UNDERGRADUATE RESEARCH AS A MEANS OF STUDENT ENGAGEMENT:
A STUDY OF RESEARCH'S INVOLVEMENT IN
FIVE AREAS OF COLLEGE LIFE

DISSertation

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ABSTRACT

Current literature supports undergraduate research as a means of reaping positive benefits for both students and institutions. Since most of the studies concerning undergraduate research focus on quantitative data and outcomes, very little literature exists that explains how students experience the research process and what factors contribute to these positive outcomes. This dissertation focuses on the ways that performing research influences student engagement on campus. Extending this concept of engagement, the study illuminates five areas that emerged in the literature—academic background, personal identity, socio-cultural factors, institutional characteristics and faculty interactions—that were conceived as having a reciprocal relationship with the student research process. The research questions theorize that each of these areas first influences a student’s research experience while the subsequent research work in turn affects the student within each of these areas. For example, we see evidence in the student participants that personal identity and interests impact the chosen research topic; however, students’ personal identities change after performing research work.

Utilizing a social constructivist paradigm, I collected data through interviews with ten students, an observation at an undergraduate research forum, and document analysis. Applying Erickson’s methodology of interpretive commentary, I identified and analyzed emergent themes and patterns in the interviews. Findings support existing
literature, while also giving us insight into how students experience the research process and the reasons behind many positive impacts. The strongest theme throughout these student interviews was the increased academic and personal confidence that students feel after completing a project. While the theories of student involvement, engagement, and integration appeared as expected in this data, given this theme of increased confidence with experience, I also analyzed these stories using the additional guiding theoretical lens of Bandura’s self-efficacy theory.
DEDICATION

Dedicated in honor of
Aaron Joseph Krabacher
and
Gregory John Krabacher

In loving memory of
Eugenia Turner Price
July 11, 1918-June 24, 2007
ACKNOWLEDGMENTS

A project such as this dissertation does not come to fruition without the contributions and kindness of countless family members, friends, teachers, and colleagues. These individuals number far too many to mention all in this acknowledgements section, but I would like to express my thanks for just a few of these contributions for which I will be eternally grateful.

I will forever be indebted to the ten students who chose to share their stories of research with me. One can see in Chapters 4 and 5 that the interviews of these students provided me with rich and insightful content explaining the undergraduate research experience. Each of these students willingly shared their own experience, ranging from their triumphs to their struggles, and these conversations were by far the most enjoyable and rewarding part of writing this dissertation.

My faculty advisor, Dr. Leonard Baird, spent countless hours helping me develop my dissertation study, discussing my research topic, and reviewing several drafts of each chapter. Besides his role as my academic advisor, Dr. Baird never failed to ask how I was doing or to take an interest in my family or pursuits outside my classroom and research work. I appreciate his guidance and support throughout my entire PhD program.

I am grateful to Dr. Patti Lather for the excellent foundation in qualitative research that she gave me in her classes. In addition, I know that this dissertation is a better document because of her input and expectations. My third committee member, Dr. Tatiana Suspitsyna, helped provide clarity to me at the beginning of this research
process at a moment when I needed some direction, and I appreciate her support as I continued my research work. In addition, I would like to thank Dr. Helen Marks for all of her kindness and insight. Her general exam question introduced me to Bandura’s theory of self-efficacy and helped me to utilize this theory in my data analysis for this project.

My participation in this PhD program was made possible by my employment in two graduate associate positions. My supervisors in these positions—Beth Wiser, Dr. Mabel Freeman, and Dr. Susan Jones—provided me through their employment significant personal and financial support, and each of them has taken an interest in my success in the graduate program. I am grateful to each of them for their contributions to my personal and professional growth.

Gaining access to my sample population would not have been at all possible without the enthusiastic help of Shannon Dowdall in the Honors and Scholars Program. Shannon helped me identify potential research participants, and she never failed to cheerfully give me more names when I contacted her on numerous occasions! I am appreciative to Dr. Allison Snow in the Undergraduate Research Office for meeting with me at the beginning of this process to give me an overview of undergraduate research at the institution. Finally, Dr. Linda Harlow, Shannon, and Dr. Snow each signed letters of support for me to include in my application to the Institutional Review Board, and I am so thankful for their help.

I have several friends and colleagues who have kept me sane at some very stressful moments in this process, and for them I am eternally grateful. My friend
Patience Whitworth provided me with an inordinate amount of help throughout the production of this dissertation, ranging from reviewing my IRB application to ensure speedy approval to lending me a digital recording device to listening to countless discussions and tangents from me about this process. Kathy Titus-Becker was my constant cheerleader, reviewing drafts, and never failing to call from North Carolina to provide me with some motivating words in the hardest days. Amy Barnes and Amy Wade commiserated with me through pregnancy as well as dissertation-writing (the two are not unlike one another!). Each of these individuals has played a significant role in seeing this project through to the end, and I appreciate their kindness and friendship.

Finally, my family has been a constant source of support throughout this PhD adventure. I am thankful for both my parents, who provided me not only with continual love but with the best formal education possible to prepare me for this endeavor. In addition, my mother, Jane Price Claxton, taught me to love to read and explore the nuances in stories. Through his desire to play the devil’s advocate (he knew it would come in handy one day!), my father, Joseph Epps Claxton, taught me to analyze a topic from several vantage points. Each of these skills came into consistent use throughout the writing of this dissertation.

I miss my grandmother, Eugenia Turner Price, very much, and I know that no one would have been prouder than she—except perhaps my grandfather, Joseph Pinkney Price—that I completed this PhD degree. I am sure that on graduation day, she will be throwing a party for me up in heaven! My grandmother told a good story better than anyone, and I know that she would have loved hearing about a project in which I
got to listen to the stories of college students. I miss her every day and I carry her in my heart.

Our son, Aaron Joseph Krabacher, arrived just as this dissertation was developing into an actual research study. I associate so many moments concerning this project with Aaron’s delightful smile. His presence has made the past 21 months so wonderful and enjoyable, and we are so blessed that he is part of our family. I will always be proud to be Aaron’s mama.

Finally, my husband, Greg, has provided to me unconditional love, steady support, and enthusiastic discussion throughout the pursuit of this degree. From his strong encouragement to apply to the program five years ago to his technological assistance with formatting my dissertation at the end of this project, he has always been completely invested in my success in this program. Having gone through my masters degree program without you, I am so grateful that I had you in my life to be a part of this degree—you made many a hard day better. Now you have truly made me a Buckeye!
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CHAPTER 1
INTRODUCTION

Colleges and universities offer learning opportunities to students in a multitude of ways. One may traditionally think of learning as something that occurs within the walls of a classroom or in the stacks of the library; however, many university missions today strive to address learning throughout the student experience. Thus, institutions may have a learning component in areas such as residence life and other student organizations, while simultaneously expanding the traditional opportunities of academic endeavors. Undergraduate research is one of the many means of enhancing learning opportunities for students. The research process provides students with a learning environment that offers intense engagement with an academic topic while often being a collaborative effort with other students or a faculty advisor. Through this involvement in research and with appropriate influences from a variety of academic, cultural, social, and institutional factors, students have an opportunity to integrate themselves more fully into the life of the university while gaining confidence that enhances their sense of self-efficacy.
Research Topic and Purpose of Study

This qualitative dissertation study examines the topic of undergraduate student research as a means of more fully involving and integrating students into the life of the academic community while enhancing self-efficacy beliefs. Theories of student involvement, engagement, and integration (Astin, 1993 and Tinto, 1993) and self-efficacy (Bandura, 2000, 1995, & 1992) serve as guiding lenses for a focus on the relationship between the student research process and five areas that emerge from the literature and are influential in a college student’s overall experience: academic background, personal identity, social-cultural factors, institutional characteristics, and faculty interactions. These five areas offer us a framework to discuss how each aspect impacts research work. In turn, there can be a reciprocal relationship between undergraduate research and each of these areas since the process of doing research can impact a student’s perceptions and feelings within each of these areas. Sub-categories of interview questions address this reciprocal relationship.

The literature concerning undergraduate student research is peppered with two primary types of articles: those that focus on the “how to” or pedagogy of research—largely revolving around programs which have worked at the author’s institution—and those that highlight the outcomes of the research process. All of this literature is significant, for the sharing of the instructional techniques of the research process is helpful in identifying the best practices of teaching students how to do this type of academic work. Likewise, proponents of research may find it equally insightful to identify the positive outcomes of research, such as greater cognitive skills, increased
graduation rates, increased student satisfaction, and higher retention rates among student researchers (Astin, 1993; Bauer & Bennett, 2003; Baum, Krider, & Moss, 2006; Hathaway, Nagda & Gregerman, 2002; Ishiyama, 2002; Landrum & Nelsen, 2002; Nagda, Gregerman, Jonidas, von Hippel, & Lerner, 1998; Nnadozie, Ishiyama, & Chon, 2001). These outcomes align closely with many institutional goals, offering strong rationale for devoting financial and human resources towards developing and sustaining undergraduate research programs.

When we focus on the actual student experience in the research process, we find a gap in the literature. Very little has been studied about how students explain the research experience as a means to integrate themselves into the life of the university community. The factors that influence involvement and form students’ constructions of the research process have not been examined thoroughly in a qualitative inquiry, nor has there been a tremendous focus on what aspects of the actual process students define as positive. The first general research question of this study asks how students see research as a means for further engagement in the university. Based on the previous literature, I chose the five sub-categories of questions which highlight potential areas in which students may view their own development as well as factors that influence their experiences within these categories.

Research Questions

The guiding questions for this study examine research as a means of enhancing engagement while also highlighting the way that research both influences and is influenced by five aspects of the college experience:
1. Does undergraduate research serve as a means of further integrating and engaging a student into the life of the university?

2. Several areas that relate to and impact an individual student’s college experience seem to emerge from the literature as influential in the research process; how do five of these (academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions) influence the student’s individual research process?

3. How does participation in undergraduate research in turn impact the student in each these five areas as well as in their overall college experience?

The five sub-categories of questions, which include the areas of academics, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions, give student participants a framework in which to discuss the ways that various facets of the experience have helped them to shape knowledge and meaning. With most of these areas, a reciprocal relationship exists in the research process. In most cases, factors in the area influence the student’s research experience. Simultaneously, the way that the student interacts or views him or herself in these areas may also be changed by his or her involvement in this research process.

In considering the reciprocal relationship between these five areas and the undergraduate research process, a natural starting point seems to be the individual student’s academic background. Through this series of questions, I hoped to learn how the participants see their previous academic experiences as impacting their research agenda, as well as how their sense of their “academic self” has seemed to shift through the research process. Each participant was also asked to reflect upon the ways in which their academic skills—such as critical thinking, cognitive complexity, etc.—have been altered by participating in research.
Closely aligned with the notion of the “academic self” are questions which revolve around personal identity, the second sub-category of questions. Just as one’s academic background impacts a research agenda, personal factors can influence what one chooses to pursue. In addition, an individual’s entire identity may change after doing a research project. A student who previously had not had interest in attending graduate school or pursuing further research may now see these endeavors as feasible and desired vocations. Depending on the experience, an individual’s self-esteem, confidence level, or sense of self-efficacy may be heightened or diminished. Questions designed to address these factors are included within the sub-category of personal identity.

Systemic frameworks—the socio-cultural contexts in which a student finds him or herself—have a tremendous bearing on the research experience. Various departments have very individualized and unique cultures of research, which may influence the research agenda, the quality of research work, and the overall experience. From these cultures stem social connections which may lead to positive outcomes such as networking opportunities or may put pressure upon a student to conform to a certain norm within that socio-cultural framework. Certain departmental cultures may value this student research work more than others, and therefore emphasize research experiences more strongly. Students’ peers might also contribute to the research process, either by discouraging or encouraging participation. In addition, research may provide the student with social networking opportunities that previously have not been available to the student.
Institutional factors (including size, location, college and major structure) and support (such as resources, funding, opportunities for student presentation or publication, and perceived public recognition for research work) also can impact the way a student derives knowledge from the research process. An institution that readily offers scholarships, grants, or unique funding opportunities for student researchers will impact the experience in a different way from an institution that has no resources to put towards this endeavor. Likewise, an institution that has few guidelines and precedent for undergraduate research will influence the experience differently. Not only were questions regarding these areas directed at students, but I also utilized the Undergraduate Research Forum as a research site to help me to understand more comprehensively the social, cultural, and institutional setting in which my participants are conducting their research.

Finally, a consistent theme throughout the literature is the positive benefits that faculty mentoring and interaction offers to students in the research process. My final subcategory of questions inquired about the ways that faculty have influenced the participants’ individual experiences. With each participant, the study explored the degree to which faculty impact a student’s research agenda, whether or not the student feels that he or she has been truly mentored, and how the faculty mentoring has influenced the student’s perceived quality of the work. In addition, I hoped to find out from students whether or not these faculty mentors have had an impact on the career and educational choices that they plan to make after college graduation.
While these five areas—academics, personal identity, socio-cultural frameworks, institutional factors, and faculty—compose my proposed research study, questions for student participants were not limited by these specific frameworks. These categories are based on themes that emerged after a review of the literature. In addition, they provide the loose structural basis with which I began this study. As I pursued this study, I addressed questions about each of these topics to participants; however, with an emergent research design, I also felt free to inquire about other areas as they emerged from my discussions with participants. For example, I asked students to discuss why they got involved in research, their initial impressions of research, and if they found challenges in the research process.

Another reason for framing the initial questions for this study into five sub-categories involves a very basic and legitimate question that is asked of all studies: why is this particular study significant? As mentioned earlier, previous studies point to the positive outcomes of undergraduate research; however, we have very little basis for understanding how students actually experience the research process, their own thoughts or feelings on this experience and outcomes, as well as an assessment of factors influencing this process. If we are truly concerned with outcomes of the research experience as previous studies would indicate, it also is helpful to understand the individual stories of these student researchers. These stories can help us by presenting a more comprehensive picture of the individual’s research experience with all of its nuances, as opposed to the categorized segmentation offered by a quantitative survey.
Summary of the Literature

While Chapter 2 contains an extensive review of the literature, it is helpful to at least summarize the existing literature when explaining the rationale for this study. A significant policy document published by the Boyer Commission in 1998 has tremendously impacted a number of large research institutions. This report highlights discovery-based methods as an integral part of the learning process; as a result, the Commission calls for a shift in the culture of learning to encompass more collaborative research projects. This shift resulted from the commission’s conclusion that ideas are not created in a solitary environment, but rather through collaboration (The Boyer Commission, 1998).

Many of the quantitative research studies that focus on undergraduate research highlight outcomes that result from participation in this process. Undergraduate research may serve as a means to retain at-risk students by enhancing academic engagement (Nagda, Gregerman, Jonidas, von Hippel, & Lerner, 1998). In addition, some studies draw a direct relationship between pursuing research and positive academic outcomes, such as increased graduation rates, graduate placement and persistence rates, higher grade point averages, collaboration between faculty and students, and increases in cognitive skills (Astin, 1993; Bauer & Bennett, 2003; Baum, Krider, & Moss, 2006; Hathaway, Nagda & Gregerman, 2002; Ishiyama, 2002; Landrum & Nelsen, 2002; Nnadozie, Ishiyama, & Chon, 2001). A few studies touch on the positive benefits of action-oriented research (Nairn & Smith, 2003; Reardon, 1994; Schaffer & Peterson, 1998; Shah & Treby, 2006; Zambo & Zambo, 2006), gender differences in the research
process (Acker & Feuerverger, 1996; Conners & Franklin, 1999), and faculty attitudes (Lancy, 2003; Leckie, 1996).

Besides these research studies, the bulk of the remaining literature consists of articles that discuss the instruction of the research process. This literature focuses on the instruction of research practice (Bradley & Bradley, 2001; Dunn, Smith, & Beins, 2007; Goette & Foote, 2000) and ways to motivate students to pursue research (McGlinn & McGlinn, 2003; Small & Arnone, 2001; Voight, 2006). Another prevalent feature of the “how-to” literature involves discussions of successful models from specific institutions (Jamison, 1998; Randall, Wilbur, & Burkholder, 2004). Although not necessarily scholarly, all of these articles are designed to provide examples of ways that colleges and universities may implement successful research programs.

Guiding Lenses and Theoretical Framework

The existing literature on undergraduate research illuminates theories which combine to form a guiding lens through which to analyze these student interviews. Astin’s (1993) theory of student involvement and Tinto’s (1993) concept of integration appear explicitly in the literature, emphasizing the contributions the undergraduate research experience can make to enhancing student engagement. Ultimately, this engagement meets many institutional goals such as increased retention and graduation rates; however, increased engagement ultimately seems to indicate greater student satisfaction with the institution (Astin, 1993; Tinto, 1993). As these interview texts were analyzed, I remained mindful of these theories as I looked for indications of enhanced integration in the life of the university through the research process.
When I began reviewing the text of each student’s story, I also noticed an additional theory that emerged from the student stories. One of the most prevalent themes throughout these texts was the increased confidence that students felt as a result of going through the steps to finish their research project. These gains in confidence were particularly noticeable in the second round of interviews, after most of the students had completed their research work. Albert Bandura’s theory of self-efficacy, which explains that individuals with high levels of personal efficacy are better able to envision themselves attaining a positive outcome in a given situation (Bandura, 2000, 1995, & 1992), provides an additional theoretical lens through which to analyze these student interviews.

The epistemology for this study is social constructivism. The philosophical basis of constructivism calls for us to look at the ways in which various individuals or groups construct meaning and knowledge in various types of contexts. Constructivism rejects the notion of one reality and instead embraces a relativist ontology. Thus, in this study, I attributed value to each individual story; however, social constructivism also allows for the identification of common themes and connections across stories (Schwandt, 1997), providing for comparative analysis of these individual participant stories.

Methodology

Given my research questions, theoretical framework, and guiding lenses, the methodology of interpretive commentary best suited the questions that I asked in this study. One reaches this commentary after reviewing the data to gather assertions,
reporting particular description in the form of quotes, and highlighting more general description of themes and patterns. As a result, I had the opportunity to honor individual stories while simultaneously illustrating the themes that are common and salient throughout the entire data corpus (Erickson, 1986). Since my research questions focused on a number of facets of the undergraduate research process, Erickson provided me with a framework for presenting quotes that demonstrated both typical and atypical aspects of undergraduate research. The culmination of this framework enabled my own commentary and interpretation to highlight salient issues to the reader.

This study served to illuminate the stories of ten undergraduate researchers at a major Midwestern university. Data was collected from two rounds of interviews, an observation of an Undergraduate Research Forum in which all ten students participated, and an analysis of the websites at the university focusing on student research. At the conclusion of data collection, I transcribed the raw data and then looked closely at each student’s comments to gather the intent of his or her storytelling. I also reviewed my field notes from interviews and observations at the research forum. I coded both interviews for each student, looking for emergent themes and patterns while simultaneously keeping in mind the theories of integration and engagement. These themes, which are elaborated in Chapter 4, helped me also to discover the emergent theory of self-efficacy, which is applied to the findings in Chapter 5.

Analysis and Significance of Findings

Data analysis focused primarily on text of the student interviews. Chapter 4 presents several emergent themes that are illuminated in these interview texts. In many
cases, these themes support the previous literature that is reviewed in Chapter 2. In addition, several of the themes may be framed within the context of the theories that were readily apparent in the review of the literature—student engagement, integration, and retention—and upon which this study was situated.

When I initially proposed this research topic, I assumed that the theories of student engagement, integration, and retention would be evident in the data since it appeared explicitly in the review of the literature. After reviewing and coding the data, however, I discovered that the most salient theme in these stories was the increased confidence that students felt after completing a research process. Having studied Bandura’s theory of self-efficacy (2000, 1995, & 1992), I began to think about the concept of efficacy as an additional theoretical lens with which to analyze the data. Chapter 5 applies self-efficacy theory to the data, giving us not only emergent themes in this study, but also an emergent theoretical framework for viewing these findings.

The significance of this study is most apparent when interpreting the themes that emerged from the findings. Since most of the previous literature on the topic of undergraduate research focuses on survey data that is oriented towards outcomes, we see little in this literature that tells us how students experience the research process and how this experience influences these outcomes. The findings in this study that are explained in Chapter 4—the paradox of connection and separation, independence, feelings of obligation, research and gender, confronting challenges, and increased confidence—are not always readily apparent in the survey data that prevails in the existing literature. Thus, previous literature does not give us a strong sense of how
students themselves experience the actual process, nor does it provide a strong explanation for the positive outcomes it reports.

Conclusion

This dissertation study illuminates the ways that students’ interview texts reflect engagement through the research process while simultaneously emphasizing the reciprocal influences between undergraduate research work and five areas of the college experience—academics, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions. Chapter 2 offers an extensive review of the literature, critiques this existing research, and analyzes three theories that emerge from the literature. Chapter 3 follows with an explanation of the methodology and methods that were used to address the research questions in this study. Results of the study are reported in Chapter 4, while the interpretation of the student stories, utilizing theories of engagement, integration, retention, and self-efficacy, appears in Chapter 5.
CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

The undergraduate research experience can offer both students and institutions positive individual benefits such as increased graduation rates, greater development of cognitive skills, and increased graduate school placement rates while simultaneously serving to integrate the student into the academic and cultural fabric of a department and a university. To best understand the complexities of undergraduate student research, however, it is helpful to review and critique the existing literature on the student research process. This chapter will first present a thematic overview of this literature in which we look at various aspects of previous work on the topic. This thematic organization of the literature into topical areas will help to frame this literature within various contexts which are useful in understanding the facets, outcomes, benefits, and challenges of the undergraduate student research experience. No literature review would be complete without an analysis and critique of this research. As a result, this chapter will then highlight theories which seem to be apparent in these studies, and which combine to form a lens through which to view participants’ interviews. This will be followed by a brief discussion of the criteria, assessment, weaknesses, and
limitations of the literature. Finally, the chapter will conclude by mentioning a few of the gaps in the existing literature. Ultimately, one of these gaps leaves open a ripe opportunity for my own qualitative dissertation study focused on the ways in which undergraduate students construct meaning and derive knowledge from the research experience.

Policy Influences on Undergraduate Research

Perhaps the most helpful place to start in a review of the literature concerning the undergraduate student research experience is a look at a major policy document and its influence over undergraduate research programs at larger institutions. Sponsored by the Carnegie Foundation and founded in 1995, the Boyer Commission on Educating Undergraduates at Research Universities authored a report in 1998 entitled *Reinventing Undergraduate Education: A Blueprint for America’s Research Institution*. Although the report is targeted towards larger research institutions, it contains lessons from which all types of institutions can learn. One only must glance briefly at the table of contents of this report to see the breadth of its reach. The report itself addresses everything from interdisciplinary programs to systems of faculty rewards in its section entitled “Ten Ways to Change Undergraduate Education.” However, for the purposes of this chapter’s discussion, this literature review will focus on the Boyer Commission’s first mandate in this change: that is, to “make research-based learning the standard” (1998, p. 15).
The Boyer Commission’s report calls for a cultural shift in the way that we view the acquisition and dissemination of knowledge in undergraduate education. The report explains:

Undergraduate education in research universities requires renewed emphasis on a point strongly made by John Dewey almost a century ago: learning is based on discovery guided by mentoring rather than on the transmission of information. Inherent in inquiry-based learning is an element of reciprocity: faculty can learn from students as students are learning from faculty (The Boyer Commission, 1998, p. 15).

Continuing its discussion of the learning environment, the Boyer Commission emphasizes that ideas typically stem from a collaboration of thoughts from several individuals, rather than from a solitary intellectual endeavor. The report calls for a shift from a learning context in which students just sit as receptors of whatever knowledge is lectured to them to an environment in which collaborative, inquiry-based knowledge and learning is the norm. In this type of environment, students are given the chance with every course to work on assignments that emphasize discovery-based methods. This process begins as soon as students matriculate into the university, since “even though advanced research occurs at advanced levels, undergraduates beginning in the freshman year can learn through research” (The Boyer Commission, 1998, p. 17). In an optimal learning environment, students should have the opportunity to take part in research mentorship and internship experiences throughout their undergraduate careers. The commission concludes that in this type of academic context, with its emphasis on collaboration, individual inquiry, and discovery-based methods, a student will be performing research at the level of a new graduate student by the time he or she reaches senior year (The Boyer Commission, 1998).
As one might imagine, the Boyer Commission’s report spawned a number of reactions, ranging from praise for its recommendation to charges that it was impractical and unrealistic. In order to assess the impact of this report, a few years after its publication the Commission requested that The Reinvention Center at Stony Brook facilitate interviews and surveys of faculty and administrators at 40 of the major research institutions at which the report was directed. Of all the topics covered in the report, undergraduate research was the one in which these institutions had made the most progress. In fact, the study found that universities now viewed undergraduate research not just as a requirement for student learning, but as something that could exist as a real asset to the institution. As of 2003, about 60% of these institutions had established campus offices that served as central locations for the administration of research programs. Perhaps these offices assisted in the facilitation of increased funding towards undergraduate research, for many of these institutions also had developed aggressive roles in seeking funding to enhance these student research endeavors (Katkin, 2003). While challenges still confront universities in their efforts to involve students in inquiry-based learning, one can only conclude from this study’s findings that the 1998 report from the Boyer Commission had a significant impact on the way in which institutions approach the undergraduate research experience.

The Pedagogy of Research

A significant portion of the literature that exists concerning undergraduate research highlights ways in which teachers can get students involved in research or offers suggestions about the “how-to” of research inquiry. As I was perusing articles
for this literature review, I began to conceptualize these particular articles as pedagogy since they involve the actual teaching of the research process. This pedagogical literature tends to fall into two categories—writings that deal with the practical steps of research, and studies or articles that focused on successful ways to motivate students to get involved in research activities. Many of these writings are not original research studies, but rather they focus on practices in the research process. For example, Dunn, Smith, and Beins (2007) recently edited *Best Practices in Teaching Statistics and Research Methods in the Behavioral Sciences*. Targeted towards two and four-year undergraduate institutions, the book addresses topics ranging from writing to getting students involved in the research process to assessment tools to measure student learning in the research process.

**Institutional Examples of Successful Programs**

One sees a number of articles of step-by-step guides of successful programs with which the articles’ writers have been involved at a specific institution or secondary school. For example, an account of models for student research can be found in a 2004 article which focuses on undergraduate research in the natural sciences, most specifically physiology. Randall, Wilbur, and Burkholder (2004) offer us a discussion of research programs at two institutions—Taylor University in Indiana and Asbury College in Kentucky—that are primarily focused on teaching, rather than research. Although these two colleges are not large research institutions, they nevertheless agreed with the Boyer Commission’s assessment of the benefits of undergraduate research. Most of the research projects in Taylor’s program occurred during the summer term,
whereas students at Asbury typically participated in research throughout their senior year. Additional differences in the programs included the funding structures. Taylor’s program was initially financed by a grant that the founding faculty member brought from another institution. This grant was later replaced by funding that was solicited from the National Institute of Health’s Academic Research Enhancement Award. Students and faculty at Asbury College were able to locate funding through a more indirect route. Given Asbury’s close proximity to the University of Kentucky, most students worked in paid summer research internships at that institution which helped to supplement their research work during the academic year at Asbury. Despite this challenge of accessing funding, both Asbury and Taylor pointed to the success of their programs as measured by several means. Both institutions had a large number of students from these research programs who presented at conferences, pursued further research work after college, and attended graduate and professional programs which required the utilization of research skills (Randall, Wilbur, & Burkholder, 2004). Thus, even teaching colleges with very little extra funding for research endeavors can find ways to offer undergraduate research opportunities to their students and incorporate this pedagogy of research into their academic mission.

Another guide based on a successful program focused on basic research skills was discussed in a conference presentation that describes two courses at the University of Louisville. Through discussion of these classes, the presenter hoped to offer readers one institution’s model of the way that an introductory research class work can really increase student enthusiasm about research while training them in skills that will benefit
their future research endeavors. One research class required that, throughout the learning process, students go through all steps required to construct a journal article suitable for publication under American Psychological Association (APA) standards—devising a research plan, soliciting comments on the plan, and writing the actual paper. In addition, these students were required to incorporate both qualitative and quantitative methods into the article. A complementing statistics course at the institution not only insisted that students master the content of statistics, but the course content also continually remind students of the conceptual nature of their statistical work in the research process. The presenter concluded at the end of her paper that the structure of these two classes provided success not only in increasing student enthusiasm and motivation to pursue further research work, but also in enhancing their practical and conceptual research skills (Jamison, 1998).

**Developing Student Research Skills**

Some literature discusses ways that secondary school students should be trained in research before they reach college. This type of training in the high school offers students helpful preparation before they begin college-level research work. For example, Bradley and Bradley (2001) “delineate specific learning activities that will simplify the process to make it manageable for developing readers and writers” (p. 1). With the charts, graphs, and forms, the article gives high school teachers a guide by which they can instruct students on the research process.

Even within the context of higher education, continual changes in technology and available information sources demand that teachers be vigilant in assisting students
in enhancing their research skills. Goett and Foote (2000) outline many of the skills that are now necessary to conduct quality research using the internet. The article highlights the fact that the ability to evaluate the quality of sources found on the internet is just as important as learning to utilize databases, digital note-taking, and proper citation of web materials (Goette & Foote, 2000).

Motivating Students

The instructional literature of the pedagogy of research sometimes focuses on the motivational aspects of student research—in other words, how teachers raise student enthusiasm for research work. Small and Arnone (2001) advocate a step-by-step research model that takes students from planning stages for a project through presentation of the research work; however, with each stage, a motivational goal accompanies the practical tasks that lead to completion of the project. These motivational goals are designed not only to keep students excited throughout the process, but also to provide students with the ambition to pursue future research endeavors (Small & Arnone, 2001). Students also may be motivated to pursue research when they inquire into an issue that affects their daily lives. In an effort to teach multicultural competencies to inner-city college freshman, one professor asked students to explain an incident that had impacted them and then research their assumptions about this incident. Topics such as racial profiling, depression, and teenage pregnancy emerged from student experiences. Group discussions about students’ research topics provided support and positive feedback, thus enhancing student motivation (Hawkins, 2006).
Another article focuses specifically on motivating college debaters to transpose the research that they do for debate work into scholarly publications. The paper offers suggestions of ways that debate coaches can encourage debaters to work collaboratively to develop these projects. Ultimately, the article’s writer concludes that this research experience and possible publications will make these students more competitive for national fellowships after college (Voight, 1996). Finally, McGlinn and McGlinn (2003) discuss student motivation in a report which analyzes the use of alternative types of research projects in a humanities course. The writers found that students who took advantage of the creative alternative research assignments that were offered—including a WebQuest project on the Holocaust or a creative research narrative—performed much better on their papers and expressed more enjoyment than their peers who chose to pursue a traditional research paper. Instructions and guides for facilitating the two creative alternatives are included at the end of the discussion (McGlinn & McGlinn, 2003).

While these types of “how-to” or motivational articles that focus on the pedagogy of research are often not considered as scholarly as some of the original studies that focus on other topics, they nevertheless have a place in this discussion of undergraduate student research. Depending on high school preparation, students arrive at a university with varying degrees of research skills. Some may have had extensive research work in high school, while others may be first exposed to qualitative and quantitative methods in a university classroom. Thus, we cannot ignore materials that offer us helpful suggestions on teaching students about the research process. These
suggestions may come from a variety of sources, including models of specific college programs or information about what projects have worked successfully in a specific high school or college classrooms.

Meeting Institutional Goals

Several studies appear in the literature which point to ways that undergraduate research can fulfill certain institutional goals. These goals include student satisfaction and retention, the development of specific academic or cognitive skills, increased graduate school placement rates, or enhanced involvement in community endeavors. Primarily oriented towards the positive outcomes of student research, this literature provides institutions with a rationale for putting forth the resources necessary to facilitate undergraduate research programs. Most of these studies focus on programs at one specific college or university; however, this section concludes with a discussion of Alexander Astin’s work on this topic, which involves a study with over 100 participating institutions across the country.

Student Satisfaction and Retention

The University of Michigan’s Undergraduate Research Opportunity Program (UROP) offers first and second year students the chance to get involved in research as soon as they arrive at the institution. Unlike many research programs, UROP is not just offered to honors-level students, and research projects are available throughout the liberal arts departments. A study of retention at Michigan found that the student-faculty research partnerships, peer advising, and academic engagement that are fostered by the program tend to positively influence retention rates of participating students. When the
study looked specifically at African American students, UROP participants were retained at more than twice the rate of their peers who were not a part of the program (Nagda, Gregerman, Jonidas, von Hippel, & Lerner, 1998).

Participation in undergraduate student research seems to positively impact student satisfaction. One measure of this satisfaction is retention; as a result, the study of the UROP program at the University of Michigan, which indicates that the program has a positive effect on student satisfaction, supports this claim of increased student satisfaction and retention (Nagda, Gregerman, Jonidas, von Hippel, & Lerner, 1998). A survey of alumni at the University of Delaware indicates that that URP alumni reported significantly higher levels of satisfaction with their undergraduate experience than graduates who did not participate in the program (Bauer & Bennett, 2003).

One might conclude that several factors in the research process contribute to this satisfaction. Students undoubtedly gain a sense of accomplishment in the finished product, particularly if they feel that their intellectual skills and cognitive development have been enhanced by the process. This sense of accomplishment may be further enhanced by the comparable gains in confidence cited by 74% of the students in a study conducted at four selective liberal arts colleges (Seymour, Hunter, Laursen, & DeAntoni, 2004). In addition, the chance to work collaboratively with faculty and peers on a project very likely contributes to this satisfaction. The increased academic engagement fostered by research may contribute to satisfaction as well. For example, a case study at Ohio University discusses faculty reactions to original research work being incorporated into general education classes in the social sciences and biological
sciences at Ohio University. Faculty report that students in these classes are more engaged with the materials and the lecture and retain the course material much longer than their peers who are not participating in original research (Wyatt, 2005). Whatever the individual reasons, based on the research, institutions would be wise to look to research programs as a possible means to increase student satisfaction while simultaneously meeting additional institutional goals such as retention and positive learning outcomes.

Impact on Graduate School Attrition

Discussions of research participation’s impact on graduate school preparation and plans seem to appear often in the literature. While many of these studies are unable to draw a direct causal relationship between undergraduate research and graduate school enrollment, this research participation can be associated with the increased likelihood of attendance. For example, a 2002 study of political science students found higher graduate school placements for students who had pursued undergraduate research than their peers (Ishiyama, 2002), while a study of University of Delaware alumni found that those who had participated in a specific undergraduate research program were twice as likely as their peers outside the program to pursue a research doctorate degree (Bauer & Bennett, 2003). A similar study in 2002 echoed these findings, concluding that those students among the 291 surveyed who had participated in undergraduate research were more likely to attend graduate school and continue research work than students who were not part of research endeavors during college (Hathaway, Nagda & Gregerman, 2002). Finally, the Oak Crest Institute of Science sponsored a research program to
encourage research involvement from two underrepresented populations in the sciences—community college students and women. Participation in the institute’s program positively impacted the way that these students felt about their career preparation and ability to do graduate work (Baum, Krider, & Moss, 2006).

One reason for this increase in graduate school participation from research participants might be the heightened contact with faculty that comes with working on a research project. Faculty members who participated in a study about the benefits of research assistantships felt that the faculty-student mentoring relationships that are established during the research process provide a context in which these faculty mentors can encourage students to continue their education and research in graduate programs. In addition, students who acquire skills that are taught through research—collaboration, analytical skills, communications skills, and time management—have cultivated the preparation which will ultimately help them in graduate school (Landrum & Nelsen, 2002). One might conclude that students who receive this combination of encouragement along with research preparation may feel more confident in their abilities to do graduate work and thus pursue this path more aggressively than their peers who did not complete research work at the undergraduate level.

In addition, student attitudes are beginning to reflect the assumption that undergraduate research work will increase their chances for admission to certain graduate programs. A 2006 study examined student perceptions of an undergraduate research program in the health sciences. The goal of the program was to cultivate researchers in the health fields. Almost half of the students involved in the research
program, however, indicated that they joined the program to enhance their application to medical school (Hecker & Violato, 2006). While some of these aspiring doctors may wind up performing research in medical school, their personal goals differs from the intent of the program.

One variation of this association between research and graduate school can be found in a recent study of McNair research internship programs. Funded by the U.S. Department of Education, the Ronald E. McNair Postbaccalaureate Achievement Program (2007) serves to increase the number of students in doctoral programs from underrepresented populations. Students who receive grants from this program can enroll at an eligible institution that will sponsor research opportunities and other scholarly activities for McNair Scholars with the purpose of preparing the student for graduate work. Hypothesizing that more rigorous programs tend to have higher graduate school placement rates, the researchers examined McNair programs at 35 institutions to identify the key factors in students’ graduate school success. In this study, success was defined as a student’s ability to gain graduate school admissions and funding opportunities, as well as persistence to completion of the graduate degree. The study’s findings concluded that three factors in the undergraduate research programs played a role in graduate school success—the degree of rigor in the application and admissions process to the McNair Scholars program, the expectations of students in the undergraduate program, and the publication of research. Programs which required that students submit extensive research proposals for admission, maintained rigorous academic standards throughout the program, and had students publish their work tended
to have higher graduate school placement rates (Nnadozie, Ishiyama, & Chon, 2001). From this study we can conclude that in order for institutions to gain a desired outcome or meet an institutional goal, they must be deliberate in structuring undergraduate research programs that require that students meet rigorous academic expectations.

*Impact on Academic and Cognitive Skills*

The literature further indicates that research helps to enhance many of the academic and cognitive skills that colleges wish their students to develop, thus meeting an institution’s educational and learning goals. A study of alumni from the University of Delaware looked at the intellectual outcomes of the university’s Undergraduate Research Program (URP). URP alumni reported higher self-assessment scores in their skills and abilities in 32 different areas than their peers outside the program. These areas included problem-solving abilities, cultural understanding, citizenship, intellectual curiosity, critical thinking, and effective writing, speaking, and listening (Bauer & Bennett, 2003).

*Community Involvement*

A research program at Bournemouth University in the United Kingdom offers us an example of a way that a university can enhance its involvement in the community through research endeavors. Forming the Bourne Stream Partnership with a number of local community wildlife and environmental organizations, the university was able to participate in efforts to improve and protect Bourne Stream and the area around it; in turn, students at the institution had the opportunity to use the stream as a field site to research water quality, perform ecological assessment, and measure environmental
sustainability. Students who were surveyed indicated that they felt more motivated and that their learning was enhanced by a project working in a local field site. In addition, the contact with environmental agencies and organizations through the Bourne Partnership left them feeling better prepared for their future careers (Shah & Treby, 2006). Thus, the partnership not only enhanced student learning and career preparation, but it also offered a model of community involvement for universities that have a land grant mission or seek additional community partnerships.

Student Success across Universities

Each of the studies discussed above which highlights ways that undergraduate research helps a university meet institutional goals involves an investigation of a specific program at an individual institution. The work of Alexander W. Astin (1993), however, provides us with a broader look at the ways in which undergraduate research can help institutions meet many of their goals in regard to student success. Seeking to identify factors that most influenced this success, Astin surveyed students at 4-year institutions across the country, examining 135 college environment measures and 57 student involvement measures. Confirming the findings of the case-specific studies, Astin’s survey indicates a high positive correlation between working on an independent research project and a number of factors that colleges often point to as meeting their institutional goals for students. These factors include a greater likelihood of attainment of a bachelors degree, greater self-reported growth in preparation for graduate work by students, a strong commitment from these students to pursue further research, particularly in the sciences, and increased student satisfaction with the college
experience. Astin also measured the positive effects of increased interactions between students and faculty. These faculty-student interactions typically are a significant part of the research experience; as a result, we can infer that students who are involved in research with a faculty mentor will benefit from the positive correlations between increased faculty-student interaction, which Astin shows to be positively correlated with factors such as greater satisfaction with the college experience, higher grade point averages, greater degree attainment, an increased likelihood of graduating with honors, and higher graduate school placement rates (Astin, 1993). Complementing the individual nature of case-specific studies, Astin’s work helps us to place the positive impacts of the undergraduate student research experience in a national context.

Faculty Involvement

*Outcomes of Working with Faculty*

The topic of faculty involvement in the undergraduate research process emerges in several ways in the literature. Most frequently, the literature focuses on outcomes and discusses the benefits—for the institution and individuals—of the close collaboration between faculty and students. These faculty-student mentoring relationships are cited frequently as one of the most beneficial aspects of the undergraduate research process for students (Bauer & Bennett, 2003; Kinkead, 2003; Lancy, 2003; and Landrum & Nelson, 2002). In particular, faculty research mentors can have a positive impact on a student’s willingness to pursue further research work in a graduate program (Landum & Nelson, 2002).
Getting Students Involved with the Faculty Research Agenda

Besides this outcome-oriented literature, other writers speak to issues that arise with a faculty member’s involvement in the student research process. Lancy (2003) addresses the question of why a faculty member might choose to become involved in this work with undergraduates, which can often be time consuming. Pointing out that his own institutional context of working at a small, student-centered teaching university influenced his decision, this faculty member nonetheless ultimately chose to work with undergraduates out of necessity. In a university department that did not have graduate students, undergraduates were able successfully to fulfill many of the research roles that may have been occupied by graduate students at a larger institution. He continues by explaining several of the ways that he utilized these undergraduate researchers in various capacities—by hiring them as teaching fellows for his class, employing them as research assistants at an anthropology museum, and offering them options for independent study or research apprenticeships (Lancy, 2003).

One of the most interesting aspects of Lancy’s essay (and an issue that should be considered by all faculty who are involved in the undergraduate research process) is his discussion of whether or not faculty should direct students towards research topics that encompass a faculty member’s own interests. While “at first glance, it may seem selfish to guide students to work on topics that feed into the faculty member’s research agenda” (Lancy, 2003, p. 89), Lancy has found that students crave this type of guidance, particularly as new researchers. Given this focus on the faculty research agenda, however, it is imperative that faculty acknowledge all student contributions to a
particular project. In addition, Lancy emphasizes that it is equally important to rid the project as much as possible of a traditional supervisor-supervisee culture and power dynamic; rather, faculty should focus on collaboration and making students feel like research colleagues (Lancy, 2003).

**Attitudes of Faculty**

Additional literature deals with faculty attitudes about undergraduate student research. An article by a librarian focuses on the way in which faculty instructors may make incorrect assumptions about their students’ research skills. This librarian explains that a number of students come to her with very common questions about research assignments. Furthermore, as new researchers, “the students have no sense of who might be important in a particular field, and find it difficult to build and follow a citation trail” (Leckie, 1996, p. 202). Given their vast experience in research, some faculty may forget what it is like to be a new undergraduate facing this task. This librarian suggests that faculty stratify their research assignments so that students work on the process systematically, with portions of the assignment turned in throughout the academic term. She concludes that this process will allow for much better quality work in the final result of the research term paper (Leckie, 1996).

Reflecting the growing use of the internet in the research process, another study investigated faculty attitudes towards web use in research. Many of the faculty reported in the study’s survey that they allowed students to utilize the web; however, often these faculty regulated which sites a student could use. This regulation stemmed largely from the faculty’s desire to ensure that the information from these websites was factual,
valid, and of research-worthy quality. In many cases, faculty doubted their students’ abilities to evaluate the quality of this information from the internet. As a result of this doubt, faculty typically required students to utilize additional resources beyond the internet, such as books and periodicals (Herring, 2001).

Participatory and Action Research

One of the factors that I noted in my review of the literature were the ways in which both high school teachers and college faculty have used research that is oriented towards student participation to excite students about the research process, to provide a study with more authentic results, or to lead to some type of political or community action. Although some of these studies occurred at the high school level, many of the foundational structures of the project could be transposed to the college setting. Furthermore, this research work in high school serves to better prepare students for college-level research work.

Political Action

An interesting example of this type of research can be found on a project at a secondary school in New Zealand that focuses on peer research. This article describes this research as “political action” since it challenges stereotypes of high school students and gives these student researchers the latitude to make a critical assessment of both their own experiences and the study’s outcome. Given the nature and topic of the research study, the peer research component seemed well-suited for the intended outcomes of this particular project. Nairn and Smith (2003) explain:

In a broader research project about high school students’ rights, namely their participation, safety, health and recreation rights, it seemed
important to find ways to model participation rights in the research process. A peer research component was therefore developed as an opportunity for young people to have roles in shaping the research process, particularly data collection and collation. Peer research is defined as young people conducting research with their peers, i.e. other young people (p. 1).

Although the students who served as peer researchers on this project had mixed reactions to their own work, there was general agreement that using peer researchers instead of adult researchers to collect the data provided the study with more authentic findings. One student felt that the high school students being studied would have been closed to adult researchers, while other students pointed to their advantage of having “insider” status as a peer. Ultimately, most of the students acknowledged that they gained valuable research skills throughout the process (Nairn & Smith, 2003).

Solution-oriented Research

A study by Zambo and Zambo (2006) explains that action research focuses on finding solutions to a problem. This particular study focused on student teacher attitudes towards action research. Theorizing that action research could be used as a professional development tool to enhance critical and reflexive thinking and efficacy in new teachers, the researchers devised a survey instrument to measure the beliefs of two groups of students—one in the first year of a undergraduate teacher preparation program, and the other in the second and final year of the same program. Survey results and analysis indicated that students believe that their use of action research helped them to develop critical thinking skills which would be helpful as they began their new profession of teaching (Zambo & Zambo, 2006).
Service-learning

Other types of action-oriented research have occurred at the university level through service-learning programs. Schaffer & Peterson (1998) assessed a service-learning research program at their home institution, Bethel College, in which students collaborated with local community service agencies to help these organizations investigate a particular need. For example, nursing students worked with the health department and surveyed the immunization status of children, while another group of students investigated the needs of elderly individuals and provided useful data to nurses at a church’s elder care program. The research process and results proved to be of great benefit to these community service agencies. Most of these agencies could not have hired the extra personnel to conduct the research, although each organization needed the data to offer supporting evidence for their programs. In cases in which regular staff would have done the research for this evidence, their time was freed to work on other projects. Prior to the project many students had expressed reservations about research as a relevant part of service learning; however, they reported at the end of the process that they felt that research should be a required portion of all future service-learning projects (Schaffer & Peterson, 1998).

In another service-learning research endeavor, the findings were utilized to influence local government policies in a way that benefited the communities that were being studied. As part of a community research workshop at Cornell University, students examined two local organizations in New York City—one, a food market run
by a lower-income community that was attempting to negotiate a renewed lease agreement, and the second being a group of lower-income families attempting to meet local regulations to renovate a housing project within the two-year timeframe required by the city. In both cases, community members were running up against a number of internal challenges and external regulations from local municipal agencies that were getting in the way of their economic progress. Through their research work, “undergraduate students, working in collaboration with local organizations, produced planning reports that caused municipal agencies to substantially alter their policies and programs towards specific low-income communities” (Reardon, 1994, p. 45). The result was a positive outcome for both the merchants at the food market and the renovators of the housing project as both groups were able to find success in meeting their goals without suffering economic, political, or legal consequences. In addition, the student researchers indicated that they came away with a much greater understanding of the ways in which race, class, and politics can interact with one another on a local level. They also reported that their research skills had been enhanced as they had acquired increased confidence in these while learning to be self-directed problem solvers (Reardon, 1994).

Gender and the Research Process

The research that addresses gender differences in the research process contains several factors that merit at least a brief mention in this thematic literature review. Perhaps the most prevalent notion that one sees in looking at studies that specifically focus on gender differences is the fact that female students and faculty tend to underrate
their own research skills, even when external assessment indicates that they are successfully completing research of high quality. For example, a 2000 study found that at the end of a research project that lasted an entire summer term, female undergraduates self-rated their research skills lower than the self-assessments of their male peers; however, the evaluations from faculty supervisors reflected no difference in assessment between men and women (Kardash, 2000).

These undergraduate students could likely be reflecting the sentiments of their female faculty role models. A qualitative study in which faculty members were interviewed about their supervisory roles in the undergraduate research process found that female participants tended to question their supervisory skills, whereas men did not mention this as a consideration (Hammick & Acker, 1998). Tenure-track female faculty at another institution indicated that they felt that they shouldered a disproportionate amount of the tasks that involved the care of students when compared to their male colleagues. Even though these women were rewarded with tenure—a clear indication of success in research—they often indicated that they felt their scholarship activities were inadequate and suffered because of the attention that they gave students (Acker & Feuerverger, 1996).

Although these studies indicate that women receive external evaluations that indicate successful research activity, perhaps they are internalizing a culture of gender discrimination that both female students and faculty feel exists in the research process. These feelings of discrimination emerge in Conners and Franklin’s 1999 qualitative study of non-traditional female students. Just as the female faculty in the Acker and
Fauerverger study felt that they shouldered more responsibility for caring for students than their male colleagues, these women felt that their at-home responsibilities offered them less time than their male peers for research. At an institutional level, they also indicated that they perceived that male students got more breaks or opportunities for research (Conners & Franklin, 1999). Perhaps these feelings of gender discrimination might influence the tendency for women to underrate their abilities.

The Challenges of Undergraduate Research

A review of the literature that surrounds undergraduate student research would not be complete without mention of some of the challenges that come with implementing these programs. Structural and cultural features at many institutions make the facilitation of these programs difficult, and “these challenges suggest that research and creative endeavors are still not central to the undergraduate mission at most institutions” (Katkin, 2003, p. 25). In the case of a small institution, the size of the institution and the strain on resources may limit the number of students who can be involved in this process. With larger universities, individual mentorship may be almost impossible given the sheer number of students. While there are ways that institutions can address these challenges, they often must think creatively to arrive at feasible solutions, such as enlisting graduate faculty to provide additional mentors or reallocating or seeking new funding for undergraduate research (Merkel, 2003).

Challenges also lie in the ability of institutions to equalize research opportunities available to all students. Overall, the number of students involved in research still remains relatively small, with the typical student researcher being at honors-level. In
addition, opportunities in different majors and academic disciplines are not always equal. Katkin cites a recent study that indicates that students in the laboratory sciences and engineering are involved in research at twice the rate of their peers in the humanities. On many campuses, the drive to increase humanities students’ involvement in undergraduate research comes not from within the department, but from other offices in the university. Accompanying this need to increase opportunities is also an imperative to find qualified faculty mentors and supervisors for students in the research process (Katkin, 2003).

Student attitudes or abilities can also prove challenging in facilitating undergraduate research programs. Students may resist research initially, claiming it is irrelevant to their work, particularly in service-oriented disciplines (Schaffer & Peterson, 1998). This feeling of irrelevance also arose in a study of physics and geography students, who viewed research as a remote process, set apart from their typical undergraduate classroom work (Robertson & Blackler, 2006). One librarian observed that students frequently look for the easiest, most efficient way to perform research, without allowing themselves the time to really delve into the complexities and nuances of a research assignment (Valentine, 1993). Due to the mixed quality of results that sometimes comes from students who are in the process of learning successful research skills, faculty may be hesitant to collaborate closely on work that is pivotal to the faculty member’s research and publication agenda (Nairn & Smith, 2003).

Finally, the technology that students utilize in the research process can offer challenges that impact the quality of research. Many students have come to use the
internet as a primary means of research, particularly when accessing on-line databases. While this can be an efficient means of gathering information, both faculty and students question the quality of the information available on the web (Herring, 2001; Goett & Foote, 2000; Lindsay & McLaren 2000). This calls on faculty to educate their student about the caliber of articles and publications that they can easily access through the use of the internet. As part of this process, to ensure fair copyright procedures, instructors must also highlight proper citing of these web resources (Goett & Foote, 2000).

Theories that emerge from the literature

Engaging, Integrating, and Retaining Students

Perhaps the two most explicit theories that we see in the existing literature on the undergraduate student research process are Vincent Tinto’s theory of student retention and Alexander Astin’s theory of student involvement. A number of the studies, including one that specifically references Tinto’s work, discuss undergraduate student research as a mechanism that universities can use to increase student satisfaction and retention as well as a factor that influences degree attainment (Bauer & Bennett, 2003; Nnadozie, Ishiyam, & Chon, 2000; Nagda, Gregerman, Jourdas, von Hippel, & Lerner, 1998). Tinto explains that student persistence to graduation hinges on a number of personal and institutional factors, and a critically important factor includes the student’s level of academic engagement both in and outside the classroom (Tinto, 1993). In discussing Tinto’s work, Pascarella and Terenzini (1991) describe this high level of engagement as integration:

The term integration can be understood to refer to the extent to which the individual shares the normative attitudes and values of peers and
faculty in the institution and abides by the formal and informal structural
requirements for membership in that community or in the subgroups of
which the individual is a part. Academic and social integration may
describe a condition (that is, the individual’s place in the academic and
social systems) or an individual perception (that is, the individual’s
personal sense of place in the systems) (p. 51-53).

As the literature suggests, the academic engagement, faculty interactions, and peer
collaborations that come with participating in the undergraduate student research
process can heighten a student’s level of academic, cultural, social, and personal
integration into the university community for many students. Tinto (1993) explains that
“effective retention programs are committed to the development of supportive social
and educational communities in which all students are integrated as competent
members” (p. 147). The structure of many undergraduate research programs—with
their faculty-student collaborations, discovery-based inquiry, and mentoring
relationships—lend themselves perfectly to developing supportive academic
communities. If we apply the lessons of Tinto’s work, we see that ultimately, this type
of academic integration of students in the intellectual community through undergraduate
research programs can serve as a means to increase retention rates.

Student Success

Astin’s work provides us with a theory that we see emerge in the literature that
also complements this discussion of student retention. While Astin’s research points to
specific outcomes that can be impacted by participation in undergraduate student
research, these outcomes are part of a larger theoretical framework that highlights the
positive effects of student involvement at the undergraduate level. Measuring over 150
variables focusing on individual student engagement and environmental influences,
Astin concludes that students who are involved in the academic and social life of the university tend to have greater success in a number of areas in college, such as degree attainment, grade point average, graduate school attendance, and increased cognitive skills (Astin, 1993). The research studies that focus specifically on the undergraduate research experience point to an association between this research and self-reported increases in cognitive factors such as critical thinking and problem-solving skills, as well as an increase in the likelihood of student researchers to attend graduate school (Bauer & Bennett, 2003; Baum, Krider, & Moss, 2006; Ishiyama, 2002; Landrum & Nelsen, 2002; Nnadozie, Ishiyama, & Chon, 2001; Schaffer & Peterson, 1998; Reardon, 1994). Astin’s theory of student involvement not only is consistent with this literature, but it also supports the concept of undergraduate student research as a beneficial means of student involvement and engagement.

Criteria and Limitations of Existing Literature

The majority of the existing literature concerning undergraduate student research seems to fall into two primary categories: descriptive explanations of successful programs at individual institutions that offer models for the pedagogy of research, and research studies—typically involving a survey instrument—that measure the outcomes, benefits, and challenges of the undergraduate research experience. With the exception of a few of the studies that focus on gender and utilize qualitative methodology, the bulk of these studies are quantitative in nature. Given the nature of these studies, one might conclude in a critical evaluation of the literature that an undergraduate research program is assessed largely on the merits of the outcomes that it
generates for the institution and for students. Since these studies are often done by faculty members, it is also natural to wonder if this measurement of outcomes becomes primary criteria for the studies because these researchers are looking for ways in which to justify the resources required to implement a successful undergraduate research programs at their institutions. In addition, the language of these studies often seems much more centered on advocating how these outcomes meet institutional goals than on the ways that these outcomes actually benefit the students that participated in undergraduate research. While this difference is extremely subtle and nuanced, a critique of the literature requires that we acknowledge some of the motivations behind the criteria of these studies when we assess them.

Since so much of the empirical literature focuses on measuring these outcomes—increased graduation rates, student retention, greater cognitive and intellectual skills, increased graduate school attendance—we find ourselves confronting weaknesses and limitations in the literature. When outcomes that meet institutional goals are the primary means of assessing undergraduate research programs, it may become easy to actually ignore the dynamics that exist within a particular program. Quantitative surveys do not always allow for the in-depth look at a program or the undergraduate research experience that interviews with individual students would offer. Without question, quantitative surveys can provide us with useful information in examining undergraduate research; however, this methodology does have its limitations in offering insights about the research experience.
Gaps in the Literature

After looking at this literature, there are facets of the undergraduate student research experience that need further exploration or assessment. Although some of the literature makes brief mention of funding research, particularly in relation to specific projects (Randall, Wilbur, & Burkholder, 2004), and other articles casually touch on resources as a consideration in the research process (Katkin, 2003; Kinkead, 2003), the issue of funding and undergraduate student research does not seem to have been examined very intently. In a climate that constantly discusses the rising costs associated with higher education, it is surprising that this issue is not more prevalent in the discussion. Since resources seem to be one of the structural challenges of implementing these programs (Katkin, 2003), we would be wise to take a closer look at how successful programs are able to fund themselves effectively. This ultimately provides aid to students, which is all the more imperative in providing equal opportunities to all students who wish to do research.

While the discussion of ethics and politics in the research process frequently emerges in methodology courses, it is rarely mentioned in the literature of undergraduate student research. Some of the literature that focuses on service-learning alludes to the ethical considerations that privileged students should take into account when working with low-income communities (Schaffer & Peterson, 1998; Reardon, 1994), and one instructor explains political roadblocks that he encountered at his institution when administering a student research program (Reardon, 1994). In another
article that focuses on the faculty role in student research, the writer charges professors with the ethical obligation to acknowledge all student contributions in a faculty-student collaboration (Lancy, 2003). Beyond these brief references, however, ethical and political considerations seem to be largely ignored when discussing research by students. Implicit in undergraduate student research is the notion that colleges and universities are preparing students for further research work in graduate school and their professions. Certainly ethical and political considerations are going to arise later in an academic career; as a result, it might be wise to examine the ways in which students confront and handle issues of politics and ethics as they emerge in undergraduate research work.

Finally, very little discussion seems to occur in the existing literature that focuses on the actual experience of being a student researcher and how research serves as a means of integrating a student more fully into the university community. A portion of the literature revolves around the “how-to” or pedagogy of research, while another large body of research exists which focuses on the outcomes of student research. In some of the studies that touch on gender differences, a few of the research participants express certain feelings about the research process. However, at the conclusion of this literature review, we still know very little about the experience itself, nor can we readily identify internal or external factors which might influence the ways that undergraduate students interact with or are influenced by various facets of the research process. This particular gap in the literature leaves a ripe opening for my own proposed dissertation topic, which is a qualitative study of the undergraduate student research experience. As
part of this study, I will utilize the methodology of interpretive commentary to examine the individual stories of ten students to inquire into how these undergraduate researchers express research as a means of involvement. In addressing this, I will focus on internal and external factors that might influence a student’s individual experience. These factors might include academic background, personal, social, and peer relationships, institutional characteristics, and faculty interaction. In the following chapter I provide a more extensive discussion of the methods that I will use to study these students’ research experiences.
CHAPTER 3
METHODOLOGY: INTERPRETING STUDENT RESEARCH STORIES

Introduction and Purpose of Study

Most of the literature that focuses on the undergraduate student research experience deals with the outcomes of the research process. In a review of the literature, we see very little of this research that examines the ways in which students actually experience this process and whether they report feeling more or less integrated into the academy during this research work. This qualitative study uses the framework of a social constructivist paradigm. In addition, several theories were utilized as guiding lenses throughout the analysis of the interview texts, including developmental and educational theories focused on the integration and engagement of students into the academic, social, and cultural life of the university community (Astin, 1993; Tinto, 1993) and the development of self-efficacy beliefs (Bandura, 2000, 1995, & 1992). My sample of ten students was asked to express through interviews their own stories of research. These interviews were analyzed and interpreted to see how the individual construction of these stories conveyed information about the student’s engagement and integration. Sub-categories of questions for student participants address five areas (academics, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions) which emerge from the literature as influential aspects of the
research process for undergraduates and serve as a framework for discussing undergraduate research as a means of student engagement and increased efficacy beliefs (See Appendix A for a complete listing of these questions). The following chapter will explain the research design which was used to respond to my research questions and provide interpretive meaning to the students’ research experiences.

Major Research Questions

1. Does undergraduate research serve as a means of further integrating and engaging a student into the life of the university?

2. Several areas that relate to and impact an individual student’s college experience seem to emerge from the literature as influential in the research process; how do five of these (academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions) influence the student’s individual research process?

3. How does participation in undergraduate research in turn impact the student in each these five areas as well as in their overall college experience?

In order to outline the methodological study of these questions, this chapter begins by identifying the theoretical framework that was used for this qualitative inquiry. Since methodology is a philosophical construct that flows from the choice of frameworks, I situate the research question in this construct. A more concrete outline of the various methods of data gathering and analysis which were used in my research study will follow these theoretical discussions. The chapter will conclude with thoughts on considerations such as politics, ethics, validity, trustworthiness, reflexivity, and the researcher’s role and relationship to student participants.
Theoretical Framework

Qualitative researchers find themselves navigating within the frameworks that fall in the post-positivist paradigms. Given my research questions and what I hope to learn about undergraduate student researchers at a large Midwestern institution, as well as my own perspective and belief systems, I have chosen to work specifically within a social constructivist framework. Constructivism offers us a philosophical stance which examines ways in which individuals or collective groups construct meaning within various contexts—whether these contexts be historical, social, psychological, or linguistic. Because various individuals or groups each make their own meanings and construct their own knowledge, the constructivist paradigm, much like the entire post-positivist framework, rejects the ideology of realism or the notion of an absolute truth that is prevalent in the scientific research (Schwandt, 1997). Since this study examined individual stories of research to inquire into whether these students feel a sense of engagement through their work, the relativist ontology of social constructivism helped me to illuminate the individual constructed experiences of these student participants as they relate to five areas that emerge from the literature—academics, personal identity, cultural and social factors, institutional characteristics, and faculty involvement.

Although constructivism reflects an ontological perspective that an infinite number of realities exist as possibilities, these realities do not have to be entirely unrelated or independent of one another. Lincoln and Guba (1985) explain:

These individual realities often overlap one another, simply because many of them are an effort to deal with the same putative phenomenon, but they differ in the meanings that are attached to the phenomenon and
in the sense making in which each actor engages in order to keep his or her world whole and seamless (p. 82).

Thus, as I examined the experiences of these undergraduate student researchers, a social constructivist framework allowed me to validate the individual experiences of students involved in my research study since constructivism insists that the “contribution of each individual in the context to the creation of a reality is recognized” (Lincoln & Guba, 1985, p. 82). However, a social constructivist framework also gave me the freedom to look for connections, similarities, and relationships of these individual realities within the context of my research. Through analysis of themes and patterns, I was able to provide interpretation of individual stories as well as connections throughout all of the interview transcriptions. The lenses of student engagement, integration, and self-efficacy theories as well as the five sub-categories of questions assisted me as I look for common themes in these students’ experiences.

A paradigm involves a number of components which thread throughout the research project, including a researcher’s chosen epistemology, ontology, and methodology. As I have mentioned, the ontological perspective of constructivism involves multiple realities; consequently, this paradigm has a relativist ontology. Following its relativist ontology and embodiment of multiple realities, constructivism reflects an epistemology that is interactive and subjectivist. As I will discussed later in this chapter in the section that concerns the research design, my own interaction as a researcher with these participants reinforced this epistemological positioning. Finally, we find methodologies within constructivism as being dialectic in nature (Denzin & Lincoln, 2001; Lincoln, 1990).
Methodology

Methodologies offer to us a very general theoretical foundation for the actual implementation of a research study (Lincoln & Guba, 2000) while simultaneously helping to clarify our own goals in the research process by providing us with what Strauss and Corbin (1998, p. 4) refer to as the “sense of vision.” Depending on the practices of a discipline, one’s methodology may vary even when focused on the same topic (Schwandt, 1997). The ontological and epistemological perspectives of social constructivism offered me an opportunity to address my research questions by looking at the individual stories of the undergraduate research experience constructed by my student participants. As a researcher interacting with participants, I was a participant in this construction. Schwandt (2000) explains that “in a fairly unremarkable sense, we are all constructivists if we believe that the mind is active in the construction of knowledge” (p. 197).

In order to illuminate and interpret the individual stories of these students and to demonstrate how these stories relate to one another, I chose to follow Frederick Erickson’s methodology of interpretive commentary (1986). To develop this type of analysis, one follows a process that Erickson outlines in his 1986 article “Qualitative Methods on Research on Teaching.” A researcher begins by reviewing and analyzing the data corpus, looking for assertions within the texts that may be supported by warrants from the student interviews. When the researcher is prepared to construct a report on the findings, she first focuses on what Erickson describes as particular description. Often, as is the case in this study, the particular description presents itself
in the form of rich quotes from the research participants. Particular description illustrates the perspective and viewpoint of individual participants, while simultaneously—when more than one interview occurs—showing how these perspectives changes over time (Erickson, 1986).

From particular description we are led to general descriptive data to “establish the generalizability of patterns that were illustrated in particular description through narrative vignette and direct quotes” (Erickson, 1986, p. 151). Within the data corpus, general description allows us to see whether a quote is typical or atypical of participants. Since this general descriptive data is usually reported synoptically, the emergent themes in Chapter 4 are organized thematically in a way that allows similar findings from different participants to be reviewed together (Erickson, 1986). Thus, we can begin comparing and contrasting these quotes as we develop our interpretations of the data.

No doubt the researcher makes choices throughout the process of reporting both general and particular description, particularly in selected quotes to include in the analysis. However, interpretive commentary—which follows general description in Erickson’s framework—allows the researcher more clearly to illuminate the aspects of the data that she finds most significant:

Interpretive commentary thus points the reader to those details that are salient for the author, and to the meaning-interpretations of the author. Interpretive commentary also fills in the information beyond the story itself that is necessary for the reader to interpret the story in a way similar to that of the author (Erickson, 1986, p. 152).
While certainly I provide some analysis as I explain emergent themes in Chapter 4, the
most obvious examples of this interpretive commentary emerge in Chapter 5. Since I
found increased confidence to be the most compelling theme in these student
interviews, I utilized a priori theory—in this case Albert Bandura’s theory of self-
efficacy—to illuminate what I as the researcher saw as the most salient theme in this
data.

The rationale for using interpretive commentary as a methodology in this study
was strong and compelling. This methodology allowed me to look individually at
student quotes and stories through particular description, while simultaneously
developing a progression towards an analysis that identified common themes and
patterns. These themes and patterns emerged for me as the most salient data in the
study. This salient data is emphasized further by the fact that very little qualitative
work, which would indicate themes and patterns among stories, has been done on the
topic of undergraduate research. Significant quantitative data exists which indicates
that undergraduate research may have a strong, even causal relationship, with positive
outcomes for students and institutions. This quantitative work, however, has not delved
below the surface to inquire into what aspect in the research process influences these
outcomes. For example, quantitative studies indicate that students who perform
research are more likely to pursue graduate work (Astin, 1993). Yet, very little in the
review of the literature gives any reason for why this might be in the case. In Chapters
4 and 5, I will discuss the theme of increased confidence in the research process—
which emerged strongly throughout the stories—as a significant reason behind the
participation in graduate work. Thus, Erickson’s framework enabled me to examine closely individual experiences and listen to student voices while also interpreting how these stories fit within the broader context of undergraduate research.

Implementing the Research Process

Research Site

My research took place at a large Midwestern research institution located in an urban area. This institution has a major emphasis on research at all levels and applies rigorous standards to the research of its faculty members who wish to gain tenure. With this emphasis on research, however, came a number of well-publicized opportunities for undergraduate student to conduct their own research and to present and share this work. The university’s Undergraduate Research Office, which is directed by an academic administrator, provides students with information about these opportunities, as well as funding and internships that can assist students in the research process.

Perhaps the most visible way that the university encourages students to participate in undergraduate research projects is its annual sponsorship of an Undergraduate Research Forum. The forum, which attracts hundreds of students as presenters each year, helps these participants to:

…share their research with members and friends of the [University Name] community; recognizes the significant contributions to research by [University Name] undergraduates; and facilitates exchange between students, faculty, and the public. Students enrolled in any undergraduate degree program at [University Name] are invited to participate, provided they are engaged in supervised research projects (The Denman Undergraduate Research Forum, 2006).

The 2007 research forum served as an observation site for this study, for it offered me a chance to gather, analyze, and interpret data about an additional feature of the
undergraduate research experience at a large research institution. Since I was able to visit with each student at the forum and examine their poster presentation, I enhanced my rapport with many of them. This rapport in turn positively influenced my discussions with the students in the second round of interviews.

**Sampling Strategies, Sample Size, and Criteria for Selection**

Two issues that arise in the preliminary stages of a research design and are related to one another are the questions of access to a population for study and debates about the appropriate sample size. Even before selecting a sample population, a researcher has to somehow gain access to this population, which may involve practical, political, and ethical considerations. Although access is one of the preliminary steps of research, it continues to be an issue throughout a research project since “the politics of access are played out daily in the field as relationships first begin, unfold, and change between researchers, gatekeepers, and informants” (Proweller, 1992, p. 213). Selection of a sample involves additional reflection on methodological and paradigmatic positioning. Denzin and Lincoln (2000) explain that “different sampling issues arise in each situation. These needs and issues vary according to the paradigm that is being employed” (p. 370). Because of this variation according to the chosen paradigm, it remains all the more important that a researcher be self-situated paradigmatically when identifying this sample.

Quantitative researchers typically seek to generalize their findings; as a result, they focus on identifying a large, random sample which will provide them with the opportunity to make these generalizations. In contrast, qualitative researchers wish to
focus very intently on a small sample that is selected purposefully to ensure information-rich cases. Patton (1990) explains:

The logic and power of purposeful sampling lies in selecting information-rich cases for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term purposeful sampling (p. 169).

Patton continues by listing 15 different methods of purposeful sampling. Snowball or chain sampling fit best with my study’s research design and context. This approach to sampling basically identifies research participants by asking various individuals who work with student researchers to recommend potential participants who might provide information-rich cases. Typically, in a specific context after several people are questioned, participant names seem to “snowball” as researchers notice several names being mentioned by a number of individuals (Patton, 1990).

In addition, the nature of a study and primary research questions also influence the qualities of a sample. Jones, Torres, and Arminio (2006) explain that “certain characteristics must be present in a sample that are most likely going to elicit insight and greater depth of understanding about the phenomenon of interest” (pp. 67-68). As one of the criteria for selection for the study, I expected each of the ten students to be involved in an independent research project within an academic department and to have aspirations of presenting a poster of this research at the Undergraduate Research Forum. I met initially with both the Director of the Office of Undergraduate Student Research as well as staff members in the Honors and Scholars Center at the university. Each of these individuals had readily agreed to help me contact students who planned to
showcase their research at the forum. After receiving approval from the Institutional Review Board to proceed with my research, I received a list of names of students who had applied to be a part of the Undergraduate Research Forum from the person in charge of the application process in the Honors Program. I contacted students via e-mail, including an electronic attachment of a letter outlining the expectations of the study. Once students agreed to be a part of the study, I scheduled the first interview. At this interview, I again explained the study, gave a hard copy of the letter to each student, and allowed time for each student to ask questions about the study. After this discussion, each student signed the consent form.

Within qualitative research, “there are no rules for sample size” (Patton, 1990, p. 184). Thus, we are left with the question of how many student participants will be enough. Lincoln and Guba (1985) suggest that we sample to the point of redundancy, or when we no longer are getting new information for the study from participants. Because of this uncertainty, I included ten students in my interview sample. Since this was an emergent research design, I had the freedom to add participants after I began the study if I saw that these additions would enhance my research. Although you will hear the words of all of the participants in Chapters 4 and 5, table 3.1 lists these ten participants for reference. Included in this listing are the students’ pseudonyms, academic disciplines, and the contexts in which their research occurred, such as for an honors thesis or a work-study program. The classifications of academic disciplines reflect those terms used to categorize students for the Undergraduate Research Forum; thus, some students fall into academic areas such as agriculture or the arts which are
classified by a broader discipline whereas others, such as psychology, indicate the student’s specific major area.
<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Discipline</th>
<th>Context of research</th>
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<tbody>
<tr>
<td>Ben</td>
<td>Education</td>
<td>Honors thesis</td>
</tr>
<tr>
<td>Biff</td>
<td>Humanities</td>
<td>Honors thesis</td>
</tr>
<tr>
<td>Catherine</td>
<td>Engineering</td>
<td>Honors thesis</td>
</tr>
<tr>
<td>Elizabeth</td>
<td>Humanities</td>
<td>Honors thesis</td>
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<tr>
<td>Hal</td>
<td>Agriculture</td>
<td>Work study position in a research lab</td>
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<tr>
<td>Helen</td>
<td>Engineering</td>
<td>Honors thesis</td>
</tr>
<tr>
<td>Norah</td>
<td>Social Sciences</td>
<td>Honors thesis</td>
</tr>
<tr>
<td>Patrick</td>
<td>Education</td>
<td>Research opportunity within an internship</td>
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<tr>
<td>Sarah</td>
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<td>Summer research program</td>
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<tr>
<td>Sophia</td>
<td>Psychology</td>
<td>Honors thesis</td>
</tr>
</tbody>
</table>

Table 3.1
Data Collection Methods

Many of the decisions of data gathering were determined by the epistemological, paradigmatic, and methodological positioning of the researcher which influences the methods package that one chooses to implement. Kemmis and McTaggart (2000) contrast data collection practices of qualitative researchers with those of quantitative researchers to illuminate this point. When quantitative researchers wish to understand participants attitudes, they might use a questionnaire and then convert the responses to a scale; in contrast, qualitative researchers will gather and analyze data differently since they “regard the data as crude approximations to the ways participants understand themselves not (as quantitative researchers may assert) as more rigorous (valid, reliable) because they are scaled” (Kemmis & McTaggart, 2000, p. 600).

An effective research design has a well-constructed methods package. Theorists of qualitative inquiry encourage researchers to follow the practice of triangulation during this process of identifying and practicing methods, which is “the use of multiple methods to study a single problem” (Janesick, 2000, p. 391). This triangulation enriches a study, making the data analysis much more multi-faceted and filled with thick description. For example, one’s inquiry will be much more developed and layered by relying not just on interviews with individual participants, but also by observing these participants in a setting such as a research forum.

For this study of the undergraduate student research experience, I chose to practice triangulation by selecting three methods for data collection—interviews of students, observations of the students’ poster presentations at an Undergraduate
Research Forum, and reviews of websites focusing on undergraduate research at the university. Talking individually with ten students who were involved in undergraduate research gave me the opportunity to learn what these individuals identify as significant factors in this experience. I conducted an interview with each of the ten students before the research forum. This first interview was fairly structured, allowing time for procedural tasks at the start. I gave each student a copy of the letter which explained the research study, allowed time for questions, and asked each student to sign the consent form. Our discussion of the undergraduate research process began with an explanation of my position and experience with undergraduate research, followed by a conversation that focused on the interview questions. Following this first round of individual meeting, I transcribed each interview.

Since these students would be showcasing their research at an annual Undergraduate Research Forum, this forum gave me a site at which I could conduct an observation of a public poster presentation of each student’s research. I examined each student’s poster presentation. As it is customary for students to have a brief presentation prepared for the forum, I asked the students to present these to me. I in turn asked questions about each project. Perhaps the most useful part of this forum, besides giving me further context for the undergraduate research experience, was that it helped me to develop a greater rapport with these students. Many of them seemed very appreciative of the chance to share their work with me, and I felt that the discussion in the second round of interviewed were enhanced because I could reference specific elements about the Undergraduate Research Forum. As a result, the data that I collected
in this second round of interviews was richer because I attended and observed the forum.

Finally, I interviewed each student following the forum and included a member check as part of this discussion. Just as my observation at the Undergraduate Research Forum helped me to develop rapport with the student and thus resulted in richer discussion, this member check served as a mechanism to extend and enhance my findings. I gave each student a copy of his or her transcript, and then discussed with each student notes that I had made regarding themes in his or her interview and my perceptions of what their stories indicated about the student’s experience. Student participants had the chance not only to provide feedback on the transcript, but also to discuss whether or not my interpretation of their research story accurately reflected their thoughts about the research process. In many cases, the member checks helped extend and enhance the conversations that I had with the students in the first round of interviews. In addition, the students seemed grateful that I had listened to their stories and tried to portray their experiences accurately. Thus, the member check added an additional layer to the data that would not have been present without this process that ensures validity.

Data Analysis and Interpretation

Data analysis is the process of making sense of the findings and again is impacted by factors such as paradigm, methods, and positioning of the researcher. During the process, the researcher actually becomes an instrument of analysis since “analysis is the interplay between researchers and data” (Strauss & Corbin, 1998). In
many cases, researchers practicing qualitative inquiry will select methods that ultimately have to be transcribed (interviews, field notes, focus groups, etc.). From reviewing these transcripts, a researcher practicing in the tradition of qualitative work can begin to identify themes, behaviors, concepts, language, and beliefs in an attempt to create models or draw conclusions. An equally important part of this process is to identify exceptions to these models (often the most interesting and useful discussions revolve around these exceptions).

When I began this data analysis, I utilized open coding in these texts, looking line by line at language, ideas, and terminology that formulate concepts and themes within the individual stories. Examining closely themes that were illuminated repeatedly, I then looked for common threads across interviews which highlighted similarities in the experiences of more than one participant. My theoretical lenses—engagement, integration, and self-efficacy—offered me useful tools for interpreting, analyzing, and writing about these stories. Simultaneously, my guiding methodology helped me to draw on individual quotes to demonstrate larger themes and ideas that tended to span across the interview texts.

In any qualitative study, the researcher must make choices about which data to include and which themes and patterns to exclude in the analysis. After coding the interviews, I chose six themes that are presented in Chapter 4. These themes include the paradox of connection and separation, independence, feelings of obligation, research and gender, confronting challenges, and increased confidence. In some cases, the actual
naming of the term evolved as I coded and analyzed the text. For example, an initial code of “engagement” grew into “connection.”

These six themes were selected because, with the exception of one (research and gender), each was apparent and discussed prevalently and frequently in at least four or five of the participants’ interviews. Thus, in deciding upon which themes to use, I chose to focus on those that were illuminated in the interviews of the most participants. In addition, the six themes seemed to transcend responses to questions in the five areas. In other words, the themes emerged across the span of the two interviews, rather than being confined to one grouping of questions. I also selected the themes because, in most cases, at least one participant offered disconfirming evidence that did not support the prevalent discussion of the theme. Despite being mentioned by only two participants, research and gender was added as a theme in the analysis because of my initial interest in the role of gender in the research process.

Role of the Researcher

In utilizing situated methodology in qualitative research, a researcher must closely examine his or her role in the research process. For the researcher, this examination involves situating the self methodologically within a paradigm, taking into account one’s own personal social and cultural positioning within the projects, and reflecting continually through a self-reflexivity journal. The successful research design in situated methodology involves a number of key issues, including trustworthiness, validity, and politics and ethics. The following sections will briefly discuss these issues.
These four critical components of a qualitative study each involve factors which fall into Lincoln and Guba’s (1985) validity chart and are echoed in Lather’s 2001 article concerning validity. Thus, Lather’s assumption that the concepts of validity, ethics, and politics have become increasingly blurred discourses is supported by additional theorists. This blurring addresses a number of questions with which a researcher must grapple in the process of conducting a rich study. The first of these to consider is the way that a qualitative researcher negotiates the political pitfalls that come with a research practice that falls outside “traditional” or positivistic notions of science. A positivist study typically offers hypotheses which remain throughout the work to be proven or disproved, while demanding that the researcher construct a study that can be generalized in other contexts. As we have discussed, qualitative research, often viewed as less-traditional, is not a priori research; we assume that the study focuses on a particular context, and while it may be transferable, it cannot be replicated (Patton, 1990).

One of the most interesting statements in Lather’s article, and one which I think speaks to the politics of qualitative research in general appears in her first note on page 241. Lather almost apologizes for using the term “validity” (she mentions that she is “hanging on to the term ‘validity’”) and notes that she hopes to “rupture validity as a ‘regime of truth;’ to displace its historical inscription toward policing the borders between science and non-science” (p. 241). Lather’s assumptions concerning the blurring of validity with ethical and political considerations provides the researcher with
the flexibility to place validity in context, rather than, in the positivist tradition, having to use a standardized form of validity. In the use of constitutive criteria for validity, we are free to engage in contextually relevant practices (Lather, 2001). Ultimately, this allows us to carry the concept of validity across the paradigms of post-positivist research.

Other political considerations arise just in the actual implementation of the research project. In fact, when a researcher makes each individual decision about research site, sample, and interview location, he or she can merge at any point into political questions. For example, in requesting documents from an institution for analysis, some researchers may encounter the political pitfalls of being denied access to certain information. In a study of undergraduate research, one might notice that students in some departments receive much greater funding than students in another. The choice about whether or not to highlight or continue deeper exploration into whether or not this funding discrepancy impacts the student experience may lead to negotiations of political pitfalls within the university context.

Ethical considerations emerge repeatedly throughout qualitative research, particularly when we focus on the role of the researcher and his or her relationship with participants. Lather (2001) explains that “questions of accountability and responsibility are ethical and social” (p. 364) while Lincoln and Guba (1985) point to actions of accountability (i.e. member checks, dependability audit, confirmability audit, etc.) as ways to enhance the validity and increase the trustworthiness of a study. Thus, it
remains imperative that the researcher communicate effectively and honestly with participants.

*Ensuring Validity in the Study*

I conducted several practices in this study to ensure trustworthiness in the study, while also addressing concerns about validity and ethics. These practices included the accurate revelation of the purpose of the study to participants, an appropriate, accurate, and systematic approach to data collection, fair and ethical treatment of research participants, the clear articulation of the position of the researcher to participants, and, finally, the thorough representation of the research data. After my proposal was approved by my university’s Institutional Review Board and I initially identify a group of student participants for this project, I contacted each of them in writing using either e-mail or letter format to explain the exact purpose and nature of my study. This correspondence included information about the types and number of interviews that I had planned and the observations that I hoped to conduct. Finally, the letter was signed by my faculty advisor and by me and gave the participant any opportunity to ask questions and expect honest and thorough answers (an expectation that extended throughout the study).

When I began interacting with participants, it was imperative to the validity of the project that I explain my own positioning in the study. This required that I think thoroughly and complexly about my role as the researcher (I spent time reflecting on this in reflexive notes that I kept during the interview process) so as to appropriately and accurately convey this role. In addition, I remained open to questions from
participants about my own experiences in research, my interest in the topic, and what I hope to do with the research (i.e. if I have publication ambitions).

While one can take any number of procedural steps to ensure trustworthiness and validity, one ultimately needs to examine various facets of her role as a researcher. In my own positioning, I found myself not only being able to identify with many of the feelings that these students explained, but also feeling a strong contrast to some. Although I also pursued undergraduate student research and this experience certainly helped me relate to many of the findings, my institutional context was quite different from the one in which these students found themselves. Besides these contextual differences, it was important that I acknowledge any power differential that might be present—whether actual or perceived—in the interview setting. With one student in particular, I felt that he had the misperception that I would be reporting my results to the organization that ran the Undergraduate Research Forum. Thus, it was important that I be clear about my own position as a PhD candidate, not as a staff member assessing the effectiveness of undergraduate research.

A thorough understanding by the participants of the study and my positioning as the researcher address the issue of fairness; however, there were additional practical, political and ethical concerns that arose throughout these communications, such as making sure that participants fully agree with and understand the nature of the study before signing written consent, as well as ensuring confidentiality. A discussion of confidentiality and written consent lead me to formulate a systematic plan for the collection, storing, and handling of data. A number of steps were taken to ensure this
confidentiality. Each participant was identified throughout the study’s texts, interview recordings, transcripts, and final dissertation, by a pseudonym. Participants were given the option to choose their own pseudonym. If one was not chosen, then I assigned a pseudonym. The written consent agreement that each participant signed had no identifying factors which could relate him or her to an individual in the study (such as identification of academic major, personal characteristics, etc.) and this consent form was stored in a separate but equally-secure location from the data. Data sources such as interview tapes, field notes, and transcripts were stored along with my computer in a secure location in my home.

After looking at ways to remain accountable and responsible while insuring fairness to participants, I think that a researcher has an ethical obligation to look for ways to make the study thoroughly comprehensive so that stories of the participants and additional data sources (such as observation notes, websites, and documents) are as rich and as informative as possible. A few ways that a researcher can provide this enhancement are through self-reflexivity, peer debriefing, and triangulation. Simultaneously, these practices also address validity concerns and increase the trustworthiness of the dissertation based on the factors that we see in Lincoln and Guba’s (1985) chart and Lather’s validity article (2001). I kept reflexive notes throughout the interview process. In addition, I identified some student colleagues who served as peer debriefers. The methods that I chose—interviews, observation, and document analysis—implemented triangulation of the topic.
Finally, I feel that ethically, one must approach research with an intent to help, not harm, the targeted research group as well as those individuals who might eventually read the study. As a result, regardless of one’s epistemological or paradigmatic framework, the research questions, methodology, and research design should be structured in a way that provides for findings that can benefit not only the research participants, but hopefully also may be transferable to other situations. Within qualitative research, we do not have the ability to replicate our study; however, through rich and thick description, we do offer the possibility for those reading our work to decide whether or not the study can be useful in their own contexts (Lincoln & Guba, 1985).

Conclusion

Although Chapter 2 points to the large number of qualitative studies that focus largely on the outcomes of undergraduate research, very little qualitative work has occurred in this area which provides explanation for these survey results. This research design utilized Erickson’s framework to develop interpretive commentary that highlights themes and patterns in the undergraduate research experiences of ten students. Situated within the social constructivist paradigm, I maintained sustained contact with the students throughout the data collection process by conducting two interviews with each student—one before and one after the research forum—and visiting every student’s poster presentation at the forum. Chapters 4 and 5 focus on the student stories in reporting findings of the study and analyzing student interview texts in relationship to one another.
CHAPTER 4

FINDINGS

Introduction

Not surprisingly, the undergraduate researchers who participated in this study seemed to relish the opportunity to talk about their experiences and the influences on their work. Most of the questions for the first interview revolved around inquiry into the student’s reasons for pursuing research and reflections on the experience within the five areas defined in the research study—academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions. Each of these areas will be addressed in Chapter 5’s responses to the research question. Interview questions were targeted towards gaining an understanding of students’ reasons for doing research and how the five areas impacted their experiences. Several themes emerged, however, that crossed the boundaries of each category and appeared in many of the students’ stories. The following chapter first looks at the ways in which students construct the research process. Following these sections on pre and post constructions of research, I will elaborate on the emergent themes that presented themselves in the students’ interviews. While the findings will be mentioned in this
chapter, Chapter 5 will offer theoretical lenses with which to discuss, analyze, and interpret these themes.

Throughout Chapters 4 and 5, quotes from student interviews will be utilized frequently. In most cases, a mention of the individual student’s pseudonym will introduce the quote. At the conclusion of the quote, it will be annotated with either “int. 1” or “int. 2,” indicating that the quote came from either the first or second interview with the student. In a few cases, when the student’s pseudonym is not present in the introductory remarks for the quote, the pseudonym will be added to this annotation (e.g. “Norah, int. 1”).

Constructing the Research Process

Since this study follows the theoretical framework of constructivism, which asserts that individuals or groups create their own meaning, knowledge, and realities (Schwandt, 1997), perhaps we should first look at the reasons that students choose to pursue research, followed by the ways in which these student participants construct their own conceptualization of undergraduate research after experiencing the research process. In reviewing the interview transcripts, I noticed a distinction between these constructions of research before the project began, and those constructions that came after the student had spent some time working on a research agenda. I have distinguished the two constructions by referring to them as “pre-constructions” (the constructions that existed prior to performing research) and “post-constructions” (how students constructed the process after beginning research) in the following discussion.
Pre-construction of the Research Process

The students’ reasons for getting involved with research tended to be strongly influenced by the way that students had constructed their identities before starting this process. Students who were focused on graduate school believed the research experience was something that would benefit them in the future, whether it was in a job or in academic pursuits. Norah summarizes the thoughts of these individuals by explaining that initially, “I just thought that this was a good platform for graduate school or post-graduate opportunities” (int. 1). Students who had aspirations for further academic work constructed the research process as a factor that could make them stand out from other applicants. In addition, the research opportunity also became constructed as a practice exercise for larger research projects later on in graduate school.

Students’ personal relationships also contributed to the way that they constructed the research process. Beyond the pragmatic reason of boosting a graduate or career portfolio, students were influenced by family members or faculty to pursue research endeavors. Two students—Sarah and Helen—mentioned that one or both of their parents are faculty members, and that these individuals very much encouraged them to get involved in the research process. Catherine discussed a desire to follow in the footsteps of her sister, who had researched a doctoral dissertation in her PhD program. In other cases, a faculty member in the student’s major department might have sparked a student’s interest in research. When Biff first spoke to his advisor about writing an honors thesis, she explained that he could be very creative in his approach to
the research work. With the realization that research would allow him the flexibility to pursue some of the creative work that he loves, he grew excited about the prospect of working on a thesis.

A few students also felt that their status as students in the University Honors Program added some extra pressure to participate in research or write a thesis. Of the ten research participants in this study, nine were part of the institution’s formal honors program. In constructing her identity as an honors student, Elizabeth saw the thesis as almost a badge of membership into a select group, stating that “here at [the university], I’m very academically ambitious, and you have to write an honors thesis. It’s part of being part of the club, so that was my first expectation” (int. 1). Although they did not seem to reflect the same degree of pressure felt by Elizabeth, Biff and Helen, who were also honors students, mentioned that they felt that the research was suggested frequently as an option, particularly to strong students at the university.

Finally, two students got involved with research as part of a job or internship. Hal held a work study job as a first year student in a science lab on campus. He gradually was given more and more responsibility, eventually working extensively with the training and supervision of other students in the laboratory. For Hal, the incentives which were provided by being an employee, such as a salary and funding, helped him to justify the time that he put into his research work:

It [research] started off as work study, so I get paid for that. And then, for this project that I’m starting with this year, I applied for a grant from [a foundation] because my project is pretty involved in [a particular topic]. So, that’s more pay. When I run out of work study, I’ll be able to tap into that and still get paid. I would still probably do [research], but I wouldn’t put as much time into it if I couldn’t get paid (int. 1).
Patrick “was not planning on doing research until I got involved in this project.” However, during an internship with a federal agency, Patrick discovered an area of interest that he felt could provide useful information to the agency.

Post-construction of the Research Experience

Contextual factors such as academic major and interest, location of the research site, guidance from faculty mentors and personal expectations influenced the way that students constructed the research process once they began working on their projects. Some of these post-constructions (preparation for graduate school, a reflection of interests, etc.) echoed the initial reasons that students got involved in research; others, however, emerged from the process of doing research. The texts of the participants’ interviews illuminate five post-constructions of the undergraduate research, including 1) research as practice for graduate school, 2) research as a means of combining personal and academic interests 3) research as “fun” (Biff, int. 1), 4) research as collaboration, 5) research as the discovery of useful and applicable information. In many cases, a single interview reflected more than one of these constructions, indicating the complexities and overlaps that come with conceptualizing the undergraduate research process.

Two student participants, Ben and Helen, each wrote honors theses and very much saw their research work and poster presentations at the Undergraduate Research Forum as critical preparation for graduate work. Perhaps this particular construction emerged strongest in their stories since both of these students began graduate programs immediately after graduating from college. Helen viewed completion of her
undergraduate research thesis as something that will ease the transition to graduate school:

I’m going to get my masters, and we have the option to do a thesis option or a non-thesis option, and so I’m going to write my masters thesis. I think because I’ve done an undergraduate thesis, it’s easier to transition into writing for my masters. Just as it is intimidating as an undergraduate to do research, I think it also would have been intimidating if my first experience had been as a masters student trying to write my thesis (int. 1).

While she initially felt the research process to be somewhat daunting, the thesis process helped Helen to identify and articulate factors that would benefit her in her graduate program, such as departmental support and strong faculty advising.

Ben echoed the confidence that Helen felt after completing an undergraduate thesis; in fact, the research process actually influenced Ben to pursue graduate work. He explains that “I don’t think I would be, in fact I know I wouldn’t be going on for my PhD if I hadn’t gotten into the whole research arena” (int. 1). Going into the process, Ben felt that he knew very little about how to actually pursue research work and the foundation that one needs for this process. As he reflected on the experience during the two interviews, however, he identified several steps in the process that he would have changed, particularly in respect to when he took his research courses:

I just took my first research course last quarter and my first— I shouldn’t say my first—stats course in twelve years this year, so that should be a prerequisite from the beginning. In hindsight it is just like everything I needed before [I started the project] I’m doing after the fact....The classes are almost more reflection. There is irony written all over that. It’s like I said, I so wish there would have been something outlined saying you are doing your research, here is what you need to do to complete the system of research. I really think that it should be a prerequisite and be outlined (int. 1).
For Ben, the actual research work was not the difficult part since “…it’s not rocket science” (int. 1) and he enjoyed his topic; however, he ran into several additional logistical pitfalls along the way such as struggles with his application to the Institutional Review Board (IRB) and access to his research population. In retrospect, Ben was grateful to have had the opportunity to experience these challenges before graduate school and had extremely positive feelings about the research process:

I thought it was extraordinary. I know I am going to be so much more confident working on my research and my graduate program. I’m glad I made all the mistakes now as opposed to later. It gave me the opportunity to make mistakes and not get criticized as much as I would, or at least that I assume (Ben, int. 2).

The concept of research as a means of combining various academic and individual interests appeared in the students’ interviews. For example, Sophia’s construction of the research process allowed her to foster both her career interest in counseling with critical investigation of new ideas.

I liked being in a position where I could utilize my want to help people but at the same time, you know, want to keep learning and be curious and have ideas about stuff. I kind of like the idea of being able to merge the two concepts (int. 1).

As a psychology student, Sophia loved to work with people yet she also wanted to challenge herself academically; the research process gave her a mechanism to integrate these two things. Norah’s own personal background heavily influenced her choice of research topics and sites. While she originally perceived research as a practical tool to help her gain admission to graduate school, she quickly realized that research would give her an opportunity to expand the academic offerings provided by the university:
Well, the first thing is that you really get to probe a question that really fascinates you that a class might not necessarily cover. I’m studying the education gap in [name of country], and there are not even classes on [name of country] in general terms. So for me, I have been able to engage in that and it has been really helpful (Norah, int. 1).

Norah’s research topic focused on girls’ education in a developing country in Asia where her parents were born. Norah had long hoped to work for educational progress in this country. Upon suggestion of an advisor, she decided to use her honors thesis as a way of investigating her interests.

Other students agreed with Norah and Sophia’s construction of research as merging academic and personal interests. Two stories in particular reflected the enjoyment and great fun that students may derive from the research project. In both, it was immediately evident that a personal interest had been incorporated into the academic arena, such that the personal and the academic become synonymous in the research process. Biff, a humanities student, was able to take an extremely creative approach to his thesis, as evidenced by both the thesis document and his poster presentation at the research forum. This type of creative work was something that Biff had enjoyed since high school; as a result, several times during his interview he describes his research as “fun” (int. 1). Biff expanded on this notion of “fun” by explaining his attraction to creative writing:

Well, I mean I have always just kind of been a reader and I have always admired someone who could tell a good yarn and make, or invent, people on the page and there they are, the characters. It has always been a fascinating thing for me. I guess I was just drawn to it (int. 1).

Sarah’s discussion of her research experience echoed the enjoyment that Biff felt with his. She explained that “I had a great [research] experience because I was
researching something that was really interesting to me” (int. 1). As a music lover, Sarah designed her qualitative study in the arts to allow for a research site at a music festival, which contributed to her positive feelings about the project. She explained “you know, everyone at [the music festival] was super-happy to be there, and really happy to help. It was a very good experience” (int. 1). Sarah’s enthusiasm about her project was enhanced further when she received feedback from her peers following a presentation to her research group:

I think everyone that I talked to was very positive about my ideas and my goals and I thought that it was nice to do. I guess there are some projects that are a little more boring. Mine was more interesting to hear about and it was so visually exciting to look at all these concert posters, and that was what I did all summer. It was a great time (int. 1).

With this positive feedback, Sarah’s own feelings about the project were reaffirmed by her peers.

Patrick’s interviews indicated that his research experience ventured beyond just a chance to combine interests or providing a degree of personal excitement. Through his research work, which was part of an internship at a federal agency, Patrick articulated that he was able to fulfill many of the gaps that he had felt were apparent in his college academic experience:

I guess on a personal level, I was somewhat dissatisfied up to this point at how much I was learning at the college level. I really thought I would be learning more, and this gave me the opportunity to really do that. Once I decide what to focus on, I found there was just an abundance of information out there to be found, and I didn’t really realize that before. I definitely learned a lot more than I would have otherwise in college (int. 1).
Not only did Patrick find that research sparked an academic interest, but it left him feeling much more satisfied about the things that he had learned during college.

Many of the stories exemplified the overlapping of constructions within the same research process. Catherine moved from her initial impression of research as a solitary endeavor to a concept of research as collaboration during the research process:

I think when I traditionally thought of research, it was very laboratory-intensive, and you are going to spend all of this time with pipettes, but clearly research is really defined by what your major and what your project is. I think another misconception that I think I had was that if you were going to do a research project, it was entirely all on you and had to be all your ideas. But really, once I started learning, it’s all about collaborating and building on other’s ideas (int. 1).

The notion of collaboration—either by building on work already begun, passing on phase two of the project to another student, and utilizing contacts to gather data—permeated Catherine’s story of the research process. In addition, Catherine bridged the gap between constructs of research as collaboration and research as useful and applicable information. Catherine’s project focused on a specific campus issue. She and her advisor planned to present it to the Board of Trustees in hopes that the board members would accept her recommendations for addressing this issue. Explaining the benefits of her plan, Catherine exclaimed “it just makes sense. It’s a sensible project” (int. 1).

This same concept of sensibility was evident throughout Patrick’s interview. This focus on utility is not surprising, given that his research occurred in the context of a work setting in a government agency. In his interviews, Patrick frequently emphasized that he liked the fact that his research had produced a policy document that
could be applied to a particular problem. In fact, Patrick did not plan on doing an independent research project for the research forum before he entered this particular work setting through an internship program. The research process illuminated for him how much information has been collected yet not analyzed:

> It really opened my eyes to the fact that there is a lot of information out there or data that hasn’t really been analyzed in any significant way, and that can be useful in a lot of areas—it’s just no one has looked at it and tried to use it.

Like many of the other students mentioned in this section, Patrick’s development of the actual topic grew from a personal interest. Given the setting of the research work in a government agency, he saw vividly the applicability of his findings to issues the agency was trying to address.

**Emergent Themes from Student Interviews**

The student discussions reflected a number of themes which emerged in the interview texts. These included the paradox of connection and separation, independence, obligation, challenges, and validation and confidence. The emergent themes crossed the boundaries of the categories of interview questions. For example, a student’s sense of obligation in the research process may have resulted from a combination of personal expectations and identity, cultural pressures, and academic background. When discussing themes in relation to one another—such as in the paradoxical themes of connection and separation—we were offered an interesting glimpse into the nuances of these students’ reflections on the research process. Finally, this discussion placed each theme within the context of previous literature on the topic of undergraduate research.
The Paradox of Connection and Separation

One of the theoretical lenses for this study was the concept of student integration and engagement. When I looked closely at individual stories with this lens, I discovered that these discussions revolving around engagement most often focused on human connections and relationships. Students used connections and relationships—particularly with peers, administrators, and faculty—in a variety of ways to enhance their sense of engagement through the research process. Peer reviewers and research groups served to increase student learning, offer support to individual researchers, and create an environment conducive to the research process. Within Helen’s major, there was a structured research class in which students met and offered feedback on their peers’ work. She explained the helpful nature of this interaction:

I was just going to say that we also have a class for our research….and we meet every quarter, four or five times a quarter, and everyone presents the research they’ve been doing in front of the classroom. All the other students listen and ask questions of the student. So, I think that’s been really valuable, to connect with other students who are thinking about graduate school or who are honors students. Just to have the presentation skills, too, I think has been a good experience. The fact that it’s all together has connected us as students (Helen, int. 1).

Norah’s experience also illuminated the positive impact that peers can have on a student’s research process. Norah had a very formal, structured group of four friends in her department which met frequently to discuss their research work. She explained that research offered a chance for students really to take responsibility for their own learning while simultaneously drawing upon peers for knowledge. She described research as an endeavor in which “there is a bit of teaching yourself, there is a bit of learning from others, which I think is really nice about research” (int. 2).
Although she did not have as formal a peer group during her own thesis work, Catherine felt that having friends who were interested in research, even in general terms, provided a means of academic engagement. “I think the other thing is that it’s good to be around your friends who are also interested in these types of things and who are also pursuing these types of opportunities (int. 1)” she said. By surrounding herself with students who were also pursuing research, Catherine was able to use these connections to create a supportive and engaging environment.

The Undergraduate Research Forum, where each participant presented a poster, offered students a chance to develop or further enhance connections and relationships. Student participants enjoyed having others take interest in their research work or to talk with individuals interested in similar topics. Sarah participated in a summer research program. The Research Forum was an attractive option to her because it allowed her to publicly display her work. In addition, Sarah appreciated the chance to showcase her research in a familiar setting. “It [the forum] appealed to me because it was here and convenient, and showing [my work] to people who actually care about me and my work” (int. 1), she said. Patrick found that the forum gave him the chance to meet a university administrator who is actually working in an area related to his research topic. The administrator took great interest in Patrick’s research. Initially motivated to participate in the forum because he wanted the chance to publicly showcase his research, Patrick indicated that “it was fun to make that connection and see that there are other people working on the same type of thing as me” (int. 2).
Most students agreed that research helped to enhance the relationships that
students had with faculty. “For me, I think it’s brought me a lot closer to faculty,” said
Hal. “It [research] lets me get to know some people a little better in the department”
(int. 1). Although Elizabeth faced some personal challenges in dealing with her advisor,
throughout the research process she developed relationships with other faculty members
which she found valuable. “The one thing this has done is that I really have a strong
base of faculty that I can turn to that I consider true advisors,” she explained (int. 1).
All of the students who mentioned faculty connections as part of the benefits of research
also pointed out that these relationships would be valuable in the future. Thus, students
saw these connections as having an impact not only on their undergraduate research
experience, but also on their opportunities to carry what they learned in these
experiences to graduate school.

Helen’s research experience offers us an interesting twist on this assumption
regarding faculty interactions, however. While Helen indicated she felt connected to
her department, faculty, and “the graduate side of things” (int. 1) as a result of pursuing
research, she did not feel that very engaged with her actual research topic. “I didn’t
enjoy as much the topic that I was doing, and it was partly because I was given this list
of projects, and you are kind of constrained by what your advisor wants to work on,”
she said (int. 2). In contrast, Sarah felt very engaged with her topic and “had a great
experience because I was researching something that was interesting to me” (int. 1).
The stories of these participants help us to see that students can feel differing degrees of
engagement and connection to various facets of the research process. Helen saw herself
as developing human connections despite the fact that she did not feel a strong affinity for her research topic.

This sense of connection and relationship speaks to the notions of engagement and integration highlighted in chapter 2. The degree of student integration into a community hinges on the extent to which that student adopts the normative values of peers, faculty, and structural influences (Pascarella & Terenzini, 1991; Tinto, 1993). Thus, it should come as no surprise that student discussions of academic engagement in this study revolve around connections that these students make with others. One’s chosen research topic falls within the realm of structures. A student like Helen, who was required to select her topic from a particular list, felt confined by these structures:

I basically did not enjoy as much the topic I was doing, and it was partly because I was given this list of projects, and you are kind of constrained by what your advisor wants to work on. I think that is true to an extent in graduate school, but I feel like you choose an advisor with a little more precision or a little more thought goes into it (int. 1).

As a result, despite her feelings of connections to other individuals, she indicated that she was not as fully engaged in the process as she might have been with a different research topic.

While students spoke frequently of human connections and relationships within the context of their research, a few participants (ironically some of the same students who discussed connections in the process) indicated that research simultaneously left them feeling separate or apart from their peers. Ben summarized the remarks of many of the students when he described his own research work as incredibly “solitary” (int. 1). Even as research enhances academic engagement for some students, its solitary
nature adversely left students feeling a type of disconnect with their peers. Norah elaborated on this ironic nuance of the research process:

I think to a certain extent it’s made me feel disconnected from a lot of students. I don’t mind sitting in front of my computer screen doing research on Saturday night. It’s something that has become very fun for me. I live across from CVS and I see a lot of students running to CVS, getting beer, and I feel really disconnected (int. 1).

Given that the research process may have left students feeling as if they are somehow isolated from others, one student felt that the Research Forum provided a supportive environment to encouraged research work. Patrick explained:

That was the type of atmosphere that was there and it was really nice, because sometimes other friends won’t understand why I put so much work into school, and you’re not just trying to please your parents, so it was nice to be in that type of environment with those colleagues (int. 2).

The Research Forum allowed Patrick to find a place where he could make connections with students with similar interests in academic pursuits. Thus, while research made him feel set-apart from some peers, it helped him to identify with those who pursued similar endeavors as his own.

Independence

Offering an additional layer in the discussion of connection and separation, the theme of independence arose in some of the stories. This independence impacted the student research experience by offering students academic flexibility that they had not previously encountered. Students indicated that their independent work helped them to learn more than they would have in a more rigid environment in which they did not have as much control of their own work. To do research, “you have to be motivated to work on your own” explained Catherine. However, students reaped the rewards of this
individual motivation since “that was a very positive experience to be motivated and take that initiative yourself” (Catherine, int. 1). Learning in the research process diverted from pedagogical styles which students felt were typical in the classroom setting. Sarah explains:

I guess I got a better experience doing it all by myself...It was interesting coming up with all these ideas and trying to figure out how to get the data that I needed. I guess it’s just a different experience when I was working by myself rather than with a group or in a classroom setting when I have to get some sort of specific goal. It was me determining my own goals. I kind of like that (int. 1).

Another student expressed that research not only benefited her current approach to learning, but it also helped her to develop new modes of thinking. Sophia explained:

I like the idea of having a lot more avenues of thinking about how to approach a problem. I’m used to only doing it this way, and if this way doesn’t work, you are kind of stuck. I feel like research teaches you to approach things from a lot of different angles (int. 1).

Sophia elaborated by explaining that she stumbled upon several roadblocks in her project. She indicated that these challenges forced her to be flexible in order to address and solve the issues that arose. Thus, not only did her sense of independence help Sophia become more engaged with her topic and the actual process of research work, but she simultaneously expanded the ways that she can approach her academic pursuits. Patrick also spoke about this sense of independence in inquiry, and he believed that he learned more when he was the person seeking out information:

I’m interested in discovering that knowledge. It’s not just waiting there for me in a manual. I’d just like to go out and discover and then put it in my words. It helps me understand it better when I’m the one who is finding the information (int. 2).
As these students indicated, independence contributed to enhanced student engagement in the learning process.

This theme of independence poses an interesting discussion in light of the paradox of connection and separation that also arose in the interviews. Given that nine of the ten participants in this study were honors-level students, it did not come as a surprise that they craved a degree of independence in their work, which helped to maintain a sense of liveliness in their academic pursuits. With this desire for flexibility, however, students still clung to the connection that research brought with it, even if they grasped it indirectly. Although she does not explicitly link one to the other, Catherine immediately followed her mention of individual motivation with a discussion of her relationship with her faculty advisor. In fact, there was no break or pause in the conversation between the two topics, as if one just automatically led to the other. The student participants found comfort in these connections, even within an environment of flexibility and independence. In essence, as they acquired a sense of independence, they still found themselves connected and obligated to those who had supported them in their research endeavors.

**Feelings of Obligation**

Throughout the stories of some of the student participants, the theme of obligation arose in a variety of contexts. For some students, obligation came before the research process actually began and focused on the students’ reasons for choosing to do research; for others, the theme of obligation arose during the research process. Elizabeth indicated that she felt obligated to do research as an honors student and that
she would have felt badly about herself and her work if she had not completed her thesis. She explicitly stated that one of the reasons she initially got involved in research was because she felt that it was expected of her as part of the honors program. In our second discussion, Elizabeth further elaborated on this strong sense of duty or pressure that she felt to be a part of research:

I would be embarrassed if I graduated and hadn’t written my thesis. When you do your orientation, that is something that they stress, and everyone I know, especially the science kids, were all involved in research. It is not something that you do that makes you better or makes your CV stand out. It is something that if you don’t have it, you feel like you are a step below (int. 2).

Elizabeth’s comments indicated that she felt obligated to both the institution and her peers to be involved in research. She saw research as an expectation of honors students; in addition, she felt that if she wanted to identify as a member in her chosen peer group, she needed to participate in undergraduate research.

Helen’s sense of obligation in the research process began also as one of the reasons that she chose to pursue research. As a woman in an academic discipline with very few female faculty members, Helen feels an obligation to consider becoming a professor to be a role model for other women. While she acknowledged that she feels pressure to do research as an honors student, her sense of obligation to female engineers exerted greater influence over her decision to do research:

…I think part of it is that I could see myself teaching someday, and so in order to teach I need a PhD, and in order to get a PhD, that requires research….I think partly, being a female in engineering, there is really a need for female professors and female masters students. There is just a general lack of females who pursue higher degrees in general, and especially in engineering. Part of it is that I would like to be a role model for younger girls in the classroom (int. 1).
Helen’s discussion indicated that she understands that research is an integral part of the faculty career path. Although her sense of obligation focuses more in a decision to become a professor, the choice to do research was nevertheless indirectly influenced by this feeling of obligation.

Helen internalized some of the themes which emerge in the literature on gender and research discussed in Chapter 2. While many of these studies focus on women underrating their abilities (Kardash, 2000; Hammick & Acker, 1998) Helen had confidence in her own academic capabilities. However, like some of the female participants in these studies, Helen recognizes the challenges that come when female students do not have role models (Acker & Feuerverger, 1996; Conners and Franklin, 1999). Despite her hesitancy to commit fully to a career as a researcher, Helen wanted to explore the option, largely due to these feelings of obligation.

Biff’s sense of obligation came as he pursued his research thesis. The research process actually helped him to shift from a position of feeling very little obligation to his audience to a strong desire to provide interesting work for the reader. With a creative writing project, Biff initially found himself in a position where he “came to the form of art for art’s sake” (int. 1). After a number of discussions with his faculty advisory, Biff had been influenced to think much more about his audience in his writing. Biff expressed a strong sense of his “responsibilities to the reader” (int. 1) throughout his interviews. His understanding of audience was much stronger than any of the other student participants.
Although the theme of obligation arose in interviews with several students, not all of the participants felt a similar sense of obligation or pressure either before or during the research process. When asked about this sense of obligation in a member check, Catherine explained that she felt that even as an honors student, her major deemphasized the research thesis option:

Well, within engineering there is not such an emphasis on [the thesis], even in honors because I am in honors, there is not so much of an emphasis. You know, if you were in the social sciences you either had to do a thesis or you had to do the honors contract. But in engineering it’s sort of like “whatever.” If you want to do it, you can, but there is no such thing as an honors contract. But, so that really wasn’t a big deal. I didn’t feel like because I was an honors student I had to do a thesis (int. 2).

Catherine’s comment suggests that multiple internal and external factors—beyond merely a student’s major discipline or position in the honors program—impacted these feelings of obligation in the research process. Even within the same major, students felt very different degrees of pressure or obligation to pursue research.

Research and Gender

The notion of gender and its role in the research process emerged in two of the students’ experiences. Norah’s research topic focused on the education of girls in an underdeveloped country. Having long been interested in the education gap between boys and girls in the country, Norah followed the suggestion of her faculty advisor to pursue that topic as a thesis study. She had the chance to travel to this country and interview two groups of high-school-aged girls. As someone from outside the country, Norah decided to interview these girls as a group “because of comfort level. I figured they would be more willing to speak with me if they had their peers with them because I
was completely foreign to them” (int. 2). Throughout the interview process, Norah strived to be respectful of the stories she heard from these girls:

> Every time I did an interview, I thought “am I just going to be a burden to them, is this a waste of time? Are they even interested in talking about themselves?” But then, you get in the interview and they are really happy to share their stories with you (Norah, int. 2).

Thus, Norah’s research work helped give voice to these girls and the stories of their own educational experiences.

Gender also emerged as a theme in Helen’s story, although the notion appeared not as a research topic, but rather as a factor in Helen’s perception about where she is situated in her department. As an engineering student, Helen found herself in a department strongly dominated by men. She was keenly aware of the lack of female role models on the faculty, and thus, felt compelled to consider a career as a professor to serve as one of these role models. However, she also recognized that even as some women find themselves avoiding her major, female students who have strong math and science skills are offered good research opportunities in her department:

> It is interesting, there are a lot of females who are doing research in [my major area], and I think part of it is I think there are more honors students who are female, or a higher percentage who are honors students of the girls are in engineering….I think because if you are female in a male-dominated department, you don’t stay there if you are not good to an extent. If you are female and you are not skilled in engineering, it’s hard to stay there. I think it’s easier maybe for girls who are able to do the math and science and not feel like they are behind to stay in (int. 1).

Thus, Helen’s interview presented an interesting tension in the idea of gender and research.
Confronting Challenges

Several students strongly expressed the frustrations that they encountered throughout the research process. All of the participants in this study were very strong students (nine of the ten participants were part of the Honors program). As a result, very few expressions of frustrations that arose focused on the actual academic content and expectations of the research process. Rather, students mentioned feeling challenged by such factors as logistical constraints, clashes with faculty mentors, and the novelty of producing such a large research document or thesis.

The amount of work required to finish all of the details necessary to complete a large research project came as a surprise to many of the students, particularly in light of their previous academic successes. Ben elaborated on the unexpected nature of these challenges:

I knew it was going to be a lot of work, but wow! [There were] a lot of challenges, obstacles that I wouldn’t have necessarily expected to be so tricky. The little things can take the largest amount of time. But it’s not rocket science (int. 1).

Both Ben and Sophia explained their extensive interaction with the Institutional Review Board (IRB), which must approve the research designs of student and faculty researchers who work with human subjects. With each project, these participants encountered delays in their applications. Sophia expressed the frustration she felt as she waited for IRB approval:

It is stressful and sometimes it gets really daunting when you’re in a position where IRB isn’t approving this, I don’t know how I’m going to get around it, or I don’t know how I’m going to change things to make this work (int. 1).
Since a researcher is not allowed to collect data without this approval, Ben and Sophia both feared that they would not be able to complete their projects in a timely manner if they did not find a way to have their applications approved.

Some students also indicated challenges in dealing with their faculty mentor. Helen and Elizabeth expressed that they wish that their advisor had offered them more guidance in the research process. Elizabeth also clashed with her advisor over the content and structure of her project. “This was really frustrating,” said Elizabeth. “We had already submitted the proposal for my honors thesis, [the advisor] had signed it, and [the advisor] decided…that it was unacceptable” (int. 1). Elizabeth continued to find her relationship with her advisor challenging throughout the process, both on a personal and academic level. Besides disagreeing with her on the academic focus of the research thesis, Elizabeth felt her advisor to be “gruff” (int. 1). Throughout Elizabeth’s telling of her research process, she clearly vacillates between frequent expressions of dissatisfaction with her advisor and occasional remarks that indicate the respect that she has for her faculty mentor as a professor. For example, in the middle of explaining some of the challenges she has had with her advisory, Elizabeth explained that “while maybe my advisor wasn’t the best fit for me, [the advisor] really has taken care of me” (int. 1) by helping Elizabeth find research contacts when she did field work for her project.

The uncertainty that came with tackling a new project offered some obstacles to the student participants. Sophia found research to be very different from the typical requirements of courses to which most students grow accustomed:
I think in general with research, it is different from anything I’ve done before, just because inevitably, things aren’t going to go exactly as planned, whereas when I study for an exam, it is limited material. There is a book, there are notes, and you take it. It’s kind of a straightforward process (int. 2).

As a new researcher, Helen echoed Sophia’s remarks on the ambiguity of the research process, particularly compared to previous classroom work. This type of uncertainty led Helen to overachieve in the data collection process:

I think that it’s overwhelming as an undergraduate because I’m not sure what data is necessarily useful data for the project, so in that sense I think I took a lot more data than I needed to because I was not exactly sure what direction the project would go. I’ve been trying to process and figure out what data shows conclusive results and what data I probably didn’t need to spend the time taking (int. 1).

Helen’s immediate reaction to the ambiguity she felt about the process was to overcompensate in the amount of data she collected.

The challenges expressed by these students differed somewhat from those that appeared in previous literature. Chapter 2 discussed challenges that largely focused on the institution’s ability to implement research programs for undergraduates. However, these students’ discussions point to some of the reasons that students may have initially resisted these opportunities for research (Nairn & Smith, 2003; Valentine, 1993). While the ten student participants in this study seemed to embrace their work, they nevertheless confronted a number of difficult situations while trying something new, such as challenges with the Institutional Review Board, questions or access to research participants, disagreements with faculty advisors, and feeling overwhelmed by the novelty of the process. These types of challenges may serve to discourage other students from pursuing research work.
Increased Confidence

The strongest theme that emerged in the student interview texts, particularly in the second round of interviews that occurred after the undergraduate research forum, was the sense of increased confidence that completing research gave to the students. For most of the participants in this study, the process of doing research and presenting their work at the Undergraduate Research Forum increased their confidence in their academic abilities. This increased confidence resulted from a number of factors. Successful completion and presentation of a project gave students a comfort level with research that they did not previously enjoy. Ben explained:

Everything that is involved within research, I have so much more in the way of clarity on how research is conducted--what to do, what not to do, even defining my thesis. I had these big grandiose ideas and finding out how to narrow everything down. The learning experience itself is just phenomenal (int. 1).

During our second interview after the research forum, Ben echoed these thoughts from our first discussion when he said that “I know I am going to be so much more confident working on my research and my graduate program” (int. 2). Ben’s increased confidence emerged from gaining a better knowledge of what goes into the research and presentation processes.

Norah and Hal each had presented posters at the Undergraduate Research Forum in years past, and both of their experiences supported Ben’s assertions that confidence emerged from actually doing research and understanding the process. These two students clearly felt a sense of confidence going into the Undergraduate Research Forum because they had a familiarity with constructing and presenting a poster that
effectively conveyed the research work. When asked how this year’s Undergraduate Research Forum differed from the last time he presented, Hal exclaimed:

I was a lot more relaxed. I think just because if you have to do it, you probably don’t do as well, but I really enjoyed my project, so I think that I had a lot of knowledge just sitting there, and I picked up on what some of the post-docs are doing research on, so I thought I was more prepared for some of the out-of-the-way questions. I think that helped a lot. Before I didn’t really have that experience (int. 2).

Norah agreed with Hal, indicating that her past experience led her to be more relaxed this time with her presentation.

It was more independent this time around. I didn’t even ask my professor’s approval on the hand-out or anything like that. I didn’t go to any of my peers either. I think it was due to time constraints, but also because I felt more comfortable with the experience. I knew what to expect from the [research forum] this year (int. 2).

Hal and Norah were awarded prizes in their academic categories at this year’s forum. In second discussion with each, it was evident how pleased each of them was to receive these recognitions.

Other students derived confidence from the validation that they received just from presenting their work at the research forum. Sophia enjoyed the opportunity to talk with people who were interested in her work:

It was really cool to be in a position where I was talking about my project, and people were like “oh, that’s actually interesting” and “wow, that’s cool and you did that.” It was like, wow, there are people who are actually interested in this (int. 2).

As part of the Undergraduate Research Forum, each student was judged on their work by two or three individuals, and prizes were awarded in each academic category.
Patrick’s interactions with the judges left him feeling appreciative of the encouragement that he received from them.

The judges were very encouraging the whole time. I wasn’t trying to win a prize or anything, so I guess that would be different for somebody who wanted to win, but for me it was just that experience that I wanted more than to win anything, so to have people judge you that were actually interested in your project, [the judge] just validated what you were doing (int. 2).

The opportunity to present their work to others and the consequent affirmation of a well-researched project led to these students feeling more confident in their own abilities.

Not all of the participants agreed with Patrick and Sophia’s excitement about sharing their work. Elizabeth questioned whether or not one of her judges was qualified to evaluate her project, and “I wouldn’t have been there [at the research forum] had I not had to be there stipulated by the [college name] scholarship.” In addition, she felt extremely disappointment for a friend that she felt should have won a prize but did not place in her category. “I think a lot of people had their feelings hurt because they felt devalued,” she said. Sadly, Elizabeth did not leave the Undergraduate Research Forum with the same degree of increased confidence and validation reflected in other participant’s interview texts.

The notion of confidence that emerged so strongly in most of the student stories illustrates Bandura’s theory of self-efficacy. This theory focuses on personal efficacy, and an individual’s ability to envision and achieve a positive outcome in a task. Efficacy originates from four sources, the greatest being mastery experiences, which are first-hand accomplishments (Bandura, 2000, 1995, & 1992). After completing their
research and presenting it at the forum, most of the students expressed a strong sense of personal efficacy in their abilities to pursue research in the future.

Conclusion

While most of the structured interview questions for this study focused on five areas that impact student research—academic background, personal identity, social and cultural factors, institutional characteristics, and faculty interactions—several themes emerged that transcended the categories. Within the students’ interviews, I saw evidence of a conflicting relationship between connection and separation. Although students craved independence and flexibility, they simultaneously appeared to be seeking out connection in the research process. In addition, the theme of obligation seemed to have a strong influence over students in their research work. Finally, increased confidence appeared to be linked to the feelings of accomplishment in completing a large project and from external validation. Chapter 5 will analyze these themes further through theoretical lenses, while also delving more deeply into the findings which respond directly to the research questions.
CHAPTER 5
ANALYSIS, DISCUSSION, AND CONCLUSIONS

Introduction

This dissertation study utilized interpretive commentary to illuminate the experiences of undergraduate researchers at a large Midwestern university. Major research questions focused on research as a means of student engagement and the ways in which five areas that emerged from the literature--academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions— influenced the research process. Overall, findings indicated that research did serve as a means of engagement for these students, and the five areas that are reflected in previous literature proved influential in these ten students’ experiences. In addition, the findings in this study reflected a number of emergent themes in the students’ stories of research. The most prevalent of these themes was the notion of increased confidence that students derive from the research process. These student interviews suggest that confidence and personal efficacy in the research process are the greatest benefits of undergraduate research.
Response to the Research Questions

The research design of this study provided for responses to three primary research questions:

1. Does undergraduate research serve as a means of further integrating and engaging a student into the life of the university?

2. Several areas that relate to and impact an individual student’s college experience seem to emerge from the literature as influential in the research process; how do five of these (academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions) influence the student’s individual research process?

3. How does participation in undergraduate research in turn impact the student in each these five areas as well as in their overall college experience?

Interview questions were crafted to address each question and its subcategories, as well as to allow for emergent themes and patterns in the student discussions. The response to Question 1 will stand alone; however, the complementary or reciprocal relationship that exists between Questions 2 and 3 makes these responses ripe for comparison. As a result, the five areas or categories of sub-questions—academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions—are discussed individually while simultaneously addressing both questions within categorical responses.

Integration and Engagement through Research – Question 1

Participant stories indicated that undergraduate research helped students feel more fully integrated into the life of the university in a variety of ways. One of the most common means of engagement occurred at the departmental level and emerged in questions that focused on the socio-cultural influences in undergraduate research.
Sophia, Norah, Helen, and Hal each mentioned that they felt like their connections within their academic department had expanded as a result of doing research. Some of these connections occurred on an individual basis, as all four students mentioned specific factors such as increased interactions with faculty, staff, and graduate students. In addition, this connection included learning how to navigate logistical channels within a department to complete paperwork and secure funding (Sophia, int. 1). These students became more fully integrated into the departmental culture, reflecting the definition of integration espoused by Pascarella and Terenzini (1991). Cited in Chapter 2, this definition describes integration (in this case into a research culture) as the perceived condition of adopting the normative values of subgroups of which the student is a member. These students adopted the research values that were modeled to them by the individuals and procedures apparent within their academic department.

Undergraduate research also fostered academic engagement by offering students a means to study additional areas of interest that are not necessarily present in a departmental curriculum. “None of these types of classes were offered in my department, so it was a great way to engage with the material since I want to pursue it down the line,” said Catherine (int. 1). Sophia emphasized that the research process gives students a better look at the comprehensive nature of the university. “It has given me a better sense of what academia is by introducing me to a different aspect of it that wouldn’t have been presented otherwise,” she said (int. 1). Thus, undergraduate research not only expanded academic options for students, but it also availed to them a new facet of the university.
The Undergraduate Research Forum served to enhance student engagement. Patrick, Sophia, Norah and Biff were excited to see projects of their friends at the research forum and to have a catch-up with friends who were presenting as well. In our second interview, Patrick recited a list of all of the people he had a chance to visit with at the forum, including his freshman roommate, a former professor, and friends from his major. For many students, the research forum became an integral part of their research experience at the university. The forum served not just as an academic event, but also as an embodiment of the culture of research at the university. Simultaneously, the forum fostered the personal relationships and connections that help students feel more of a part of the university community. These connections illuminate the student’s perceived sense of place that Pascarella and Terenzini (1991) emphasize as one of the characteristics of integration.

Findings in the Context of Questions 2 and 3

From previous literature on the topic of undergraduate research, five general areas seemed to emerge as having the most impact on student research experiences. Interview questions for this study were crafted around these areas, which include academic background, personal identity, socio-cultural factors, institutional characteristics, and faculty interactions. Chapter 1 theorized that these areas tend to have a reciprocal or mutually influential relationship with the undergraduate research process. While each of these factors influences the research process, the process in turn can impact a student within each of these areas. Findings in these areas and responses to research questions 2 and 3 are discussed below.
Academic background. The student participants in this study very much saw their previous academic interests as playing a predominant role in determining their research agendas. For most, the research process became an opportunity to delve deeply into something that had interested them for a long time. Thus, it was typical to find that a student’s research topic had been dramatically impacted by prior academic curiosity. Ben was able to take two areas in which he has strong academic interests—international studies and education—and merge these together for his research topic. He explained that after some time spent looking at a topic focused on international education, taking a class on exceptional children, and discussing with friends who work for the state department of education his ideas, “I opted to switch gears and focus more on English as a Second Language. That way it kept me focused on the whole international aspect, but it was a new avenue” (int. 1). Similarly, Sarah was able to incorporate her love of music with her project within her visual arts major:

I knew a little thing about how people listen to music now, when they end up listening to music and why, because that was a different research project we did in class. And, so from there I think I really wanted to get further into it, into music and I was looking at what aspects of music I could see, so I just focused on the visualization of music because I think it’s a strange thing that music is this audio thing (int. 1).

Sarah and Ben’s interdisciplinary approaches to research allowed them to cross academic boundaries beyond their major areas and thus enhanced their enjoyment of the research process while looking at topics that they previously had not examined.

Some of the students articulated that their research theses gave them the chance to study a particular topic of interest that was not specifically offered in an academic course at the university. Catherine had fostered her own interest in a particular area of
science since high school, and she discussed how her thesis helped her to explore this interest within the context of her major. She explains:

I’ve been really involved with [area of science] at [the university], so I really wanted to somehow connect that passion with my major. I started talking with different professors in my department and they asked if I had heard of this academic area called [name of area]. And that was the perfect connection between this interest I had and my major, and so that’s how I got interested in my topic, and that’s how I picked it (int. 1).

Norah agreed with Catherine, and also added that her research gave her the chance to understand what rigorous work entails:

I’m studying the education gap in [country name] and there aren’t even classes on [country name] in general terms. So for me, I’ve been able to engage in that and that’s been really helpful. I think also what is really great about research is that students get a really good sense of committing to a long-term project which they have to see through for a year or two (int. 1).

For these students, the research process enriched their previous work by allowing them to focus on areas that they may not otherwise have had the opportunity to study in a structured manner with a faculty member. In addition, Norah’s interviews allowed us to see the reciprocal relationship that research has with academic pursuits. Just as her academic interests influenced her topic, the process of doing research helped her to formulate the academic discipline required to see a research project through to completion.

Echoing many of the findings in Chapter 2’s literature review and addressing research question 3, a few student participants saw the research process as having a positive impact on their academic skills. Sophia felt that the process “changed the way that I view the courses that I take and the subject matter that I have in my classes, but at
the same time, also the way that I take in information that I get from the outside world, the way I read” (int. 1). She explains that she has become much more critical when she hears statistics being bantered around, wanting to know “well, how big was your sample, what does that really mean” (int. 1). Hal also found that his experiences in research left him more eager to question academic facts and challenge faculty members:

I think it makes me more, I think I get into a little more conflict, I think. Some of the professors don’t really know what they are talking about, and it you, I mean, everybody is an expert in something, but if you kind of want to call them out if they do something wrong, but you know that they’re still a PhD so you can’t do it (int. 1).

While some of the students saw changes on specific academic or cognitive skills others, when asked, indicated that they did not feel that the research process had impacted these. Helen explained that even though research had given her “maybe to an extent an easier time reading articles in the field,” she was “not necessarily convinced that [academic and cognitive skills] have” been enhanced by the research process. Elizabeth felt that in previous research work she had benefitted from “having to learn to articulate theoretical arguments and use that argumental vocabulary” (int. 1); however, with her project for the research forum, “I don’t think that secondary skills or things like critical reading have been really honed” (int. 1). Although both saw the research process itself as something that will benefit them in the future, Helen and Elizabeth expressed some degree of disappointment in the topics that they chose to pursue for this particular project. In both cases, the research process served to clarify their own academic interests by pointing them in directions that differed somewhat from their current research topics. For example, while Helen has not ruled out pursuing research
in the future (and undoubtedly she will have to conduct research in her masters program), she feels that a different topic or approach might have made her project easier for her:

I would say that I would recommend it [research] to students as just a good experience and I feel like I learned a lot from it, but at times it has been frustrating. Maybe having a more clearly-defined project and a clearly-defined goal would have made it a shorter process. I just feel like it dragged on forever for me (int. 1).

While most of the students saw their academic interests as playing a large role in their research process, Hal indicated that to a certain degree he viewed his research as work, not necessarily as an academic pursuit. With a job in a science lab, he found himself working on projects for which the lab has received funding. When pressed in our discussion about whether or not he sees research as just work, Hal—who spent 15-20 hours per week in his lab—expressed some ambiguity about the notion to him of research as “just work” yet still doesn’t see it as part of the academic process. A definite distinction arose between the projects for which the student has responsibility and those that belong to other people in the lab. He explained:

Research for me—I’m not in honors—so it’s not part of the academic process. It’s more of a hobby type thing….It’s not really a job. I mean, if it was just a job, I probably wouldn’t spend so much time doing it. It’s a job at first, but once you get your own project going or something. It’s different when you’re helping somebody else do their research. It feels, you know, it’s just a job. Once you get, start working on your own stuff—I can’t really describe it. It’s not just a job, but there still is that notion there like sometimes you really don’t want to do it, but you are getting paid so it helps (Hal, int. 1).

By feeling ownership of a research project in the lab, Hal saw his research moving beyond being “just a job.” While payment for his work continued to be an incentive for
him to pursue research, he did gain personal fulfillment and satisfaction from completing his own studies. Hal voiced some displeasure at what he saw as inequalities in academic and research opportunities between students with honors status and those without it:

If you are not an honors undergrad., I do not think you get enough support because they are trying to push their best through, and I think they overlook some of the other undergrads (Hal, int. 1).

This displeasure provided a reason for his hesitancy in labeling his research work as a purely academic pursuit.

Personal identity. The notion of personal identity was conceptualized in this study as the way that interview data portrayed and described the individual participant’s sense of self. These individual identities came across in many of the categories, emerged as interwoven with the students’ academic backgrounds, and played heavily in the choice of the students’ research topics as well as how students approached the research process. In many of the student stories, personal and academic interests—and therefore personal and academic identities—were largely inseparable, and research provided a means for the academic arena to become an extension of this personal focus. Sarah’s personal love of music—a discipline which she approached both personally and academically—enriched her research work in the visual arts and enhanced her view of herself as an artist. Sophia’s interest in people, particularly those from specific ethnic populations, informed her study within the social sciences. For Biff, the creative work that he developed for his research thesis was something that he would have chosen to pursue regardless of whether or not he had received academic credit for it; in fact, he
and several friends formed an independent publication largely to print work that was similar to that presented in his thesis and at the research forum.

The stories of some students indicated that their personal identities—in particular their roles as family members—impacted them in their research work. Helen and Sarah, whose parents are faculty members, and Catherine, who mentioned that her sister had received her PhD, all were influenced to pursue research by their personal identities within the familial context. Each had watched a parent or sibling’s involvement with research, and all mentioned this relationship as something that impacted them in the process. Sarah explained how her personal role as the daughter of faculty influenced her in pursuing research:

Both of my parents are faculty. One is on faculty [at one institution] and one teaches [at another institution], so they both have this kind of standard of higher learning and they’ve always encouraged me to do more and to always be doing the best kind of work that I can be doing for my age. So, I think those sort of goals helped influence me to try to do these sort of things to try and get ahead. And, I guess I have this background in higher scholar learning (int. 1).

Thus, research not only helped her meet the high standards she set for herself, but also fulfilled her parents’ expectations.

When asked about personal influences in the research process, Ben saw his personal involvement in athletics as a metaphor for his research and academic work. Ben followed a non-traditional path to the undergraduate thesis process. Having initially graduated from high school in the late 1980’s, he spent two years at another state university before leaving college and holding a full-time job for over a decade. He recently returned to college to finish his degree at the university. It is clear from
discussions with Ben and from his plans to begin a PhD program soon after graduating from college that he enthusiastically embraced his return to higher education and has derived a great deal of satisfaction from the research process. Ben felt that a recent athletic competition that he found particularly challenging provided an appropriate metaphor for his experience:

I was sitting there saying “you know, I may have come in last but what I managed to accomplish under the circumstances and when I look at my academic career, it has been stellar.” So, there was a bizarre correlation, but there is no shame in coming in last when I look at what I’ve accomplished academically. I have to give myself a pat on the back (int. 1).

Ben’s return to college coincided with the beginning of his involvement in these particular athletic events. His personal identity as an athlete seemed to be tied to his work as a student and, consequently, his work as a researcher.

Norah’s personal background—her parents are from the country where her study is focused— influenced her choice of research topics. In addition, Norah offered us an example of the ways in which the research process can impact one’s personal identity. Throughout the two discussions with Norah, it was evident that she thrived in her research work. She expressed tremendous enthusiasm for her topic, the various parts of her study, and her participants. In addition, she talked eagerly about the chance to continue working and building upon her research in the future. Norah explained the subtle yet critical shift that has occurred in the way that she views herself:

I really want to be a scholar; I don’t want to be a student. I somehow find a distinction between the two terms, and I think that research has really helped me with that. There’s always more to learn, there’s always more to know and I think I’ve become more actively involved in the
process of learning. Research has really changed that for me—it’s the focus of what I do (int. 1).

Before she embraced the identity of the scholar, Norah felt as if she often was just going through the motions of her academic work; however, after pursuing research, she began to identify herself as a scholar. This identity permeates many aspects of her life, including her school work, her relationships and interactions with friends, and her plans for the future. The process of doing research influenced not only her professional and academic ambitions, but also the way that she personally views herself.

Socio-cultural factors. Each of the students in this study was asked about the influences of their socio-cultural context in the research process. Students discussed what they perceived as an overall culture of research at the university, as well as departmental cultures of research. In addition, interview questions also highlighted social and professional networks as part of the socio-cultural factors that become influential in the research process. While certainly these concepts of culture and social networks may somewhat overlap with questions revolving around institutional characteristics, the questions focused on integration within the context of research cultures and peer groups. Interview questions that emphasized institutional characteristics focused on structural aspects, such as size, location, funding, and opportunities available to students.

As mentioned earlier, many students cited their involvement in the honors program as a strong influence in their decision to pursue research. These students reflected a notion that student research becomes part of—and perhaps even an expectation of—the honors culture at the university. A few students also agreed that the
prestige of the Undergraduate Research Forum contributes to the overall culture of undergraduate research at the institution by giving students a place to publicly showcase their work. Patrick explained that “…I really wanted to do something with this paper because I think that it’s the best work I’ve produced as an undergraduate…. [the research forum] was an opportunity for me, once I had done the research, to have it disseminated and displayed” (int. 1). This public forum can also be a motivating force for students in the research process:

…it gives people an incentive, you have a deadline of sorts. You have to get your abstract in for [forum], so it makes you start to think about ‘well, how am I going to design my project? How am I going to approach this.’ So I think that it’s really useful” (Sophia, int. 1).

Beyond the university culture of undergraduate research, several of the students mentioned characteristics of the individualized cultures within their academic disciplines. Helen and Ben each used the word “solitary” to describe their experiences with the culture of research; however, each has had the opportunity to interact with graduate students—although indirectly—during the research process. In contrast, Sophia, who worked in a psychology laboratory, describes her culture as one of collaboration:

I would say that the culture is one of mutual help, like everybody wants to help everybody else. If somebody else has something—I feel like that’s one of the things I’ve picked up with research is this collaborative aspect of things. I like the idea of “if one person doesn’t know how to deal with this problem, this person has gone through this before, so then I’ll help you.” Or “I had this data already, and I can share it with you.” I like that sort of “let’s help each other out” kind of culture (int. 1).

Catherine echoed similar thoughts in her own discussion of culture. While she was not working in a laboratory like Sophia, she “knew a lot of the people who I’d be collecting
data from, so I kind of had those relationships established already” (int. 1). Knowledge of the cultures of certain offices on campus with whom Catherine had been working on projects prior to her research eased the logistical process of data collection.

Although some students worked in more collaborative settings than others, discipline did not necessarily dictate whether or not a student viewed his or her experience as more solitary or more collaborative. Catherine and Helen both researched within the field of engineering; however, Helen found her project to be somewhat isolating, whereas Catherine consistently used the word “collaborative” to describe her work. Although discipline may play into this culture of research to a certain degree, other factors, such as the type of project, the chosen methodology and methods, and the individual student’s perspective on the work played a large role in defining this research culture within student experiences.

When students were asked specifically to talk about the culture within their departments, most students tended to focus on describing specific attributes of this culture. In contrast, Sarah discussed what she perceived to be the absence of a normative culture in her discipline.

I think [name of discipline] research is not well established. There are not any particular norms that you have to follow, so it is kind of do it as you feel like, as you think is appropriate, kind of as you will sort of thing. I don’t know that we really have a specific culture. We have this absence of set rules. I think that’s our culture (int. 1).

For Sarah, this type of culture offered her the freedom that she craved in pursuing her research work. She felt that the absence of norms was merely a reflection of the ethos
of her discipline in which students were continually encouraged to think broadly, creatively, and differently from standard conventions.

Finally, one student identified a clear distinction between disciplinary research cultures. Elizabeth, who switched academic areas over the course of her project, stated a clear preference for the culture of her first department when asked in which departmental culture she found the best fit for her own interests.

In the [name of discipline] field, yes. The people that I’ve met there are much more relaxed. The one thing that I would really like about being a professor is that you have the opportunity to do something that’s so creative, and that’s something that even in this project, just learning to use different sources and draw new conclusions. It’s just such a creative and productive career (int. 1).

A glimpse into these two cultures helped Elizabeth see which area she will pursue in future graduate work. Thus, experiencing these two cultures impacted Elizabeth’s choice of future research endeavors.

When students were asked about whether or not they had developed friendships, social connections, or networks through their research work, the results were largely mixed. A few of the students in the study, including Catherine, Sophia, Biff, and Helen, described social relationships that had developed to a certain extent because of the research process. Others, such as Hal and Elizabeth, indicated that they had not developed friendships during the research process.

An interesting example of the ways that these social networks can assist in the research process was found in Norah’s story of research. Norah had a very close-knit group of students within her department. Each of the students in the group was pursuing research work with a common underlying theme, and they provided
tremendous support to one another throughout the process by meeting regularly to
discuss their theses. Norah viewed these social relationships as the core of her own
culture of research:

Yes, we are the ones who keep each other motivated, and talk about our
experiences, our hopes, our ambitions in terms of what we want to do
with our research. So that is what I think of when I think of the culture
of research. It’s students who really treat this as their capstone
experience and also what they want to do for the rest of their lives (int. 1).

It was evident throughout our discussion that Norah’s undergraduate research
experience had been very positively impacted by her membership in this small group of
students. In addition, this group of students became well-known among the faculty and
staff in Norah’s department, gaining the informal name “Fab Four.” Not only did
Norah benefit from the input of her friends, but she also was pleased with the informal
departmental recognition that being part of this group brought to her. Norah’s cohort of
the “Fab Four” exemplified the reciprocal relationship that research can have within an
area of a student’s life. The research process influenced these social relationships by
bringing the four students closer together through academic pursuits; in turn, the regular
discussions that these students held certainly enriched the individual theses of the four
students.

Institutional characteristics. The students in this study are part of one of the
largest research institutions in the nation. The university has sought to increase student
participation in undergraduate research by offering opportunities such as the
Undergraduate Research Forum as well as individual department forums where students
can display their research work. The recent establishment of the Undergraduate
Research Office offers students at the university a central location to discover research opportunities at the institution and provides weekly information sessions to undergraduate students. Since institutional characteristics, such as size, location, funding, and opportunities offered to student add an additional layer to the contextual factors that may influence students in the research process, students were asked to talk about how these factors may have influenced them in the undergraduate research process.

Most of the students in this study benefited financially from the university’s emphasis on undergraduate research. Nine of the ten student participants received some type of funding—through scholarships, grants, or a salary—to assist them directly in the research process. Elizabeth explained how being at a large university and its institutional characteristics impacted her in the research process:

First of all, because there is a lot of pressure for top students to do research, I feel like for me it’s been such an illuminating experience. The fact that there is so much pressure means that there is institutional support, like the money. Even just watching the undergraduate research office get off the ground—I’ve been participating in a few things with that. I’m excited for the next couple of years of students because they really are going to have a wonderful resource (int. 1).

Elizabeth elaborated by explaining that when considering colleges, she had looked at several small liberal arts colleges. She believed that had she attended one of those, she would not have had the same research opportunities. Catherine also felt that she benefited from the size and resources of the university. She explained that “coming from a very small community where there weren’t any of those resources available, it’s great to come to [this university] where you have those opportunities” (int. 1).
Hal’s perspective on institutional support and its relationship to undergraduate research differed from most of the students in this study, largely due to his status outside the honors program. He felt that most of the institution’s efforts to develop undergraduate research focused on students within the honors program:

I don’t know how research works in other departments, but it seems like honors students get a lot of favoritism….Not everybody wants to do it, but I think they are passing over a lot of potential institutionally because it seems like for research, they don’t really care about non-honors (int. 1).

Although he later indicated that he specifically applied to research labs for work study positions, he also indicated that he felt that he got into research almost by accident. In addition, he did not think that the institution’s size or structure impacted the individual student’s research process very much; rather, as part of a smaller department on campus, “I think it’s not really the institution size but the department size that would affect something like [the research process]. So no, I don’t think size [of the institution] has much to do with it” (Hal, int. 1). More than any of the other student participants, Hal drew a clear distinction between institutional support and work within his department.

While Ben was clearly enthusiastic about being at a large university and articulated several of the benefits of the institution’s characteristics, including peers, faculty, and financial support, he pointed out another challenge that students can confront at a large institution. Within Ben’s discipline, much of the research within the department targets a specific local population. Due to the strain on this population within the local community, procedures have been put into place by the university
regarding access to this population. Ben was not aware of these formal procedures, and his data collection was delayed because his initial individual attempts to contact his population were rejected. Thus, the university’s size—and the subsequent number of researchers targeting his population—served as a small hurdle in Ben’s research process.

*Faculty interactions.* Many of the student participants discussed the positive impact that their faculty advisor had on their research experience. Biff, who developed a personal friendship with his advisor over several years of working with him, explained that “my advisor, as a mentor, he’s really, really good…he knows how to prod you in the right directions, and so I’ve really benefited from his input” (int. 1). Norah praised her advisor repeatedly during the interview, and mentioned that he helped her to develop her own love of research and he had become a role model for her:

> He’s my research advisor, and he’s completely been a good mentor. He’s also really emphasized just the importance of research and how much it had enhanced, not just his undergraduate experience, but his graduate experience as well. So I guess I just kind of fed off all of his information and his past experiences (int. 1).

Norah and Catherine talked extensively about their faculty advisor motivating them to push themselves in their work. In Norah’s case, her advisor continually suggested additional approaches and methods that would enrich her study. Catherine discussed her own advisor’s enthusiasm for her project:

> Just yesterday, he said “[Catherine], I want you to present this [research] multiple times to different people.” So he’s just always going, he never stops. He just consistently wants to help you take your research to a higher level or take your thoughts to a higher level, which is great and very inspiring (int. 1).
Catherine’s project had pragmatic implications for implementation of new policies at the university, and her advisor encouraged her throughout the project to present her work to offices and boards on campus who had authority over this implementation.

The advisor of another student participant helped him acquire funding and scholarships so that he could pursue his research and academic work. Ben, who planned to work with his undergraduate faculty advisor when pursing a graduate program, explained that he did not even solicit help from his advisor in locating funding. “I didn’t even prompt him for it. He just found it for me and I almost cried,” said Ben. “Money was getting really tight, so from that regard I ended up with a few scholarships this year” (int. 1).

While most students acknowledged a positive impact, two in particular mentioned that they had learned to be judicious when asking for time commitments from their faculty. Helen and Sophia recognized the demands that faculty members confront in their work. As a result, “I also learned how to be frugal about time because they are busy and they have a lot of things to do and I can’t expect them to lead me through everything” (Sophia, int. 1). Helen felt that her advisor’s hectic schedule left her in a position where she did not meet with him as frequently as she would have liked. “It’s [working with an advisor] a lot of having to pursue him,” she explained. “He’s just busy with other things” (int. 1). In both interviews, Helen expressed that although she felt overall her advisor was helpful and supportive, she would have liked more guidance from him in the research process.
Almost all participants felt their advisor impacted their research process in a very strongly positive way; however, the experience of one student in particular did not reflect this. Elizabeth confronted challenges working with her advisor, and her discussion of these challenges played a prominent role in both of my interviews with her. She first clashed with her advisor over the conception of her research project. “We butted heads a lot academically,” she said. Like Helen, Elizabeth wished for more guidance with her research, but also found it difficult to deal with her advisor when the faculty member demanded last minute changes to things in the project that had already been approved. Finally, Elizabeth found it difficult to deal with her advisor on a personal level, describing the faculty member’s personality as “gruff” (int. 1). While Elizabeth could acknowledge some positive aspects of the relationship with her faculty advisor, it was very clear from the beginning of our discussions that this relationship had negatively impacted her undergraduate research experience.

Most students felt that the faculty relationship that they developed in the undergraduate research process will be beneficial to them in the future. All of the student participants expressed a desire to eventually attend graduate or professional school. Students believed that they would have the chance to draw on their advisors’ contacts when applying to graduate programs and for jobs. Sophia summarized the thoughts of many of the participants:

I’ve already started to notice the relationships in academia can help you in ways that you don’t perhaps even know yet. Like I said with the whole job thing, my advisor knows some people at different places, and even with the graduate school process, he knows some people’s style or what kinds of things they like or don’t like, insights that I wouldn’t get...
otherwise if I didn’t know somebody who had directly worked with these people. Otherwise I would be finding these things just solely (int. 1).

By working closely with an advisor and strengthening these relationships, students were able to derive both academic and professional benefits from the knowledge base and connections of their faculty mentors.

Theoretical Lenses

This research study began with the notion of applying Astin and Tinto’s a priori theories of involvement and integration to the research process. These theories appeared explicitly and implicitly in my review of the literature. As I coded my data and noticed the repeated theme of confidence within the data, Bandura’s theory of self-efficacy emerged as an additional theoretical lens for my study. When we apply self-efficacy to the data, we can see the ways that the students’ discussions of confidence indicated increased levels of personal efficacy in the research process. These theoretical perspectives focusing on engagement, integration, and efficacy are discussed below.

Student Engagement

Astin and Tinto’s complementary theories combine to focus on increased student engagement and integration into the academic community as a result of the research process. These two theorists have found that many of the factors associated with research, such as faculty interactions, collaborative environments, heightened involvement with an academic department, and peer review relationships contribute to students feeling a greater sense of involvement and integration into the community of a university. Student involvement is linked to factors such as higher graduate rates, increased retention, enhanced cognitive skills, and greater student satisfaction (Astin,
The theories of Astin and Tinto are mentioned in Chapter 2’s literature review as theoretical approaches that emerge explicitly in previous studies on the topic of undergraduate student research.

Stories of student participants reflect the complementary theories of Astin and Tinto. As discussed in Chapter 4, an emergent theme in the students’ stories was the paradox of connection and separation that resulted from participation in the research process. Most of these students felt engaged in the academic life of the institution before they began their research work; however, research helped them to integrate into new cultures at the university. For example, both Catherine and Norah discussed friendships that had developed or strengthened throughout the research process. Others, such as Hal, indicated that they felt closer to their faculty advisors because of their work in research. Ben indicated that one of the most positive aspects of his research project was that it made him feel much more confident in his abilities to do graduate work; thus, research provided a catalyst for his integration into a PhD program. While the paradox of connection and separation did leave most students feeling detached from certain aspects of their college life during the research process, most of the participants found themselves engaging with and integrating into new cultures as a result of their research work.

**Self-efficacy**

The theory of self-efficacy provides us with a helpful and plausible understanding of the ways in which individuals or groups psychologically exercise personal or collective control over situations that are challenging. Albert Bandura,
perhaps the most noted and prolific scholar of self-efficacy theory, sees efficacy beliefs as ways to produce valuable outcomes while avoiding negative side-effects or results. He frequently explains that individuals with high levels of personal efficacy are better able to envision themselves attaining a positive outcome in a given situation (Bandura, 2000, 1995, & 1992). In addition, individuals with significant efficacy beliefs also have the motivation to take the necessary steps to achieve these positive outcomes, since “perceived self-efficacy refers to beliefs in one’s capacity to organize and execute the courses of action required to manage prospective situations” (Bandura, 1995, p. 2).

While we might find it easy to apply the individualized psychological process of self-efficacy to the motivated and ambitious students participants in this study, efficacy beliefs do not exist within a vacuum in an individual’s mind. Rather, one’s sense of self-efficacy originates from four sources which involved both internal and external factors: mastery experiences, vicarious experiences, social persuasion, and psychological and emotional states (Bandura, 1995). These four sources offer the complexity of analysis required to view these students’ experiences through the lens of self-efficacy.

Mastery experiences are those first-hand, personal accomplishments that lead an individual to believe there is precedent for personal success in completing another challenging endeavor (Bandura, 1995). The validation that several of the students felt with the poster presentations at the research forum and the increased confidence that emerged in the student stories reflect Bandura’s notion of mastery experiences. Ben’s expression of confidence in his abilities to perform future research exemplified the
psychological impact that these mastery experiences can have on a student. In addition, Hal and Norah offered evidence that having this mastery experience can lead to additional successes. As the only two students in this study who had previously presented at the Undergraduate Research Forum, each won prizes in their category this year.

When an individual does not yet have personal experiences with an endeavor, he or she may reach for vicarious experiences to enhance his or her own self-efficacy beliefs. In this second source, others serve as role models through which an individual can vicariously envision his or her own success (Bandura, 1995). With vicarious experiences, faculty interactions play an increasingly significant role in helping student increase self-efficacy in the research process. A faculty advisor can provide not only academic guidance, but an advisor also demonstrates a model of someone who has been through the research process. Norah spoke about her advisor’s recollections of his own research processes, and she mentioned how much these had inspired her in her own work (int. 1). In addition, these vicarious experiences may explain why students crave connection with their faculty advisors in the research process, despite wanting independence and flexibility.

Social persuasion offers a third source of efficacy in which others do not model behavior, but rather they encourage an individual in the pursuit of a challenge through their enthusiasm and confidence (Bandura, 1995). In my study, social persuasion seems to align closely with the sense of obligation that many students dutifully feel towards research. Elizabeth, Helen, and Biff pointed out that the institution frequently
persuades honors-level students to participate in research activities. While this persuasion is no doubt enthusiastic and well-meaning, my findings indicate that it created or enhanced some students’ feelings of obligation in the research process.

Both positive and negative physiological and emotional factors such as stress, euphoria, mood swings, fatigue, pain, soreness, and sense of accomplishment can impact one’s self-efficacy beliefs (Bandura, 1995). The challenges that several of the students discussed—disagreements with faculty advisors, frustrations with IRB, uncertainty in dealing with a larger project—were factors that contributed to negative emotions. In addition, beyond the four sources of efficacy, external factors can also impact whether an individual has strong or weak beliefs in self-efficacy. Individuals tend to constantly monitor their own abilities, and this type of monitoring frequently occurs by comparing one’s ability to others. This social comparison can become a powerful force in personal efficacy beliefs (Bandura, 1992). Elizabeth’s disappointment that her friend did not win a research prize and her assumptions that some students felt devalued by the judging spoke to this notion of social comparison. While most participant experiences indicated that the students felt validation just from being part of the experience, Elizabeth points out that this social comparison can foster negative emotions about the research process.

Implications for Practice

The student stories gave voice to a number of implications for practice. One of the most prevalent themes in the text of the interviews was the increase in confidence that students had in their research abilities after going through the process at the
undergraduate level. Several students mentioned that they felt better prepared to tackle future research endeavors, particularly in graduate school. After reviewing self-efficacy theory, we might logically conclude that having high levels of efficacy will help students successfully complete a research process and benefit from all of the positive outcomes that result from this. If institutions hope to encourage students in these endeavors, they would be wise to put in place structures which enhance this research efficacy.

There are several resources that colleges and universities can offer to students which might help these students feel as if they have a greater degree of control over their abilities to complete a project. For example, many institutions may offer internal research grants or can help students to access funds through outside sources such as corporations or foundations. The students in this study had high praise for the university’s efforts to fund undergraduate research work. Having the means to cover the costs of research might contribute to increased self-efficacy by relieving a source of stress. Institutions can also make the technology that increases the efficiency of research, such as computer software, data-collection programs, and statistical analysis programs, readily accessible to student researchers. Easy access to these types of resources can enhance the positive sense of control that students have over their work, and subsequently increase their levels of personal research efficacy.

Self-efficacy also helps us to see how critical an encouraging role model can be for students in the research process. The student participants in this study had a variety of feelings about their faculty advisors, ranging from admiration to ambivalence to a
degree of resentment. The feelings largely resulted from the degree and type of involvement that the faculty member had with the student during the process, as well as how many restrictions were placed on the student. While faculty mentors are the logical people to fulfill the position, often these human resources are stretched and some faculty may be unable to provide the type of necessary support. Institutions would be wise to evaluate this allocation of human capital and identify ways that it can help increase this faculty-to-student contact. When this is not possible, graduate students and undergraduate peers who have already completed research can serve in this role modeling capacity. In formally addressing this issue, colleges and universities can set-up structured programs to ensure that all student researchers have access to the vicarious experiences that seem to be a primary source in enhancing personal efficacy beliefs.

The student experiences supported many of the personal benefits of research cited in the previous literature that is summarized in Chapter 2. Institutions should examine how they distribute these opportunities to students to ensure that one particular group or discipline if not favored. An institution may need to formulate policies or develop structures to ensure that all students have equitable access to research programs which offer so many beneficial outcomes.

Implications for Research

This study holds several implications for future research—both qualitative and quantitative—on the topic of undergraduate student research. This particular study could be expanded to include more students, and these ten participants could be
interviewed annually for longitudinal data on the long-term effects of undergraduate research. A longitudinal qualitative study might inquire into graduate school placements, the experience of future research work in both graduate school and career endeavors, and personal reflections on the undergraduate research process and how it has impacted academic and career choices. Since increased confidence appears as such a prevalent finding in the data, a study might examine whether or not this sense of self-efficacy spills over into other aspects of an individual’s life.

Both qualitative and quantitative studies could take a look at the factors that enhance the undergraduate research experience. The interviews in this study suggest that factors such as faculty support and degree and type or interactions, peer influences, ease of logistics in the research process, and affinity for the research topic can influence the way that students feel about their experience. Survey data would provide an efficient way of measuring these factors and their impact on the experience. A complement to these types of survey results would be follow-up interviews or focus groups to derive more in-depth nuances of these survey results.

Limitations of the Study

Although this study yielded rich data from its ten student participants, it does have its limitations. Given the nature of qualitative research, the study is impossible to generalize across institutions. We might hope to transfer some of the knowledge from these students to another site. The research design, however, allows only an examination of ten individual research experiences. The small sample size also poses limitations with regards to the diversity of the participant group. Not all of the
disciplines that are categories in the Undergraduate Research Forum are represented in the sample. While the forum categorizes students into 11 disciplines, only six disciplines are represented by the students in this sample. In addition, the snowball sampling strategy that was utilized for this project made it impossible to predict individual characteristics such as race, gender, or socioeconomic status when I gathered the sample.

An additional limitation to this study focuses on the context of these students’ research experiences. Seven of the ten participants conducted their research for an honors thesis, and nine of the ten participants were part of the honors program at the university. It became apparent to me after first round interviews that many of the students in the study had internalized a similar culture of research. This likely occurred since they are all students at the same university, and most are part of the honors program. Since these participants have been strong students throughout their time in college, the study is really limited to looking at students who have taken advantages of academic opportunities already. Thus, the study really does not focus on how research can involve students who have had marginal college grades, nor does it allow for stories from students (with the exception of one) who have not been identified as the strongest students at the university.

Since I wanted to focus on students who were showcasing their work at the Undergraduate Research Forum, I was not able to gather my sample until students filed their applications for the forum. The application deadline was six weeks before the forum; thus, most students were almost finished with their research project when I
contacted them. These interviews were conducted during a two-month period in the spring of 2007. While I met individually with each student for two interviews and visited the poster presentations of participants at the Undergraduate Research Forum, my contact with each student was limited. The short timeframe of the interviews did not allow for me to talk with students as they decided to pursue research, settled on their research topic, and initiated the research design. Rather, I only heard their stories as they were completing most of their research work. Perhaps different themes may have emerged if I had conducted additional rounds of interviews throughout the academic year leading up to the forum.

Strengths of the Study

Although the interviews for this study began at the end of most of the students’ research experience, I did have sustained contact with the students during the conclusions of most of the projects. The “before and after” interviews—one prior to the research forum and a follow-up interview, which included a member check, afterwards—combined with a visit to each student’s poster presentation, are a strength of this study. Students had the opportunity to talk with me several times about their experiences, and I think that the structure and timing of the interviews allowed not only for discussion of the research experience while the students were involved in it, but also for reflection upon the research experience after its conclusion.

In addition, I think that utilizing my own position as a current researcher and as a previous undergraduate researcher enhanced my interactions with these student participants. Many of them asked about my own experiences researching at the
undergraduate level, and all were curious about my dissertation research. I freely shared with them my own stories—both from undergraduate and graduate work—and commiserated with several of them on such daunting tasks as IRB approval, the defense process, and writing and re-writing multiple drafts. My position as a researcher and this sharing of experiences enhanced my relationships with these students and gave them a greater comfort level in their conversations with me. This position, as well as the structure of the interviews and observation, allowed for thick and insightful data that illuminates the stories of these students. Thus, these rich discussions are perhaps the greatest strengths of this study.

Very little of the previous literature on the topic of undergraduate research has focused on experiences of students. The literature tends to fall into two categories—pedagogical or instructional documents that focus on the “how-to” of research or quantitative work that aims to define the impacts or outcomes of the research process for students. While both of these types of literature are useful in developing undergraduate research programs, very little work exists that really listens to individual student stories about aspects of their research experience. A strength of this study is its use of qualitative methodology to illuminate the experiences of ten students.

As we have seen through the emergent themes in these stories, this qualitative approach identifies some of the dynamics, such as relationships with faculty advisors or interest in the chosen research topic, which may positively or negatively impact an individual student’s experience. Thus, the study fills a gap in the literature by illuminating some of the factors that contribute to the positive nature of the research
experience, as opposed to merely demonstrating the outcomes of performing research. While the existing quantitative data may provide a rationale for developing research programs, these student experiences underscored factors that may enhance the actual student research process.

Simultaneously, this study also surpasses the knowledge that we derive from reading the pedagogical or instructional literature of undergraduate research. These “how-to” guides that are prevalent in the literature actually tend to focus on the process of doing research; however, these articles typically fail to focus on student feedback regarding the process. Just as many of the quantitative studies focus on institutional goals or outcomes (i.e. increased graduation rates, student satisfactions, graduate school attrition, etc.) this instructional literature is also geared towards an institutional perspective. Articles focus on how to gather resources and faculty for research or implement a research curriculum rather than on individual factors that will enhance or hinder the student experience. Thus, this study fills a gap in the existing literature while also providing a complement to both the qualitative surveys and “how-to” writings on the topic.

Summary and Conclusion

The student interviews in this research study support much of the previous literature which indicates the positive outcomes of undergraduate student research. These outcomes may be beneficial for the student (increased graduate school placement rates, a greater desire to do research in the future, enhanced cognitive skills) as well as the institution (greater student satisfaction and increased retention rates). Since most of
the studies of undergraduate research are quantitative in nature—typically involving a survey instrument—this study of ten students provided a perspective that is lacking in the literature of undergraduate student research. These students gave voice to the actual experience of doing research, articulating many of the challenges, frustrations, and joys of the process.

Certainly these stories highlighted many of the positive outcomes that support those in the literature and expand on various themes such as research and gender and the feelings of separation, connection, independence, and obligation in research. In addition, through the stories of these students, we were able to see that the research experience is impacted by much more than just a student’s discipline or general academic area. Among these participant experiences, an individual’s relationship with his or her faculty advisor and personal interest in the chosen research topic emerged as the strongest indicators of a student’s positive feelings about his or her research experience. These two factors surpassed others that emerged as smaller impacts in the process, such as institutional support, research culture, or a student’s major.

This study contributes to the existing body of literature on undergraduate student research not only by inquiring into the actual experience of doing research, but also by illuminating factors within the experience that may contribute to positive outcomes. Findings offer explanations for many of the positive outcomes reflected in previous research on the topic. What became truly apparent over the course of the interviews were the strong feelings of confidence these students developed in their work and abilities. While a survey can tell us that students who perform research may be more
likely to attend graduate school, this type of research instrument does not always fully account for all of the reasons, such as increased confidence or a heightened sense of personal efficacy, which might contribute to this increase.

The structure of this study, with two interviews—one before the Undergraduate Research Forum and one after—and one observation allowed me to develop a rapport with these students while seeing them in three different phases of the research process. These feelings of confidence emerged most strongly in the second interview, when most students had successfully completed their research project and received feedback at the Undergraduate Research Forum. This theme of confidence may be analyzed using Bandura’s theory of self-efficacy. With such analysis, one can see perhaps the greatest benefit of performing research—enhancing the ability for a student to feel a sense of agency to control positively and effectively his or her academic future.
REFERENCES


APPENDIX A

Interview Questions

*General Questions*

What were your perceptions of the research process prior to pursing this project?

Has your sense of what research is changed in this process? How?

What has been positive about pursuing this project?

What has been negative about pursuing this project?

Would you encourage other students to pursue research and why?

How do you think that your college experience would have been different if you had not pursued this project?

*Academics*

How did your previous academic experience influence your research experience and agenda?

How does research shape your current sense of “academic self”?

Have you noticed changes in certain academic skills as a result of doing research (e.g. enhanced skills in writing, critical thinking, approaches to conversations, analytical thinking, etc.)?

Do you feel that the research process has empowered you in the learning process?

How does pursuing research help you to feel more connected to and engaged in the academic life of the university?

Have you decided to pursue further academic work as a result of research and why?

*Personal Identity*

What factors in your life influenced your decision to do research and your chosen research topic?
Has the research experience changed the way that you see yourself?

Has your sense of personal identity and self-esteem changed?

Did you view yourself as a scholar before you pursued research?

Do you now see yourself as a scholar?

**Socio-cultural Factors**

How would you describe the culture of research with which you have been involved?

How do you fit within this culture of research?

Does your research culture encourage collaboration or more independent work?

Were you involved in peer research groups?

What types of social relationships have you developed because of your research experience, or has this experience changed your social connections?

Do you see research as a networking opportunity?

How has research helped you to feel more connected to or engaged with your research culture (i.e. discipline or department)?

**Institutional Characteristics**

How do factors such as institutional support (including resources, funding, opportunities to showcase student research, messages send to students via public relations documents, etc.) and structure (size, location, division of disciplines and majors, etc.) affect your undergraduate student research experience?

Do you feel that you have benefited in your research endeavors by being at a large research institution?

Are you excited at the prospect of receiving institutional recognition at the Undergraduate Research Forum?

Does the ability to showcase your research at the forum influence the way that you approach research or your feelings about the process?
How has pursuing research helped you to feel more connected or engaged with the institution as a whole?

*Faculty*

How have faculty influenced your experience?

Have you had a faculty mentor throughout the research process?

How has this mentor enhanced your research experience?

If you have developed a close relationship with a faculty member, do you feel that this will benefit you in the future and how?

How integral do you think that your faculty advisor was to your research experience?
E-mail to Invite Participation

Greetings! You are invited to participate in a dissertation research study concerning the undergraduate research experience at Ohio State. This qualitative study is entitled Undergraduate Research as a means of Student Engagement: A Study of Research’s Involvement in Five Areas of College Life. I am currently a PhD candidate in the department of Higher Education Administration here at Ohio State, and this study serves as research for my dissertation. My faculty advisory and co-investigator is Dr. Leonard L. Baird, Professor of Higher Education and Student Affairs.

I received your name from Shannon Dowdall in the Honors and Scholars Center, and she is coordinating applications for the Denman Research Forum. My study focuses on student researchers involved in the Denman Research Forum. If you choose to be a part of my study, you will be asked to participate in two interviews--one before the forum, and a follow-up interview after the forum. Each interview should last an hour or less, and you will be asked questions about various aspects of your research experience. In addition, the Denman forum will serve as an observation site for my study, so I will visit your poster presentation at that event. A number of measures will be taken to ensure confidentiality in this process. An extended explanation of what these measures entail, as well as a complete explanation of the study, is attached to this e-mail. For your participation, you will receive a $20.00 gift card Barnes and Noble.

I am happy to answer any questions that you might have about this study. If you are interested in participating, please feel free to respond to this e-mail or contact me at one of the phone numbers listed below. Thank you very much for your consideration.

Sincerely,
Anne C. Krabacher
PhD Candidate, Higher Education Administration
work: (614) 247-7175
home: (614) 784-0537
APPENDIX C

Informational Letter to Invite Participation

April, 2007

Dear Student:

You are invited to participate in a dissertation research study concerning the undergraduate research experience at Ohio State. This qualitative study is entitled *Undergraduate Research as a means of Student Engagement: A Study of Research’s Involvement in Five Areas of College Life*. The investigators for this study are Dr. Leonard L. Baird, a professor in the department of Higher Education Administration at Ohio State and Anne Claxton Krabacher, a PhD candidate in the department of Higher Education Administration at Ohio State. This study serves as research for Anne’s dissertation.

**Purpose of Study**

This investigation of the student research experience will focus on examining ways that research contributes to further engagement in the life of the university. In addition, we hope to learn how five factors influence the research process. These factors include a student’s academic background, personal identity, cultural and social influences, institutional characteristics, and faculty interactions. Conversely, interview questions will also focus on how the research process can influence students in each of these five areas. We are particularly interested in students who are planning to showcase their research work at the Denman Undergraduate Research Forum. With this research, the co-investigator hopes to address a gap in the current literature regarding undergraduate research. This literature is largely quantitative in nature and focuses on the outcomes of research, rather than on the actual student experience and what influences this. With the qualitative approach to the study, we hope to discover more nuanced information about the actual experiences of a student researcher.

**Participation in the Research**

Your participation in this study is entirely voluntary. You will be asked to sign a consent form before we begin the data collection process. If at any point during the study you wish to withdraw this consent, you are free to do so without penalty or repercussion. Data collection will include two interviews—one in April and one following the Denman Undergraduate Research Forum in May. You are free to refuse to respond to any interview questions that you do not wish to answer. In addition, the co-investigator will visit your poster presentation at the Denman Forum.
Data Collection: Interviews
If you choose to be a human subject in this research, you will be asked to participate in two interviews. Each of these interviews will be recorded using an audio recorder. The first interview will be conducted before the Denman forum, and the second follow-up interview will occur during the two weeks after the forum. In the first interview, you will be asked a series of questions that focus on your general impressions of the research process, and well as questions that highlight the five areas mentioned above (academic background, personal identity, cultural and social influences, institutional characteristics, and faculty interactions). Before the second interview, you will be given a copy of the transcription of your first interview, which will allow us to address any clarifying questions.

Data Collection: Observations
The Denman Undergraduate Research Forum will be used as an observation site for this study. Your poster presentation will be observed as part of this study. An overall observation of the forum will also occur.

Ensuring Confidentiality
We will take a number of measures to ensure the confidentiality of your identity throughout this process. You will have the opportunity to select a pseudonym that will be used throughout the written analysis of this project; if you do not choose a pseudonym, one will be assigned to you. In addition, all tape recordings, interview notes, and field notes will be kept in a locked cabinet in the office of the co-investigator. Your name will not appear on any of these notes, nor will it appear in the transcriptions of the interviews. The consent form that you sign will be kept separate from these notes, recordings, and transcriptions so that the names on the forms cannot be matched with information in these notes and recordings.

Questions Regarding the Study
Please feel free to address any questions that you may have to the investigator and co-investigator of this project at any point. Our phone numbers and e-mails are listed at the bottom of this letter.

Sincerely,

Dr. Leonard L. Baird
Professor
Higher Education Administration
614-688-3045
Baird.62@osu.edu

Anne Claxton Krabacher
PhD Candidate
Higher Education Administration
614-247-7175
Krabacher.4@osu.edu
CONSENT FOR PARTICIPATION IN RESEARCH

I consent to participating in a research study entitled: Undergraduate Research as a means of Student Engagement: A Study of Research’s Involvement in Five Areas of College Life.

Dr. Leonard L. Baird, Principal Investigator, or his authorized representative, Anne Claxton Krabacher, has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me. I also understand that I can refuse to answer any interview questions to which I do not wish to respond during the data collection process.

Finally, I acknowledge that I have read fully and understand the consent form. I also sign it freely and voluntarily. With my signature, I also acknowledge that I am 18 years of age or older. A copy of this consent form has been given to me.

Date: Signed:

____________________________________  ________________________________

(Participant)

Signed:

(Principal Investigator or his/her authorized representative)