/Hispanic. All remaining participants were grouped into Multiple/Other. The groups were recoded as Caucasian = 0; Black/African American = 1; Latino/Hispanic = 2; Asian/Pacific Islander = 3; Multiple/Other = 4.

Academic major of the participants was also dummy coded. The 24 different options for major (majsum) were recoded into four groups. The groups created reflected what research has revealed about academic majors and important outcomes of college education. The first group included Business majors. Science, technology, engineering and mathematics (STEM) majors are the second dummy coded academic major group. The third group represented participants who indicated humanities and other social science related majors, including humanities majors, education, liberal studies, history, and communication majors. The final group represents the participants who had the remaining majors available in the instrument and multiple majors. Prior studies have suggested that outcomes for students in the first three groups differ from outcomes for students in other academic majors (Ackerman, Kanfer, Beier, 2013; Guimond, et al., 2003; Sidanius, et al., 1991).

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Table 2

Frequency of Variables in Regression Equation

| Variable | N |
|------------|------|
| SEX_RC | 1972 |
| RACEC | 1437 |
| RACEAA | 211 |
| RACEHLAT | 91 |
| RACEAPR | 94 |
| RACEOTH | 117 |
| HUM_MAJOR | 648 |
| BUS_MAJOR | 419 |
| STEM_MAJOR | 207 |
| OTH_MAJOR | 712 |
| FAC3 | 1959 |
| FAC4 | 1955 |
| FAC6 | 1955 |
| FAC7 | 1956 |
| FAC10 | 1957 |
| PERS8 | 1935 |
| STACQ4 | 1927 |
| STACQ5 | 1925 |
| STACQ8 | 1928 |
| STACQ9 | 1928 |
| STACQ10 | 1924 |
| GNWRITE | 1882 |
| GNSPEAK | 1883 |
| GNANALY | 1877 |
| GNSYNTH | 1873 |
| GNINQ | 1877 |
| GNWORLD | 1890 |
| GNPHILS | 1883 |
| GNOTHERS | 1886 |

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The first group was called “BUS_MAJOR” (Business = 1; all other majors = 0). The second dummy coded group included STEM majors was called “STEM_MAJOR” (Computer and information sciences = 1; Engineering = 1; Mathematics = 1; Physical Sciences = 1; all other majors = 0). The third group that included humanities and other social science majors was called “HUM_MAJOR” (Communication = 1; Education = 1; Ethnic, cultural studies, and area studies = 1; Foreign languages and literature = 1; History = 1; Humanities = 1, Liberal/general studies = 1; Multidisciplinary studies = 1; Social sciences = 1; Visual and performing arts = 1; all other majors = 0). The final dummy coded group that identified participants who indicated the remaining majors in the instrument, as well as multiple majors, and was called “OTH_MAJOR” (Agriculture = 1; Health and related fields = 1; Parks, recreation, leisure studies, sports management = 1; Pre-professional = 1; Public administration = 1; Undecided = 1; More than one major = 1; all other majors = 0).

Next, it was necessary to dummy code variables for race. In each case, the reference group was coded as “1” and all remaining responses as “0”. The first race group dummy variable for Caucasian was called “RACEC” (Caucasian = 1; Black/African American = 0; Latino/Hispanic = 0; Asian/Pacific Islander = 0; Multiple/Other = 0). The second dummy variable for Black/African American was called “RACEAA” (Black/African American = 1; Caucasian = 0; Latino/Hispanic = 0; Asian/Pacific Islander = 0; Multiple/Other = 0). The group dummy variable for Latino/Hispanic was called “RACEHLAT” (Latino/Hispanic = 1; Caucasian = 0; Black/African American = 0; Asian/Pacific Islander = 0; Multiple/Other = 0). The dummy variable for Asian/Pacific Islander was called “RACEAPR” (Asian/Pacific Islander = 1; Caucasian = 0; Black/African American = 0; Latino/Hispanic = 0; Multiple/Other = 0). The final

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race group dummy variable for Multiple/Other was called “RACEOTH” (Multiple/Other = 1; Caucasian = 0; Black/African American = 0; Latino/Hispanic = 0; Asian/Pacific Islander = 0).

The next step was to create composite variables to reflect the main independent and dependent variables. The independent variables for intergroup contact (IGCCOMP) and student faculty interaction (SFICOMP) were each created using responses to questions measuring experiences with diversity and faculty respectively. Each composite variable was the mean of the combined responses. The dependent variables for cognitive gains (CSRGCOMP) and sociocultural gains (SCSRGCOMP) were created in a similar manner using the responses to survey questions on self-rated gains of participants.

The responses to five different questions were combined to create the composite for intergroup contact (IGCCOMP). Each of the questions asked respondents to share how often they engaged or exchanged with people different from themselves, i.e., experienced diversity. Specifically, questions on the frequency of serious conversations or exposure to students from different countries, cultures or ethnicities were included in this composite (STACQ4, STACQ5, STACQ8, STACQ9, STACQ10). For each question respondents rated their frequency on a scale (1 = never; 2 = occasionally; 3 = often; and 4 = very often). The composite score (IGCCOMP) was a mean of the sum of the selected questions, and ranged between 1 and 4.

The composite for student faculty interaction (SFICOMP) included responses to six questions. The questions used for the composite asked respondents to rate the frequency in which they engaged with faculty in settings beyond lecture and the classroom (FAC3, FAC4, FAC6, FAC7, FAC10, PERS8). Respondents were asked about the frequency with which they met with faculty to discuss term papers, personal concerns, career plans or to socialize outside the classroom. For each of the six questions respondents rated their frequency on a scale (1 =

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never; 2 = occasionally; 3 = often; and 4 = very often). The composite score (SFICOMP) was a mean of the sum of the selected questions, and ranged between 1 and 4.

The composite variables on self-rated gains are also the mean of the respective variables. The five variables comprising the cognitive gains composite (CSRGCOMP) asked respondents to rate their gain in different cognitive skills. These skills include effective writing and speaking, the analysis and synthesis of information and the ability to learn individually (GNWRITE, GNSPEAK, GNANALY, GNSYNTH, GNINQ). For each question respondents rated their gain on a scale (1 = very little; 2 = some; 3 = quite a bit; and 4 = very much). The composite score (CSRGCOMP) was a mean of the sum of the selected questions, and ranged between 1 and 4.

The final composite variable (SCSRGCOMP) used three questions where respondents were asked to rate their gains in areas that reflect diversity. I used responses to questions on gains in knowledge of other parts of the world and different peoples, philosophies and cultures, as well as gains in the ability to get along with different people (GNWORLD, GNPHILS, GNOTHERS). For each question respondents rated their gain on a scale (1 = very little; 2 = some; 3 = quite a bit; and 4 = very much). The composite score (SCSRGCOMP) was a mean of the sum of the selected questions, and ranged between 1 and 4.

Analyzing the Data

Once cleaned and recoded, I analyzed the data using multiple regression analysis. Regression analysis seeks to identify changes in the dependent variable that are a result of changes in the independent variable. Multiple regression analysis is used in identifying separate and combined effects of multiple independent variables on a dependent variable (Pedhazur, 1997). The analysis for this study included two multiple regression analyses, using hierarchical reasoning for each equation as I chose the steps in which each independent variable was entered

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into the equation. The first examined the relationship between SFI/IGC and cognitive gains. The second focused on the relationship between SFI/IGC and sociocultural gains. Each regression equation followed the same steps with the exception of the dependent variable. For each equation, sex and race variables were entered into step 1, followed by major variables in step two, and both SFI and IGC were entered in the final step (see Tables 3 and 4). In each of the equations, Caucasian (RACEC) and other major (OTH_MAJ) were used as reference groups.

In summary, this study was designed to explore the linkages between collegiate experiences in select areas and select gains among college students. The methodology described in this chapter was deemed sufficient to answer the research questions posed in the study.

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Table 3

Hierarchical Regression Equation for Cognitive Gains

Model 1

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$$

Model 2

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8$$

Model 3

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + b_9 X_9 + b_{10} X_{10}$$

| Model 1 ^{a,b} | Model 2 ^{a,b} | Model 3 ^{a,b} |
|--------------------------------------|--------------------------------------|--------------------------------------|
| Y= cognitive gains | Y= cognitive gains | Y= cognitive gains |
| a = intercept | a = intercept | a = intercept |
| b_1 = beta coefficient of SEX_RC | b_1 = beta coefficient of SEX_RC | b_1 = beta coefficient of SEX_RC |
| X_1 = SEX_RC | X_1 = SEX_RC | X_1 = SEX_RC |
| b_2 = beta coefficient of RACEAA | b_2 = beta coefficient of RACEAA | b_2 = beta coefficient of RACEAA |
| X_2 = RACEAA | X_2 = RACEAA | X_2 = RACEAA |
| b_3 = beta coefficient of RACEHLAT | b_3 = beta coefficient of RACEHLAT | b_3 = beta coefficient of RACEHLAT |
| X_3 = RACEHLAT | X_3 = RACEHLAT | X_3 = RACEHLAT |
| b_4 = beta coefficient of RACEAPR | b_4 = beta coefficient of RACEAPR | b_4 = beta coefficient of RACEAPR |

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Table 3 (continued)

Hierarchical Regression Equation for Cognitive Gains

| Model 1 | Model 2 | Model 3 |
|--|--|--|
| $X_4 = \text{RACEAPR}$ | $X_4 = \text{RACEAPR}$ | $X_4 = \text{RACEAPR}$ |
| $b_5 = \text{beta coefficient of RACEOTH}$ | $b_5 = \text{beta coefficient of RACEOTH}$ | $b_5 = \text{beta coefficient of RACEOTH}$ |
| $X_5 = \text{RACEOTH}$ | $X_5 = \text{RACEOTH}$ | $X_5 = \text{RACEOTH}$ |
| | $b_6 = \text{beta coefficient of STEM_MAJOR}$ | $b_6 = \text{beta coefficient of STEM_MAJOR}$ |
| | $X_6 = \text{STEM_MAJOR}$ | $X_6 = \text{STEM_MAJOR}$ |
| | $b_7 = \text{beta coefficient of HUM_MAJOR}$ | $b_7 = \text{beta coefficient of HUM_MAJOR}$ |
| | $X_7 = \text{HUM_MAJOR}$ | $X_7 = \text{HUM_MAJOR}$ |
| | $b_8 = \text{beta coefficient of BUS_MAJOR}$ | $b_8 = \text{beta coefficient of BUS_MAJOR}$ |
| | $X_8 = \text{BUS_MAJOR}$ | $X_8 = \text{BUS_MAJOR}$ |
| | | $b_9 = \text{beta coefficient of SFICOMP}$ |
| | | $X_9 = \text{SFICOMP}$ |
| | | $b_{10} = \text{beta coefficient of IGCCOMP}$ |
| | | $X_{10} = \text{IGCCOMP}$ |

Notes:

^a RACEC was used as the reference group for race in the regression model.

^b OTH_MAJOR was used as the reference group for academic major in the regression model.

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Table 4

Hierarchical Regression Equation for Sociocultural Gains

Model 1

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$$

Model 2

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8$$

Model 3

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + b_9 X_9 + b_{10} X_{10}$$

| Model 1 ^{a,b} | Model 2 ^{a,b} | Model 3 ^{a,b} |
|--------------------------------------|--------------------------------------|--------------------------------------|
| Y= cognitive gains | Y= cognitive gains | Y= cognitive gains |
| a = intercept | a = intercept | a = intercept |
| b_1 = beta coefficient of SEX_RC | b_1 = beta coefficient of SEX_RC | b_1 = beta coefficient of SEX_RC |
| X_1 = SEX_RC | X_1 = SEX_RC | X_1 = SEX_RC |
| b_2 = beta coefficient of RACEAA | b_2 = beta coefficient of RACEAA | b_2 = beta coefficient of RACEAA |
| X_2 = RACEAA | X_2 = RACEAA | X_2 = RACEAA |
| b_3 = beta coefficient of RACEHLAT | b_3 = beta coefficient of RACEHLAT | b_3 = beta coefficient of RACEHLAT |
| X_3 = RACEHLAT | X_3 = RACEHLAT | X_3 = RACEHLAT |
| b_4 = beta coefficient of RACEAPR | b_4 = beta coefficient of RACEAPR | b_4 = beta coefficient of RACEAPR |

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Table 4 (continued)

Hierarchical Regression Equation for Sociocultural Gains

| Model 1 | Model 2 | Model 3 |
|--|--|--|
| $X_4 = \text{RACEAPR}$ | $X_4 = \text{RACEAPR}$ | $X_4 = \text{RACEAPR}$ |
| $b_5 = \text{beta coefficient of RACEOTH}$ | $b_5 = \text{beta coefficient of RACEOTH}$ | $b_5 = \text{beta coefficient of RACEOTH}$ |
| $X_5 = \text{RACEOTH}$ | $X_5 = \text{RACEOTH}$ | $X_5 = \text{RACEOTH}$ |
| | $b_6 = \text{beta coefficient of STEM_MAJOR}$ | $b_6 = \text{beta coefficient of STEM_MAJOR}$ |
| | $X_6 = \text{STEM_MAJOR}$ | $X_6 = \text{STEM_MAJOR}$ |
| | $b_7 = \text{beta coefficient of HUM_MAJOR}$ | $b_7 = \text{beta coefficient of HUM_MAJOR}$ |
| | $X_7 = \text{HUM_MAJOR}$ | $X_7 = \text{HUM_MAJOR}$ |
| | $b_8 = \text{beta coefficient of BUS_MAJOR}$ | $b_8 = \text{beta coefficient of BUS_MAJOR}$ |
| | $X_8 = \text{BUS_MAJOR}$ | $X_8 = \text{BUS_MAJOR}$ |
| | | $b_9 = \text{beta coefficient of SFICOMP}$ |
| | | $X_9 = \text{SFICOMP}$ |
| | | $b_{10} = \text{beta coefficient of IGCCOMP}$ |
| | | $X_{10} = \text{IGCCOMP}$ |

Notes:

^a RACEC was used as the reference group for race in the regression model.

^b OTH_MAJOR was used as the reference group for academic major in the regression model.

Chapter Four

Results

This chapter reports the results of the study. I start by describing the sample. The second section presents the results of the data analyses and responds to the two research questions posed in the study.

Sample

After accounting for missing data, the sample included 1,807 records submitted by respondents who participated in the 2007, 2008, 2009 and 2010 administrations of the College Student Experiences Questionnaire (CSEQ). The sample was drawn from 6,172 participants who identified as college seniors on the questionnaire: 1,570 in 2007, 1,583 in 2008, 1,805 in 2009, and 1,214 in 2010.

Among the 1,807 participants, 1,087 (60.2%) were female and 720 (39.8%) were male. Participants were assigned to one of five racial groups for analysis. White/Caucasian students were the majority of the sample, numbering 1,332 (73.7%). African American students made up the second largest group at 191 (10.6%), followed by Asian/Pacific Islanders at 90 (5%) and then Latino/Hispanic at 87 (4.8%). The remaining participants in the sample were combined to make the final group, Other, that numbered 107 (5.9%). Participants were also assigned to one of four academic major groups. The first group of 385 (21.3%) was comprised of business majors. STEM majors were the next group representing 188 (10.4%) respondents, followed by those in humanities majors at 580 (32.1%). The final group was made of participants who indicated their major was agriculture, pre professional, recreation management, public administration, were

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undecided or in majors not indicated in the CSEQ. This final group was the largest of the four, numbering 654 (36.2%).

Results of Data Analyses

I conducted hierarchical regression analysis to address both research questions in the study. The purpose of hierarchical regression is to determine “the proportion of variance accounted by all the independent variables (i.e., R^2) is partitioned incrementally, noting the increment in the proportion of variance accounted for by each independent variable (or by a set of independent variables)” (Pedhazur, p. 244, 1997). For purposes of this study, two separate analyses were conducted using cognitive gains and sociocultural gains as the dependent variables. The same eleven independent variables were included in each analysis and each analysis included three models.

Cognitive and sociocultural gains were composite scores for each participant comprised of responses to items on the CSEQ. The cognitive gains composite included responses to five items that asked students for self-rated gains in writing and speaking skills, and abilities in analytical thinking, inquiry and synthesizing ideas ($\alpha = .85$). The composite for sociocultural gains was comprised of three items that asked students to self-rate respective gains in knowledge of other parts of the world, different philosophies, and the ability to get along with people different than them ($\alpha = .70$).

The independent variables included sex, race, academic major, and composite variables for intergroup contact (IGC) and student faculty interaction (SFI). Variables for race included Caucasian, African American, Asian/Pacific Islander, Latino/Hispanic, and “Other” (Native American, more than one, other). Responses to academic major were parceled into four variables including business majors, STEM majors, humanities majors, and participants who

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identified as having multiple majors. Six items comprising SFI asked participants to respond to the frequency with which they interacted with faculty outside of class alone or with classmates, how often they discussed projects, career plans, or personal concerns with faculty, and the level at which they worked with faculty on research projects ($\alpha = .82$). IGC was composed of five items that asked students to identify the frequency with which they became acquainted with students of different races or nationalities, and how often they had serious discussions with students from different religions, races, and countries ($\alpha = .88$).

The hierarchical analysis was run to determine if the addition of academic major, then SFI and IGC improved the prediction of gains above sex and race. The partitions, or “blocks”, of independent variables for each hierarchical analysis were identical, resulting in three regression models in each equation. As the analysis progressed through the blocks, each independent variable’s contribution to the prediction of the dependent variable was assessed after controlling for the previous independent variables. The first block included sex and race, and the second block added academic major to the analysis. The final block included all the remaining variables of the analysis after adding SFI and IGC and accounting for the previous two blocks.

To assess the results of hierarchical regression equation, it is important evaluate a number of different statistics. One important measure is R^2 , which denotes the variation of the dependent variable explained by the independent variable(s) in the equation. As the hierarchical regression progresses through each model the significance of R^2 and the change in R^2 between each model is evaluated.

The purpose of running a hierarchical regression is to assess the contribution of each independent variable to the dependent variable. That contribution is evaluated through the significance of regression coefficients, i.e. (B), of each independent variable, which estimates the

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change in dependent variable, (cognitive or sociocultural gains), for each unit increase in a predictor. Overall, the purpose of the study is reflected in the final model in the analysis: the impact the independent variables as a whole have on the dependent variable.

Regression Analysis of Cognitive Gains

The first question posed in this study explored the relationship between SFI and IGC on cognitive gains. Before conducting the analysis, I tested the assumptions of regression analysis including linearity, homoscedasticity, normality and multicollinearity. The first two assumptions can be tested by reviewing a scatterplot of the relationship between the predicted and residual scores for cognitive gains. To check for linearity, the scores should appear as a horizontal scatter of the residual scores. For homoscedasticity, the residuals must be spread equally over the predicted values of cognitive gains. The scatterplot for cognitive gains in Figure 1 reflects that these criteria were met.

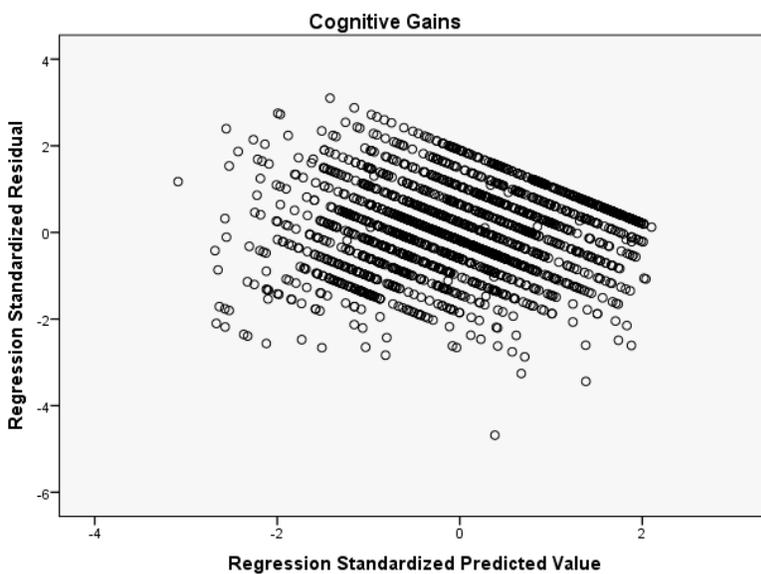


Figure 1. Scatterplot test for linearity assumption of cognitive gains

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Two different tests can be used to check for normality: a histogram and a P-P Plot. In this case, the histogram (Figure 2) shows a normal distribution of the standardized residuals, and

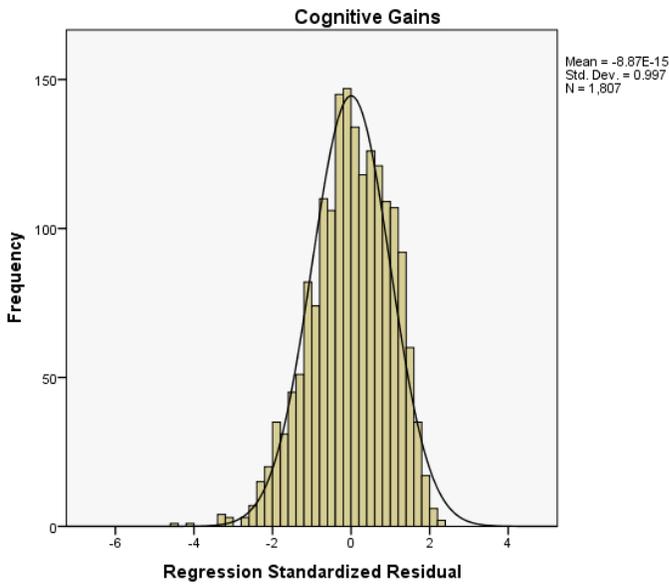


Figure 2. Histogram test for normality assumption of cognitive gains

the P-P Plot of studentized residuals shows normal distribution along a diagonal line (Figure 3).

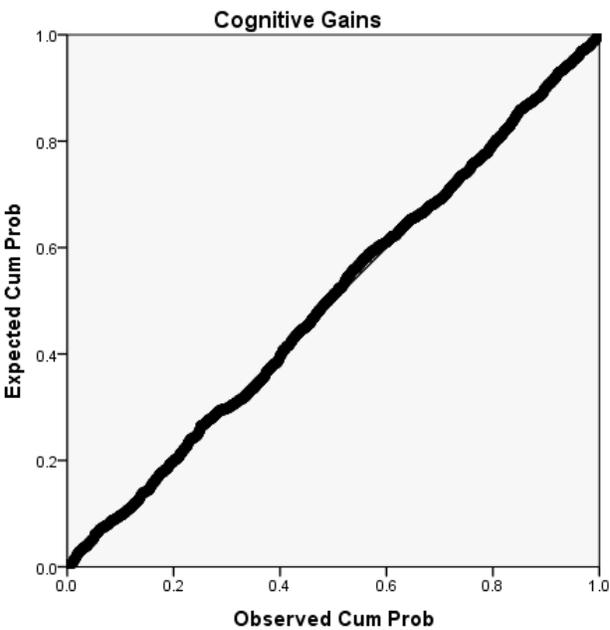


Figure 3. P-P Plot test for normality assumption of cognitive gains.

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For the final assumption test of multicollinearity, the correlation of two or more of the independent variables is tested. For a violation of multicollinearity, a correlation of .70 or higher between two variables must exist. The correlations between independent variables in the analysis of cognitive gains show that no high correlation is present (Table 5).

Since I found no violation of assumptions, I ran the analysis. The first block of analysis regressed sex and race on cognitive gains (Table 6). The prediction of cognitive gains by sex and race was significant, $R^2=.013$, $F(5,1801) = 4.787$, $p < .0005$. This result suggests race and sex are both significant predictors, and account for 1.3% of the variance in cognitive gains (Table 7), revealing that women have a cognitive gain that is 0.098 higher than men. However, not all racial groups were significant. As indicated in the method section, the racial groups were converted into five different dummy variables (RACEHLAT, RACEAA, RACEC, RACEOTH and RACEAPR). The regression coefficients showed that being Latino/Hispanic (RACEHLAT) ($B = .158$, $p < .05$) was significant, indicating the cognitive gain of 0.158 higher when compared to the cognitive gains of Caucasian (RACEC) participants (Table 8). Moreover, African American (RACEAA) ($B = .121$, $p < .05$) was 0.121 higher predictor of cognitive gains compared to Caucasian, while Asian/Pacific Islander (RACEAPR) and other races (RACEOTH) are not significant predictors compared to other racial groups, ($p < .05$).

The second partitioning of independent variables included academic majors (Block 2), and lead to a change in R^2 of .005, $F(8, 1798) = 1.403$. Academic majors were converted into four different dummy variables (STEM_MAJOR, BUS_MAJOR, HUM_MAJOR, OTH_MAJOR) for the regression analysis. Regressing academic major on cognitive gains revealed a minimal change in R^2 ; less than half a percent of the variance in cognitive gains (Table 7). However, the block as a whole was significant despite the regression coefficients showing no academic major variables as predictors of cognitive gains (Table 8).

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Table 5

Correlations Between Independent Variables in the Regression on Cognitive Gains (N=1807)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|------|------|----|
| 1. Sex | -- | | | | | | | | | |
| 2. African American | .015 | -- | | | | | | | | |
| 3. Asian/Pacific Islander | .004 | -.079 | -- | | | | | | | |
| 4. Hispanic/Latino | -.002 | -.077 | -.051 | -- | | | | | | |
| 5. Race Others | .013 | -.086 | -.057 | -.056 | -- | | | | | |
| 6. STEM Majors | -.104 | .013 | .080 | .016 | -.039 | -- | | | | |
| 7. Business Majors | -.187 | .054 | -.020 | -.003 | -.039 | -.177 | -- | | | |
| 8. Humanities Majors | .141 | -.024 | -.059 | -.027 | -.012 | -.234 | -.358 | -- | | |
| 9. SFI | .010 | .027 | -.003 | -.006 | .026 | -.032 | -.091 | .067 | -- | |
| 10. IGC | -.031 | .145 | .081 | .032 | .080 | -.050 | -.031 | .007 | .344 | -- |

Note: Multicollinearity indicated > .7

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Table 6

*Summary of Hierarchical Regression Analysis for Variables Predicting Cognitive Gains
(N=1807)*

| | Block 1 | | Block 2 | | Block 3 | |
|---------------------------|----------|---------|----------|---------|----------|---------|
| | B | β | B | β | B | β |
| Constant | 3.012*** | | 3.016*** | | 2.171*** | |
| Sex | .098** | .077 | .090 | .070 | .109 | .085 |
| African American | .121* | .059 | .123 | .060 | .032 | .016 |
| Asian/Pacific Islander | -.077 | -.027 | -.064 | -.022 | -.134 | -.046 |
| Hispanic/Latino | .158* | .054 | .162 | .055 | .126 | .043 |
| Race Others | .046 | .018 | .044 | .017 | -.027 | -.010 |
| STEM Majors | | | -.085 | -.042 | -.031 | -.015 |
| Business Majors | | | .004 | .003 | .056 | .036 |
| Humanities Majors | | | .023 | .017 | .019 | .014 |
| SFI | | | | | .193*** | .215 |
| IGC | | | | | .168*** | .215 |

*Note: *p < .05, **p < .005, ***p < .0005*

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Table 7

Cognitive Gains Hierarchical Regression Model Summary (N=1807)

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change | df1 | df2 | Sig. F Change |
|-------|------|----------|-------------------|----------------------------|-----------------|----------|-----|------|---------------|
| 1 | .115 | .013 | .010 | .62286 | .013 | 4.787 | 5 | 1802 | .000 |
| 2 | .124 | .015 | .011 | .62265 | .002 | 1.403 | 2 | 1799 | .240 |
| 3 | .368 | .136 | .131 | .58372 | .120 | 124.906 | 2 | 1797 | .000 |

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Table 8

Regression Analysis for Cognitive Gains (N=1807)

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|------|-------------|--------|------|
| 1 | Regression | 9.285 | 5 | 1.857 | 4.787 | .000 |
| | Residual | 698.710 | 1801 | .388 | | |
| | Total | 707.995 | 1806 | | | |
| 2 | Regression | 10.917 | 8 | 1.365 | 3.520 | .000 |
| | Residual | 697.078 | 1798 | .388 | | |
| | Total | 707.995 | 1806 | | | |
| 3 | Regression | 96.037 | 10 | 9.604 | 28.185 | .000 |
| | Residual | 611.958 | 1796 | .341 | | |
| | Total | 707.995 | 1806 | | | |

Note: $p < .0005$

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The full regression model including SFI and IGC (Block 3) produced a substantial R^2 change. Adding SFI and IGC resulted in a significant change of R^2 of .12, $F(9, 1797) = 28.185$, $p < .0005$ (Table 7). The first two partitions that included sex, race and academic major showed significant inference on variance of cognitive gains, but the final model accounts for nearly 13.6% of variance. The first question in this study sought to identify whether SFI (SFICOMP) and IGC (IGCCOMP) influenced cognitive gains when controlling for the other IVs, and the regression coefficients of the full model show both SFI and IGC are significant predictors; SFI has a strong coefficient of ($B = .193$, $p < .0005$) and IGC nearly as strong at ($B = .168$, $p < .0005$). For each unit increase in SFI and IGC, there is a .193 and .168 increase in cognitive gains respectively (Table 8). Replacing the regression coefficients with the respective estimates, the final regression equation for cognitive gains is:

$$\text{CSRGCMP} = 2.171 + .098*\text{SEX_RC} + .121*\text{RACEAA} + .0158*\text{RACEHLAT} - .077*\text{RACEAPR} + .046*\text{RACEOTH} - .085*\text{STEM_MAJOR} + .023*\text{HUM_MAJOR} + .004*\text{BUS_MAJOR} + .193*\text{SFICOMP} + .168*\text{IGCCOMP}$$

Regression Analysis of Sociocultural Gains

Following the same process as the analysis of cognitive gains, I tested assumptions for the analysis of sociocultural gains. The scatterplot graphic shows the horizontal scatter of residual scores and equal spread of predicted values to satisfy the assumptions of linearity and homoscedasticity (Figure 4). The normal distribution evident in the histogram and along the diagonal of the P-P plot fulfills the criteria for normality (see Figures 5 and 6). The assumption for multicollinearity is also met (Table 9) as no correlation between independent variables surpasses the .7 threshold.

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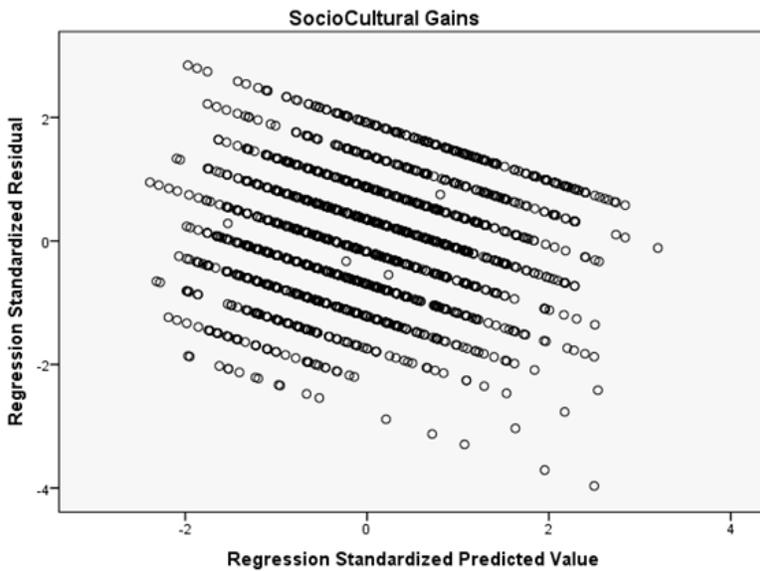


Figure 4. Scatterplot test for linearity assumption of sociocultural gains.

The hierarchical regression analysis of SFI and IGC on sociocultural gains followed the same partitioning scheme as the analysis of cognitive gains (Table 10). The first partition (Block 1) entailed a regression equation with sex and race as independent variables.

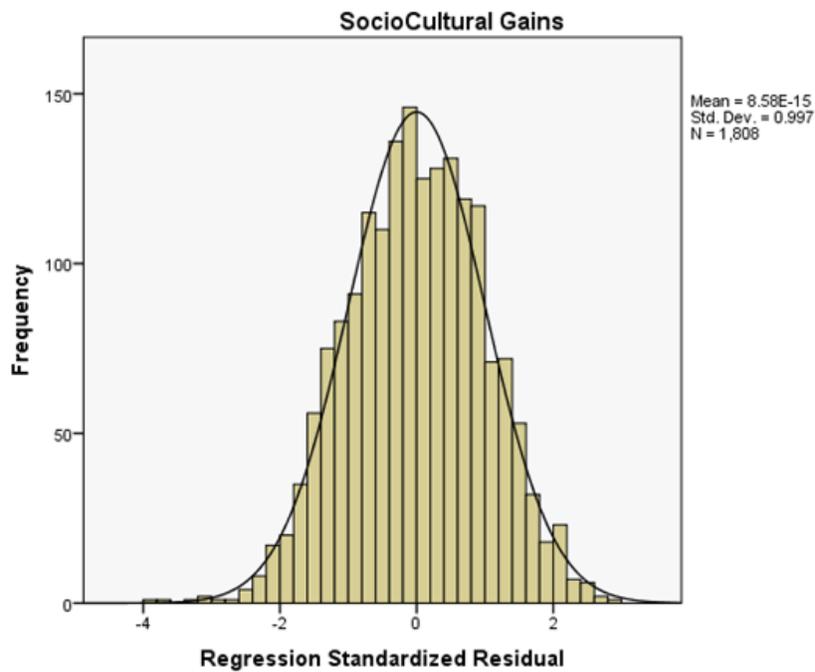


Figure 5. Histogram test for normality assumption of sociocultural gains.

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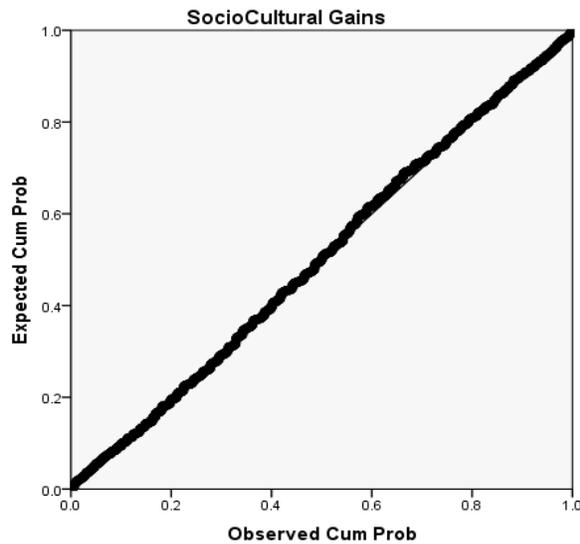


Figure 6. P-P Plot test for normality assumption of sociocultural gains.

The equation was significant, R^2 of .009, $F(5, 1801) = 3.302$, $p < .05$, accounting for less than 1% of variance in sociocultural gains (Table 11). Despite the fact that sex (SEX_RC) was not significant, three different race predictors were significant. The regression coefficients indicate that African American (RACEAA) ($B = .155$, $p < .005$) is significant, showing a 0.155 higher sociocultural gain than Caucasians, the reference group (Table 12). Moreover, Asian/Pacific-Rim (RACEAPR) ($B = .151$, $p < .05$) were 0.151 higher and Latino/Hispanic (RACEHLAT) ($B = .182$, $p < .05$) were 0.182 higher in sociocultural gain than Caucasians (Table 10). The only race group not significant was the Other group (RACEOTH).

The second partitioning also proved to be significant (Block 2) after introducing academic major into the regression equation and controlling for sex and race. Showing an R^2 change of .012, the equation resulted in both positive and negative predictor influence on the variance in sociocultural gains, $R^2 = .021$, $F(8, 1799) = 4.802$, $p < .0005$ (Table 10 and 11). STEM majors (STEM_MAJOR) ($\beta = -.165$, $p < .005$) were a negative predictor, a -0.165 less

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Table 9

Correlations Between Independent Variables in the Regression on Sociocultural Gains (N=1807)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|------|------|----|
| 1. Sex | -- | | | | | | | | | |
| 2. African American | .015 | -- | | | | | | | | |
| 3. Asian/Pacific Islander | .004 | -.079 | -- | | | | | | | |
| 4. Hispanic/Latino | -.002 | -.077 | -.051 | -- | | | | | | |
| 5. Race Others | .013 | -.086 | -.057 | -.056 | -- | | | | | |
| 6. STEM Majors | -.102 | .012 | .080 | .016 | -.040 | -- | | | | |
| 7. Business Majors | -.187 | .054 | -.020 | -.003 | -.039 | -.178 | -- | | | |
| 8. Humanities Majors | .140 | -.024 | -.059 | -.027 | -.012 | -.235 | -.357 | -- | | |
| 9. SFI | .010 | .028 | -.003 | -.006 | .026 | -.033 | -.091 | .067 | -- | |
| 10. IGC | -.031 | .145 | .081 | .032 | .080 | -.051 | -.031 | .007 | .344 | -- |

Note: Multicollinearity indicated > .7

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Table 10

Summary of Hierarchical Regression Analysis for Variables Predicting Sociocultural Gains (N=1807)

| | Block 1 | | Block 2 | | Block 3 | |
|------------------------|----------|---------|---------|---------|---------|---------|
| | B | β | B | β | B | β |
| Constant | 2.722*** | | 2.717 | | 1.623 | |
| Sex | .032 | .022 | .008 | .006 | .036 | .032 |
| African American | .155** | .068 | .163 | .071 | .030 | .050 |
| Asian/Pacific Islander | .151* | .047 | .184 | .057 | .077 | .070 |
| Hispanic/Latino | .182* | .055 | .194 | .059 | .138 | .071 |
| Race Others | .075 | .025 | .073 | .025 | -.029 | .065 |
| STEM Majors | | | -.165** | -.072 | -.091 | -.039 |
| Business Majors | | | .004 | .002 | .068 | .039 |
| Humanities Majors | | | .104* | .069 | .102 | .068 |
| SFI | | | | | .200*** | .198 |
| IGC | | | | | .260*** | .297 |

*Note: *p < .05, **p < .005, ***p < .0005*

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Table 11

Sociocultural Gains Hierarchical Regression Model Summary (N=1807)

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | R Square Change | F Change | df1 | df2 | Sig. F Change |
|-------|------|----------|-------------------|----------------------------|-----------------|----------|-----|------|---------------|
| 1 | .095 | .009 | .006 | .70113 | .009 | 3.302 | 5 | 1802 | .006 |
| 2 | .145 | .021 | .017 | .69751 | .012 | 7.246 | 3 | 1799 | .000 |
| 3 | .427 | .182 | .178 | .63778 | .161 | 177.366 | 2 | 1797 | .000 |

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Table 12

Regression Analysis of Sociocultural Gains (N=1807)

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|------|-------------|--------|------|
| 1 | Regression | 8.116 | 5 | 1.623 | 3.302 | .006 |
| | Residual | 885.833 | 1802 | .492 | | |
| | Total | 893.949 | 1807 | | | |
| 2 | Regression | 18.692 | 8 | 2.337 | 4.802 | .000 |
| | Residual | 875.257 | 1799 | .487 | | |
| | Total | 893.949 | 1807 | | | |
| 3 | Regression | 162.986 | 10 | 16.299 | 40.068 | .000 |
| | Residual | 730.963 | 1797 | .407 | | |
| | Total | 893.949 | 1807 | | | |

Note: p < .0005

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significant predictor than other majors (OTH_MAJOR) (Table 10). Humanities majors (HUM_MAJOR) ($B = .104$, $p < .05$) were shown to be a positive influence, a 0.104 more significant predictor than other majors, but the coefficient for business majors (BUS_MAJOR) suggested that there was no influence on sociocultural gains (Table 10).

The final model (Block 3) resulted in a significant change in R^2 of .161 from Model 2, indicating that the addition of SFI and IGC account for more than 18% of the variance in sociocultural gains (Table 11,12), $R^2 = .182$, $F(10, 1797) = 40.068$, $p < .0005$. The regression coefficients for both SFI (SFICOMP) and IGC (IGCCOMP) imply a statistically significant influence on sociocultural gains, ($B = .200$, $p < .0005$) and ($B = .260$, $p < .0005$) respectively (see Table 12). Each unit increase of SFI resulted in a .200 increase in sociocultural gains. Showing even stronger influence, for each unit increase of IGC there was a .260 increase in sociocultural gains. After replacing the estimates with the respective regression coefficients, the final regression equation for sociocultural gains was:

$$\begin{aligned} \text{SCSRGCOMP} = & 1.623 + .032*\text{SEX_RC} + .155*\text{RACEAA} + .182*\text{RACEHLAT} + \\ & .151*\text{RACEAPR} + .075*\text{RACEOTH} + -.165*\text{STEM_MAJOR} + .104*\text{HUM_MAJOR} + \\ & .004*\text{BUS_MAJOR} + .200*\text{SFICOMP} + .260*\text{IGCCOMP} \end{aligned}$$

In conclusion, the results of this study provided answers to the two questions posed in this study. Overall, sex had a significant influence on cognitive gains but not on sociocultural gains. Race too, had a strong influence on gains. While being of African American and Hispanic/Latino descent had strong influences on cognitive and sociocultural gains, being of Asian/Pacific Islander background only influenced sociocultural gains. Being a STEM major had a negative influence on sociocultural gains for students, while being a humanities major had

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a positive influence. Majoring in business had no influence on sociocultural gains, and no academic major positively influences cognitive gains. However, both SFI and IGC had a strong influence on students' cognitive and sociocultural gains. Chapter Five discusses these results and their implications for future practice, research and policy.

Chapter Five

Discussion and Implications

This chapter includes a discussion on the study's findings. I start by reviewing the results and answering the two research questions posed in the study. Next, I describe how the findings compare to prior research, and suggest how the results may be used in future practice, research and policy in higher education. I conclude by offering limitations to the study and final thoughts.

Discussion

The first research question in this study sought to determine the level of influence that SFI and IGC had on cognitive gains when controlling for sex, race and academic major. A hierarchical regression model was designed rendering a final regression equation that revealed that SFI and IGC together explain a significant portion of variance (13%) in cognitive gains. Cognitive skills in the study included writing and speaking skills, analyzing ideas and thinking on one's own. SFI items included discussing a paper or project, career plans or personal concerns with a faculty member, as well as socializing or having discussions with faculty and peers outside of class and working with faculty on research projects. Items reflecting IGC included being acquainted with students from different ethnic and racial backgrounds, different countries and religions, and having serious conversations with peers from different races and countries.

Essentially, this result suggests that the more frequently students interact with faculty members about class projects or career interests, talk with faculty outside of class or about personal matters (all SFI activities), and when they get to know students who are different from themselves with respect to race, nationality, background, and religion (all IGC activities), they make cognitive gains in writing, speaking, analyzing ideas, and learning on their own.

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There are a couple of different reasons why SFI may contribute to cognitive gains. To start, college and university leaders are increasingly offering programs such as undergraduate research initiatives that promote student-faculty interactions. These programs foster the kind of interactions between students and faculty that promote cognitive growth.

Additionally, students are increasingly immersing themselves in campus activities, particularly Millennial generation students. They have grown up in an atmosphere where participation is rewarded and have translated that participation to campus life. Consequently, they may be participating in clubs and organizations that are advised by faculty members, increasing their interpersonal interaction with faculty, hence realizing cognitive gains.

Likewise, there may be a couple explanations for the influence that IGC has on cognitive gains. College students are an increasingly diverse lot. Enrollments among students from traditionally underrepresented groups, particularly Hispanics and international students, are growing rapidly. This increases the opportunity for students to interact with others who are different from them. As students engage with people from different backgrounds, they are exposed to different ways of thinking and alternative philosophies – the kinds of activities that are associated with cognitive gains in this study.

Second, the curriculum has increasingly exposed students to issues of diversity. In fact, many institutions now require all students to complete at least one course that exposes them to issues of diversity. These classes introduce students to different philosophies and require them to engage in conversations with others who are different than them. These are the very activities that the results of my study suggest are associated with increases in cognitive skills. For every unit increase of IGC, cognitive gains increase .193 (see Table 6).

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Finally, it is important to note the impact that sex, race, and academic major have on cognitive gains. These factors explain <1.5% of variance, but vary by demographic characteristic. For example, female students achieve more cognitive gains than men. Asian/Pacific Islander students do not show the same positive and significant response as whites, African Americans or Hispanic students (see Table 6). Despite the fact that STEM majors often engage with faculty members in project work, and humanities majors are more likely to engage in diversity courses and focus on disciplines that include the study of race, religion and culture, no single academic major had a significant impact on cognitive gains.

To address the second question in this study, a hierarchical regression model was designed with the same independent and control variables but a different dependent variable: sociocultural gains. The resultant regression equation rendered similar results as the first, with SFI and IGC accounting for a significant portion of variance (18.2%) in sociocultural gains. The outcomes that comprise sociocultural gains are seen as important to the success after college as cognitive gains (AAC&U, 2005). The ability to get along with different kinds of people, awareness of different philosophies and cultures, and knowing about other parts of the world (all sociocultural gains) have become increasingly important to employers.

There are reasons why SFI might contribute to sociocultural gains. For one, although the professoriate is largely made up of white faculty members, students who have the opportunity to engage with minority faculty members explore different points of view and are challenged in their ways of thinking. Additionally, minority faculty often teach the diversity courses that are becoming required elements of the core curriculum on college campuses. When minority faculty members have meaningful exchanges with students about papers or projects, or participate in conversations with students outside classroom, there may be an impact on sociocultural gains.

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There are also a few explanations as to why IGC affects sociocultural gains. The college campus provides a number of opportunities for students from different backgrounds to have meaningful interactions. Interactions with others different than oneself are more likely given the increasing diversity of students on campus. Extensive resources are dedicated to the co-curricular experiences of college students, from speakers to concerts to social activities. As students participate in these activities, the potential for exposure and meaningful discourse with students different than themselves is more likely. These facets of IGC can translate into sociocultural gains.

One potentially influential example of where IGC can take place is the residential setting. Few settings have greater capacity for late night discussions and commiseration than the setting roommates share. If roommates happen to be from different racial or cultural backgrounds, each has the opportunity to learn about the other, and grow in their understanding of a different place, culture or point of view leading to sociocultural gains.

However, it is important to recognize that not all students experience the gains in understanding and knowledge of others that SFI and IGC can promote. Students of different genders, races and academic majors can respond to these influences differently. These demographic factors account for <2% of the variance in sociocultural gains. Sex has no significant bearing on sociocultural gains. Race is a significant predictor of gains, however, as African American, Hispanic/Latino and Asian/Pacific Islander students each experience more positive gains than white students. While humanities students enjoy positive gains, STEM fields are a negative predictor and studying business has no impact at all on sociocultural gains (see Table 10).

Connections of the Results to Prior Research

It is also important to examine how the findings of my study relate to prior research on the topic. To start, the influence of SFI on cognitive gains (Anaya, 2001a; Ishiyama, 2002; Kuh & Hu, 2001; Toutkoushian & Smart, 2001) and the influence of IGC on sociocultural gains (Bowman, 2009; Chang, et al., 2006; Gurin, et al., 2002; Villalpando, 2002) have been studied extensively. However, research on the impact of SFI on sociocultural gains and of IGC on cognitive gains is sparse. Moreover, the impact of both predictors (SFI and IGC) interacting on each outcome (cognitive and sociocultural gains) had not been studied. The design of this study, utilizing composites for both the predictors and outcomes, addressed that gap and the results both partially confirm and contradict prior research on these outcomes. In general, my results regarding the significance of IGC and SFI on both outcomes confirm previous studies, but they conflict with results from prior research with respect to which students benefit from SFI and IGC experiences.

For example, my results are consistent with prior research that revealed that interacting with faculty and engaging with peers from diverse backgrounds are predictors of complex thinking skills, the ability to connect ideas and to communicate those ideas effectively (Anaya, 2001a; Endo & Harpel, 1982; Gurin, et al., 2002; Hurtado et al., 2003; Mayo, Murgui'a & Padilla, 1995), all outcomes that arguably are associated with cognitive gains. Prior research showed that students who spend time with faculty members on undergraduate research projects and spend time with students from different backgrounds experience improvements in analytical thinking and the ability to communicate what they have learned from those different perspectives (Antonio et al., 2004; Hunter, et al., 2007; Ishiyama, 2002); my results confirm such findings. Additionally, this study's results confirm prior research that reported that out of class

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experiences with faculty (such as discussing a paper or talking about a personal matter), and interacting with students from diverse backgrounds improved critical thinking skills (Anaya & Cole, 2001; Chang, et al., 2006).

Previous research also revealed that when students experience interactions with faculty in different settings, and engage with diverse peers in different situations, they enjoy a number of cognitive gains. The sex, and racial/ethnic background of students influenced the degree of those gains, however, depending on the nature of the interaction (Chang, 2001; Kim and Sax, 2009b; Ku & Hu, 2001). My findings confirm a number of different studies in which students experience stronger gains when interacting with faculty through research projects or class related work and diverse peer groups. African American, Hispanic/Latino and female students experience gains in critical thinking skills when they engage in research with faculty (Anaya & Cole, 2001; Kim & Sax, 2007; 2009b). Moreover, my study confirms prior research that African American and female students may experience cognitive benefits when they are exposed to different racial groups on highly diverse campuses or in diversity courses (Chang et al., 2006; Laird, 2005).

Although my findings revealed that academic major was a significant predictor, none of the individual major groups were significant, consistent with earlier research that used academic major as variable of study but failed to find these factors significant (Cole, 2010; Toutkoushian & Smart, 2001). However, as my study shows that major is a significant predictor overall, my findings partially confirm the results of previous research. They affirm earlier studies that showed STEM and humanities majors experience significant gains in critical thinking and synthesizing ideas when they participate with faculty members on collaborative research (Ishiyama, 2002; Kim & Sax, 2007; Kuh & Hu, 2001). In addition, my findings confirmed a

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previous study that business majors reported strong gains in analytical thinking and synthesizing information when they experienced significant SFI with a minority faculty member (Hodes Research, 2008).

Although my study overwhelmingly affirms prior studies on the significance of engaging with faculty members and peers from different backgrounds on cognitive gains, my findings partially contradict previous research on the predictive value of SFI and IGC for particular students. A 2009 study showed that Latino students experience negative gains, while Asian and white students have positive cognitive gains as a consequence of significant SFI (Kim & Sax, 2009a); in direct contrast to my study. My findings showed a .158 increase in cognitive gains for Hispanic/Latino students and no significance in gains for Asian/Pacific Islander students. Further, my findings showed a .098 increase in cognitive gains for female students, in contradiction to two different studies. The first showed women are less likely to have gains in critical thinking and communication skills, both cognitive gains, when they engage with faculty members on projects (Cole, 2007). The second showed that gains in critical thinking were equally significant for both men and women when they had conversations with faculty outside of class (Sax, et al., 2005).

As my study did not show that a specific type of academic major was a significant predictor of cognitive gains, it partially contradicts previous research that revealed a student's major was an important influence on positive gains. In particular, earlier studies showed that STEM majors experienced negative gains when they were not satisfied with the nature of their SFI or had negative IGC (Chavous, et al., 2004; Cole & Espinoza, 2009).

My results also confirm previous research into SFI and IGC as predictors of a student's ability to gain knowledge of other people and places, awareness of different philosophies and

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ways of life, and the ability to get along with other people (Bowman, 2009; Chang, et al., 2006; Gaither & Sommers, 2012; Gurin et al., 2004; Hurtado et al., 2003; Nelson-Laird et al., 2005).

However there is a dearth of research studying the influence of SFI on sociocultural gains for all students beyond the influence of minority faculty or instructors of diversity courses (Hall & Rivera-Torres, 2011). My findings do partially support two separate studies that showed minority faculty interaction with students promote the understanding of different cultures and people, each a sociocultural gain (Chiteji, 2008; Larke & Larke, 2009).

In contrast to SFI, there are more studies regarding IGC and sociocultural gains that my study supports. The growing diversity of college campuses creates significant opportunities for relationships and meaningful conversations with people from different backgrounds, resulting in sociocultural gains (Chang, et al., 2006; Gurin, 1999; Hurtado et al., 2003); my findings confirm this. Corroborating prior research in maintaining relationships with peers from different races and cultures (Antonio, 2004b; Chang et al., 2006; Van Laar et al., 2005), my findings showed students experience positive gains in their understanding of diverse beliefs and cultures.

Prior research into the impact of diversity courses on a student's understanding of other cultures, ethnicities and ways of thinking is also supported by my study. In one study, college seniors engaged in diversity education where they had discussions with students from different backgrounds were more likely to understand and value different points of view and have positive feelings about people different than themselves (Gurin, et al., 2004); these are activities associated with gains in my study, as well. However, it is important to note that previous studies have shown that students who voluntarily participate in curricular engagement around racial and ethnic diversity report stronger sociocultural gains than those who take diversity courses because they are required to do so (Gurin, et al., 2002).

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My findings also confirm prior research into the predictive influence of interacting with faculty and diverse peers on sociocultural gains when considering a student's background and academic major. When Hispanic/Latino and Asian/Pacific Islander students interact with faculty, including discussions about course work outside of class, they make significant gains in social awareness (Kim & Sax, 2009a), an outcome supported by my study. Further, my findings also partially confirm a study that controlled for student race and the impact of IGC on students' positive valuation of diversity (Chang, 2001). This study showed positive gains regardless of race, whereas my study showed this is true only for African American, Hispanic/Latino and Asian/Pacific Islander students.

There are very few studies that focus on the effect of academic major and IGC on sociocultural gains. However, my study does partially confirm prior research into hierarchy enhancing (HE) majors that include STEM related fields and business majors. Specifically, prior research found that these majors have a negative effect on sociocultural gains, and my study confirms that STEM can have a negative effect on valuing diversity and having positive racial attitudes (Guimond, et al., 2003).

My study also contradicted results of prior research into the influence of interacting with faculty members and with peers from different races, religions and countries, especially when considering student background. First, my findings partially contradict previous studies showing that when students experience significant SFI, including assisting faculty with research, there is a decrease in social awareness for African American and Hispanic/Latino student (Kim & Sax, 2007). My study shows a .155 and .182 increase in sociocultural gains when a student is either African American or Hispanic/Latino, respectively.

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Additionally, my findings contradict a study that showed negative gains in appreciating different people and cultures following interacting with foreign nationals (Spencer-Rodgers & McGovern, 2002); my study showed positive gains related to differing cultures and ways of life as a consequence of IGC. My study also partially contradicts a previous study that controlled for student background factors and showed college seniors have positive gains in understanding different people and places (Umbach & Kuh, 2006); my findings revealed that race and academic major can either positively or negatively influence sociocultural gains. A brief summary of how my findings confirm or contradict prior research is presented in Table 13. Beyond their relationship to prior research, the results of my study also have implications for the future.

Implications for Future Practice, Research and Policy

The study had implications for future practice, research, and policy. A number of different groups including housing administrators, administrators of multicultural programs, academic deans, and career services administrators may benefit from the results of this study with respect to practice. For example, my results suggest that administrators responsible for coordinating living learning communities would do well to develop experiences that promote out of class engagement between faculty and students, and between students from different backgrounds. Housing communities that are comprised of students from the same academic major could create opportunities for housing administrators to work with faculty to engage in the out-of-class interaction that led to cognitive gains in my study. Further, learning communities that focus on diversity and multiculturalism could attract students from different backgrounds, creating opportunities for meaningful interactions between students from diverse backgrounds. Cognitive and sociocultural gains are associated with these forms of interaction in my study.

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Table 13

Summary of findings related to prior research

| | |
|------------------------|--|
| Cognitive Gains | <p>My study confirms prior research that SFI and IGC both can positively impact cognitive gains</p> <p>My study partially confirms prior research that showed African American, Hispanic/Latino and female students may experience positive cognitive gains as a result of SFI and IGC.</p> <ul style="list-style-type: none">• <i>Prior study showed Hispanic/Latino was a negative predictor and Asian/Pacific Rim was a positive predictor of SFI on cognitive gains.</i>• <i>Prior study showed female students experienced negative cognitive outcomes as a result of SFI.</i> <p>My study confirms that African American and female students may experience cognitive gains as a result of IGC and SFI.</p> <p>My study confirms that academic major can be predictor in cognitive gains as a result of SFI and IGC.</p> <ul style="list-style-type: none">• <i>Prior research showed STEM majors had negative cognitive gains when SFI or IGC was negative.</i> |
| Sociocultural Gains | <p>My study confirms prior research that SFI and IGC both can positively impact sociocultural gains</p> <p>My study supports prior studies that showed interaction with minority faculty, relationships with diverse people and being engaged in diversity education can result in sociocultural gains</p> <p>My study showed that only African American, Hispanic/Latino and Asian/Pacific Rim races were positive predictors as a consequence of SFI and IGC.</p> <ul style="list-style-type: none">• <i>One previous study showed sociocultural gains regardless of race, while another showed gains only in Hispanic/Latino and Asian students.</i> <p>My study partially confirmed prior research that showed academic major as a significant predictor of sociocultural gains resulting from SFI and IGC. My study showed STEM as a negative, Humanities as a positive, and business major having no predictive value.</p> <ul style="list-style-type: none">• <i>Prior research showed STEM and business majors both as negative predictors, and humanities majors as a positive predictor.</i> |

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The results of my study can also inform administrators of multicultural programs about the kinds of programs that promote student faculty engagement and meaningful discussions between students from different backgrounds. For example, programs that connect minority faculty to students on topics of diversity can challenge a student's point of view, promoting an appreciation for different philosophies, synthesizing information and different ways of thinking. Additionally, programs that invite students to discuss events through the different lenses of a diverse study body can lead to understanding different cultures. It would be important for multicultural program administrators to market and encourage minority students to participate in these events. While it might be a default to assume Caucasian students most benefit from these exchanges, my findings indicate that minority students benefit even more from these types of interactions with students from different backgrounds.

Academic leaders might also choose to review the practice of employing professionals to handle academic advising in lieu of faculty. Advising sessions often include discussions on career plans, ambitions, and personal concerns. Moreover, students meet with advisors at least twice a year in preparation for registration for the following semester; this could mean at least eight significant one-on-one interactions with a faculty member over the course of a four-year college experience. The results of my study show that students achieve significant cognitive gains as a result of these types of interactions with faculty. Further, formal interactions such as advising reflect the types of engagements that minority students may be more comfortable with because they understand their role and the role of the faculty member in the interaction contrast to out-of-class, informal interaction where those roles are less clearly defined.

Finally, staff members who work in career services offices may also benefit from the results of this study. Career services administrators often advise students on the experiences

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needed to be attractive to employers in different fields. Certain professions value or even require the types of cognitive and sociocultural gains identified in my study. Staff in these offices may offer seminars on the different qualities sought by employers and identify the different experiences that provide opportunities for students to interact with faculty or students from different backgrounds, enabling students to potentially realize the cognitive and sociocultural gains identified in my study.

My study also serves as a starting point for future research. To begin, I found SFI and IGC to be positive predictors of cognitive and sociocultural gains. Additional research could be conducted into the predictive nature of SFI and IGC on other outcomes when studied together as in my study. For example, research could be conducted into whether SFI and IGC are predictors of self-efficacy, a reflective learning outcome. Self-efficacy is the belief in one's ability to complete tasks and accomplish goals (Bandura, 1986). Students with high levels of self-efficacy engage in learning and achieve more; this is similar to my study in that participants with high levels of SFI and IGC experience more gains. However, what positively impacts the development of self-efficacy? Researchers could identify whether the predictors I used have the same impact on self-efficacy.

Another study could focus on different demographic factors and the gains. This study focused on sex, race and academic major. Further research could be carried out to see if different factors such as institutional type (PWI, HBCU, rural/urban, public/private), student classification (class standing), organizational membership (fraternity/sorority, athlete, leadership), or socioeconomic status influence cognitive and sociocultural gains.

Future research could also be conducted into the whether the nature of online education impacts the gains studied in my research. The growth in online education has created a need to

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understand the implications of forgoing the traditional higher education environment. Does interacting with faculty and diverse peers online change the levels, significance, or the types of exchanges that represent SFI and IGC? Researchers could seek to identify what impacts cognitive and sociocultural gains in the online educational environment.

The present study created composite variables to represent the different interactions faculty have with students and the interactions between students and peers from different backgrounds. Future research could be conducted into the impact each of the different interactions that made up SFI and IGC in this study has on cognitive and sociocultural gains. My research showed that together, the composites of SFI and IGC have a significant influence on gains, but it is possible that some interactions incumbent to SFI and IGC are more significant positive predictors of these outcomes than others.

Finally, there are implications from my study on future policy development. For example, the results of this study show that students report both cognitive and sociocultural gains when they interact with faculty on research projects or speak to faculty about career plans. These are activities that might be captured in annual faculty activity reports or in promotion and tenure procedures. Academic leaders responsible for administrating these procedures might consider revising the policies that guide these processes.

The funding of higher education is consistently under scrutiny as policy makers seek to identify the best use of dwindling financial resources in the hopes to create a model that renders the most value for the dollar. The findings of my study show that students can experience desirable cognitive and sociocultural gains as a consequence of interacting with diverse peers. Policy makers might use the results to incentivize programs that include diversity education as a part of the curricular or co-curricular agenda.

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Lastly, there are policies that govern housing assignments on a residential campus. Housing officers responsible for administering the assignments process might use the results of this study to create policies on roommate assignments. Typically, roommates are assigned based on the date they apply for housing or their responses to token questions regarding lifestyle and sleeping habits. Policies could be created that require all incoming students to have roommates from different racial, cultural or other types of demographic backgrounds. The results of my study showed that the intergroup contact resulting from relationships including those created through cross-racial and/or cross-cultural roommates, can lead to positive sociocultural gains in students.

Limitations of the Study

Even though my study made contributions to future practice, research, and policy, there were limitations that merit attention. The first is in the nature of the responses given by the participants. The responses to the items that comprised both SFI and IGC, as well as cognitive and sociocultural gains were self-rated gains. Self-rated responses assume the participants are candid and honest. Successful college seniors might feel the need to inflate their responses, while participants who have struggled in college might have more negative responses. Either eventuality might have skewed the results.

A second limitation to this study is omission of institutional type as a measure. Institutional type (including PWI, HBCU, public, private, student size) can influence the level of student faculty interaction, which in turn can impact gains. The student to faculty ratio is often greater at research-intensive institutions, an obstacle to significant SFI, and small private liberal arts colleges purport to have greater frequency of SFI. Including institutional type as a measure might have allowed for closer examination of the relationship of SFI on both cognitive and

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sociocultural gains. The same is true regarding the potential influence of institutional type on the level of interaction between a student and diverse peers. Including institutional type might allow for investigating whether attending a minority serving institution, such as an HBCU, HSI, or Tribal College creates a different predictive value of IGC on cognitive and sociocultural gains. Moreover, at an HBCU or other minority serving institution, students who identify as minority and majority are very different from samples used in prior research. Responses by students at minority-serving institutions to questions about IGC might be very different than responses to those items from respondents at PWIs.

A third limitation of this study is modernity of the instrument. The CSEQ has not been updated since 1998 and arguably items may not measure IGC and SFI activities that are relevant to the contemporary college experience. An updated instrument might elicit data on gay, lesbian or transgender experiences, or experiences interacting with peers and faculty through electronic means such as email, texting or blogs.

Additional limitations involve the nature of the data used for this study. The secured for this research was a slice of all CSEQ respondents who identified as “seniors” over four consecutive administrations of the instrument between 2007 and 2010. It was not possible to control for differences in the college experience that might have occurred over such an extended time period. Also, the CSEQ yields secondary data, not data collected specifically for this study. To that end, only items in the existing instrument were used to generate the model for this study. For example, only three items, the minimum for factorial design, were used to measure sociocultural gains.

A final limitation was the methodology utilized for this study. Creating composite variables for the primary independent and dependent variables negated any study of individual

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factors of either predictor variables or outcomes. Identifying the association between specific interactions with faculty and diverse peers to particular cognitive and sociocultural gains might prove significant. Conducting a Spearman's rank order correlation analysis between each factor would allow for examination into the strength and direction of each association. To better promote successful outcomes from IGC and SFI, it might prove helpful to identify which experiences have a stronger association with the important outcomes of this study.

Conclusion

Despite the limitations of this study, the findings contributed to literature on cognitive and sociocultural gains and the type of influence student faculty interaction and intergroup contact has on those outcomes. My results help cement the relationship between SFI and cognitive gains, and between IGC and sociocultural gains. Moreover, my findings help bridge the gap between these two outcomes, showing that controlling for student background, the impact of both predictor variables is still significant. Along with this study, additional research may also improve the gains that students achieve as a result of targeted interactions with faculty and peers from different backgrounds.

As enrollment in higher education continues to rise, so do the expectations stakeholders have about the outcomes graduates achieve. The burgeoning costs of attendance puts pressure on institutions to deliver experiences that produce the skills employers have identified as essential to success. Creating opportunities for students to interact with faculty and peers from different backgrounds produce desirable cognitive and sociocultural skills. My findings proffer insights to the experiences that can lead to those outcomes.

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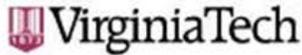
Appendix A

CSEQ Survey

The College Student Experiences Questionnaire is copyrighted material, and thus, not available for inclusion in this document. It can be retrieved via the Center for Postsecondary Research at Indiana University website at: http://cseq.iub.edu/pdf/cseq_whole.pdf.

Appendix B

IRB Approval Letter



Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (497)
Blacksburg, VA 24060
540/231-4606 Fax 540/231-0969
email irb@ut.edu
website <http://www.irb.ut.edu>

MEMORANDUM

DATE: April 3, 2013
TO: Joan B Hirt, Chris MacDonald
FROM: Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)
PROTOCOL TITLE: Self Rated Gains in College Seniors
IRB NUMBER: 13-001

Effective April 2, 2013, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the New Application request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

<http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Exempt, under 45 CFR 46.110 category(ies) 4**
Protocol Approval Date: **April 2, 2013**
Protocol Expiration Date: **N/A**
Continuing Review Due Date*: **N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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