FACULTY-MENTORED UNDERGRADUATE RESEARCH: A QUALITATIVE EXAMINATION OF ITS Influence on Student Engagement and Academic Achievement

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DEDICATION

Dedicated in loving memory of my mother, Angela Marie Johns. Although you departed this earth just before I started this journey, your strength and resilience endures within me and nurtured my confidence and persistence to complete this work.

And to my son, Eric. You inspire me in more ways than you know.
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ABSTRACT

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Previous research, using quantitative measures such as participant surveys, have produced a wealth of information about the design, implementation, and perceived benefits of STEM – science, technology, engineering, and mathematics focused faculty-mentored undergraduate research. However, in order to gain a deeper understanding of the perceived benefits associated with faculty-mentored undergraduate research, an in-depth exploration of faculty-mentored participants’ experiences and perceptions is essential. Using qualitative data derived from interviews with faculty-mentored undergraduate research participants from across various academic majors and disciplines, this study explores how and in what ways undergraduate students at a public comprehensive academic institution believe that their faculty-mentored undergraduate research experience influences student engagement and academic achievement. The results of this study revealed students from across various academic majors and
disciplines generally believe participation in faculty-mentored undergraduate research positively influences student engagement, as well as influences academic achievement by improving test-taking and study skills, and by enhancing individual motivation and persistence. Though the degree of influence varies according to the mentors’ availability, level of interaction, and students’ preconceptions of faculty-mentored undergraduate research.
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Chapter 1

Introduction

The outcome of post-secondary education and degree attainment have significant social and economic benefits (Perna & Finney, 2014; Lambert, 2014; Kazis, Vargas & Hoffman, 2004; Pennington, 2004). Thus, post-secondary institutions have a vested interest to improve student learning and academic achievement. Similarly, state and federal higher education policymakers have public policy objectives to improve student learning and academic achievement and are increasingly expecting higher education institutions to improve degree completion rates (Haskins, Holzer, & Lerman, 2012; Deming & Dynarski, 2009; Callan, et al., 2006; Titus, 2006; Adelman, 2006). Accordingly, post-secondary institutions are seeking to develop educational practices to keep students engaged on the path to graduation. Some have developed undergraduate research programs that emphasize faculty-student interaction to enhance learning and improve academic achievement outcomes (Baenninger & Hakim, 1999; Wilson, Cramer & Smith, 2003). The general perception among these institutions is high-impact educational practices such undergraduate research and other related activities referenced by Kuh (2008a) enhances student engagement and influences academic achievement.
Underlying this perception is evidence-based empirical research that suggests teaching and research are mutually supportive of student achievement—that faculty-student engagement activities have a positive impact on student success (Kuh, 2003; Laird, Chen & Kuh, 2008; Reason, 2009, citing Pascarella & Terenzini, 2005).

Purpose of Study

The purpose of this qualitative study examines faculty-mentored undergraduate research as a high-impact educational practice to explore how and in what ways it influences student engagement and academic achievement. The primary research question framing this qualitative study is:

RQ: How and in what ways does student participation in faculty-mentored undergraduate research influence student engagement and academic achievement among undergraduate students?

For the purpose of this study, faculty-mentored undergraduate research refers to research and creative activities conducted by undergraduate students under the guidance of a faculty-mentor, in which undergraduate students make an original intellectual or creative contribution to an academic discipline as a protégé to a faculty-mentor who guides the research or creative activity conducted by undergraduate students. It is primarily independent of the curriculum and excludes course-related student research or
creative activity that receives formal academic credit (Craney, et al., 2011; Stamatopolos, 2009; Council on Undergraduate Research, 2015). High-impact educational practices are teaching and learning practices that educational research suggests increase rates of student engagement for college students from many backgrounds. Such practices include but are not limited to First-Year Experience (FYE) programs, learning communities, collaborative assignments and projects, and undergraduate research (Kuh, 2008a).

The term student engagement is the extent to which students are engaged in purposeful activities that higher education research has shown to be linked with high quality learning outcomes (Hu & Kuh, 2001, referencing Astin, 1985, 1993; Pace, 1995; Chickering & Gamson, 1987), and encompasses academic as well as non-academic and social aspects of students’ college experience (Krause & Coates, 2008). This includes, but is not limited to, active and collaborative-based learning and activities that encourage interaction between students and faculty, and students and peers both within and outside of the classroom.

The term academic achievement is the associated outcome(s) from the students’ faculty-mentored research participation and experience. It includes but is not limited to, changes in academic performance, earned grades, study skills, learning aptitude, and levels of motivation that students reference as a result of conducting research with a faculty-mentor.
Significance of Study

Effective educational practices such as active and collaborative learning and student-faculty interaction are shown to be associated with higher grades and greater student self-supported educational gains (Laird, Chen & Kuh, 2008, citing Kuh, 2007; Kuh, 2009, referencing the National Survey of Student Engagement, 2013; Pascarella & Terenzini, 2005). This is because what students do during college counts more in terms of how and what they learn and whether they will persist in college compared with their background characteristics or where they go to college (Laird et al., 2008, referencing Astin, 1991; Chickering & Reisser, 1993; Kuh & Associates, 2005; Pascarella & Terenzini, 2005). Moreover, students who are engaged develop habits that promise to stand them in good stead for a lifetime of continuous learning (Laird, Chen, & Kuh, 2008).

Student engagement also has compensatory effects—students who start college less advantaged tend to benefit more than higher-achieving students (Cruce, et al., 2006). More importantly, previous studies show students who leave college prematurely are less engaged than their counterparts who persist to graduation (Hughes & Pace, 2003; Kuh, et al., 2005). Thus, an exploration of specific high-impact educational practices such as faculty-mentored undergraduate research in the context of student engagement matters. Furthermore, an important aim in higher education is to support students to realize not
only the contested uncertainty of knowledge, but also the importance and the fascination of pursuing that knowledge (Healey & Jenkins, 2000). Accordingly, there is a recognition that teaching and research are becoming ever more intimately related to support students in their pursuit of knowledge. Thus, exploring high-impact educational practices such as undergraduate research in the context of student-faculty interaction and academic achievement may shed additional insight on the benefits of faculty-mentored undergraduate research.

In addition, just as Tinto (1997) begun to explore the importance of students’ academic involvement in the classroom, and Braxton et al., (2000) exploration of students’ involvement in active learning, the outcome of this qualitative examination can potentially expand our understanding of faculty-student interactions by exploring how and in what ways does student participation in faculty-mentored research influences engagement and student academic achievement.

Previous studies, using quantitative measures such as participant surveys, have produced a wealth of information about the design, implementation, and perceived benefits of STEM focused faculty-mentored undergraduate research programs (Fechheimer, et al., 2011; Lopatto, 2010, 2009, 2004; Jones, et al., 2010). However, such measures result in a loss of the depth, scope, and power of individuals’ personal perspectives on their own experiences (Henne, 2008). Besides, an assessment of faculty-
student interaction and the potential influences that research experience has on student academic success also require an examination of extrinsic measures (Fechheimer, et al., 2011). Therefore, in order to gain a deeper understanding of the influences and underlying perceived benefits associated with faculty-mentored undergraduate research, this study provides a qualitative exploration of students’ experiences across various academic disciplines via their past participation in faculty-mentored undergraduate research.

Through this study, students’ experiences are explored to develop, rather than reject or confirm any existing hypotheses. Placing current understanding of students’ experiences and perspectives within this theoretical framework offers a comprehensive conceptual map to identify engagement practices that shape and influence student academic achievement (Reason, 2009).
Chapter 2

Literature Review

Engagement is a broad phenomenon that encompasses academic as well as non-academic and social aspects of the student experience (Krause & Coates, 2008). Specifically, student engagement focuses on the extent to which students are engaging in activities that higher education research has shown to be linked with high quality learning outcomes (Krause & Coates, 2008). Some researchers define engagement as the quality of effort that students themselves devote to educationally purposeful activities that contribute direct to desired outcomes (Hu & Kuh, 2001, referencing Astin, 1985, 1993; Pace, 1995; Chickering & Gamson, 1987).

Student engagement in educationally purposely activities is positively related to academic outcomes (Kuh, et al., 2008). Specifically, student engagement activities positively effect grades in both the first and last year of college, as well as persistence to the second year—even after controlling for a host of pre-college characteristics and other variables associated with these outcomes such as merit aid and parental education (Kuh, et al., 2008). Equally important is the effects of engagement are generally in the same positive direction for students from different racial and ethnic backgrounds, including full-time, part-time, residential and commuter students (Kuh, et al., 2008).
Examining Student Engagement

In studying engagement, it is necessary to assume that it is possible to identify a range of beneficial activities and conditions associated with learning (Krause & Coates, 2008). Thus, for an understanding of engagement to carry explanatory power, it must focus on the circumstances and conditions that are understood to be fundamental for certain types of learning (Krause & Coates, 2008). Given the increasing diversity of students, experiences, and institutions, researchers are now asking how to increase student engagement broadly (Reason, 2009).

The National Survey of Student Engagement (NSSE), an annual survey of undergraduate students at four-year institutions, measures students’ participation in educationally purposeful activities that prior research show are linked to desired outcomes of college (Chickering & Gamson, 1987; Pascarella & Terezini, 2005). Specifically, the NSSE provide aggregate reports to participating institutions to assess and improve undergraduate education by grouping ten “Engagement Indicators” representing broad dimensions of student experiences associated with learning and development (Kuh, 2001). The NSSE Engagement Indicators are organized within four themes: (1) Academic Challenge—higher-order learning, reflective & integrative learning, learning strategies, and quantitative reasoning; (2) Learning with Peers—collaborative learning and discussions with diverse others; (3) Experience with Faculty—
student-faculty interaction and effective teaching practices; and (4) Campus Environment—quality of interactions and supportive environment (NSSE, 2013).

The NSSE (2013), which include data from two companion surveys, the Faculty Survey of Student Engagement (FSSE) and the Beginning College Survey of Student Engagement (BCSSE), report the following findings:

- Students whose courses challenged them to do their best work also experienced greater emphasis on higher-order learning and higher levels of reflective and integrative learning.

- On average, first-year students and seniors majoring in engineering and biology were most engaged in collaborative learning, while their peers majoring in arts and humanities, social sciences, and social services professions were engaged in collaborative learning the least.

- First-year students and seniors interacted with faculty at higher rates than their counterparts.

These findings echo a similar finding that first-year students and seniors reported greater gains in personal development, general education knowledge, and practical competencies on campuses where faculty members engaged them using active and collaborative learning exercises (Umbach & Wawrzynski, 2005). Though generally accepted as a
reliable source, the NSSE instrument is relatively short and does not measure all relevant aspects of engagement (Kuh, et al., 2008).

The Survey of Undergraduate Research Experiences (SURE) (Loppato, 2004, 2007) produced similar findings as the NSSE. Like NSSE, SURE collects quantitative data on student engagement. However, unlike NSSE, SURE collects engagement data specifically intended to measure benefits associated with student participation in undergraduate research. The findings from NSSE and SURE are based on data collected from students. Students’ experiences and perceptions of engagement are important; however, students are not the only source of information about what happens in college and university classrooms (Laird, Chen, & Kuh, 2008). Institutional characteristics, mission, practices, as well as the academic curriculum are also important components when examining engagement and its influence on student academic achievement.

Effects of Institutional Characteristics on Student Engagement and Achievement

In general, when adjusting for precollege differences (i.e. college preparation factors) of admitted students, the effects of institutional characteristics (public vs. private) on student engagement and academic achievement disappear (Pascarella & Terenzini, 1991, 2005). Also, the effects of institutional size and type (liberal arts vs. research) on student engagement and academic achievement vary but are very small (Reason, 2009).
There is, however, one notable exception: where a student begins his/her college career effects subsequent educational attainment (Pascarella & Terenzin, 2005). Specifically, attending historically black colleges/universities or women’s institutions positively influences engagement and academic achievement for African-American students and women students respectively (Reason, 2009). This may be attributed to more supportive faculty and peer relations for such students at these institutions. (Reason, 2009, referencing Pascarella & Terenzini, 2005). Diminutive empirical data support a similar finding for other student groups, including Latina/Latino students attending Hispanic-serving Institutions (HSIs) (Reason, 2009). Conversely, beginning a college career at a two-year institution decreases students’ chances of earning a bachelor’s degree, even in studies that control for students’ precollege differences such as college preparation, racial/ethnic background and social-economic status (Long & Kurlaender, 2008; Pascarella & Terenzini, 2005). This may, however, have more to do with the transfer function than any deleterious effect of two-year institutions, as data show once a student transfers to a four-year institution is successfully completed, the difference in the bachelor’s attainment gap disappears (Reason, 2009, citing Pascarella, 1999).

While the effects of institutional characteristics on student engagement and academic achievement appear indirect, the effect of institutional mission appears to influence student achievement (Reason, 2009). Hence, understanding the interplay
between student achievement and institutional mission provides an interpretive framework for approaching how particular student-faculty collaborative activities influences student engagement and academic achievement.

Effects of Institutional Mission on Student Engagement and Achievement

Institutions have two missions— their espoused or written mission, and their enacted mission, i.e., what the school does in terms of programs and practices (Schein, 2004; Kuh, 2006, referencing Schein, 2004). The enacted mission matters much more to students’ success because it reflects what students actually experience (Kuh, 2006). The enacted mission is also important because the degree to which students perceive the institution’s actions to align with its vision and mission effects their academic achievement (Reason, 2009). Thus, a reference to the beneficial effect between teaching and research is often made in mission statements of universities (Jenkins, et al., 2003) as universities try to attract students with an educational policy or educational concept that deliberately aims at research and teaching or integration of both teaching and research (Verburgh, Elen, & Lindblom-Ylanne, 2007, citing Elsen, et al., 2005). However, an institution may claim to have an educational mission committed to “educating the whole student but in fact provide little encouragement or support for student involvement in intellectual or social activities” (Kuh, 2006, p. 241).
At strong-performing institutions, the enacted mission overlaps significantly with the espoused mission, in which students and faculty have a fairly clear idea of what they are trying to accomplish (Kuh, 2006). These institutions are “dedicated to expanding educational opportunities for students who by traditional measures are not expected to succeed in higher education... they value diversity...place emphasis on high-quality undergraduate teaching and first year transition and orientation courses that help students acquire skills and self-confidence, and rewards for meaningful student-faculty interaction” (Kuh, 2006, p. 214). In addition, senior academic leaders at these institutions effectively explain why balancing the research and teaching mission of the institution is crucial to maintaining high-quality undergraduate programs and support services while also illustrating how the research mission enriches the undergraduate experience (Kuh, 2006).

However, some make a clear distinction between teaching and research mission of institutions—that research-mission institutions are oriented towards discovery and enlargement of knowledge, whereas teaching-mission institutions are oriented towards the distribution of knowledge and the development of students (Neumann, 1992, 1994). Others hold the view that teaching and research missions should not be seen as polar opposites, but rather as complimentary facets of academic practice and call for
institutions to adopt more research-like ways of teaching students (DiCarlo, 2009; Kandiko & Kinchin, 2012, referencing DiCarlo, 2009).

Anecdotal evidence suggest an apparent conflict between institution and faculty regarding their respective roles in response to their institutions’ mission. Lueddeke (1999) asserts this form of institutional role conflict is a significant factor that makes the introduction of institutional change difficult. Lueddeke cites Crimmel’s (1984) observation, “Hired to teach, but paid to [research] and publish,” as indicative of the institutional role conflict and paradox facing faculty at some liberal arts mission-focused colleges and universities.

Emphasis for institutions to strike a balance between teaching and research is influenced by shifts in the ideas of knowledge, changes in the nature of undergraduate education, and perceptions of time available for teaching and research (Verburgh, et al., 2007). Such emphasis urge academic institutions to recognize and redefine themselves, and more specifically, reconsider the nexus between teaching and research (Verburgh, et al., 2007, citing Rowland, 1996). Recognizing and reconsidering the nexus between teaching and research seem apparent; however, striking a balance between teaching and research appears challenging for institutions.

For all 4-year institution types (i.e., public and private research and liberal arts colleges and universities), the ability to simultaneously achieve high teaching impact and
research productivity is to spend more hours in the classroom (Fairweather, 2002). However, spending more hours in the classroom may deter faculty from using collaborative teaching techniques (Olsen & Simmons, 1996). Also, simultaneously achieving high levels of productivity in teaching and research is relatively rare, and institutional policies that intend to encourage teaching productively and effectiveness may adversely impact learning and individual research productivity, and vice versa (Fairweather, 2002).

In addition, the immersion in research can breed a narrowness that detracts from the broad-based knowledgeability that students perceive as being an important element of “good” teaching (Friedrich & Michalak, 1983). However, this may be limited to particular kinds of research in certain areas/disciplines—that for some faculty, the belief that there is not enough time to be a good researcher and a good teacher can be denied as institutions can be effective to reconcile the demands of teaching and research (Friedrich & Michalak, 1983). Whether all institutions can successfully reconcile the demands of teaching and research remains debatable. But research shows faculty who engaged in research are not necessarily less effective teachers as often claimed. This is based on the lack of consistent negative correlations between research productivity and teacher ratings that indicate performance as a researcher does not significantly detract from performance as a teacher (Centra, 1983).
Moreover, students readily identify a range of benefits derived from their faculty’s interest in research (Healey, et al., 2010). For these students, the most positive facet of being taught by research-active faculty is that it enhances their enthusiasm and motivational abilities to learn and succeed (Healey, et al., 2010). While there are some instances where students associate faculty engagement in research with being less interested in teaching and spending reduced amount of time with their students (Jenkins, Healey, & Zetter, 2007), an effective means to link teaching and research and to ensure students benefit from faculty research may be the adoption of a research-based curriculum, in which students are encouraged to develop their own research skills (Elton, 2001; Healey, 2005).

Furthermore, students and faculty-mentors who find sustained engagement are strongly encouraged to work together as these relationships appear to have the most positive impacts on the productivity and on the success of students (Fechheimer, et al., 2011). Thus, the opportunity for student interaction with faculty may be an important component of the teaching-research nexus, particularly by enabling and fostering closer contact with more tacit aspects of knowledge and learning (Neumann, 1994). Such interaction encourages co-learning between faculty and students and influences student engagement and achievement (Le Heron, Baker, & McEwen, 2006).
Collectively, empirical evidence suggest academic institutions could usefully adopt, or rediscover in some instances, the “mission-idea” of returning students to the center of their activities, and providing a guiding ethos of inquiry and scholarship for all members of the academic community (Healey, et al., 2010). The emphasis on scholarship is fundamental as it tends to encourage student-centered and reflective teaching practice (Healey, et al., 2010). More importantly, previous findings (Braxton, et al., 2004; Ganssemer-Topf & Schuh, 2006) support findings of others (Terenizini & Reason, 2005; Pascarella & Tereznini, 2005; Reason, 2009), that institutional effects on student learning outcomes, including student academic achievement, are less about what an institution is than what an institution does— that the effects of institutional characteristics are seemingly indirect (Reason, 2009, citing Pascarella & Tereznini, 2005). On the other hand, institutional behavior and mission, understood through the lens of organizational theory (Schein, 2004; Berger, 2001-2002), exerts influence, albeit often indirectly, on students’ academic achievement (Reason, 2009).

Effects of Institutional Practices on Student Engagement

As institutions align policies and practices in support of student success, students are more likely to succeed academically and persist (Reason, 2009, citing Berger, 2001-2002). There are certain institutional practices that are known to lead to high levels of student achievement and student engagement (Astin, 1994; Chickering & Reisser, 1993;
Kuh & Associates, 2005; Pascarella & Terenzini, 2005). The most-referenced being the engagement indicators modeled after Chickering & Gamson’s (1987) seven principles for good practice in undergraduate education: (1) student-faculty contact, (2) cooperation among students, (3) active learning, (4) prompt feedback, (5) time on task, (6) high expectations, and (7) respect for diverse talents and ways of learning (Laird, Chen and Kuh, 2008). The ability to achieve high levels of student achievement and engagement is not however limited to Chickering & Gamson’s (1987) seven good practice principles. Institutional perception, as well as allocation of resources and institutional expenditures also appear to effect student engagement and student academic achievement.

Specifically, institutions that are perceived to convey a sense of caring, along with institutional integrity, likely increase student engagement and achievement through greater levels of social integration—that students at both residential and commuter institutions are more likely to engage and persist if they believe the institution is committed to student welfare (Reason, 2009). Similarly, institutions that are perceived by students to exhibit collegial, symbolic, or systematic characteristics enhances students’ chances of academic achievement (Berger, 2001-2002). Though some degree of bureaucracy is necessary to support student persistence, too much bureaucracy can contribute to students’ sense of being “just a number” and decrease the likelihood of student achievement and persistence (Reason, 2009).
Additionally, how an institution allocates resources, organizes learning opportunities and services to induce students to partake in such opportunities enhances student engagement (Laird, Chen & Kuh, 2008). Hence, using the classroom to create communities of learning must be high priority in terms of creating a success-oriented campus culture (Kuh, et al., 2008) as students attending institutions that invest and employ a comprehensive system of complementary initiates based on effective educational practices are more likely to perform better academically, to be satisfied, and to persist and graduate (Kuh, et al., 1991).

In addition, institutional expenditures for instruction are significantly and positively related to first-year student persistence and six-year graduation rates (Gansemer-Topf & Schuh, 2006). Similarly, institutional expenditures for academic support services (e.g. library, technology, and academic advising) positively predict measures of academic achievement and retention, although only for more highly selective institutions (Gansemer-Topf & Schuh, 2006). Even though the relationship between academic support expenditures and academic achievement at less selective institutions is unclear, institutional expenditures that support the academic mission of the institution result in higher student achievement and retention rates (Reason, 2009, citing Gansemer-Topf & Schuh, 2006).
Finally, there is a positive correlation between an institution’s sponsored research activities and student graduation (Kim, et al., 2003). This suggests an institution’s investment and productivity in research do not take away from its productivity in graduating students. This also challenges the belief that there needs to be a trade-off between an institution’s research and instructional activity, as there appear to be ways in which an institution’s research expenditures and activities can simultaneously enhance students’ academic achievement and persistence to graduation (Kim, et al., 2003).

Effects of Curriculum/Classroom Experience on Engagement & Academic Achievement

The correlation between classroom experience and degree completion for four major racial/ethnic groups: African-American, Asian-American, Latina/Latino, and Whites vary. (Museus, Nichols, & Lambert, 2008). However, empirical data show student-faculty classroom interaction can influence student engagement and overall achievement (Fechheimer, et al., 2011), as well influence academic achievement among select student groups when social and academic involvement and institutional commitment factors are examined.

For example, the amount of faculty contact between faculty and African-American students affects both retention (Braddock, 1981) and academic performance (Nettles, Thoeny, & Gosman, 1986). Furthermore, contact between faculty and African-American students plays an even more critical role at predominantly White universities
than at historically Black colleges and universities (Braddock, 1981; Fleming, 1984). It may be that faculty serve as institutional brokers for minority students at majority universities, connecting minority students to the academic and intellectual mission of the university (Nagda, et al., 1998). This interaction may further contribute to institutional identification and a sense of belonging among minority students (Nagda, et al., 1998). Although some literature connect campus climate to Latina/Latino student engagement and achievement at predominately White institutions (Hernandez, 2000; Hernandez & Lopez, 2004-2005), empirical data that links student engagement and achievement among Latina/Latino students attending HSIs is less clear (Reason, 2009).

With respect to curriculum, students who major in certain academic disciplines persist to graduation at greater rates than students in other majors (Reason, 2009). More specifically, students majoring in STEM fields are more likely to persist to degree than students majoring in social sciences (Adelman, 1999; Leppel, 2002; Pascarella & Tereznini, 2005). However, much of the effect of academic discipline seems to be indirect through students’ perceptions of relationships and engagement with faculty and peers—that regardless of academic discipline, pedagogical approaches that encourage active, collaborative, and cooperative learning provide advantages over more passive instructional approaches (Reason, 2009, citing Pascarella & Tereznini, 2005).
For example, both first-year and senior students majoring in different academic disciplines were found to be challenged and engaged in active and collaborative learning activities on campuses where they and the faculty report frequent course-related interactions (Umbach & Wawrzynski, 2005). Similarly, students at institutions where faculty use engaging pedagogies more often generally participate more frequently in educationally effective activities, which has the salutary effect of fostering high levels of student success, including persistence (Laird, et al., 2008). This is based on the belief that if faculty use principles of “good practice” to design assignments and engaging pedagogies to structure in-class and out-of-class activities, students would ostensibly put forth more effort (Laird et al., 2008). This also follows that if individual student effort, influenced by engagement activities, is the critical determinant, then it is important to focus on ways in which an institution can shape its academic, interpersonal, and extracurricular offerings to encourage student engagement (Kuh, 2006, citing Pascarella & Terenzini, 2005). This is supported by findings that show first-year students at institutions with higher-than-expected persistence are more actively participating in class and doing more collaborative academic work with their peers than are their counterparts at institutions with as-expected persistence (Laird, et al., 2008). This is consistent with the finding that average level of active and collaborative engagement in academic endeavors is higher on campuses doing better than expected in terms of persistence,
which collaborates a link between active and collaborative engagement practices with student learning outcomes and academic achievement (Laird, et al. 2008, referencing Braxton, Millem, and Sullivan, 2000).

Similarly, Tinto’s (1993) Theory suggests classroom experiences are related to academic achievement and persistence through academic integration. Using Tinto’s Theory (1993) as a guide, researchers have demonstrated both direct and indirect relationships between in-class experiences, social integration, and students’ achievement and persistence (Braxton, Bray & Berger, 2000; Braxton, Milem, & Sullivan, 2000). Specifically, researchers have connected links between “good” teacher behaviors (e.g. clarity, organized presentation of material) with student achievement and persistence (Braxton et al., 2000). Researchers also found a positive link between active pedagogies (e.g. classroom discussion) and persistence (Braxton, Milem, & Sullivan, 2000). The most significant finding suggests faculty characteristics and behaviors that increase engagement within the classroom can increase student engagement and influence student achievement and persistence (Braxton, Bray and Berger, 2000; Braxton, et al., 2000; Pascarella et al., 2008).

Collectively, the current body of literature suggest there is a meaningful correlation between student-faculty interaction, student learning, integration, and academic achievement (Braxton, Sullivan, & Johnson, 1997; Hurtatdo & Carter, 1997;
Milem & Berger 1997), and provides some evidence that links students’ classroom experiences to engagement. Previous research findings also provide support that student engagement matters to learning outcomes and academic achievement, and affirms student engagement is perhaps “the most influential driver of student decisions about persistence” (Reason, 2009, p. 678). However, further research that specifically explores actual measures of faculty-student activities and institutional practices is needed to improve our understanding of the effect of classroom experiences on student achievement and persistence (Tinto, 2006, 2007).

Effects of Faculty-mentored Undergraduate Research

Faculty-mentored undergraduate research is often associated with promoting effective faculty-student engagement (Kuh, et al., 2005; Nikolova Eddins, 1999; Nikolova Eddins, & Williams 1997; Nikolova Eddins, et al., 1997; Boyer Commission on Educating Undergraduates in the Research University, 1998; Kinkead, 2003, referencing the Boyer Commission, 2002; Fricke, 1981, 2003). Theoretically, faculty-mentored research correlates with the Cognitive Apprenticeship Model (CAM), which holds the assumptions that: (a) learning is a social process; (b) competence in a domain is defined in terms of expertise rather than innate ability; (c) meaningful learning is active, constructive and self-regulating; and (d) learning activities should reflect real world rather than decontextualized academic tasks (Adedokun, et al., 2010, referencing Shuell,
Within this theoretical framework, faculty-mentored undergraduate research is viewed as an apprenticeship learning model in which the novice (i.e. student) studies under the mentorship of an expert (i.e. faculty member) (Adedokun, et al., 2010). Accordingly, through guided participation and collaborative interaction, the novice student gradually acquires knowledge, expertise and skills that fosters academic and professional success (Adedokun, et al., 2010).

Benefits of Faculty-mentored Undergraduate Research

The specific reported benefits of faculty-mentored undergraduate research are numerous. For example, faculty-mentored undergraduate research is associated with promoting strong disciplinary variability in the undergraduate curriculum (Kandiko & Kinchin, 2013)—that research opportunities early in the college career are important to attract and retain students in science research careers (Campbell & Skoog, 2004; Hurtado, et al., 2007; Russell, et al., 2004). Similarly, participation in a liberal arts faculty-student undergraduate research program in the first and second academic years are strong indicators for predicting academic success in subsequent years (Nagda, et al., 1998; Werner & Sorum, 2003; Ishiyama, 2002).

In addition, participation in faculty-mentored research has been linked to building confidence. Specifically, students who participate in faculty-mentored undergraduate research generally feel more confident engaging with faculty (Fehheimer, Webber &
Kleiber, 2011; Foertsch, Alexander & Penberthy, 1997); feel more confident about learning (Alexander, Foertsch, & Daffinrud, 1998), and feel more confident interacting with peers and making formal presentations (Fehheimer, et al., 2011; Alexander, Foertsch, Daffinrud & Tapia, 2000).

Participation in faculty-mentored undergraduate research has also been shown to strengthen students’ inquiry skills (Gafney, 2001; Lopatto, 2004; Seymour, et al., 2004; Kardash, 2000; Mabrouck & Peters, 2000), enhance critical thinking and reasoning skills (Kardash, 2000), reflective judgment (Bauer, 2001; Ward, Bennett, & Bauer, 2002), and disciplinary knowledge (Ishiyama, 2002). Also, surveys indicate that undergraduate research opportunities help clarify student’s interest in research and encouraged students who had not anticipated graduate studies to alter direction toward pursuit of a doctorate (Russell, et al., 2007).

In addition, perceptions of alumni from all academic disciplines generally report greater amounts of enhanced skill levels as a result of their participation in faculty-mentored research as an undergraduate (Bauer & Bennett, 2003). Faculty who served as faculty-mentors in undergraduate research programs value the opportunity to mentor and to develop intellectual partnerships with students (Adedokun, et al., 2010). Moreover, students who participate in faculty-mentored undergraduate research are more likely to earn a baccalaureate degree (Nagda, et al., 1998).
Among racial/ethnic groups, effects of undergraduate research opportunities tend to be strongest among Hispanics/Latinos, but most racial/ethnic group differences were relatively small (Russell, et al., 2007). Also, surveys found almost no differences between men and women (Russell, et al. (2007).

Limitations of Faculty-mentored Undergraduate Research Programs

As referenced above, the benefits associated with faculty-mentored undergraduate research programs are numerous; however, there are some limitations. For example, undergraduate research programs pose some challenges to faculty-mentors, particularly, regarding time and scheduling. Specifically, some faculty-mentors believe there is not enough time to adequately mentor students, and their schedules often conflict with students or other academic obligations (Adedokum, et al., 2010).

Also, the percentage of students engaged in undergraduate research programs depend on different criteria and measures to assess participation (Fechheimer, et al., 2011) as student selection criteria vary among institutions, and the students’ participation in many faculty-mentored undergraduate research programs is limited to the summer before their senior year (Hunter, et al., 2007; Kardash, 2000; Seymour, et al., 2004). Therefore, some benefits associated with faculty-mentored undergraduate research programs may be under or overstated as faculty-mentored undergraduate research programs are generally subject to different participation selection criteria, as well as time
and duration limitations (Jones, et al., 2010) that some studies fail to consider when examining and assessing the benefits of faculty-mentored undergraduate programs (Hakim, 1998; Levis-Fitzgerald & Denson, 2005). Hence, controlling for program selection, time and duration throughout students’ entire college career is essential when examining and assessing the benefits of faculty-mentored undergraduate research program participation (Jones, et al., 2010).

When time and duration of the faculty-mentored undergraduate research program are controlled, student participation is significantly associated with earning a baccalaureate degree and persistence among minority student biology majors at a research university (Jones, et al., 2010). While this finding is specific to undergraduate minority students majoring in biology at a particular research university, it has broader implications on the extent to which faculty-mentored undergraduate research influences student academic achievement for all students, regardless of race/ethnicity and academic discipline.
Chapter 3

Methodology

This study uses qualitative research methods to explore the experiences and perceptions of undergraduate students who previously conducted research with a faculty-mentor. The strengths of using qualitative research methods derive significantly from “process theory”—a process that views and connects people, situations, and events in which explanation is based on an analysis of how situations and events influence others. Furthermore, quantitative methods such as surveys are often poor at identifying (Maxwell, 2013, citing Britan, 1978; Maxwell, 2004a, 2004c; Patton, 1990). Conversely, the use of qualitative research methods helps to better understand the particular contexts within which study participants act and the influence that this context has on their experiences (Maxwell, 2013).

To be genuinely qualitative research, a study must take account theories and perspectives of those studied, rather than relying entirely on established theoretical views or the researcher’s perspective (Maxwell, 2013). Accordingly, in-person interviews with undergraduate students who conducted research with a faculty-mentor was primary
method used in this study to account for the experiences and perspectives of those who participated in faculty-mentored undergraduate research. The purpose of the interviews were to explore underlying factors that students reference and/or identify as a direct or indirect influence on their engagement and academic achievement as a result of their faculty-mentored research participation.

Research Design and Data Collection

Participant interviews are useful for providing a comprehensive understanding of the examined phenomenon as interviewers can clarify and magnify participant responses (when needed) through guided follow-up questions (Creswell, 2003). This flexibility also afford opportunities to discover new information and supplement existing viewpoints. Accordingly, the design of this exploratory examination consisted of in-person interviews with undergraduate students who conducted research with a faculty-mentor.

An interview with a focus group consisting of individuals who conducted research with a faculty-mentor early in their college years was conducted as part of this examination’s methodological approach. The purpose of conducting an interview with the focus group was to consider homogeneity to inform questions to ask study participants during individual in-person interviews.

Following the focus group interview, a protocol consisting of pre-determined questions was developed for the in-person study participant interviews. All questions
were open-ended to elicit unfiltered responses and perceptions related to study participants’ faculty-mentored undergraduate research experience. To ensure a diverse but homogeneous mix of attributes essential to the purpose of the study, background and demographic questions were included and asked of all study participants. Background questions included academic class standing (i.e. junior, seniors, etc.), and prior undergraduate experience (i.e. previously conducted or never conducted research with a faculty-mentor). Demographic questions included gender, as well as residential (commuter vs. non-commuter) and enrollment status (full-time vs. part-time). Demographic questions also included inquiries of race/ethnicity. Specifically, participants were asked to self-identify their race/ethnicity from categories used by the National Center for Education Statistics (NCES). The purpose for asking participants to identify their race/ethnicity was intended to explore potential differences between race/ethnicity and participants faculty-mentored research experience (See Appendix A).

To ensure consistency for subsequent analysis, all participants were asked the same questions; however, follow-up questions varied if clarification of participants’ responses were needed. To ensure accuracy, all participant interviews were audio-taped and transcribed verbatim. To the extent possible, anonymity was granted to ensure identifiable information was not disclosed in the final publication of the study, and to
encourage study participants to express views and opinions openly and freely without concern of retribution.

A total of twelve participants were interviewed for this exploratory examination. The number of study participants was intentionally small as qualitative researchers typically study a relatively small number of individuals rather than collecting data from large samples and aggregating the data across individuals or situations (Maxwell, 2013). A small number of cases also helps qualitative researchers to better understand how events, actions, and meanings are shaped by the unique circumstances in which these occur (Maxwell, 2004a).

**Study Participants and Site Selection**

The recruitment of study participants was negotiated with the participants' institution Office of Undergraduate Research. Specifically, a request was made to the participants' Office of Undergraduate Research to send a campus-wide communication to solicit volunteers to participate in a research study regarding their past faculty-mentored undergraduate research experience. The communication specified that interested individuals were required to be junior or senior standing students who conducted research with a faculty-mentor for at least one academic semester or academic summer session (See Appendix B).
Particular focused was placed on junior and senior academic standing students as these students are deemed to be more detailed about articulating influences related to their faculty-mentored undergraduate research experience. Also, junior and senior academic standing students are deemed to be more reflective when recalling their experience with conducting research with faculty-mentor earlier in their undergraduate academic years. However, students of all academic majors and disciplines were encouraged to participate in this exploratory study. Nineteen individuals expressed an interest to be interviewed for study, of which twelve ultimately agreed to participate.

Table 1 below provides descriptive information about the participants.

<table>
<thead>
<tr>
<th>Participant 1</th>
<th>Race/ethnicity</th>
<th>Gender</th>
<th>Academic Major</th>
<th>Academic Standing</th>
<th>Enrollment Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 2</td>
<td>Asian, non-Hispanic</td>
<td>Female</td>
<td>Psychology</td>
<td>Senior</td>
<td>Full-time</td>
</tr>
<tr>
<td>Participant 3</td>
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<td>Junior</td>
<td>Full-time</td>
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<td>Senior</td>
<td>Full-time</td>
</tr>
<tr>
<td>Participant 5</td>
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<td>Female</td>
<td>Health Info &amp; Policy</td>
<td>Junior</td>
<td>Full-time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>Gender</th>
<th>Academic Major</th>
<th>Academic Standing</th>
<th>Enrollment Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant 1</td>
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<td>Senior</td>
</tr>
<tr>
<td>Participant 2</td>
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<td>Senior</td>
</tr>
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<td>Participant 3</td>
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<td>Female</td>
<td>Psychology</td>
<td>Senior</td>
</tr>
<tr>
<td>Participant 4</td>
<td>Black, non-Hispanic</td>
<td>Female</td>
<td>Biological Sciences</td>
<td>Junior</td>
</tr>
<tr>
<td>Participant 5</td>
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<td>Senior</td>
</tr>
<tr>
<td>Participant 6</td>
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<td>Senior</td>
</tr>
<tr>
<td>Participant 7</td>
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<td>Senior</td>
</tr>
<tr>
<td>Participant 8</td>
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<td>Female</td>
<td>Psychology</td>
<td>Senior</td>
</tr>
<tr>
<td>Participant 9</td>
<td>White, non-Hispanic</td>
<td>Female</td>
<td>Psychology</td>
<td>Senior</td>
</tr>
<tr>
<td>Participant 10</td>
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<td>Junior</td>
</tr>
<tr>
<td>Participant 11</td>
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<td>Gender &amp; Women’s Studies</td>
<td>Junior</td>
</tr>
<tr>
<td>Participant 12</td>
<td>Hispanic, no race specified</td>
<td>Female</td>
<td>Gender &amp; Women’s Studies</td>
<td>Junior</td>
</tr>
</tbody>
</table>
All participants were informed of the purpose of this study, the method of the data collection, and assured identifiable information will be kept confidential (See Appendix C). Thus, the names and other identifiable information of participants are disguised and were not disclosed to their institution in order to protect their privacy, as well as to encourage them to share their experiences and perceptions openly without retribution. No incentives of any kind were offered to participants. Participation in this examination was based solely on the participants’ willingness to share their faculty-mentored research experiences and perceptions.

All study participants were enrolled at a public comprehensive institution (PCI) that has a faculty-mentored undergraduate research (UR) program. Particular interest was placed on a PCI as more than two-thirds of full-time students pursuing bachelor’s degrees attend public (state funded or supported) colleges and universities (Bowen, et. al., 2009), yet virtually no research exist that examines the effects and/or influences that faculty-mentored undergraduate research has on engagement and academic achievement of students attending PCIs despite growing concerns to improve learning outcomes and educational attainment specifically among students attending PCIs.

The name of the PCI is intentionally withheld as permission to identify the institution was not granted in an effort to further protect the confidentiality and
information provided by its student who agreed to participate in this examination. Although the identity of the PCI could not be disclosed, institutional characteristics of the PCI are unveiled. Specifically, the PCI is located in the mid-Atlantic region of the United States and had an undergraduate student enrollment of approximately 11,000 at the time data were collected for this examination. Other institutional characteristics of the selected PCI include a strong commitment to undergraduate teaching, and an undergraduate research (UR) program that encourages undergraduate students to conduct research with a faculty-mentor. Unlike many PCIs, the selected PCI has an UR program that is not limited to STEM-focused disciplines. Thus, study participants from the selected PCI are encouraged to conduct research with a faculty-mentor regardless of their academic major or discipline. Accordingly, the UR program of the selected PCI encompasses a variety of academic majors and disciplines, which is relevant to the purpose of this exploratory examination, and therefore has the potential to broaden the understanding and subsequent analysis of influences that faculty-mentor undergraduate research has on student engagement and academic achievement.

Data Analysis

Consistent with current qualitative data analysis methods, this exploratory examination used a constant comparative analysis of interview transcripts and research notes to identify recurring or unique themes (Strauss, 1995). According to Jones, et al.,
(2006), constant comparative analysis engages the researcher in a process of collecting and analyzing the data simultaneously at all stages of the data collection and interpretation process, and the results in the identification of codes. Specifically, research notes and other observations were analyzed as part of an initial assessment of influences that study participants referenced during their interviews when recalling their faculty-mentored undergraduate research experience. Thus, as data were being collected and transcribed, research and self-reflected notes were made to help form initial themes.

Coding, which involves analyzing data line by line to identify themes, was then conducted. Coding is used to retrieve and categorize similar data chunks to identify and cluster segments relating to the proposed research question or themes (Miles, Huberman, & Saldana, 2014). In qualitative data analysis, coding is a researcher-generated construct that symbolizes and thus attributes interpreted meaning to each datum for later purposes of pattern discretion, categorization and theory building—a deep reflection, analysis, and interpretation of the data’s meaning (Miles, Huberman, & Saldana, 2014).

A content analysis was then conducted to analyze the resulting data with the aim of generating categories of engagement and academic achievement influences that participants referenced during their interviews as they reflected on their faculty-mentored undergraduate research experience. This process continued until the data reached a point of saturation—the point of which it became redundant (Bogdan & Biklen, 1998).
Findings from the content analysis were then compared to determine trends, similarities, differences, anomalies and potential outliers.

Reliability and Validity

In qualitative research, the researcher is the primary instrument of data collection and data analysis (Miles & Huberman, 1994). Thus, in order to avoid possible threats, biases, and to test the reliability and validity of the examination conclusions, the following strategies, as suggested by Maxwell (1996), were conducted: triangulation, member-checking, and the use of “rich data.” Specifically, this examination used multiple data collection methods such as transcribed participant interviews and research memos to counterbalance flaws that may be inherent in using a single research method. The use of multiple data collection methods allowed for the analysis of competing explanations and discrepant data to test the reliability and validity of the data and resulting conclusions. Similarly, this examination used member-checking by taking findings back to study participants for feedback and verification on the accuracy of interpretations to ensure the reliability and conformability of the data.

The qualitative aspect of this exploratory examination inherently provided rich data. For example, the transcribed participant interviews captured details that can be found and referred to long after the interviews have taken place. The research memos also created rich data as the reactions and initial theories were documented before the
actual analysis of the data. The use of research memos have a long tradition in qualitative research (see Emerson, Fretz & Shaw, 1995; Marshall & Rossman, 2006; Maxwell, 2005; Miles & Huberman, 1994; Straus & Corbin, 1990) because they create conscious moments of structured, systematic reflection during the development and implementation of the research (Ravitch & Riggan, 2012). Finally, use of participants across academic disciplines from diverse demographics backgrounds also lends credibility to the interpretation of common themes and experiences. The aforementioned strategies aided in protecting the data and ultimately the findings and conclusions from reliability and validity threats.

Limitations

Several limitations of this study are readily apparent. First, this study was conducted at one PCI with a small sample size consisting of all female study participants. However, ample descriptions of the study participants are provided so others can decide the transferability of this study to their institutions. Furthermore, as with most qualitative research studies, this study relied primarily on participants’ experiences and perceptions. While a qualitative approach is a legitimate method to explore influences on student engagement and academic achievement, this does not mean other research methods are illegitimate, or that participants’ perspectives and individual experiences are beyond limitations. Limitations notwithstanding, this study used a qualitative approach to explore
participants’ experiences and perception as this method is deemed to be an effective means to provide greater insight of how and in what ways faculty-mentored undergraduate research influences student engagement and academic achievement. Nevertheless, the findings, due to the small number of study participants, are not intended to represent the experiences of all students who participate in faculty-mentored undergraduate research. Moreover, the findings, due to the small number of study participants, cannot make generalizations beyond the scope and context of the experiences of students who participated in the exploratory examination.
Chapter 4

Findings

In this chapter, three main themes are summarized, which emerged from study participants’ interviews: (a) influences on engagement, (b) influences on academic achievement, and (c) other related influences. Specifically, the first theme includes participants’ references of how and in what ways their faculty-mentored undergraduate research experience influenced engagement with their faculty-mentor, other faculty, peers and fellow students. The second theme includes participants’ references of how and in what ways their faculty-mentored undergraduate research experience influenced their academic achievement. The third theme includes related influences that participants’ referenced as a result of their faculty-mentored undergraduate research participation and experience. Quotes from participants are presented as part of the findings to preserve the essential aspects of their experiences.

Because faculty-mentored research experiences vary according to participants’ pre-dispositions and level of contact and commitment of faculty-mentors, the study participants’ background, as well as the descriptors that participants referenced when recalling the relationship and interaction with their faculty-mentor can neither be ignored nor overemphasized. Nonetheless, a brief narrative of each participant is deemed relevant
and therefore is summarized below. In addition, Table 2 provides details about the participants’ background and the level of interaction with their respective faculty-mentor to conceptualize how and in what ways participants believe their faculty-mentored undergraduate research experience had an influence on their engagement and academic achievement.

While not intended, all students that participated in this study were female, who expressed a common desire to share their faculty-mentored undergraduate research experience to affirm their significance as researchers—a role that they perceived as being male-dominated. Additionally, as inferred during their interviews, the female participants’ faculty-mentored undergraduate research experience appeared to play an essential role in increasing their self-efficacy, which may have influenced their willingness to share their experiences and decision to participate in this study.

Participants’ Narratives

Participant 1: A white female residential student, majoring in Biological Sciences. She is an academic standing junior, who conducted research with a faculty-mentor for one academic semester during her sophomore academic year. Participant 1 was enrolled as a full-time student at the time of her faculty-mentored research experience.
She became interested in conducting research with a faculty-mentor during her freshman year after attending an information session on campus about undergraduate research. Upon reading a research paper authored by a professor in the Biological Sciences department, Participant 1 sent the professor an e-mail to advise that she read his paper and asked the professor if he was looking for students to work in his lab. The following semester, Participant 1 was invited to work in the professor’s lab, which ultimately afforded an opportunity to conduct research with the professor serving as her mentor. When asked why she pursued an opportunity to work in the professor’s lab, Participant 1 replied, “I wanted to try and do research…figure out is this something I'd actually enjoy and want to spend my life doing.”

Participant 2: A black female residential student, majoring in Chemical Engineering. She is currently an academic standing senior, who conducted research with a faculty-mentor for three academic semesters, which began during the latter part of her sophomore year and continued throughout her junior academic year. Participant 2 was enrolled as a full-time student at the time of her faculty-mentored research experience.

Her interest to conduct research with a faculty-mentor occurred after meeting other students who conducted research with a faculty-mentor but was unsure how to secure a faculty-mentor. So she e-mailed a few professors in the Engineering departments.
to inquire about possible research opportunities. Eventually, a professor within the Environmental Engineering Department responded by advising of a research opportunity and agreed to serve as her mentor. Although Participant 2 hoped to secure a mentor who was faculty member in her academic major, she viewed Environmental Engineering as a branch of Chemical Engineering and thus accepted the opportunity to conduct research with the professor in the Environmental Engineering Department. When asked why she desired to conduct research with a faculty-mentor, Participant 2 stated that she intends to go to graduate school and therefore wanted to “get a head start on obtaining actual research experience.”

Participant 3: An Asian female commuter student, majoring in Psychology. She is an academic standing senior, who conducted research with a faculty-mentor for two academic semesters during her junior academic year. Although Participant 3 is currently a commuter student, she was a full-time residential student at the time of her faculty-mentored research experience.

She became interested in conducting research with a faculty-mentor after performing experiments as a freshman in her psychology classes. Participant 3 stated the experiments conducted in psychology classes during freshman year informed an expectation to conduct research in her latter academic years. Participant 3 stated she was
later encouraged by her mentor to do research, and that she accepted the opportunity to
conduct research to challenge herself. Participant 3 further stated that she viewed
conducting research with her faculty-mentor as a natural progression of becoming a
seasoned researcher.

Participant 4: A black female residential student, majoring in Biological Sciences. She is currently an academic standing junior, who conducted research with a
faculty-mentor for one academic semester during her sophomore year. Participant 4 was
enrolled as a full-time student at the time of her faculty-mentored research experience.

Her interest to conduct research with a faculty-mentor evolved upon learning of
undergraduate research opportunities through the school’s Office of Undergraduate
Research. Because she did not have a particular research interest, Participant 4 e-mailed
more than twenty faculty members across campus to inquire about possible research
opportunities. Eventually, her mentor was one of few faculty members who responded to
her inquiries. However the mentor was not a faculty member within her academic major.
Nevertheless, Participant 4 stated she accepted the opportunity to conduct research with
the mentor because she desired research experience in any field. Although the mentor
was not a faculty member within her academic major, the research she conducted was
related to her academic discipline—something that she admittedly did not recognize until her research experience demonstrated the related connections.

Participant 5: A white female commuter student, majoring in Environmental Sciences. She is an academic standing senior, who conducted research with a faculty-mentor for two academic semesters during her junior academic year. Although Participant 5 is currently a commuter student, she was a full-time residential student at the time of her faculty-mentored research experience.

She became interested in conducting research with a faculty-mentor after attending an information session sponsored by the institution’s Office of Undergraduate Research. Participant 5 changed her academic major from Secondary Education to Environmental Sciences at the start of her junior academic year and sought research opportunities within her new academic major to explore potential career opportunities related to her new academic major. Participant 5 also desired research experience because she had aspirations of attending graduate school. Unlike most of the other participants, Participant 5 was strategic about identifying potential faculty that she desired to serve as her mentor to conduct research. For example, in addition to learning about the general research interests of faculty from departmental websites, Participant 5 visited the school’s library to read peer review journal articles authored by faculty to assess whether their
research aligned with her research interests. Eventually, Participant 5 was able to secure a faculty-mentor whose research aligned with her interests.

**Participant 6:** A black female residential student, majoring in Biological Sciences. She is currently an academic standing senior, who conducted research with a faculty-mentor for two academic semester during her junior academic year. Participant 6 was enrolled as a full-time student at the time of her faculty-mentored research experience.

She initially became interested in conducting research with a faculty-mentor after learning about undergraduate research opportunities as a participant in the Meyerhoff scholars program. According to Participant 6, the Meyerhoff program encouraged her to conduct research with a professor on-campus to increase her competitiveness as a candidate for graduate school. Because Participant 6 have aspirations of attending graduate school, she pursued research opportunities by e-mailing “a lot of professors in Biology Department and waited for a response.” Her e-mail advised that she was a Meyerhoff Scholar inquiring about opportunities to conduct research with a faculty-mentor. Participant 6 also stated that she pursued opportunities to conduct research with a faculty-mentor to find out whether or not she liked doing research, and that she was
aware faculty on campus were conducting interesting research and wanted to get involved and get her “feet wet and just experience research”.

Participant 7: A white female commuter student, majoring in Sociology. She is an academic standing senior, who conducted research with a faculty-mentor for one academic semester during her sophomore academic year. Although Participant 7 is currently a commuter student, she was enrolled as a full-time residential student at the time of her faculty-mentored research experience.

Her interest to conduct research with a faculty-mentored occurred by happenstance upon walking around the halls on campus one day and seeing a pamphlet for the Ronald E. McNair Scholarship Program. After reading about the program she became interested but decided not to apply. The following semester she decided to apply and was accepted. However she did not realize that a core component of the program provided opportunities to conduct research with a faculty-mentor. Intrigued, she welcomed the opportunity to conduct research with a faculty-mentor. When asked why she welcomed the opportunity to conduct research with a faculty-mentor, Participant 7 replied, “I’ve always had an interested in research… but because of the rigorous nature of it I was reluctant to pursue it thinking it would be too intense, but when I was accepted in
the [McNair] program and learned that it offered an opportunity to do research with a mentor I couldn’t pass up the opportunity to at least try it.”

Participant 8: A black female residential student, majoring in Psychology. She is currently an academic standing senior, who conducted research with two faculty-mentors during her junior academic year. Participant 8 was enrolled as a full-time student at the time of her faculty-mentored research experience.

She initially became interested in conducting research with a faculty-mentor after working with a graduate student as a research assistant during her sophomore year. Although Participant 8 performed menial tasks as a research assistant, she was able to observe actual research performed by the graduate student. Her observations of the graduate student peaked her interest to conduct research. Gradually, Participant 8 was given more substantive research tasks within the lab and her performance was observed by the graduate student and faculty who worked in the lab. Ultimately, two faculty members who conducted research within the lab approached Participant 8 for assistance with their research. This experience led to opportunities to conduct research with the two faculty members, who later served as her mentors.

Participant 9: A white female residential student, majoring in Psychology. She is an academic standing senior, who conducted research with a faculty-mentor for two
academic semesters during her junior academic year. Participant 9 was enrolled as a full-time student at the time of her faculty-mentored research experience.

Her interest to conduct research with a faculty-mentor developed after participating in an honors program during the summer before entering her junior academic year. As an honors program participant, she conducted a survey for parents of children with autism (comparing ethnicities), measuring parent stress, psychological well-being of parents, and child behavioral problems. The experience she obtained that summer stimulated her interest in research; specifically her desire to conduct research with a faculty-mentor whose interests investigated the effects of autism. When asked why wanted to conduct research with a faculty-mentor whose research interests investigated the effects of autism, Participant 9 replied, “I wanted to focus on research area that appeared to receive little attention and thought that researching stress and well-being related to autism would be interesting”.

Participant 10: An Asian female residential student, majoring in Health Information and Policy. She is an academic standing junior, who conducted research with a faculty-mentor for two academic semesters during her sophomore year. Participant 10 was a full-time student at the time of her faculty-mentored research experience.
She became interested in conducting research with a faculty-mentor after taking a course during her freshman year that covered health disparities among minority groups and populations living in rural and inner-city communities. According to Participant 10, the course ignited her desire to research health disparities—an area that she wanted to further explore. With the help of a former professor, Participant 10 was paired with a faculty member whose research explores health disparities among minority communities. The faculty member eventually agreed to serve as Participant’s 10 mentor. As a result, Participant 10 was offered an opportunity to conduct research with her mentor in an area directly related to her interest.

Participant 11: An Hispanic female residential student, majoring in Emergency Health Services. She is currently an academic standing junior, who conducted research with a faculty-mentor for two academic semesters during her sophomore year. Participant 11 was enrolled as a full-time student at the time of her faculty-mentored research experience.

Her primary reason for pursuing an opportunity to conduct research with a faculty-mentor was to explore potential career opportunities within the emergency health services field. Participant 11 is unsure whether she wants to attend professional or
graduate school upon earning her bachelor’s degree and decided to pursue an opportunity to conduct research with a faculty-mentor to help her decide a career path.

Initially, Participant 11 was reluctant to pursue an opportunity to conduct research with a faculty-mentor out of fear that a faculty member would not be interested in working with her due to academic major. Specifically, Participant 11 viewed her academic major as “non-traditional” and not compelling enough for faculty to seriously consider. However, with assistance from the institution’s Office of Undergraduate Research, Participant 11 was able to secure a mentor whose research is in the area of emergency management and disaster relief—two areas that Participant 11 is considering as a career upon earning her bachelor’s degree.

Participant 12: An Hispanic female residential student, majoring in Gender and Women’s Studies. She is an academic standing junior, who conducted research with a faculty-mentor for one academic semester during her sophomore year. Participant 12 was a full-time student at the time of her faculty-mentored research experience.

She decided to pursue an opportunity to conduct research with a faculty-mentor to challenge herself and to do something that “not a lot of undergrads do.” When probed further, Participant 12 stated that she viewed conducting research with a faculty-mentor as a privilege, and believe she was capable of being successful if given the opportunity.
Participant 12 confessed that she was nervous and a little apprehensive in the beginning because she assumed conducting research with a faculty-mentor would be a lot of work. In spite of her initial reservations, she determined the experience would be a great opportunity and decided to pursue it. In the end, she secured a faculty-mentor whose research focuses on sexualities and gender systems. Participant 12 hopes her faculty-mentored research experience will be viewed favorably when she applies to graduate school.

**Table 2**

*Study Participants’ Background & Contact/Interaction with Faculty-mentors*

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<thead>
<tr>
<th>Participant</th>
<th>Previous Research Experience</th>
<th>Duration of Faculty-mentored research experience (# of academic semesters)</th>
<th>Academic Major/Discipline</th>
<th>Academic Standing</th>
<th>Level of Contact/Interaction with Faculty-Mentor (average # of weekly interactions)</th>
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<tr>
<td>Participant 1</td>
<td>None</td>
<td>1</td>
<td>Biological Sciences</td>
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<tr>
<td>Participant 2</td>
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<td>Emer. Health Services</td>
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<td>Gender &amp; Women’s Studies</td>
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As shown in Table 2 above, six of the twelve study participants major in STEM-related disciplines, while the remaining six participants currently major in social science related disciplines. All twelve study participants conducted a faculty-mentored research project within or related to their respective academic major/discipline. As represented in Table 2, none of the twelve study participants had research experience prior to conducting research with a faculty-mentor. With respect to academic standing, five of the twelve study participants are juniors and the remaining seven participants are seniors. Both junior and senior academic standing participants conducted research with a faculty-mentor in their junior or sophomore academic year.

The duration of the faculty-mentored research experience of participants majoring in STEM-related averaged two academic semesters, but the average duration of all twelve study participants’ faculty-mentored research experience was one and half to two academic semesters. However, the level of engagement between study participants and their respective faculty-mentor varied by the participants’ academic standing and academic major/discipline.

For example, junior academic standing participants averaged two weekly contacts/interactions with their faculty-mentor, while senior academic standing averaged three weekly contacts/interactions with their respective faculty-mentor. Similarly, as represented in Table 2, study participants majoring in STEM-related disciplines had
slightly more contacts/interactions with their faculty-mentor than study participants majoring in social science related disciplines.

While the number of contacts and interaction between study participants and their faculty-mentor alone cannot determine the success of the participants’ faculty-mentor research experience, the frequency of the participants’ contact and interaction with their respective faculty-mentor can aid to better understand the level of influence that study participants believe contributed to their engagement and academic achievement. Also, the frequency of the interaction between study participants and their faculty-mentor offers insight on the faculty-mentors’ behavior and availability, which research literature suggest contributes to the social and academic needs of students (Lopatto, 2003a; Lopatto, 2009). Thus, knowing the frequency of study participants’ contact/interaction with their faculty-mentor is an integral component of the following findings.

Influences on Engagement

During individual interviews, study participants spoke in-depth about how and in what ways their faculty-mentored research experience influenced the degree, level, and scope of interaction and overall engagement with their faculty-mentor, other faculty, peers, and fellow students. Some words commonly expressed by participants were “confident”, “less-intimidating”, and “comfortable” when recalling ways in which their
faculty-mentored research experience influenced engagement with their faculty-mentor.

For example, some statements made by participants were:

I’ve gotten closer to her [faculty-mentor] and I don’t think I would have had the confidence to build that relationship if it weren’t for the research that I conducted under her mentorship.

My research experience with my mentor increased by confidence with interacting with him [faculty mentor]. I’m now more comfortable with talking to him about my career and research goals and my desires to pursue internships…

Working with my faculty-mentor increased my confidence in communicating with my mentor about the research I conducted and the struggles I had with juggling courses and meeting deadlines.

My first faculty-mentor was not a good fit for me but it was a good learning experience for me to have the confidence to let it be known and to seek another mentor in the same department, which I understood was politically sensitive but the interaction of my first mentor made it less intimidating and made me more comfortable to pursue another mentor.

In general, participants mentioned that their faculty-mentored research experience positively influenced their engagement with their faculty-mentor; however some differences were found between the participants’ academic standing and the level and degree of engagement with their mentor and other faculty.
As represented in Chart 1 above, senior academic standing participants who conducted research with a faculty-mentor during their junior or earlier academic year mentioned their level of confidence increased as they felt less intimidated and more comfortable over time when interacting with faculty. Specifically, more than half of senior academic standing participants mentioned that their level of engagement with their professors had strengthened following their faculty-mentored research experience— that having to initiate and set-up meetings with their faculty-mentor and others professors involved in their faculty-mentored research project improved their communication and interpersonal skills, which ultimately boost their comfort and level of confidence to interact with faculty. Moreover, senior academic standing participants commonly stated that they would not have had an increased level of confidence to engage and to build
relationships with their professors to discuss school and non-school related matters if it were not for the interaction that their faculty-mentored research experience had influenced.

While junior academic standing participants also believe that their level of confidence to engage with professors had increased due to their faculty-mentored research experience, the degree and scope of their engagement with professors was not the same as senior academic standing participants. Specifically, three of the five junior academic standing participants mentioned that upon conducting research with a faculty-mentor, their level of confidence steadily increased over time when interacting with professors; however, unlike senior academic standing participants, junior academic standing participants did not express the same level of confidence to talk to professors about struggles they had with juggling courses and meeting deadlines, nor did they express the same comfort level as senior academic standing participants when talking to their faculty-mentor about non-school related matters such as future career and research goals.

Similarly, junior academic standing participants did not express the same level of confidence and comfort as senior academic standing participants when articulating expectations and dissatisfaction with their faculty-mentor. For example, when the majority of senior academic standing participants desired more time to interact with their
faculty-mentor, and/or felt that their faculty-mentor was not a “good fit” they expressed having a level of confidence and comfort to let it be known that they desired more interaction and/or sought another faculty-mentor. Whereas almost none of the junior academic standing participants expressed having the same level of confidence and comfort as senior academic standing participants when articulating similar expectations and dissatisfaction.

For example, junior academic standing participants referenced a lack of comfort and confidence to express dissatisfaction with the amount of supervision and direction received from their faculty-mentor. Specifically, four of the five junior academic standing participants believe that their standing as juniors did not entitle them to express certain expectations and dissatisfaction concerning their faculty-mentor and/or their faculty-mentor research experience— that the ability to express certain expectations and dissatisfaction was reserved for more senior level research mentees. When probed further, junior academic standing participants believe their standing as juniors did not afford them the ability to articulate expectations and dissatisfaction of matters that they deemed sensitive such as seeking or requesting another faculty-mentor that they believe to be a better fit.

Three of the five junior academic standing participants further stated that expressing certain expectations such as requesting more supervision and direction from
their faculty-mentor could be viewed or interpreted as an inability to meet faculty-mentors’ expectations, and that such likely interfered with their level of comfort and confidence to articulate certain expectations and dissatisfaction concerning their faculty-mentor and/or their faculty-mentor research experience. Conversely, nearly all senior academic standing participants attributed their faculty-mentored research experience as increasing their level of confidence and comfort to engage with faculty-mentors to express expectations and dissatisfaction, including matters that they deem sensitive such as requesting more supervision and direction from their faculty-mentor if and when they believe such was needed.

The word “assertive” also emerged when some participants described how and in what ways they believe their faculty-mentored research experience influenced engagement with their faculty. Specifically, participants from all academic majors and disciplines and academic standings mentioned that their faculty-mentored research experience had influenced them to become more assertive to contact their faculty-mentor and other faculty to ask questions and/or to seek clarification regarding course-related matters. For example, some statements made by participants were:

I learned to be a bit more assertive when engaging professors. I was a passive person before conducting research with my mentor and I talked to my mentor about this and she definitely encouraged me to engage more in class…to participate more.
One thing my [faculty-mentored research] experience did was teach me to be more assertive and say, “hey, I really need to meet with you about this…I’m a little lost. Can we talk sometime soon?”

I don’t feel as intimidated by faculty…I became more assertive with e-mailing them to set-up meetings to voice my concerns or to ask questions because of my [faculty-mentored research] experience.

Collectively, the extent to which participants across all academic standings and majors/disciplines expressed an increase level of confidence and assertiveness due to their faculty-mentored research experience suggest such was attributed to the nature and scope of the participants’ interaction with their faculty-mentor. Specifically, the level of interaction between senior participants and their faculty-mentor was reportedly higher and more frequent than the level of interaction between junior academic standing participants and their respective faculty-mentor. Similarly, as shown in Table 2, participants majoring in STEM-related disciplines had slightly more contact and interaction with their faculty-mentor than participants majoring in social science related disciplines. Thus, the frequency and the degree of the faculty mentorship suggest that it influenced the participants’ level of confidence and assertiveness across academic standing and majors/disciplines.

Nevertheless, nearly all participants expressed that their faculty-mentored research experience has helped with their level of personal growth when interacting with faculty and university administration. Specifically, both junior and senior academic
standing participants believe that they have become closer to faculty and administrators that they might not have otherwise engaged if it were not for their faculty-mentored research experience— that their faculty-mentored research experience has made encounters with faculty and administrators easier to interact with and to engage faculty and administrators. However, some differences were found between the participants’ level of engagement and the academic home of faculty and administrators.

For example, the level of participants’ engagement was found to be more pervasive with faculty and administrators within the same academic home as participants. In other words, when queried about the faculty and administrators with whom they frequently interact, participants majoring in STEM-related disciplines expressed higher levels of interaction and engagement with faculty and administrators within STEM-related departments and units than faculty and administrators in social science departments. Similarly, when queried about the faculty and administrators with whom they frequently interact, participants majoring in social science related disciplines expressed higher levels of interaction and engagement with faculty and administrators within social science departments and units than faculty and administrators in STEM-related departments and units.

Interestingly, participants majoring in STEM-related disciplines commonly referenced STEM-related faculty as virtual peers— that their faculty-mentored research
experience, which afforded an opportunity to engage and to work side-by-side with
STEM faculty-mentor to make significant contributions to research, had influenced their
perception that STEM-related faculty were virtual peers. For example, some statements
made by participants majoring in STEM-related discipline were:

The research that I conducted with my [faculty] mentor positively influenced my
interaction with other faculty in my department…they really, really know me
from the research I did with my mentor…I’ve been able to work with them not
just on research-related things but on other outside projects because they view me
like their peer.

…so after working side-by-side with my mentor in my department and actually
making significant contributions to research, you start seeing faculty as almost
peers.

While participants majoring in social science related disciplines also mentioned
that their faculty-mentored research experience afforded an opportunity to engage and to
work side-by-side with a faculty-mentor to make significant contributions to research,
they did not expressly reference nor view faculty in social science related disciplines as
virtual peers. Rather, nearly all participants majoring in social science related disciplines
had a hierarchical perception of faculty in that they consistently and expressly viewed
faculty within the social science departments as merely “experts in the field” with whom
their faculty-mentored research experience provided an opportunity to interact and
engage. For example, a couple statements made by participants majoring in social science related disciplines were:

…it [faculty-mentored research experience] helped me to grow up. Coming out of high school, professors are big scary authority figures. But after working side-by-side with my mentor you start seeing professors as experts in their field and that you have an opportunity to assist and learn from.

…because I actually had that [research] experience with my mentor, I’m able to understand the professor-student hierarchy isn’t as big as I originally thought. So, I find myself talking to other faculty in my department more about my research and my research interests.

Thus, participants majoring in social science disciplines were generally more likely than participants majoring in STEM-related disciplines to have a more traditional view of the professor-student relationship because they tended to emphasize the knowledge and intellectual benefits that is often associated with faculty-student interactions. Whereas participants majoring in STEM-related disciplines had a more egalitarian view of the professor-student relationship as they tended to express the personal, as well as the professional benefits gained from their faculty-mentor interaction.

Specifically, four of the six participants majoring in STEM-related disciplines commonly referenced that their faculty-mentored research experience enabled an opportunity to develop a continual personal and professional relationship with faculty who taught within their academic department. Thus, the majority of participants majoring
in STEM-related disciplines were generally more likely than participants majoring in social science related disciplines to emphasize the personal consideration role of faculty over the knowledge and intellectual benefits that is often associated with faculty-student interactions.

Participants also expressed that their faculty-mentored research experience has helped with professional growth when interacting with peers. However, some differences between the level of influence and the participants’ academic disciplines were found.

As represented in Chart 2 above, more than half of the participants from all academic majors and disciplines believe that their faculty-mentored research experience influenced interactions and engagement with peers and fellow researchers by affording opportunities to attend and present research at national and regional research conferences.
and symposia—that their level of confidence to interact and engage with peers increased when their research projects were selected for presentation and subsequently praised by fellow researchers and subject-matter experts at research conferences and symposia. Participants also uniformly stated that when faculty-mentors commended their work it encouraged and made them feel worthy to interact and engage with peers.

Specifically, the majority of participants majoring in STEM-related disciplines mentioned that their faculty-mentored research experience encouraged them to interact with fellow researchers at research conferences and symposia by providing an opportunity to discuss their research. In the same way, nearly half of the participants majoring in social science disciplines mentioned that their faculty-mentored research experience provided an invaluable experience to learn how to effectively engage and to communicate their research to an audience of peer researchers at research conferences and symposia, as well as taught them that innovative and cutting-edge research is not necessarily carried out individually but is often conducted with and among peers from different disciplines—that peers from various disciplines can work collectively on different components of a research project to make significant and valuable contributions to research.

However, as represented Chart 2, participants majoring in STEM and social science disciplines differ as to the level of influence that providing opportunities to
interact and engage with fellow researchers is viewed as an essential and necessary skill in their future research pursuits and academic careers as aspiring researchers.

During individual interviews, participants also mentioned that their faculty-mentored research experience positively influenced engagement with fellow students. As represented in Chart 2, more than half of the participants across all academic disciplines mentioned their faculty-mentored research experience influenced them to develop and maintain peer social networks as a way to support and to encourage fellow students.

For example, five of the twelve participants stated they became interested to pursue opportunities to conduct research with a faculty-mentor upon learning and/or being encouraged by students who previously conducted research with a faculty-mentor. Additionally, the majority of participants mentioned that they have encouraged fellow students to be comfortable with interacting and engaging with faculty by sharing examples and scenarios learned from their faculty-mentored research experience. Specifically, four of the six participants majoring in social science related disciplines expressed that they have shared their faculty-mentored research experience with other students who were nervous and/or apprehensive about interacting with and engaging with professors. Similarly, nearly all participants majoring in STEM-related disciplines mentioned that they rallied together, use each other as support, and formed bonds with
fellow students and classmates who also conducted research with a faculty-mentor. For example, statements made by participants included the following:

I encouraged other students to be more comfortable talking with faculty and would tell them ways they could also become more comfortable talking with faculty.

….and since I’ve been through the [faculty-mentored research] process, I share my experience with other students who are nervous and apprehensive about interacting with their [faculty] mentor and other faculty.

Students in my class, particularly those in my lab who conducted research with a faculty-mentor, rallied together and we used each other as support.

I got a lot closer to fellow students and classmates; especially the ones who were also conducting research with a [faculty] mentor.

…and I found myself like really advocating for students to do research.

I was recognized as ‘student researcher of the week’ so people would come up to me and say, “hey I saw your picture…I’m really interested in doing research…where do I start?” I would encourage them and tell them how to go about it.

…now there are at times where I’m still the quiet reserved person…I guess that’s a natural part of me, but when students asked about my [faculty-mentored research] experience I felt obligated to tell them because I had such a great experience and I think it should be more on the forefront than it is.

Participants majoring in STEM-related disciplines also mentioned that they encouraged other students in STEM-related disciplines to do research with a faculty-mentor but stressed the experience is only rewarding with a “good” mentor. When
queried further, four of the six participants majoring in STEM-related disciplines described a “good” mentor as a faculty member who takes a personal interest in students’ success and is available and open to talk about things beyond academics and the progress of the research project.

As shown in Chart 2, less than half of participants majoring in social science related disciplines stated that they encouraged other students to conduct research with a faculty-mentor. However when asked by other students about their faculty-mentored research experience, nearly all participants majoring in social science disciplines said they felt obligated to tell other students about their experience because they had a positive experience and believe faculty-mentored research should be encouraged for all students in social science related disciplines. Still, three out of the six participants majoring in social science disciplines stated when other students have asked about their faculty-mentored research experience, they stressed that conducting research with a faculty-mentor can be time-consuming and difficult to balance the expectations of faculty-mentors with personal life commitments.

Although the level of engagement between participants and their respective faculty-mentor, peers, and fellow students varied by the participants’ academic standing and academic major/discipline, no expressive differences were found between participants’ race/ethnicity with respect to how and in what ways their faculty-mentored
research experience influenced engagement with their faculty-mentor, peers, and fellow students. However, when recalling their faculty-mentored research experience, a few participants, particularly those majoring in STEM-related disciplines, reflected whether the scope, level, and nature of the engagement was attributed to their faculty-mentor being of the same gender, and/or whether the interaction with their faculty-mentor would have been different if their faculty-mentor was of the opposite gender.

Specifically, one participant majoring in a STEM-related discipline revealed that she worked with a male faculty-mentor and wondered how that influenced her interaction with him. Similarly, another participant majoring in a STEM-related discipline mentioned she was not sure whether she would have had the same positive level of interaction and engagement experience if her faculty-mentor was a female. Another participant majoring in a STEM-related discipline stated having a faculty-mentor who was of the same gender may have played a part in her engagement experience when interacting with her faculty-mentor. Moreover, another participant majoring in a STEM-related discipline stated she thinks her experience had a lot to do with the fact that her faculty-mentor was a female and suspected her level of interaction and overall engagement may have been different if her mentor was a male. Some of these gender-related revelations were reflected in the following participants’ statements:
I’ve worked with a male [faculty] mentor and sometimes wonder how that influenced my interaction with him.

…but I’m not sure if I would have had the same positive experience if my [faculty] mentor was a female.

Working with a [faculty] mentor who was the same gender as me may have played a part in my experience when interacting with her.

I think my experience had a lot to do with the fact that my [faculty] mentor was a female…I suspect it may have been different if my mentor was a male.

In general, participants who reflected whether the engagement and interaction would have been different if their faculty-mentor was of the same or opposite gender commonly expressed having a positive faculty-mentored research experience. Nevertheless, the faculty-mentors’ gender is an important consideration because all study participants, as referenced in Table 1, were female. Consequently, the mentors’ gender offers greater insight of the participants’ perception of why they believe such may have influenced the level and scope of engagement during their faculty-mentored research experience.

Also, while participants across all academic disciplines and academic standings spoke positively about their mentors, some mentioned that they expected to work more closely with the faculty-mentor than they did. Specifically, some participants expressed dissatisfaction with having to interact with the mentors’ graduate assistants more
frequently than desired. For these participants, having to interact with the mentors’ graduate assistants was disappointing because they expected the faculty-mentored research experience would afford greater opportunities to interact and work more closely with the mentor.

Influences on Academic Achievement

Participants spoke in-depth about how and in what ways they believe their faculty-mentored research experience had a direct or indirect influence on their academic achievement with respect to improvement in grades, motivation, persistence, study and test-taking skills. However, as represented in the Chart 3 below, some differences were found between the participants’ academic disciplines and the level of influence that they believe the faculty-mentored research experience had on their academic achievement.

![Chart 3](image)

**Chart 3**
Differences in Level of Influence on Academic Achievement

- Improved Course Grades and Overall Grade Point Average (GPA)
- Increased Motivation to Learn New, Complex, and Challenging Concepts
- Increased Level of Persistence and Perseverance to Succeed Academically
- Improved Study and Test-taking Skills

- STEM
- Social Sciences
For example, three of the six participants majoring in STEM-related disciplines believe that their faculty-mentored research experience did not have much of an influence on their grades earned in courses or had much of an influence on their overall grade point average— that their grades generally were the same before and after their faculty-mentored research experience. The remaining three of the six participants majoring in STEM-related disciplines stated that while their grades had improved, they did not see a connection between the improvement in their grades and their faculty-mentored research experience. However, half of the participants majoring in social science related disciplines believe course grades and overall grade point average had improved as a result of their critical thinking and analytical skills being enhanced by the faculty-mentored research experience. Similarly, a few participants majoring in social science related disciplines mentioned an improvement in course grades and overall grade point average due to an increase in their motivation to learn as a result of the faculty-mentored research experience. Specifically, some statements made participants included the following:

I don’t think it [faculty-mentored research experience] had that much of an effect on my academic achievement in terms of grades and my grade point average.

…so, my grades, while they have improved, I don’t see the connection between the improvement and my [faculty-mentored] research experience.
...and because of my [faculty-mentored] research experience, I’ve been able to bolster my GPA.

My grades have gotten better because my motivation and like my drive and dedication to learning increased because of my [faculty-mentored] research experience.

My grades remained pretty much the same but my motivation to learn I would say changed because of the experience I had with conducting research with my [faculty] mentor.

Increases in personal motivation and motivation to learning was commonly referenced by participants across all academic majors and disciplines when mentioning how and in what ways they believe their faculty-mentored research experience had an influence on their academic achievement. Specifically, participants across all academic majors and disciplines stated their faculty-mentored research experience influenced their motivation to learn new, complex, and challenging concepts. For example, more than half of the participants across all academic majors and disciplines mentioned the faculty-mentored research experience motivated them to take extra and advanced courses in research methods to improve their knowledge and proficiency in quantitative and qualitative research methods respectively— that their faculty-mentored research experience demonstrated the importance of having a solid grasp and understanding of quantitative and qualitative research methods in order to effectively conduct specific types of research.
Moreover, the participants who were motivated to take extra and advanced research methods courses mentioned they would not have sought to improve their knowledge and proficiency of advance research methods if it were not for their faculty-mentored research experience. Also, nearly all participants in STEM-related disciplines mentioned that they never thought publishing as an undergraduate was possible but now are seeking to publish— that they view publication of their research as an extension of academic achievement and that were motivated to publish as a direct result of their faculty-mentored research experience.

Similarly, participants frequently referenced an increase level of persistence and perseverance when speaking about how and in what ways their faculty-mentored research experience influenced their academic achievement. Specifically, participants across all academic majors and disciplines mentioned that their faculty-mentored research experience contributed to an overall increase in their level of persistence and perseverance to complete research projects and to succeed academically. For example, some participants majoring in STEM-related disciplines commonly expressed feelings of once being discouraged by repeat iterations and edits to improve and to refine their research but the encouragement and personal support received from their faculty-mentor increased their level of persistence, as well as taught them to persevere and to succeed in spite of set-backs. Similarly, a few participants majoring in social science related
disciplines commonly expressed feelings of once wanting to give up on learning things that seemed too challenging but that the intellectual and personal support received from their faculty-mentor increased their persistence to learn challenging things, which increased their persistence to excel academically. For example, some statements made participants were:

Going through that [faculty-mentored research] experience and getting beat down by edits was really hard but I think learning to overcome that and being able to finish in spite of that increased my level of persistence and perseverance to succeed.

…at the end it [faculty-mentored research experience] led to an overall boost in persistence like, okay, I can do this…I’ve done this.

I used to want to give up on learning things that seemed too challenging for me. Now I’m like I’m not giving up…so my [faculty-mentored] research experience definitely increased my persistence to learn and to excel academically.

When probed further, the extent to which participants expressed an increase level of persistence and perseverance on account of their faculty-mentored research experience was attributed to the level of interaction and availability of their faculty-mentor. Specifically, when participants were satisfied with the level of interaction and availability of their faculty-mentor, they sought and received encouragement and support from their faculty-mentor, which ultimately influenced them to persist and to persevere whenever they faced challenging events and/or felt discouraged about the progress of their research or other academic-related matters.
However, a few participants referenced the race/ethnicity of the faculty-mentor as a possible factor which may have contributed to their increase levels of motivation, persistence, and resulting academic achievement. Specifically, two (2) black participants and one (1) Hispanic participant speculated whether their increased levels of motivation and persistence to perform well academically were attributed to their mentor being of the same race/ethnicity.

For example, one Hispanic participant stated conducting research with her faculty-mentor who was of the same race/ethnicity increased her level of persistence and sense of motivation to learn from her mentor and subsequently do well academically. Similarly, a black participant stated that her motivation to learn and persistence to do well academically may have been attributed to her faculty-mentor being black— that her mentor pushed and encouraged her in ways that she was not sure would have been the case if her faculty-mentor was of another race. Likewise, another black participant stated while her faculty-mentored research experience increased her motivation to do well academically, she did not know if she would have been as motivated to learn and do as well academically if her faculty-mentor was not black. These race-related reflections were revealed in the following participants’ statements:

Conducting research with my [faculty] mentor who was the same race as me may have increased my level persistence and sense of motivation to learn from her.
...but my sense of motivation may have had to do with my [faculty] mentor being black...he pushed and encouraged me in ways that I’m not sure would have been the case if he was another race.

Although my [faculty-mentored] research experience increased my motivation, I don’t know if I would have been as motivated to learn if my mentor wasn’t black. The black and Hispanic participants who reflected whether the race of their faculty-mentor contributed to their increase levels of motivation and persistence and resulting academic achievement generally expressed having a positive faculty-mentor research experience. Still, the influence of the faculty-mentors’ race/ethnicity is important as eight of the twelve participants, as referenced in Table 1, were minority students (four black, two Hispanic, and two Asian) who attended a predominately White university. Thus, the race/ethnicity of the faculty-mentor provides insight of why the minority participants’ believe such may have contributed to their increased levels of motivation, persistence, and subsequent academic achievement.

Participants also mentioned that their faculty-mentored research experience had an influence on their academic achievement by improving their study and test-taking skills. Specifically, participants across all academic majors and disciplines found that their faculty-mentored research experience improved their study and test preparation skills; particularly when preparing for exams that contain a substantial amount of
application-based questions. However, as represented in Chart 3, slight differences were found.

For example, four of the six participants majoring in STEM-related disciplines believe that their faculty-mentored research experience allowed them to see direct links of their faculty-mentored research experience and concepts tested in exams. Similarly, about half of the participants majoring in STEM-related disciplines believe that their faculty-mentored research experience afforded them the ability to learn to question and use research to determine answers to exam questions. Additionally, three of the six participants majoring in social science related disciplines believe the hands-on aspects of their faculty-mentored research experience demystified the process of learning new and complex concepts and that such allowed them to improve their understanding and ultimately perform better on essay-based exams.

Moreover, participants expressed that their faculty-mentored research experience had an influence on their academic achievement by improving their learning aptitude and capacity. Specifically, participants across all academic majors and disciplines referenced the faculty-mentored research experience as improving their understanding, focus, and diligence to learn and encouraged them to think more critically and scientifically. For example, statements made participants included the following:
My understanding of class material heightened…when a lecture or assignment is introduced in class related to my research I’m already possibly familiar with it because I had prior exposure or previous knowledge of it and can follow it and contribute to the discussion.

…and so it [faculty-mentored research experience] improved my understanding and focus and diligence to learn and stay on task.

The [faculty-mentored] research experience that I had made it a lot easier to understand things. I can now read technical publications and studies and kind of figure out and understand the methodology used and explain the results.

My [faculty-mentored] research experience encouraged me to think more critically when analyzing or confronting new information…this helped me to learn new concepts and things that I had no prior knowledge of.

However, as reflected in Chart 4 below, the level of influence varied slightly between participants majoring in STEM and social science disciplines.

![Chart 4](chart.png)

For example, five of the six participants majoring in STEM-related disciplines believe their comprehension of class material amplified and sharpened as a result of their
faculty-mentored research experience— that when a lecture or class assignment introduces a concept related to research conducted with their faculty-mentor, they are most likely familiar with it because they had prior exposure or previous knowledge of it and can follow it and can contribute to class discussions.

Similarly, five of the six participants majoring in STEM-related disciplines mentioned that their faculty-mentored research experience made it easier to understand new scientific and abstract concepts— that when reading scientific and technical publications and research studies, they can now figure out and understand the methodology used, as well as explain the results. Likewise, nearly all participants majoring in social science related disciplines found that their faculty-mentored research experience encouraged them to think more critically and scientifically when analyzing or confronting new information and this has helped them to learn concepts and theories in which they had no prior knowledge or exposure.

Additionally, participants across all academic majors and disciplines believe their faculty-mentored research experience had an influence on their academic achievement by training them to apply concepts and information rather than simply memorizing information—that such skill made exams and select course material easier to understand because they could apply concepts and information rather than simply memorizing it.
Furthermore, participants from all academic majors and disciplines found that their faculty-mentored research experience enhanced their undergraduate education beyond traditional classes and lectures by teaching them to explore research questions, think scientifically, design experiments, and analyze data. Moreover, the majority of the participants, particularly those majoring in STEM-related disciplines, mentioned conducting research under the guidance of a faculty-mentor emphasized their role as a researcher—that unlike the research carried out in their laboratory classes such as biology and chemistry that simply demonstrate scientific concepts, faculty-mentor research underscored their role as researchers who seek to solve problems or answer certain questions connected to developed hypotheses.

Although participants across academic majors and disciplines and academic standings generally spoke positively about how and in what ways faculty-mentored experience influenced their academic achievement, some mentioned that they expected to receive more direction and supervision from their faculty-mentor. Specifically, some participants expressed dissatisfaction with having to conduct their research projects with little direction from faculty-mentors. For these participants, having to conduct research with minimum direction from mentors was disappointing because they expected the faculty-mentored research experience to be intensely supervised and thus expected to receive more direct and supervised mentoring from their faculty-mentor.
Other related influences

For some participants, their undergraduate experience has been transformed by their faculty-mentored research experience. According to these participants, the undergraduate experience is not just about going to class, taking exams, and getting “good” grades. For them, conducting research as an undergraduate with a faculty-mentor made them more well-rounded and mature students, as well as taught them things about themselves that otherwise may not have surfaced if it were not for their faculty-mentor research experience. This view specifically resonated with participants who initially did not seek faculty-mentor research opportunities based on preconceived beliefs that they were not intellectually adept or adequately prepared to conduct research with a faculty-mentor but the effect of the faculty-mentored research experience changed their perception. Thus, the extent to which participants believe faculty-mentored research transformed their undergraduate experience was based on some participants’ preconceptions, which influenced the outcome of their faculty-mentored research experience.

Still, participants across all academic majors and disciplines and academic standings believe the faculty-mentored research experience improved their organizational and time-management skills by teaching them how to balance competing priorities related and unrelated to school matters. For example, three junior academic standing
participants, and five senior academic standing participants expressed that they held on-
campus and off-campus part-time jobs while conducting research with a faculty-
mentor—that the faculty-mentor research experience taught them how to balance work
and classes while conducting research with their faculty-mentor.

Moreover, participants across all academic majors and disciplines and academic
standings believe that their faculty-mentored research had influenced or confirmed their
career goals and/or academic aspirations to some level or degree. Specifically, all
participants majoring in STEM-related disciplines, and nearly all participants majoring in
social science disciplines mentioned that their faculty-mentored research experience had
influenced their career path.

For example, two junior academic standing participants and one senior academic
standing participant majoring in STEM-related disciplines stated prior to conducting
research with their faculty-mentor they were mainly interested in pursuing an MD degree
only, but after their faculty-mentored mentored research experience, coupled with
continued engagement with their faculty-mentor, they are now looking into ways to
combine research conducted with their faculty-mentors and have aspirations of pursuing
a MD/Ph.D. Similarly, two senior academic standing participants majoring in STEM-
related disciplines stated that their faculty-mentored research experience exposed them to
the research side of academics—that prior to their faculty-mentored research experience
they did not really have an idea what PhDs did but after interacting with their faculty-mentor and learning more about different types of research from their faculty-mentored research experience, they realized earning a Ph.D. was something they are now interested in pursuing.

Additionally, more than half of participants majoring in social science disciplines stated they were thinking of only earning a bachelor's degree but the faculty-mentored research experience re-focused their thoughts in that they never considered nor had any aspirations of earning a PhD or even going to graduate school to pursue a master's degree but now have goals to attend graduate school to pursue advanced degrees, which was directly attributed to their faculty-mentored research experience. The remaining participants majoring in social science disciplines commonly stated the exposure received from their faculty-mentored research experience has given them some insight into the career fields they want to work in, as well as helped them to narrow down the kinds of academic and professional career fields that they do not want to pursue.

For example, one participant majoring in a social science discipline stated that she still wants to go to graduate school but that her faculty-mentored research experience showed her what she really wants to do as a career, which is not research. Another participant majoring in a social science discipline stated that she thinks conducting research with her faculty-mentor definitely influenced the kind of research that she
ultimately wants to do as a career but in a totally different field than what she had initially intended or originally wanted to do. Similarly, another participant majoring in a social science discipline stated her faculty-mentored research experience influenced her to remain open to the idea of research as an academic career but not in the same area of research that she did with her faculty-mentor.

While nearly all participants believe that their faculty-mentored research experience positively influenced their decision to pursue graduate or professional school upon earning a bachelor’s degree, one participant majoring in a social science discipline believe her faculty-mentored research experience confirmed that she may not have the aptitude to pursue graduate study. Specifically, the participant stated:

From the beginning I was kind of split between two paths. I was considering the academia industry, or perhaps going into the corporate world, or something like that. But my [faculty-mentored] research experience made me realize that maybe I might not be cut out for grad school. I liked the experience but research isn’t something that I want to do as a career nor is it something that I'm truly passionate about.

In addition to the belief that faculty-mentored research experience influenced or confirmed their career goals and/or academic aspirations, participants across all academic majors and disciplines and academic standings believe their faculty-mentored research experience enabled them to link their research interests with societal needs. For example,
more than half of the participants majoring in social science disciplines and STEM-related disciplines expressed that they believe working on a research project and/or in a research laboratory with their faculty-mentor was more helpful to address current societal problems than attending and spending time in the classroom. Similarly, nearly half of all participants across academic majors and disciplines stated that their faculty-mentored research experience has broaden their research interests to pursue research that is aimed at solving societal issues.

While most participants across all academic majors and disciplines and academic standings referenced similar positive related influences, some participants expressed that their faculty-mentored research experience had some ‘not-so-positive’ influences. For example, two participants majoring in STEM-related disciplines, and one participant majoring in a social science discipline believe their faculty-mentored research experience decreased their desire to attend classes regularly.

Specifically, the two participants majoring in STEM-related disciplines stated that they were so enthused about working with their faculty-mentor on their research project that they did not desire going to class as much anymore— that they viewed the research conducted with their faculty-mentor as more important than attending class. Similarly, a participant majoring in a social science discipline stated that she found it more difficult to stay focus on classes unrelated to her faculty-mentored research project, and that at times
she would rather be doing something related to her research project than going to class.

For example, a couple participants stated the following:

I was so jazzed about working with my [faculty] mentor on the research project that I didn’t feel like going to class as much anymore…the research project was way too cool.

It was a lot harder to stay focus on classes unrelated to my [faculty-mentored] research…at times I would rather be doing something related to my research than going to class.

Additionally, in spite of the perceived positive benefits that many participants associate with their faculty-mentored research experience, a few participants, particularly those majoring in STEM-related disciplines, identified negative influences regarding the availability of their mentor. For these participants, not being able to access their mentor when they needed assistance was a common source of frustration. For example, one participant’s statement reflected the views of many when she stated:

My [faculty] mentor was a very busy person but I still expected to meet with her more often than I did.

When queried further, participants expressed that their faculty-mentors’ other commitments such as teaching and advising other students negatively impacted the mentors’ availability. Similarly, some participants expressed that when mentors attended to and/or prioritized other individuals’ research projects over their own, it obstructed the
progress of their research project and negatively affected the faculty-mentored research experience.
Chapter 5

Analysis and Discussion

The results of this qualitative examination suggest participation in faculty-mentored research influences engagement among undergraduate students—that undergraduate students who conduct research with a faculty-mentor are generally and likely to exhibit increase levels of engagement when interacting with faculty-mentors, other faculty, and peers during and outside of school related activities. Specifically, participation in faculty-mentored research appears to positively influence student engagement by increasing students’ comfort and confidence when interacting with faculty and peers, and by enhancing students’ communication and interpersonal skills.

This seems to corroborate existing literature that show high-impact educational practices such as providing undergraduate research opportunities is often associated with promoting effective student engagement (Kuh, et al., 2005; Nikolova Eddins, 1999; Nikolova Eddins, & Williams, 1997; Kinkead, 2003, referencing the Boyer Commission’s report, 2002; Fricke, 1981, 2003). This is also consistent with previous research findings that show participation in faculty-mentored research is linked to building confidence, as well as other research findings that show students who conduct research during their undergraduate academic years generally feel more confident
engaging with faculty (Fehheimer, Webber & Kleiber, 2011, Foertsch, Alexander & Penberthy, 1997), feel more confident about learning (Alexander, Foertsch, & Daffinrud, 1998), and feel more confident interacting with peers (Fehheimer, et al., 2011, Alexander, Foertsch, Daffinrud & Tapia, 2000).

Moreover, the results of this study suggest the scope of influence that faculty-mentored undergraduate research participation has on student engagement is not limited to students who major in specific academic disciplines— that regardless of academic major or discipline, involving undergraduate students in faculty-mentored research may have the same potential benefits and outcomes for students across academic disciplines.

Equally important is the range of influence that faculty-mentored research participation has on engagement generally appears to be in the same positive direction for participants from different racial/ethnic backgrounds as the results of this exploratory study found no expressive differences between the participants’ race/ethnicity and how and in what ways they believe their faculty-mentored research experience influenced engagement with faculty-mentors, other faculty, and peers. This is similar to prior findings that suggest among racial/ethnic groups, engagement related effects of student participation in mentored undergraduate research tend to be strongest among Hispanics/Latinos, but most racial/ethnic group differences are relatively small (Russell, et al., 2007).
However, the results of this study show the level and the degree to which faculty-mentored research influences student engagement vary according to participants’ academic standing, academic major/discipline, and the frequency of interaction with their faculty-mentor. For example, while junior academic standing participants; particularly those majoring in STEM related disciplines, believe that their level of engagement had increased due to their faculty-mentored research experience, they did not express the same level of confidence as senior academic standing participants when talking to professors about struggles they had with juggling courses and meeting deadlines; nor did they express the same comfort level as senior academic standing participants when talking to their faculty-mentor about non-school related matters such as future career and research goals.

This parallels to the National Survey of Student Engagement (2013), which include data from two companion surveys, the Faculty Survey of Student Engagement (FSSE) and the Beginning College Survey of Student Engagement (BCSSE), that found on average, seniors majoring in STEM-related disciplines such as engineering and biology, are most engaged and report higher personal gains from collaborative and high-impact educational practices than their peers majoring in humanities and social sciences. This also echoes a similar finding that seniors generally report greater gains in personal
development such as an increase level of confidence when faculty have engaged them through active and collaborative learning practices (Umbach & Wawrzynski, 2005).

Although research show students who major in certain academic disciplines are more engaged than students in other majors (National Survey of Student Engagement, 2013; Reason, 2009), much of the effect of academic discipline seems to be indirect through students’ perceptions of their relationships and interaction with faculty and peers— that regardless of academic discipline, pedagogical approaches that encourage active, collaborative, and cooperative learning provide advantages over more passive instructional approaches (Reason, 2009, citing Pascarella & Terezini, 2005). This matters because high-impact educational practices such as faculty-mentored undergraduate research participation early in the college years appear to encourage active, collaborative, and cooperative learning, and may be an effective means to nurture students’ engagement through their relationships and interactions with faculty and peers. Nevertheless, the results of this study suggest the scope and frequency of the faculty mentorship is key when assessing the level and degree to which faculty-mentored research influences student engagement.

Specifically, the results of this qualitative study show the extent to which participants across all academic standings and majors/disciplines will experience increased levels of engagement on account of their faculty-mentored research
participation is determined by the nature and scope of the interaction with their faculty-mentor— that participants who experience more frequent and direct interactions with faculty-mentors will likely associate greater levels of engagement with their faculty-mentored research experience than participants who have less frequent and indirect interactions with faculty-mentors. Moreover, the results of this study suggest participants who have less frequent and indirect interaction with their faculty-mentor will likely express higher levels of frustration and disappointments with their faculty-mentored research experience.

While the scope and frequency of the interaction between participants and their faculty-mentor cannot solely determine the success of participants’ faculty-mentored research experience, it does offer valuable insight regarding the mentors’ behavior and availability, which research literature suggest contributes to the social and academic needs of students (Lopatto, 2003a; Lopatto, 2009). Accordingly, the scope and frequency of the faculty mentorship is important when exploring faculty-mentored research participants’ perceptions of how and in what ways they believe it influences engagement. However, when exploring participants’ perceptions, it is equally important to take into account the effects of institutional mission and practices.

As Schein (2004) argues, institutions have two missions— the espoused or written mission, and their enacted mission, i.e., what the school does in terms of programs and
practices. The enacted mission matters much more to students because it reflects what they actually experience. At strong-performing institutions, the enacted mission overlaps significantly with the espoused mission, in which students and faculty have a fairly clear idea of what they are trying to accomplish (Kuh, 2006). These institutions are dedicated to helping students acquire self-confidence and rewards for meaningful student-faculty interaction (Kuh, 2006).

In addition, these institutions are often perceived by students to convey a sense of caring by providing greater levels of social integration, which positively influence student engagement because students enrolled at these institutions are likely to believe that the institution is committed to their welfare (Reason, 2009). Moreover, senior academic leaders at these institutions, like the institution where participants of this study are enrolled, effectively balance and incorporate the research and teaching mission of the institution as crucial to maintaining high-quality undergraduate programs and support services while also illustrating how the research and teaching mission enriches the undergraduate experience.

While some make a clear distinction between the teaching and research mission of institutions—that research-mission institutions are oriented towards discovery and expansion of knowledge, and teaching-mission institutions are oriented towards the distribution of knowledge and the development of students (Neumann, 1992, 1994),
others hold the view that teaching and research missions should not be seen as polar opposites, but rather as complimentary facets of academic practice and call for institutions to adopt more research-like ways of teaching students (DiCarlo, 2009; Kandiko & Kinchin, 2012).

The emphasis for institutions to strike a balance between teaching and research is influenced by shifts in the ideas of knowledge, as well as changes in the nature of undergraduate education (Verburgh, et al., 2007). Such emphasis urge academic institutions to recognize and redefine themselves, and more specifically, reconsider the nexus between teaching and research. Thus, although seemingly overlooked, the institutional mission and practice is particularly relevant to how and in what ways participants of this qualitative exploratory study believe faculty-mentored undergraduate research influences student engagement.

Specifically, the participants’ institution appear to recognize a valuable interconnection between its teaching and research mission by developing an undergraduate research (UR) program that encourages students across all academic majors and disciplines to conduct research with a faculty-mentor. Consequently, the aim of the institution’s UR program and its deliberate interconnection between its teaching and research mission appeared to matter to participants because it reflected what they actually experienced, and signaled an institutional commitment to participants by
providing encouragement and support for student involvement in intellectual activities. Such practice is unlike many other public comprehensive institutions (PCIs) that seem to struggle with balancing their teaching and research mission, and/or tend to place more emphasis on students majoring in STEM-related disciplines and less emphasis on students majoring in social science and humanities disciplines to conduct research with a faculty-mentor.

Unfortunately, for nearly all institution types (i.e., public and private liberal arts, research, and comprehensives), the ability to simultaneously achieve high teaching impact and research productivity is to spend more hours in the classroom (Fairweather, 2002). However, spending more hours in the classroom may deter faculty from using collaborative teaching techniques (Olsen & Simmons, 1996). Similarly, the immersion of research into the academic curriculum can breed a narrowness that detracts from the broad-based knowledgeability that students perceive as being an important element of “good” teaching (Friedrich & Michalak, 1983).

Nevertheless, students readily identify a range of benefits derived from their faculty’s interest in research (Healey, et al., 2010). For these students, including the participants of this study, the most positive facet of being mentored by research-active faculty is that it enhances their engagement, enthusiasm, and motivational abilities to learn. While there are some instances where students associate faculty involvement in
research with being less interested in teaching and spending reduced amount of time with their students (Jenkins, Healey, & Zetter, 2007), an effective means to link teaching and research and to ensure students benefit from faculty research may be the adoption of a research-based curriculum, in which students are encouraged to develop their own research skills (Elton, 2001; Healey, 2005). Conceptually, the results of this study suggest participation in faculty-mentored undergraduate research encourages students to develop their own research skills by providing opportunities for undergraduate students to closely and systematically interact with research-active faculty.

The findings of this exploratory study also suggest providing more opportunities for student interaction with faculty may be an important component for reconciling the teaching and research mission of public comprehensive institutions, particularly by enabling and fostering closer contact with more tacit aspects of knowledge and learning that research literature has shown to encourage co-learning between faculty and students and influence student engagement (Le Heron, Baker, & McEwen, 2006).

Collectively, empirical evidence, in conjunction with the results of this study, suggest academic institutions could usefully adopt, or rediscover in some instances, the “mission-idea” of returning students to the center of their activities, and providing a guiding ethos of inquiry and scholarship for all members of the academic community. Perhaps more importantly, the results of this study support findings of others (Terenzini
that suggest institutional characteristics, as they relate to student engagement, are less about what an institution is than what an institution does.

While the faculty-mentored research experiences and perceptions among participants of different genders could not specifically be explored in this study (because all participants were of the same gender), a few participants hypothesized whether the level and scope of their interaction with the faculty-mentor was attributed to the mentor being the same gender as them. Likewise, a few participants hypothesized whether the level and scope of their engagement with the faculty-mentor would have been different if the mentor was not the same gender as them.

Notwithstanding the exploratory limitations, the results of this study suggest the faculty-mentor’s gender can influence the level and scope of student engagement as some faculty-mentored research participants who found commonality through self-identification with the mentors’ gender generally reported greater levels of influence on their engagement. Thus, participants of this study perceived mentors who were the same gender as them as being more supportive. This perception was also found among female students who attend predominately women’s colleges and universities (Reason, 2009). Although speculative, the findings of this study suggest the impact of the mentor’s gender provides additional insight on the participants’ perceptions of why they believe the
mentors’ gender may have influenced the level and scope of engagement during their faculty-mentor research experience. This is perhaps more meaningful with respect to this exploratory study as all participants were female, who commonly expressed a desire to take part to affirm their significance as researchers— an activity that they perceive as being male-dominated.

When applied to the Cognitive Apprenticeship Model (CAM) model, the results of this study also suggest participation in faculty-mentored research has a positive influence on undergraduate students’ academic achievement. CAM holds (a) learning is a social process; (b) competence in a domain is defined in terms of expertise rather than innate ability; (c) meaningful learning is active, constructive and self-regulating; and (d) learning activities should reflect real world rather than decontextualized academic tasks (Adedokun, et al., 2010, referencing Shuell, 1997). Within this framework, faculty-mentored undergraduate research is an apprenticeship learning model in which the novice (i.e. student) studies under the mentorship of an expert (i.e. faculty member) (Adedokun, et al., 2010). Accordingly, through guided participation and collaborative interaction, the novice student gradually acquires knowledge, expertise, and skills that fosters academic success.

Although students who participated in this study were split as to whether their faculty-mentored research experience had a direct influence on grades earned in courses
and overall grade point average, they uniformly described direct and indirect ways in which faculty-mentored research participation influenced their academic achievement. Specifically, participants referenced positive changes in their academic performance as a result of having conducted research under the guidance and direction of a faculty-mentor.

For example, when recalling the faculty-mentored experience, participants across all academic majors and disciplines mentioned the faculty-mentored research experience had an influence on their academic achievement by improving their study and test-taking skills. Participants also mentioned that the faculty-mentored research experience had an influence on their academic achievement by improving their learning aptitude and capacity. In general, this corroborates existing literature that show student participation in undergraduate research has been shown to strengthen students’ inquiry skills (Gafney, 2001; Lopatto, 2004; Seymour, et al., 2004; Kardash, 2000; Mabrouck & Peters, 2000), enhance critical thinking and reasoning skills (Kardash, 2000), reflective judgment (Bauer, 2001; Ward, Bennett, & Bauer, 2002), and disciplinary knowledge (Ishiyama, 2002).

This also appear to corroborate previous research findings that participation in high-impact educational practices such as undergraduate research programs early in the college years are strong indicators for predicting success in subsequent years (Nagda, et
al., 1998; Werner & Sorum, 2003; Ishiyama, 2002). Furthermore, the results of this study are generally consistent with previous research findings that show perceptions of alumni from all academic disciplines commonly report greater amounts of enhanced academic skill levels as a result of their participation in mentored research as an undergraduate (Bauer & Bennett, 2003).

The results of this qualitative study also suggest participation in faculty-mentored research influences academic achievement by increasing students’ personal motivation and persistence to succeed academically. The range of influence was generally in the same positive direction for participants from different racial/ethnic backgrounds as no expressive differences were found between the participants’ race/ethnicity and how and in what ways their faculty-mentored research experience had an influence on their academic achievement. However, a few minority participants speculated whether the race/ethnicity of the faculty-mentors contributed to their increased level of motivation and persistence to succeed academically.

Even though the impact of the faculty-mentors’ race/ethnicity on student academic achievement was not specifically explored, the outcome of this qualitative study suggests regular interaction between mentors and minority faculty-mentor research participants has a positive influence on the academic achievement among minority
faculty-mentored research participants. This corroborates research literature that suggest the amount of contact between faculty and African-American students affects both retention (Braddock, 1981) and academic performance (Nettles, Thoeny, & Gosman, 1986).

The outcome of this study also supports previous research that found contact between faculty and African-American students plays an even more critical role on student academic achievement at predominantly White colleges and universities than at historically Black colleges and universities (Braddock, 1981; Fleming, 1984). This may be because faculty serve as institutional brokers for minority students at predominantly White colleges and universities, connecting minority students to the academic and intellectual mission of the university. This interaction may further contribute to institutional identification and a sense of belonging among minority students (Nagda, et al., 1998). Diminutive empirical data support a similar finding for other student groups, including Hispanic students attending predominantly White colleges and universities (Hernandez, 2000; Hernandez & Lopez, 2004 – 2005).

Moreover, the results of this qualitative study suggest the race/ethnicity of faculty-mentors may contribute to the academic achievement among minority students who take part in faculty-mentored research at predominantly White institutions. This is
important as eight of the twelve students who participated in this study examination self-identified as minority students (four black, two Hispanic, and two Asian), who attended a predominately White institution. Additionally, participants of this study who found commonality through self-identification with the mentors’ race/ethnicity generally reported greater levels of influence on their academic achievement. Although speculative, the race of the faculty-mentor provides greater insight as to why minority participants of this study believe identification and affinity with the mentors’ race/ethnicity may have contributed to their increased levels of motivation, persistence, and subsequent academic achievement.

Notwithstanding the racial/ethnic demographics of faculty, the experiences and perceptions of those who participated in this study suggest faculty who serve as mentors in undergraduate research programs value the opportunity to mentor and to develop intellectual partnerships with students. Additionally, the experiences and perceptions of those who participated in this study suggest participation in mentored research as an undergraduate generally increases student persistence, specifically among minority students majoring in STEM disciplines. While this is limited to the experiences and perceptions of undergraduate minority students majoring in STEM related disciplines at a particular public comprehensive university, the results of this study suggest that such has broader implications of how and in what ways faculty-mentored undergraduate research
influences student academic achievement for all students, regardless of race/ethnicity, academic discipline, and the type of institution where students are enrolled. However, the results of this exploratory examination confirmed that the level and degree to which faculty-mentored undergraduate research influences student academic achievement is generally depended on the scope of interaction and availability of the mentor.

Specifically, when participants were satisfied with the scope of interaction and availability of the faculty-mentor, they tended to seek and receive encouragement from the faculty-mentor, which ultimately increased their motivation and persistence to succeed academically. Similarly, when participants received desired levels of supervision and direction from faculty-mentors, they were more motivated to succeed academically—that the perceived lack of supervision and direction provided by the faculty-mentor generated frustration and disappointment, which adversely impacted their motivation and persistence to succeed academically.

Accordingly, the results of this study suggest faculty-mentors who are perceived by students to convey a sense of devotion and accessibility are likely to influence student academic achievement through greater levels of social integration—that students, regardless of academic major and standing, are more likely to persist academically if they believe their faculty-mentor is committed to student academic success. Similarly, the results of this study suggest faculty-mentors who are perceived by students to provide
consistent and direct supervision generally enhances students’ chances of academic achievement. However, prior research show faculty-mentored research does pose some challenges for faculty-mentors, particularly regarding time and accessibility.

For example, research literature found some faculty-mentors believe there is not enough time to adequately mentor students, and that their schedules often conflict with students’ or other academic obligations (Adedokum, et al., 2010). Nevertheless, faculty-mentored research participants, including those who took part in this study, believe faculty’s time and availability is an essential component to student-faculty engagement and students’ academic success— that the faculty-mentors’ other academic obligations, particularly teaching obligations, can negatively influence the perception and experience of undergraduate students who participate in faculty-mentored research.

Consequently, it is recognized that simultaneously achieving high levels of productivity in teaching and research is relatively rare, and institutional policies that intend to encourage teaching productively and effectiveness may adversely impact learning and individual research productivity, and vice versa (Fairweather, 2002). Hence, a new institutional paradigm— one that is concerned with learning productivity, not teaching productivity, is both needed and warranted in undergraduate education. By shifting the intended institutional outcome from teaching to learning, the new “Learning Paradigm” makes possible a continuous improvement in learning productivity and does
not limit institutions or faculty to a single means of empowering students to learn (Barr & Tagg, 1995).

Essentially, the primary goal of the *Learning Paradigm* is to produce learning outcomes more effectively and efficiently with every student by whatever means that work best. Thus, as previously mentioned, an effective means to link teaching and research and to ensure students benefit is to adopt a research-based co-curriculum, in which students are encouraged to develop their own research skills. Arguably, colleges and universities that incorporate high-impact educational practices such as faculty-mentored undergraduate research in the academic curricular and teaching model recognize their purpose is not to transfer knowledge but to create environments and experiences that bring students to discover and to construct knowledge as co-producers of learning. Such practice allows students to comprehend complex issues, as well as to think critically and creatively to solve problems; thereby influencing students’ academic achievement.

Moreover, as referenced in the findings, some participants believe their undergraduate experience has been transformed by faculty-mentored research— that their undergraduate experience is not just about going to class, taking exams, and getting “good” grades. For them, conducting research as an undergraduate with a faculty-mentor made them more well-rounded and mature students, as well as taught them things about
themselves that otherwise may not have surfaced if it were not for their faculty-mentor research experience. However, as the results of this study suggest, the extent to which participants believe faculty-mentored research transformed their undergraduate experience was often attributed to participants’ preconceptions, which appeared to influence the outcome of their faculty-mentored research experience.

Specifically, none of the participants had research experience prior to conducting research with a faculty-mentor. This is an essential fact when assessing students’ preconceptions because like all learners, students who never conducted research and/or participated in faculty-mentored undergraduate research bring a variety of initial ideas, opinions, motivations, expectations, beliefs, and attitudes about the faculty-mentored research experience. While preconceptions are not necessarily misconceptions, “they have the potential to interfere with students’ learning outcomes and can hinder students from harnessing the benefits of their learning experiences” (Adedokum & Burgess, 2011, p. 13). Thus, identifying and highlighting students’ preconceptions of faculty-mentored research is important as such preconceptions generally impact the outcomes that students associate with their faculty-mentored research experience.

For example, this study found that the level of supervision and direction that participants expected from faculty-mentors was largely attributed to participants’ preconceptions that their faculty-mentored experience would provide more extensive and
direct mentoring from faculty-mentors— that they would receive more supervision from faculty mentors, and that conducting research with a faculty-mentor meant that they would be told exactly what to do by faculty-mentors during every step of the research process.

Similarly, some participants expected that their faculty-mentored research experience would provide immediate opportunities to perform complex tasks and did not anticipate having to perform simpler tasks before gradually being granted an opportunity to perform more complex tasks. Also, many participants had preconceived beliefs that their faculty-mentored research experience would not be time-consuming— that having to balance their faculty-mentored research with attending classes, work, and other aspects of the educational and personal life would not be as difficult. Coincidently, the majority of students who took part in this study expressed that their faculty-mentored research experience improved their time-management skills. This is a noteworthy finding as improvement in time-management skills is often overlooked or omitted as an influential effect from current research literature and studies that examine the potential benefits of undergraduate student participation in research. Hence, the results of this study suggest further inquiry that explores faculty-mentored undergraduate research and its potential influence on improving students’ time-management skills is warranted.
Finally, the results of this study suggest participation in faculty-mentored research positively influence and/or help to clarify or confirm students’ career goals and/or academic aspirations. For example, student who took part in this qualitative study spoke of how faculty-mentored research influenced or confirmed their career goals and/or academic aspirations to some level or degree. Specifically, some participants who had not previously thought about or had aspirations of attending graduate or professional school referenced their faculty-mentored research experience as influencing their decision to pursue graduate and/or professional school after earning their baccalaureate degree. Many participants who expressed an interest in attending graduate school had aspirations of pursuing a doctorate—a goal that they attributed to their faculty-mentored undergraduate research experience.

Equally important were the study results that found some participants who had thought about or had aspirations of attending graduate or professional school referenced their faculty-mentored research experience as helping them to clarify alternative career goals and/or academic aspirations. These results echo previous findings that show providing research opportunities early in the college career are important to attract and retain students in certain research careers (Campbell & Skoog, 2004; Hurtado, et al., 2007; Russell, et al., 2004), and indicate undergraduate research opportunities help clarify students’ interest in research, as well as encourages students who had not
anticipated graduate studies to alter their direction toward pursuit of a doctorate degree (Russell, et al., 2007).
Chapter 6

Conclusion

The purpose of this qualitative study was to explore faculty-mentored undergraduate research as a high-impact educational practice to determine how and in what ways it influences student engagement and academic achievement among undergraduate students. Accordingly, the undergraduate students who participated in this study all conducted research under the guidance and direction of a faculty-mentor. Relying on data collected from participant interviews, participants’ faculty-mentored research experiences were explored to develop, rather than reject or confirm any existing hypotheses regarding influences that faculty-mentored undergraduate research has on student engagement and academic achievement.

Accordingly, the results of this study found student participation in faculty-mentored undergraduate research influences student engagement and academic achievement among undergraduate students. Specifically, this study found participation in faculty-mentored undergraduate research positively influences students’ engagement with faculty-mentors, other faculty, and peers, and that participation in faculty-mentored undergraduate research positively influences students’ academic achievement as it relates to academic performance, learning aptitude, study and test-taking skills, motivation and
persistence. The range of influence that faculty-mentored undergraduate research has on student engagement and academic achievement is generally in the same positive direction for participants from different racial/ethnic backgrounds and academic majors and disciplines.

However, the level and degree of influence that faculty-mentored undergraduate research participation has on student engagement and academic achievement is depended on the availability of faculty-mentors, as well as the scope and frequency of the interaction between participants and their respective mentors. Additionally, the level and degree of influence that faculty-mentored undergraduate research participation has on student engagement and academic achievement is attributed to participants’ preconceptions of faculty-mentored undergraduate research, which appear to impact the outcome of participants’ faculty-mentored research experience.

Also, the level and degree of influence that faculty-mentored undergraduate research participation has on student engagement may be based on female participants’ conceptions regarding the impact that the faculty-mentors’ gender has on their engagement. Similarly, the degree of influence that faculty-mentored undergraduate research participation has on student academic achievement may be based on minority participants’ conceptions regarding the effects that the mentor’s race/ethnicity has on their motivation and persistence to succeed academically. Thus, faculty-mentored
undergraduate research participants who find commonality through self-identification with the mentors’ gender and/or race/ethnicity will generally report greater levels of influence on their engagement and academic achievement.

The results of this study also found participation in faculty-mentored undergraduate research can influence and/or confirm participants’ career goals and/or academic aspirations to some level or degree. Additionally, the outcome of this qualitative exploration suggest there is a correlation between high-impact educational practices such as faculty-mentored undergraduate research and student academic achievement, and provides some evidence that links students’ participation in faculty-mentored undergraduate research and student-faculty interaction experiences to effective student learning. Moreover, the results of this study provide support that student engagement matters to learning outcomes and student academic achievement, and affirms student interaction with faculty is perhaps the most influential driver of student engagement and academic achievement.

While the findings of this study are based on a modest sample size of participants’ faculty-mentored undergraduate research experiences at a single public comprehensive institution (PCI), it underscores senior university officials, faculty, as well as student affairs practitioners from all academic institutional types should consider the study’s results when seeking to develop faculty-mentored undergraduate research programs. It
also calls attention to stronger consideration for institutions to incorporate faculty-mentored undergraduate research into the academic curricular and teaching model as means to support, encourage, and/or improve student engagement and student academic achievement among undergraduate students. However, when developing faculty-mentored undergraduate research programs, and when incorporating faculty-mentored research into the academic curriculum, the following strategies are recommended to institutions:

- Create incentives for faculty to volunteer their time to serve as mentors to students who desire to conduct research under the guidance and direction of a faculty-mentor. Such incentives include, but are not limited to, counting faculty research mentorship to students toward faculty tenure and promotion decisions.

- Allow students to earn academic credit for faculty-mentored undergraduate research experience to fulfill stated or required learning outcomes for courses across various majors/disciplines. Although some institutions allow students to earn undergraduate research credits to fulfill an elective or thesis requirement, many institutions view faculty-mentored undergraduate research as a co-curricular activity and thus do not allow faculty-mentored research participants to earn academic credit. Alternatively, allowing students to earn academic credit for faculty-mentored undergraduate research experience to fulfill course learning
outcome requirements aligns with the institution’s commitment to undergraduate research by incorporating faculty-mentored research into the academic curriculum and teaching model as means to support, encourage, and/or improve student engagement and student academic achievement among undergraduate students.

- Extend the duration of faculty-research undergraduate research projects to at least one academic year (i.e. two consecutive semesters) to maximize the students’ experience and opportunity to receive the full benefits that are generally associated with faculty-mentored undergraduate research participation.

- Provide faculty-mentored undergraduate research opportunities for students from all academic majors, including students majoring in social science and humanities disciplines. This will ensure diversification of students who engage in research, and ensure that all students may potentially receive to some extent the benefits that are generally associated with faculty-mentored undergraduate research participation.

- Provide support training to faculty wishing to serve as mentors to students who desire to conduct research under the guidance and direction of a faculty-mentor. The training should highlight the faculty’s role as teachers and mentors by encouraging students in their research and course work, discussing academic and career goals, providing timely feedback, being
available to give guidance and direction, and to discuss students’ research progress and set-backs. This is key because how students perceive the availability and commitment of the faculty-mentor will generally determine how and in what ways their faculty-mentored undergraduate research experience influences their level of engagement and academic achievement.

The results of this study revealed that exploring high-impact educational practices such as undergraduate research in the context of student-faculty interaction and academic achievement sheds additional insight on the benefits of faculty-mentored undergraduate research. Specifically, this study expanded current understanding of faculty-student interactions by exploring how and in what ways faculty-mentored undergraduate research influences engagement and student achievement. By expanding current understanding through students’ experiences and perspectives, the results of this study offer a theoretical and practical framework that identify student engagement practices that shape and influence student academic achievement.

Still, the results of this study warrant further exploration to determine whether similar findings associated with student participation in faculty-mentored undergraduate research are generally the same for male, part-time, non-residential, and undergraduate students majoring in humanities-related disciplines as these groups did not participate in
this study. Understanding whether the experiences of these student groups are similar to those who participated in this study is important because simply providing the same opportunities for all student groups to participate in faculty-mentored undergraduate research may produce vastly different experiences.
APPENDIX A

INTERVIEW PROTOCOL
Faculty-mentored Undergraduate Research Exploratory Study

Demographic Information

Can you state your gender?

Can you specify your race/ethnicity from the following list?

(a) Amer. Indian/Alaska native, non-Hispanic;
(b) Asian, Hawaii/Pac. Islander, non-Hispanic;
(c) Black or African American, non-Hispanic;
(d) Hispanic, no race specified;
(e) Hispanic, race specified;
(f) More than one race, non-Hispanic;
(g) White, non-Hispanic
(h) Do Not Wish to Specify

What is your current academic standing-- are you currently a Junior or Senior?

What is your current academic major(s)?

Are you a currently a full-time or part-time enrolled student?

Are you currently a commuter or residential student?
Faculty-mentored Participation Background

When did you conduct research with a faculty-mentor (Semester/Year)?

What academic classification (e.g., freshmen, sophomore, junior, etc.) were you when you conducted research with a faculty-mentor?

What was the duration of your faculty-mentored experience (e.g., one semester, two semesters, summer, etc.)?

What was your academic major(s) at the time you conducted research with a faculty-mentor?

Was the research you conducted with your faculty-mentor related to a course or project within or outside your academic major?

Were you a full-time or part-time student at the time you conducted research with a faculty-mentor?

Were you a residential or commuter student at the time you participated in faculty-mentored research?

How did you learn about the opportunity to conduct research with a faculty-mentor? (e.g. were you asked by your faculty-mentor or did you pursue an opportunity to conduct research with a faculty-mentor)?

Why did you pursue or want to conduct research with a faculty-mentor?
Faculty-mentored Undergraduate Experience

Thinking back to your experience when you conducted research with your faculty-mentor, how and in what ways did your experience influence your level of engagement or interaction with your faculty-mentor, other faculty, classmates, or others?

From your prospective how and what ways did your faculty-mentor research experience influence your academic achievement? In other words, how and in what ways did your experience change or have an impact on your academic performance in courses, grades, study skills, learning aptitude, motivation, persistence, or other things that you consider part of your academic achievement as a result of conducting research with a faculty-mentor?

How did your faculty-mentor research experience influence or effect your future academic or professional aspirations? In other words, did it confirm your projected academic or professional career path or influence you to consider a new academic major or career path? Is so, how?

What were some unexpected or unanticipated things that occurred as a result of your faculty-mentored research experience that you believe had an influence on your academic achievement or interaction or levels of engagement with your faculty-mentor?

What are some other things that you want to me know about your faculty-mentored research experience that you feel are important?

Before we conclude, is there anything else you would like to share with me regarding your faculty-mentored research experience?
Dear UMBC Student,

I’m a doctoral candidate in the Graduate School of Education at the University of Pennsylvania. My dissertation explores potential influences that faculty-mentored undergraduate research has on student engagement and student academic achievement.

I understand you may be a student who previously conducted research with a faculty-mentor. If so, I would like to have a conversation with you about your faculty-mentored research past experience as part of my dissertation study. The commitment involves a one (1) hour individual interview with me this fall. To participate in the study, you must a junior or senior standing students who previously conducted research with a faculty-mentor for at least one academic semester or academic summer session.

If this sounds interesting to you, please let me know as soon as possible. I am glad to answer questions that you may have about the interview and my dissertation study. All replies will be confidential. I look forward to hearing from you and thanks for your consideration.

Sincerely,

Michael Nichols
Michaelnichols1914@yahoo.com
(443) 685-3277
APPENDIX C

PARTICIPANT CONSENT FORM

STUDY TOPIC: Faculty-mentored Undergraduate Research: Influences on Engagement and Student Academic Achievement.

FOR QUESTIONS ABOUT THE STUDY, CONTACT: Michael L Nichols, micahaelnichols@yahoo.com, (443) 685-3277.

DESCRIPTION: You are invited to participate in a research study on the potential influences that faculty-mentored undergraduate research has on engagement and student academic achievement. You will be asked to take part in an interview which will focus on your past faculty-mentored undergraduate research experience.

Interviews will be tape recorded and transcribed, and the audiotapes and transcriptions will be kept in a secure location. All publications and presentations will ensure your confidentiality. This research is being conducted as part of a doctoral dissertation at the Graduate School of Education at the University of Pennsylvania.

RISKS AND BENEFITS: There are no anticipated risks associated with this study. As a participant in this study, you may request to receive a copy of the summary findings upon completion of this project. Upon your consent, this interview will be audio taped. The audiotape will later be transcribed for research purposes, but will never be played for any audience other than the researchers directly involved in the project. Upon completion of the project audiotapes will be erased.

TIME INVOLVEMENT: Your participation in this experiment will take approximately 60 minutes. Brief (approximately 10-15 minutes) follow-up interviews may be requested as needed. You will be invited to review the interview transcript and make corrections.

PAYMENTS: Although your assistance is greatly appreciated, there will be no payment for your participation.

PARTICIPANT’S RIGHTS: If you have read this form and have decided to participate in this project, please understand your participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You have the right to refuse to answer particular questions. Your individual privacy will be maintained in all published and written data resulting from the study. If you have questions about your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Office of Regulatory Affairs with any question, concerns or complaints at the University of Pennsylvania by calling (215) 898-2614.

I give consent to be audio taped during this study; please initial: ____ Yes ____ No

The extra copy of this consent form is for you to keep for your records.

SIGNATURE

_____________________________  DATE ____________

____________________________
Printed Name
BIBLIOGRAPHY


