ABSTRACT

Title of Dissertation:	FOSTERED LEARNING: EXPLORING EFFECTS OF FACULTY AND STUDENT AFFAIRS STAFF ROLES WITHIN LIVING-LEARNING PROGRAMS ON UNDERGRADUATE STUDENT PERCEPTIONS OF GROWTH IN COGNITIVE DIMENSIONS
	Nicole Natasha Long Doctor of Philosophy, 2012
Directed By:	Professor Susan R. Komives Department of Counseling, Higher Education, and Special Education

The purpose of this study was to explore effects of faculty and student affairs staff roles within living-learning programs (LLPs) on perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning among LLP participants. This study used two data sources from the National Study of Living-Learning Programs (NSLLP), a multi-institutional study of LLPs that included data on student background characteristics, experiences, and outcomes. Data sources included the 2007 baseline study and data from the Living-Learning Programs Survey. The 2007 NSLLP administration contained data from 48 institutions and 11,606 students living in LLPs.

The General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) served as the conceptual framework for this study. This model proposed that learning and cognitive development were functions of institutional characteristics, student background/pre-college traits, interactions with agents of socialization (peers and faculty), institutional environment, and quality of effort. An adapted form of this model

was used in this study to include the potential effects of LLP characteristics, such as the involvement of faculty and student affairs professional staff. The cognitive outcomes used in this study were critical thinking/analysis abilities, cognitive complexity, and liberal learning. Hierarchical linear modeling was used to examine the direct and differential effects of faculty and student affairs professional staff roles on the study outcomes.

Study results showed that numerous curricular and co-curricular experiences shared positive and negative relationships across all three cognitive outcomes. Student affairs mentorship had a negative direct association with cognitive complexity and liberal learning, while increased student affairs socio-cultural involvement contributed positively. Faculty involvement in socio-cultural activities also contributed positively. Student affairs mentorship, student affairs socio-cultural activities and faculty socio-cultural activities accounted for differential effects on sense of belonging for cognitive complexity. Only student affairs mentorship yielded a differential effect for sense of belonging when examining liberal learning. A primary implication for practice was the importance of designing integrative curricular and co-curricular experiences, such that faculty and student affairs staff not only work together to in the design, but also participate in these efforts within LLPs.

FOSTERED LEARNING: EXPLORING EFFECTS OF FACULTY AND STUDENT
AFFAIRS STAFF ROLES WITHIN LIVING-LEARNING PROGRAMS ON
UNDERGRADUATE STUDENT PERCEPTIONS OF GROWTH IN COGNITIVE
DIMENSIONS

By

Nicole Natasha Long

Dissertation submitted to the Faculty of the Graduate School of the
University of Maryland, College Park, in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
2012

Advisory Committee:

Professor Susan R. Komives, Chair
Professor Stephen Koziol
Associate Professor Karen Kurotsuchi Inkelas (University of Virginia)
Assistant Professor Julie Park
Assistant Professor Stephen John Quaye

Dedication

This dissertation is dedicated to all of my family, living and deceased, who were unable to attend college due to numerous societal and institutional barriers. I will share this experience and others with future generations to come so that they, too, might have the opportunities with which I have been blessed.

There are many doctoral students who directly or indirectly helped me along the way with my dissertation or assisted in my development as a researcher. I offer many thanks to current and former CSP students Dr. Matthew Soldner, Jay Garvey, Claire Robbins, Lucy LePeau, Stephanie Chang, Julie Choe Kim, Dr. Graziella McCarron Pagliarulo, Dr. Kristan Cilente Skendall, and José Riera. All of your support inside and outside the classroom made all the difference in the world.

Finally, I thank my family for their unending support through the journey to doctor. You might not have always understood what I was studying or why obtaining a Ph.D. took so long, but you were always there. My mom, Imogene Long, you were always there as my rock through these five years. I thank God that you are still on this earth to share in the joys of seeing your *baby* reach the end of the doctoral journey.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

For more than 20 years an interest in higher education accountability from
multiple audiences prompted institutions to demonstrate their unique contribution to
espoused educational outcomes (Astin, 1991; Heller, 2001; Kuh, 2001; Thelin, 1996). In
particular, "The assessment of student learning outcomes remains a high priority on the
institutional agenda," (Kinzie, 2010, p. 12) as it received widespread attention from
federal constituents (United States Department of Education, 2006). The assessment of
student learning remains at the forefront because it is part of the broader context of
demonstrating institutional effectiveness and excellence (New Leadership Alliance for
Student Learning and Accountability, 2010; Suskie, 2009). In essence, the hallmark of
higher education is its aim to promote learning and growth for the students who
matriculate in postsecondary education.

The means by which institutions choose to promote learning and growth are
diverse in scope. However, one method for promoting learning that has been adopted by
many institutions is the living-learning program (LLP). In fact, a 2009 *USA Today* article
reported that at the time of publication nearly 200 institutions housed LLPs on their
campuses (Bonner). Such a method for promoting learning calls for collaborative efforts
between academic and student affairs (Terenzini & Pascarella, 1994; Tinto, 2003). These
collaborative efforts are underpinnings for the creation of seamless learning experiences
for students (Kuh, 1996). Terenizini & Pascarella noted that "institutional structures
[that] promote cohesive environments that value the life of the mind and high degrees of

student academic and social involvement" (p. 29) are what define quality undergraduate education.

By including interconnected learning opportunities such as LLPs, institutions attempted to move from the idea of what Terenzini and Pascarella (1994) called "parallel but separate tracks" (p. 32), which relegated academic affairs and student affairs to specific domains of learning such as cognitive development and personal growth, respectively. Tinto (2003) later offered that the effectiveness of such efforts relies on both the work of faculty and student affairs professionals. Despite encouraging shared relationships between academic and student affairs agents and garnering popularity on hundreds of college campuses, there "is a lack of systematic focus on research on their effectiveness in delivering the student learning outcomes they are designed to promote" (Inkelas & Soldner, 2011, p. 1). Moreover, the effectiveness of faculty and student affairs professionals' LLP responsibilities in achieving student learning goals remains uncertain.

Background and Context

Most recently, the Commission on the Future of Education led by former U.S. Secretary of Education Margaret Spellings ignited conversation about accountability in higher education. The Commission concluded that American higher education has too often "relied heavily on reputation and rankings derived to a large extent from inputs such as financial resources rather than outcomes" (United States Department of Education, 2006, p. 14). Other constituencies within higher education have voiced the sentiment that other measures for success that focus specifically on learning are more appropriate means of determining excellence rather than traditional metrics such as enrollment and persistence (Association of American Colleges and Universities, 2007;

Greater Expectations National Panel, 2002). Through the Commission's call for a more accountable higher education community, it pressed that colleges and universities need to have demonstrable outcomes, particularly ones associated with student learning (United States Department of Education). Consequently, the academy must choose "between proactively taking responsibility for demonstrating accountability on [its] own terms or passively having requirements dictated from the outside with little or no control" (Ewell, 2009, p. 6).

Despite a call for increased accountability for student learning in higher education, there is not a universal set of standards for learning that all college graduates should attain from a college education. While various higher education entities (e.g. national professional associations, regional and discipline-based accreditation organizations) have alluded to the importance of certain student learning outcomes, a definitive set of outcomes for college graduates remains a void with no solid stance on specific learning outcomes all students should meet within the broad spectrum of higher education (Association of American Colleges and Universities, 2007).

Although college students matriculate in college with the intent of obtaining a degree, the degree itself should not be the absolute purpose behind seeking a postsecondary education (Kellogg Commission on the Future of State and Land-grant Universities, 1999). Rather, education has been thought to serve a broader purpose for students rather than degree attainment solely. The writings of John Dewey (1938) laid a foundation for how education in its broadest forms may be purposeful and serve broader societal roles. According to Dewey, a primary goal of traditional forms of education "is

to prepare [individuals] for future responsibilities and for success in life" (p. 18). This idea of the role of education is consistent with contemporary goals of higher education

Consistent with Dewey's (1938) conceptualization of traditional forms of education, Chickering and Gamson (1987) asserted in their seminal work, *Seven Principles for Good Practice in Undergraduate Education*, that "an undergraduate education should prepare students to understand and deal intelligently with modern life" (p. 2). Chickering and Gamson's notion of what students should learn in undergraduate education also suggests that the role of undergraduate education is broader in scope and encompasses knowledge and development needed beyond college. A broader scope for undergraduate education in preparation for life beyond college has continued to be affirmed in higher education (Association of American Colleges and Universities, 2007; Kellogg Commission on the Future of State and Land-grant Universities, 1999).

In their reform statement, *Returning to Our Roots* (Kellogg Commission on the Future of State and Land-grant Universities, 1999), the Association for Public Land-grant Universities emphasized the need for colleges and universities to focus on learning centered around knowledge, skills, and values needed for careers, citizenship, and life-long learning. Similarly, the Association of American Colleges and Universities has championed the need for a more comprehensive focus of higher education through a liberal education agenda. This liberal education agenda has been advanced through the promulgation of the Liberal Education and America's Promise (LEAP) essential learning outcomes (Association of American Colleges and Universities, 2007). The LEAP essential learning outcomes entail several clusters of knowledge and skills related to student learning such as critical thinking, problem solving, and analysis skills, all of

which are thought to contribute to learning that is beneficial for students beyond the college environment.

Learning, as measured by growth in cognitive development and skills that LEAP (Association of American Colleges and Universities, 2010) purports, is often an expected outcome of matriculation in college. However, the specific learning objectives that are expected of students are diverse. Most commonly, students are expected to engage in learning that targets cognitive tasks associated with specific knowledge of a content area and analytical, problem solving, writing, and communication skills (Astin, 1993; Pascarella & Terenzini, 2005). The Lumina Foundation, a prominent player in the student learning movement, also proposed that students demonstrate similar skills as the ones described above in its recently launched *Degree Qualifications Profile* (2011). Within this curricular-focused document, the foundation proposed a framework that detailed sets of knowledge and demonstrable skills that college students should possess upon earning degrees at the associates, bachelors, and master's levels. According to the profile, the specific domains that learning should encompass are applied learning, intellectual skills, specialized knowledge, broad and integrative knowledge, and civic learning. Developmental outcomes associated with cognitive domains have also been echoed within the co-curriculum.

The Council for the Advancement of Standards (CAS), an organization that promotes the use of standards of professional practice in student affairs and services, identified six domains for learning and developmental outcomes as another component of compliance with the CAS Standards (CAS, 2010). The learning and development outcomes articulated by CAS also address the importance of cognitive outcomes such as

knowledge construction and application, critical thinking, and reflective thinking (CAS, 2008). Although, CAS and Lumina represent distinct foci within the co-curriculum and curriculum, respectively, outcomes within both spheres can be mutually agreed upon as being important to the learning and development of students (Drechsler, Komives, & Fincher, in press).

Providing college students with purposeful educational experiences that prepare them for work and life have been an imperative in education. In order to fulfill the purposes of education described above, traditional notions of teaching and learning must be transcended. Dewey (1938) emphasized that in order to transcend traditional norms of teaching and learning, educators play a critical role, which entails "the shaping of actual experience by environing conditions" (p. 40) to promote learning. This more progressive form of education as Dewey described represents a more holistic view of learning in which makes students the core of learning with curricular and co-curricular environments (Joint Taskforce on Student Learning, 1998; Keeling, 2004; Kellogg Commission on the Future of Student and Land-grant Universities, 1999). The responsibility for learning within this framework, no longer solely rests solely with faculty within the classroom environment, which does not promote the greatest optimization of student learning (Allen & Cherrey, 2000). This notion of learning within multiple contexts has been paramount to how education has and will continue to be approached at the college level.

Higher education researchers, in particular, have been interested in the dynamic nature of the college learning environment. Specifically, the relationships between college students and their experiences in institutional environments in which they engage are of interest in order to acquire a better understand how college environments work

6

(Astin, 1993; Pace, 1984; Pascarella & Terenzini, 2005). College impact models have

provided frameworks for understanding the ways in which college provides opportunities

and experiences that, theoretically, produce markedly different developmental outcomes

for students who attend college when compared to their counterparts (Astin). However,

Astin cautioned that much of what is considered to be college impact research is in

actuality research that "looks merely at change or growth in students rather than impact"

(p. 5).

Chickering and Gamson (1987) asserted that colleges and universities have the

ability to shape the college environment such that it is conducive to enhancing

undergraduate education.   The college environment consists of not just the physical

environment but also the intellectual environment that promotes learning (Kellogg

Commission on the Future of State and Land-grant Universities, 1999). Traditionally, the

college environment has been conceptualized according to dualities such as curricular

versus co-curricular or academic and non-academic components (Kuh, 1996). However,

in order to optimize the college environment to promote positive outcomes

reconceptualizing the college environment such that these dichotomous environments are

thought of as one environment for learning is advantageous (Kuh, 1991, 1996).

Specifically, Kuh (1996) called for the creation of "seamless" learning

environments where "what was once believed to be separate, distinct parts…are now of

one piece, bound together so as to appear whole or continuous" (p. 136). He further

asserted that structuring the college environment in this way is more closely aligned with

the realities that students simultaneously engage across multiple contexts within and

outside of the classroom. This suggests that the college student experience is most

influential when students can view it as an experience shaped by a single, interconnected environment. In order to structure the college environment as Kuh (1991, 1996) articulated, institutions need to be intentional about specific ways in which they can accomplish this task.

Seamlessly shaping the college experience with more fluidity across learning environments can be achieved through the use of practices that are considered to promote learning (Kuh, 1996, 2008). Kuh described what he called "high-impact practices," which include experiences such as learning communities and other common intellectual experiences that support and stimulate learning among most students. Engagement within the college environment through high-impact practices are beneficial because they engage students in demanding, purposeful activities and require interactions with peers, faculty, and staff over time (Kuh, 2008). There is an inherent assumption that experiences such as these within the curricular environment should promote students' growth and development (Chickering & Gamson, 1987). Interestingly, data from the 2007 National Survey of Student Engagement (NSSE) has supported this assumption. Kuh (2008) reported that engagement in educationally purposeful activities had conditional effects for some underrepresented student populations. For example, students who entered college with lower ACT scores benefitted most from these activities in terms of first year grade point average. A similar effect occurred for Hispanic students when taking into account first year grade point average when compared to White/Caucasian students. Meanwhile, African American students also experienced a greater probability of returning to college for a second year compared to White/Caucasian students when involved in educationally purposeful activities.

Indeed, high-impact practices have a greater impact on some student populations. However, another important aspect to note about these activities is where they occur within the college environment. High-impact practices, which are education rich, are not purely relegated to the curricular component of the academic environment (Kuh, 2008). Rather, they can occur across the curriculum and co-curriculum, thus having the capacity to foster the notion of a seamless learning environment (Kuh, 1996). An example of this as Kuh (2008) noted are common intellectual experiences and learning communities.

A specific institutional practice that melds the curricular and co-curricular contexts of learning communities and common intellectual experiences are living-learning programs (LLPs). These programs, in particular, have been used as a means of advancing educational outcomes such as those associated with the promotion of learning and growth. For example, Brower and Inkelas (2010) noted that LLPs support curricular and co-curricular participation, peer and faculty interactions, and academically supportive residence hall climates that are linked to increased learning in areas promoted by LEAP such as critical thinking and knowledge application.

Intentionality is an important aspect of LLPs in that they are grounded in structured curricular and co-curricular experiences (Shapiro & Levine, 1999). Additionally, there is support that the learning and development of college students occur both in and outside the classroom with faculty and administrators who work with the co-curricular aspects of college (Allen & Cherrey, 2000; Banta & Kuh, 1998; Keeling, 2004). Therefore, LLPs would assuredly promote this type of development because of their concerted merger of curricular and co-curricular experiences.

Statement of the Problem

Despite the widely accepted belief that LLPs promote positive educational outcomes by means of their intentionally structured curricular and co-curricular environments (Clarke, Miser, & Roberts, 1988; Masterson, 2008), there is not much research to support that they work in the ways they have been espoused to work (Andrade, 2007; Brower & Inkelas, 2010). A specific aspect of LLPs in which little is known pertains to the unique effects faculty and student affairs staff roles within LLPs contribute to students' perceptions of their learning.

There is substantial research on the role of faculty (Astin, 1993; Kim & Sax, 2009; Lundberg & Schreiner, 2004; McHugh Engstrom, 2008; Sax, Bryant, & Harper, 2005) and co-curricular experiences (Nelson Laird, 2005; Pascarella, 2001; Rugutt & Chemosit, 2009) on positive student outcomes such as cognitive skill development. Meanwhile, there is a more modest body of research that examines in depth the effect of interactions with faculty outside of class (Fusani, 1994; Jaasma & Koper, 2001). Blake (2007) called for student affairs professionals "to envision themselves as promoters of learning and academic achievement in virtually everything they do with students" (p. 69), yet their involvement in specific types of learning remains unexamined. Furthermore, the involvement of student affairs staff in promoting learning is timely when institutions need to be more resourceful. To that end, student affairs practitioners

> who routinely interact with students beyond the classroom may become more
> important to the quality of the undergraduate experience because they can help
> students make meaning of the academic experience by connecting classroom
> learning with their lives outside of the classroom (Kuh, 1996, p. 136).

The Student Learning Imperative: Implications for Student Affairs strengthens Kuh's assertion by addressing the shared responsibility between student affairs professionals and faculty for engaging students in activities for promoting learning (ACPA, 1996).

Although there is recognition of the importance of faculty and student affairs staff involvement in student learning, there is a gap in the literature related specifically to the effects of faculty and student affairs staff roles within LLPs on cognitive outcomes often associated with learning. The purpose of this study is to examine the effects of faculty and student affairs staff roles within LLPs on perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning among undergraduate students in LLPs. The following research questions will guide the study:

- What key curricular and co-curricular student experiences are associated with student perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- Which roles played by faculty and student affairs professional staff within LLPs are directly associated with differences in student perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- Do faculty and student affairs staff roles within LLPs account for differential relationships between students' perceptions of and experience in college and self-perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

By addressing these research questions, it will be possible to identify effective involvement structures for beginning to understand how faculty and student affairs staff can optimize student learning.

Definition of Terms

Several key terms associated with this study have been identified. The definitions of living-learning program, faculty and student affairs professional staff roles, critical thinking/analysis abilities, cognitive complexity, and liberal learning—as they are employed in this study—are provided below. All of the definitions of key terms are from the 2007 baseline study of the National Study of Living-Learning Programs (NSLLP), a multi-institutional study that examined college outcomes among students residing in living-learning programs and traditional residence hall environments (Inkelas & Associates, 2008). Furthermore, the 2007 NSLLP study contained self-reported student data and data regarding LLP structures from LLP program administrators from each participating institution in the study.

Living-learning program

Within the NSLLP, an LLP is defined as a programmatic effort in which "undergraduate students live together in a discrete portion of a residence hall (or the entire hall) and participate in academic and/or [co-curricular] programming designed especially for them" (Inkelas & Associates, 2008, p. I-2).

Faculty roles

The role of faculty within LLPs is operationalized according to two means of involvement and interaction faculty have with LLP students from the NSLLP 2007 baseline study (NSLLP Living-Learning Programs Survey Instrument, n.d.). The first role entails faculty serving as academic advisors to LLP participants. The second role involves faculty involvement outside of the physical classroom space by conducting social/cultural outings. These outings included going to live performances or museums.

<u>Student affairs professional staff roles</u>

Student affairs staff roles are composed of two types of involvement and interaction with LLP participants (NSLLP Living-Learning Programs Survey Instrument, n.d.). The first role encompasses serving as mentors to LLP participants. Secondly, the student affairs staff role is also defined by conducting social/cultural outings with LLP participants.

<u>Critical thinking/analysis abilities</u>

In the creation of the NSLLP, factor-based scales were created in order to measure the construct of critical thinking/analysis abilities through students' self-reports. Inkelas, Vogt, Longerbeam, Owen, and Johnson (2006) stated that critical thinking is a meaning making process that encompasses the ability to view, analyze, and disagree with diverse perspectives.

<u>Cognitive complexity</u>

Within the NSLLP, cognitive complexity is defined as students' perceived growth in their "ability to critically analyze, to learn on their own, to learn new material, and to understand relationships between ideas" (Inkelas, Vogt et al., 2006, p. 58).

<u>Liberal learning</u>

Liberal learning was identified as a self-reported growth measure related to students' openness to new ideas. Inkelas, Vogt et al. (2006) stated that "liberalism includes an appreciation of a broad education, openness to differing views, the ability to discuss controversial issues, and enjoyment of art, music, and cultural diversity" (p. 58).

More specific information regarding the 2007 baseline and Living-Learning Programs survey instruments from which the definitions of key terms were obtained are

presented in Chapter 3. Additionally, detailed descriptions of the composition of composite scales used in the study can be found in Chapter 3.

Significance of the Study

A basic premise of LLPs is to educate and support students, simultaneously, within their curricular and co-curricular environments (Clarke, et al., 1988; Inkelas & Weisman, 2003; Masterson, 2008). This education and support within LLP environments typically comes from faculty and student affairs staff who are one structural aspect of LLPs (Shapiro & Levine, 1999). Brower and Inkelas (2010) stated that the roles of faculty and student affairs staff varies within the national landscape of LLPs. Although there is some descriptive information available regarding faculty and student affairs staff roles in LLPs, the effects of these specific roles remains unexamined. This study, however, addressed this lack of information regarding effects of types of faculty and student affairs staff roles by examining LLP students' perceptions of their learning via the cognitive dimensions of critical thinking/analysis abilities, cognitive complexity, and liberal learning. Understanding what types of faculty and student affairs staff involvement may guide LLP program administrators in incorporating curricular and co-curricular elements in the structures of new and existing LLPs.

Furthermore, this study used a measure of frequencies of involvement in specific roles by faculty and student affairs staff. By doing so, this study will attempt to yield information about how much involvement by faculty and student affairs staff matters in students' learning. Both academic and student affairs units will have a better sense of the importance of frequency of involvement in specific activities such as advising, mentoring, and participation in socio-cultural events with students outside of class.

Given that LLPs are commonly found within large research universities, understanding how much involvement in these roles may have implications for which faculty and staff may be attracted to participation in LLPs if greater amounts of involvement within the LLP are necessary to optimize learning.

Although not a primary focus of this dissertation research, this study will also provide needed information regarding the curricular and co-curricular experiences of residential students and their relationships to perceptions of learning. According to Brower and Inkelas (2010), "Strong LLPs are those that anticipate, nurture, and value learning opportunities in and out of the classroom" (p. 42). More information about influential curricular and co-curricular experiences among LLP participants has practical implications for LLP program administrators. This study may help inform decisions related to student experiences that practitioners can facilitate and for which they should provide adequate funding for the purposes of strengthening their programs.

Summary of Methods

Quantitative analyses of data from the National Study of Living-Learning were employed in order to identify key college experiences and involvement that affect LLP participants' perceptions of their growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning and the effects of faculty and student affairs staff roles on the perceptions. The NSLLP is a multi-institutional study that examines college outcomes of LLPs. To conduct this study, data from LLP participants in the 2007 baseline study and data obtained from LLP program administrators regarding LLP structural characteristics will be used. Descriptive statistical analyses were included in order to provide information about the analytic sample. Hierarchical linear modeling

(Raudenbush & Bryk, 2002) was used for the purpose of examining the multi-level effects of faculty and student affairs staff roles on student perceptions in the specified cognitive dimensions.

Delimitations

Since this study used data from the National Study of Living-Learning Programs, the study was limited to students who participated in an LLP. Participation in an LLP would suggest that students may have more intentional interactions with faculty and student affairs staff than students who live in traditional residence hall environments or do not live on campus. Because of the scope of the study, the results will be most applicable to other forms of intentional learning environments.

Another delimitation of this study was that the variables from the NSLLP were self-reported by study participants. Although standardized measures of cognitive outcomes exist, this study was limited to students' self-perceptions of their growth in cognitive outcomes.

CHAPTER II

Organization of the Literature

Research that guides the study will be presented pursuant to the Creswell (2009) approach for organizing a literature review. As such, the extant research will be grouped according to the independent and dependent variables associated with a study. In applying Creswell's model, the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) will serve as the theoretical guide further organizing the extant research related to growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. This specific example of college impact theory suggested that the college environment has an impact on the expected educational goals and outcomes associated with students' matriculation in college (Astin, 1993; Pascarella & Terenzini, 2005). The review of the literature will commence with theoretical and conceptual perspectives on the dependent variables of cognitive outcomes and follow with literature specifically related to living-learning programs and the variables used in the study.

Conceptual Framework

Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Figure 1) will be the framework used to guide this study. Pascarella derived this causal model from an extensive synthesis of research on cognitive outcomes. The model consists of five sets of variables that are hypothesized to directly and/or indirectly influence learning and cognitive development.

Figure 2.1. Pascarella's (1985) General Causal Model for Assessing the Effects of

Differential College Environments on Student Learning and Cognitive Development.
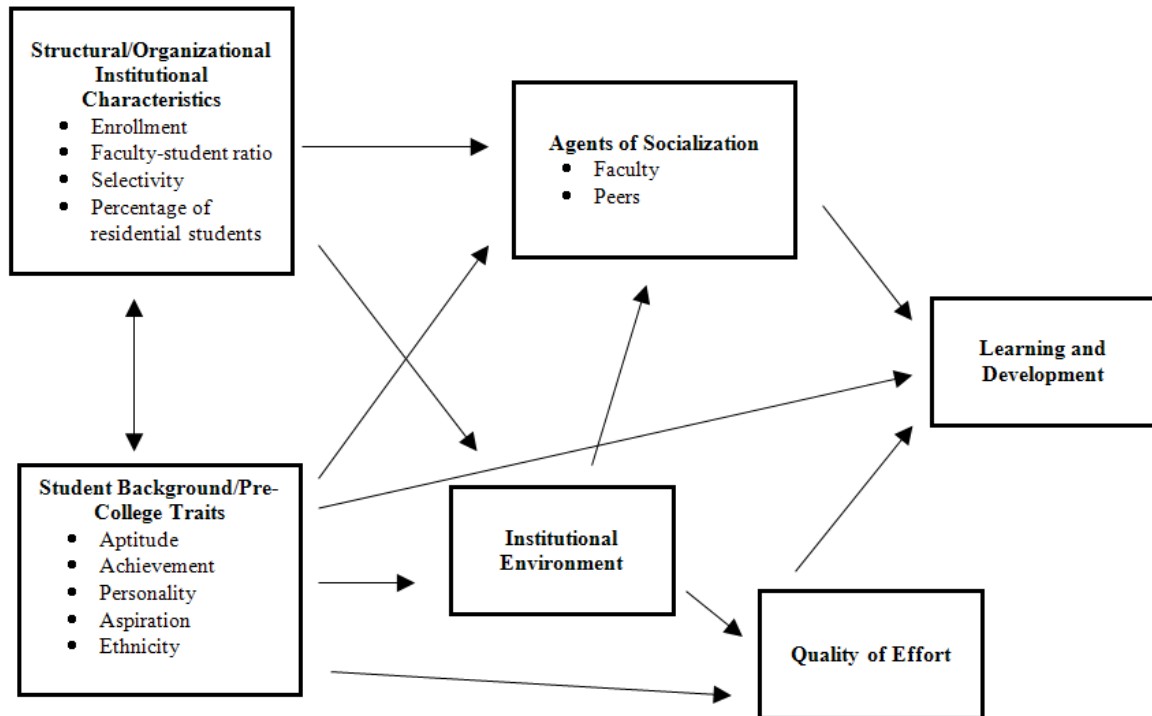
Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), *Higher Education: Handbook of Theory and Research* (Vol. 1). New York, NY: Agathon. Page 50, Figure 1. Copyright 1985 by Agathon Press. Reprinted with kind permission of Springer Science and Business Media.

Pascarella (1985) proposed that structural and organizational characteristics of

institutions and the background and pre-college characteristics of students shape the

institutional environment. Structural and organizational elements of the institutions

include characteristics such as enrollment, faculty-student ratios, selectivity, and the

percentage of students residing on campus. Structural and organizational characteristics

of the institution were hypothesized to have an indirect effect on student learning and

cognitive outcomes. Meanwhile, student background and pre-college traits included

characteristics such as aptitude, achievement, personality, aspiration, and ethnicity.

Within Pascarella's (1985) model, he hypothesized that the

structural/organizational characteristics of institutions, student pre-college characteristics,

and the institutional environment shaped students' interactions with agents of

socialization within the institution. These agents of socialization included faculty and

students' peers. Additionally, these interactions, along with the institutional

environment, and student background characteristics were believed to have direct effects

on the quality of effort students make in college. Furthermore, these agents of

socialization, students' pre-college characteristics, and the quality of effort made in

college are hypothesized to have direct effects on outcomes related to learning and

development in college.

Learning and Development

Cognitive abilities are associated with learning and developmental processes.

How learning and development has been conceptualized in the literature has varied in

foundational education literature. Vygotsky (1978) offered that "[l]earning is more than

the acquisition of the ability to think; it is the acquisition of many specialized abilities for

thinking about a variety of things" (p. 83). According to this definition, learning is

thought of as a tangible object that an individual obtains. However, other conceptions of

learning contend that it is a meaning-making process requiring active participation (Joint

Taskforce on Student Learning, 1998). Meanwhile, development is concerned with tasks

and stages along a trajectory characterized by increasing complexity (Chickering &

Reisser, 1993). Considering these two definitions, learning has been viewed as more of an object and development as an action, organized by a structure for becoming more complex.

In particular, the relationship between learning and development has been theorized in multiple ways. Vygotsky (1978) offered that there are three primary theoretical positions on the relationship between learning and development. First, learning and development are independent of one another. Not only are they independent, "[d]evelopment needs to happen prior to the occurrence of learning instead of development working in concert with learning" (p. 81). This theoretical position further implied that individuals may not have the capacity to learn if required developmental processes have not occurred. Another approach to understanding the relationship between learning and development supposed that learning and development occur simultaneously. In an illustrative fashion, "learning and development coincide at all points in the same way that two identical figures coincide when superimposed" (p. 81). The third position that Vygotsky offered was that learning and development are "mutually dependent and interactive," in that learning prompts individuals to mature and grow.

Although there are different theoretical positions regarding the relationship between learning and development, a basic premise still exists in that educational environments serve as a vehicle for promoting learning and development. Dewey (1938) wrote the following

> The history of educational theory is marked by opposition between the idea that
> education is development from within and that it is formation from without; that it

is based upon natural endowments and that education is a process of overcoming

natural inclination and substituting in its place habits acquired under external

pressure (p. 17).

Dewey's position suggested that development is an internal process in which an

individual's educational environment has the capacity to have an influence over it. For

example, educational experiences may serve as an opportunity to overcome inclinations

not to engage in newfound thought due to the socializing nature of education to prompt

new ways of thinking through specific activities. The socializing nature of educational

environments then equips individuals with experiences for the purpose of changing

behaviors. This idea of change is a critical aspect of the cognitive development processes

that are commonly associated with matriculation in college.

Conceptual and Theoretical Models of Cognitive Development

Conceptual and theoretical models have been used to understand change related to

learning and development in educational environments such as higher education.

Through his study of child development, Piaget (2001) was one of the earlier theorists

who conceptualized developmental processes. Although his work was rooted in the study

of children and adolescents, Piaget has served as a foundation for later models of

understanding cognitive development. An essential element of Piaget's work was that

the development of individuals is greatly influenced by their social environments. Piaget

asserted that the social environment is highly influential in that it "compels [an

individual] to recognize facts, but also provide him with a ready-made system of signs,

which modify his thought" (p. 171). These new means of thought are organized by

structures in which individuals replace old knowledge with new learning. Thus, an

environment has the capacity to serve as an arena for acquiring knowledge or learning and act as a catalyst for development.

Specifically, cognitive-structural development theories have been used to understand how individuals move from simplistic ways of thinking to ones that are more sophisticated and complex. Examples of such developmental theories include the Perry (1970, 1981) Scheme of Intellectual and Ethical Development, Epistemological Reflection Model (Baxter Magolda, 1992), and Women's Ways of Knowing (Belenky, Clinch, Goldberger, & Tarule, 1997). In particular, these theories and models, which will be discussed further, have garnered substantial use in understanding how college students develop.

Perry Scheme of Intellectual and Ethical Development

According to Perry (1970), students are faced with an inevitable multitude of differing values within and outside of the college environment. Perry claimed that when exposed to differing values or ideas, individuals employ processes for understanding, discerning between, accepting, and rejecting them. To approach such differing values individuals use an epistemological framework to guide their understanding and further employ this framework in their intellectual and ethical development.

Epistemology informs individuals' development in terms of knowing and decision-making. Perry's (1970, 1981) development scheme consisted of nine successive positions that increased in cognitive complexity. The qualitative study used to generate Perry's scheme was conducted using a sample consisting of 104 male students from Harvard University. Participants in the study were asked to reflect upon their college experiences.

The nine positions generated from the study formed three groups: dualism, relativism, and commitment (Perry, 1981). Perry (1981) asserted that dualism was characterized by a dichotomous way of thinking. Individuals within this position believe that there exists an Authority who holds all truths. Dualism consists of the first three positions of the scheme. Position One was called basic duality, implying that individuals' actions and ways of understanding were viewed dichotomously. For example, actions are seen as either right or wrong. Moreover, individuals believed truth rested with one single authority. Within educational settings, Perry (1970) wrote that authority figures serve as the link between truth and an individual.

The following two positions were representative of a diversity of opinions, truths, and values of which none is more right or wrong than another (Perry, 1981). These two positions indicated a level of multiplistic thinking. Position Two, was called Multiplicity Pre-Legitimate. In this position, "[d]iversity and complexity are still perceived as *alien* but as elements introduced *within* the community by willful Authorities who are failing of their meditational role…he perceives diversity and complexity not so much as alien to the community but alien to *him*" (Perry, 1970, p. 73, italics in original text). The idea of recognizing multiple perspectives did not sit well with individuals in this position, as they may have resisted the notion of multiple perspectives. Multiple perspectives were not seen as legitimate within this component of the intellectual scheme (Perry, 1970).

Within Position Three, Multiplicity Subordinate, individuals began to accept the idea of there being truth in multiple perspectives. Additionally, uncertainty about truths became inevitable, as "uncertainty implies the legitimacy of a multiplicity of answers" (Perry, 1970, p. 92). Individuals then became agents in grappling with uncertainty, thus

taking ownership over their ability to question and discern. Uncertainty was also viewed as temporary (Perry, 1981), meaning that individuals within this position may believe that truth exists. However, such truth was temporarily unknown.

The next group of positions constituted the realization of relativism. Relativism implied that while a diversity of opinions, truths, and values exist, they were not all equally valid. Furthermore, context informed what was considered knowledge. Lastly, individuals working within commitment were able to make decisions based on the relativistic nature of opinions and values (Perry, 1981). Within Position Four, Relativism Subordinate, individuals still were not independent in their thought. There was still a reliance on authority figures. For example, individuals thought that it is desirable by authority figures to think "relativistically." Students weighed the multiple perspectives of information. The world was still assumed to be dualistic, meanwhile incorporating Multiplicity and Relativism into one's scheme (Perry, 1970). Within Position Four, authorities still held right and wrong answers, but also recognized that authorities may not have all the answers. When this was the case, any opinion could be valid (Perry, 1981).

The fifth position was called Relativism Correlate, Competing, or Diffuse. Within this position, authorities no longer possessed absolute knowing. There was no longer one authority but multiple authorities (Perry, 1970). Individuals then had a sense of agency in knowing. This agency manifested itself in individuals' desires to explore different perspectives (Perry, 1981).

The sixth position was called Commitment Foreseen. Perry (1970) claimed that commitment "refers to an act, or on-going activity relating a person as agent and chooser

24

to aspects of his life in which he invests his energies, his care, and his identity" (p. 135). Within this position, individuals realized that there was a need to accept certain truths and that the acceptance of certain truths meant that there must be a rejection of others (Perry, 1981). Position Six also required that individuals connect their identities and values to decisions about truth and realities (Perry, 1970).

Positions Seven, Eight, and Nine comprised the group called Evolving Commitments. These positions were not as distinctly different from one another in the sense that there are not clear lines between an individual's progression from one to another. In essence, the last three positions were seen as "degrees of ripening in an art" (Perry, 1970, p. 153). Position Seven constituted individuals' actions to make decisions for themselves in certain areas of their lives. Meanwhile, Position Eight "describe[d] a level of experience in which the stylistic issues of Commitment have emerged in greater prominence over external forms" (p. 154). Position Eight involved an individual's approach to following through on a commitment. Lastly, Position Nine entailed the integration of commitments with personal meaning into an individual's identity.

The process by which individuals moved to subsequent positions was complex. Advancing to a new position required work that encompassed reconceptualizing an individual's schema, thus relearning and unlearning previous knowledge (Perry, 1970). Individuals who moved from one position to another for a significant amount of time did so because they engaged in what was called temporizing behavior. Similarly, individuals established commitments, thus relying on multiplistic and relativistic thinking, avoided decision making and used an escape mechanism to do so. Lastly, individuals who

regressed to dualism as a result of a desire to avoid examining the world in a complex

manner were said to have retreated (Perry, 1981).

Although the Perry (1970, 1981) scheme has been foundational in providing a

progressive, organized manner of understanding how college students move through their

intellectual and ethical development, it is not a model for development that is entirely

inclusive. First, the Perry scheme was developed using a sample of White college-aged

men at an Ivy League institution. Having a sample that lacks ethnic and racial diversity

may bias the model in terms of its application to more diverse student populations.

Additionally, Knefelkamp (1999) noted that the scheme assumes "a more mature student

moves through the levels of thinking complexly and is able to develop 'independence' of

thought and judgment" (p. viii). This assumed goal of the Perry (1970, 1981) scheme is

problematic because the concept of 'independence' is more congruent with Western

forms of culture in which collectivism is not of greatest value. Furthermore, traditional

conceptions of development, such as Perry (1970, 1981), do not take into account the

roles in which privilege, power, and culture play in one's development (Tanaka, 2002).

Epistemological Reflection Model

To conceptualize thinking and knowing, Baxter Magolda (1992) developed the

Epistemological Reflection Model. Baxter Magolda developed this model using a sample

of 101 male and female traditional-aged college students at a public Midwestern

university. This model presented four ways of knowing across five domains. These

ways of knowing included absolute, transitional, independent, and contextual knowing.

The domains included the role of learner, role of peers, role of instructor, evaluation, and

nature of knowledge. This model increased in cognitive complexity from absolute to

contextual knowing. Most common among college freshmen, absolute knowers viewed knowledge as certain. Authorities possessed all knowledge and answers. Meanwhile, transitional knowers believed that absolute knowledge existed, but that there were certain instances in which there may be uncertainty. Independent knowers were characterized by their understanding that knowledge was generally uncertain. The last and most complex way of knowing was contextual knowing. Specifically, contextual knowers understood that knowledge was uncertain and that some knowledge was more legitimate than others. Lastly, "patterns of knowing that appeared to be gender-related in previous ways of knowing seem[ed] to converge in the contextual perspective" (p. 57).

Although Baxter Magolda's (1992) model suggested that individuals transitioned in their knowing and that knowing was dependent upon context, there was some criticism of her conception of knowing. Welte (1997) argued that discussing individuals as types of knowers suggested that individuals could be described as one type of knower. Additionally, Welte contended that individuals experienced context-dependent ways of knowing. This notion of context-dependent knowing was supported through recent research in which college students were found to have exercised different, desirable ways of knowing in curricular and personal settings (Pizzolato, 2006).

Women's Ways of Knowing

Baxter Magolda's (1992) research suggested that the trajectory toward more complex ways of thinking was divergent for men and women in the less complex stages and convergent as individuals' thinking became more complex. This notion of gender difference in knowing was further supported by the work of Belenky, Clinchy, Goldberger, and Tarule (1997) in *Women's Ways of Knowing*. Belenky et al.'s

qualitative study of women explored self-reported gaps that women experienced in learning environments. This study using 135 women resulted in five ways of knowing called silence, received knowledge, subjective knowledge, procedural knowledge and constructed knowledge.

Silence was marked by a lack of voice and represented "an extreme in denial of self and in dependence on external authority for direction" (Belenky, et al., 1997, p. 24). Women in Silence were disconnected from the meanings and usage of language. Meanwhile, women who used Received Knowledge as a way of knowing found that words and language were integral to their knowing because they were listening-oriented. Received Knowers operated from a dualistic framework, in which they lacked the confidence necessary to make judgments about right and wrong. Subjective Knowledge, on the other hand, was a position in which truth was "personal, private, and subjectively known or intuited" (p. 54). Individuals who were subjective knowers value personal experience as a means of truth and understanding. Procedural Knowledge was characterized by truths that were not simply known because of one's personal experience. This form of knowledge also required that individuals sought analysis to discern what an objective truth was. Lastly, Constructed Knowledge was the integration of self with knowledge. Belenky et al. wrote that within this type of knowledge "*All knowledge is constructed,* and *the knower is an intimate part of the known*" (p. 137, italics in original text).

In sum, the cognitive-structural theories described above were indicative of the use of stages in describing how cognitive development progresses. In doing so, these developmental theories and models focused primarily on where in individual is in their

development and the lenses from which they understood their environments, rather than the environment itself. Despite their thoroughness of developmental progression, these theories did not provide a means for understanding what specific aspects of an individual's world may prompt progression. Furthermore, the theories served as general descriptors of development rather than depictions of specific cognitive skills and tasks. If the environment played an integral role in influencing development (Dewey, 1938; Piaget, 2001), then it is essential to better understand how these environments function.

College impact literature has worked to address this issue with its focus on identifying specific aspects of the college environment and how they affect change in students during their matriculation in college (Astin, 1993; Pascarella & Terenzini, 2005). Although college impact research does not directly investigate the internal processes involved in learning and development, it provides a structure for examining the environmental and involvement aspects of college that are believed to promote progression in students' development.

Assessing Learning

While college impact literature (Astin, 1991, 1993; Pascarella & Terenzini, 2005) has provided frameworks for assessment and research, it has not specified the exact methods that are most beneficial for measuring student learning. Literature specifically related to assessment has addressed the issue of how to measure and examine learning that is believed to occur on college campuses. Examining student learning is beneficial in that "exploring reasons why students are not achieving our expectations stimulate specific discussion about ways to improve sets of educational practices" (Maki, 2004, p. 3).

Measures for assessing student learning have been varied and chosen based on the desirability of the methods for assessing learning. Assessment requires "developing a comprehensive understanding of the dimensions of student learning [that] involves the selection or design of direct and indirect methods" (Maki, 2004, p. 88). Student learning has been assessed primarily through two methods: direct and indirect assessments (Maki; Suskie, 2009). Although direct and indirect methods are commonly used in higher education assessment and research, they both bear their unique challenges and opportunities.

According to Maki (2004), direct methods of assessment require students to demonstrate learning in specified domains, such that an observer to draw evidence-based conclusions on the students' learning. A commonly used type of direct assessment is standardized instruments for learning. Encompassing content within a domain, standardized instruments are objective tests, created by psychometricians, which assess content, knowledge, or tasks. Another important aspect of standardized instruments is that they are norm-referenced, such that "the meaningfulness of scores on tests…is derived by comparing the individual examinee's performance with the performance of others" (Crocker & Algina, 2006, p. 69). Within higher education, commonly used standardized instruments include the Collegiate Assessment of Academic Proficiency, Collegiate Learning Assessment, Graduate Record Exam, Measure of Academic Proficiency and Progress, and Watson-Glaser Critical Thinking Appraisal. Although there are some benefits to using standardized instruments to assess learning, these instruments do not capture the complexity of learning or specifically address specific environments of interest that are believed to relate to learning (Maki).

On the other hand, indirect methods of assessment are also used to assess student learning. Indirect assessment methods consist of perceptual measures of students' learning and the educational environment, thus not providing evidence of learning (Maki, 2004). Indirect measures often serve as proxies that suggest learning has occurred since they rely on self-reported data. Examples of indirect measures of learning include self-reported surveys such as the College Student Experience Questionnaire or the Noel-Levitz Student Satisfaction Inventory. Indirect methods of learning such as these are deemed less compelling than direct methods of learning (Suskie, 2009). Since these methods may be less compelling, they are best used in tandem with direct methods of learning, rather than in place of them (Maki).

Furthermore, it is not only important to consider how student learning is assessed, but it is also important to consider what contributes to student learning. According to Suskie (2009), institutions need to take in to account what she referred to as the learning context. The learning context "refers to the environment in which the learning process takes places, particularly those aspects that might affect the learning process and/or its outcomes" (p. 99). In specific terms, the learning contexts may include campus environments such as courses, co-curricular programs, peers, faculty, and mentors (Maki, 2004; Suskie). In addition to having an understanding of what campus environments may potentially have an effect on student learning, it is necessary to have a sound understanding of how student learning will be measured and operationalized.

Cognitive Domain Outcomes Operationalized

Cognitive Complexity

To grow cognitively and increasingly complex has been the crux of theory associated with intellectual and cognitive development (Baxter Magolda, 1992; Belenky, et al., 1997; Perry, 1970, 1981; Piaget, 2001). Although student development theories have served a primary role in characterizing the development of college students, in actuality these theories are not always used to operationalize different types of cognitive skill development in the research that addresses growth in cognitive skills. Cognitive development is composed of a number of intellectual abilities such as communication, objective reasoning, drawing conclusions, and evaluation (Pascarella & Terenzini, 2005). For example, according to the NSLLP, cognitive complexity is defined as perceived growth in "the ability to critically analyze, to learn on one's own, to learn new material, and to understand relationships between ideas" (Inkelas, Vogt et al., 2006, p. 58).

Critical Thinking

The ability to think critically is another common aspect of cognitive skill development. Many researchers have noted that there is no one single definition of critical thinking (Pascarella & Terenzini, 2005). However, there are common elements among the different ways in which critical thinking is conceptualized. Pascarella and Terenzini reported that some critical thinking included recognizing relations, drawing conclusions, interpreting data, and solving problems. Similarly, Jones et al. (1995 cited in Erwin, 2000) identified the following skills as comprising critical thinking: interpretation, analysis, evaluation, inference, presenting arguments, reflection, and dispositions. In their study of living-learning programs, Inkelas, Vogt et al. (2006)

considered critical thinking to be a process by which an individual makes meaning. This meaning-making process is comprised of the ability to analyze and consider contrary viewpoints. In addition to specific cognitive tasks, Suskie (2009) offered that critical thinking is characterized by a "healthy skepticism about facts and arguments" (p. 85). Previously defined tasks associated with critical thinking appear to be similar among higher education researchers. What is of most importance to understand is that critical thinking is not one singular skill, rather it is a collection of skills.

Pascarella and Terenzini (2005) wrote that critical thinking "involves both cognitive skills and the dispositional openness or willingness to apply those skills" (p. 157). The disposition toward critical thinking has been examined empirically through the use of the California Critical Thinking Disposition Inventory (CCTDI) (Giancarlo & Facione, 2001). The CCTDI consists of seven latent constructs related to the disposition to think critically: truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgment. The dispositional aspect of openness as a salient part of cognitive growth is not entirely unique to critical thinking.

Liberal Learning

The Association of American Colleges and Universities (2011) has been a leading champion of liberal education, as it is central to the organization's mission. Through the *Greater Expectations* document, AAC&U (2002) declared that liberal education is "[a] philosophy of education that empowers individuals, liberates the mind from ignorance, and cultivates social responsibility" (p. 25). Another critical aspect of liberal education is that it is focused on the manner in which students learn and think rather than particular

33

information and content. Within this same vein, growth in liberal learning is marked by students' inclination to be open to and appreciate new ideas and different points of view (Inkelas & Weisman, 2003).

Liberal education agendas in higher education have been said to foster such openness, as well as important aims such as the cultivation of intellectual judgment, social responsibility, and integrative learning (Schneider, 2004). These aspects of liberal education not only take in to account the development of analytic skills and appreciation for difference, but also the purposeful application of these skills across multiple contexts (Chezchowski, 2003; Laff, 2006). Although research has shown that these skills associated with liberal education are sometimes not seen as necessary by students (Humphreys & Davenport, 2005), a comprehensive "liberal education *is* a practical education because it develops…those capacities needed by every thinking adult" (AAC&U, 2002, p. 26, emphasis in original text).

The college context is one in which the development of domains such as cognitive complexity, critical thinking, and liberal learning can occur. Learning can occur in many experiences in college. Within the college setting opportunities for students to engage with one another and across disciplines are often cultivated in experiences in which students are part of a community of learners. Opportunities such as learning communities, in their most generic form, are one example that "empower[s] participants to see their roles and relationships in new ways" (Smith, 2003, p. 1). Learning communities, specifically living-learning programs, are believed to possess the capacity for intentionality in structuring learning opportunities to address development in cognitive domains.

Living-Learning Programs

The modern day living-learning program (LLP) grew out of the revolutionary Experimental College at the University of Wisconsin in 1927 (Meiklejohn, 2001). Meiklejohn (2001), an early education reformist and scholar, asserted that within the context of a large public university, "students live as scattered individuals, or in accidental or relatively meaningless groups" (p. 248). He believed that the lack of organization of students was not educationally beneficial. The Experimental College addressed this problem, as it restructured the first two years of college so that the undergraduate experience was more conducive to meeting the educational aims and values of a liberal education. Through the establishment of smaller groupings of faculty and students—learning communities—within the Experimental College, the environmental conditions of the undergraduate experience were designed for engagement in more enriching relationships within and outside of the classroom among students and faculty through intentional pedagogical practices.

Presently, LLPs have continued to serve as an innovative programmatic initiative on college campuses to enhance the college experience. Within the contemporary LLP, "*living* and *learning* are combined seamlessly in students' college experience" (Inkelas & Weisman, 2003, p. 335, italics in original text). The living aspect of LLP requires that students live in designated spaces within residence halls. Meanwhile, the learning aspect of LLPs entails curricular and co-curricular programming and experiences intended specifically for students residing in the assigned LLP space (Inkelas & Associates, 2008).

The underlying purpose behind LLPs remains consistent with the reason for the creation of the Experimental College (Meiklejohn, 2001). The presence of LLPs at

universities provide intentional methods of supporting learning by making the university feel smaller within curricular and co-curricular contexts (Inkelas & Weisman, 2003; MacGregor, Smith, Matthews, and Gabelnic, 1997, cited in Shapiro & Levine, 1999; Terenzini & Pascarella, 1994). The design of LLPs is consistent with characteristics that Shapiro and Levine offered as being associated with learning communities. Despite the lack of agreed upon definition of learning communities, Shapiro and Levine (1999) contended that common characteristics of learning communities include the following: a) the arrangement of students and faculty into more intimate groups, b) an integrative curriculum, c) assistance with creating curricular and social support systems, d) opportunities that help students become acclimated to cultural aspects of an institution, e) intentionality of the fostering of faculty relationships, f) a focus on learning outcomes, g) community-oriented means of delivering curricular support initiatives, and h) means for focusing on the experience of first-year students.

What has separated LLPs from the most basic forms of learning communities is the notion of a shared living space (Inkelas & Associates, 2008; Inkelas & Weisman, 2003). The inclusion of living space within the learning community structure requires connections between curricular and co-curricular units through partnerships between academic departments and student affairs units (Masterson, 2008). Although there is no prescribed way in which these partnerships should be structured, it is assumed that, jointly, the curricular and co-curricular spheres of the college environment can come together to create a cohesive environment to promote learning and development.

Cognitive Outcomes and Residential Environments

The residential environment contains opportunities to "compliment and extend the formal curricula with purposeful learning engagements" (Luna & Gahagan, 2008, p. 3). Connections with the campus residential environment have been considered in terms of cognitive growth. Campus residential environments have been studied widely in terms of their impact on academic achievement (Stassen, 2003) and perceptual measures of the academic environment (Schussler & Fierros, 2008). However, the body of research on the role of the residential environment on specific cognitive skill development is modest. For example, Flowers (2004) examined intellectual skills among African American students in order to understand if living on- or off-campus resulted in markedly different educational gains. The study was conducted using items from the College Student Experiences Questionnaire and included a sample over 6,000 students, representing 212 institutions. The findings from the study revealed that living off-campus did not have an effect on self-reported gains among African American students.

As indicated earlier, colleges and universities have used LLPs as interventions to promote learning and development. Differences in LLP types and the institutions in which they are housed have been considered in previous research about cognitive outcomes (Inkelas, Vogt, et al., 2006; Inkelas & Weisman, 2003). In an examination of the effect of different types of LLP foci, using data from the National Study of Living-Learning Programs, students who participated in LLPs reported a greater desire to learn about multiple perspectives compared to their peers in a traditional residence hall (Inkelas & Weisman, 2003). However, differences in cognitive complexity among LLP and

traditional residence hall students could not be accounted for by their participation or lack of participation in LLPs (Inkelas, Vogt, et al., 2006).

The literature that specifically addresses the contribution of LLP participation to growth in cognitive outcomes tends to be comparative in nature. The aforementioned studies examined growth in cognitive outcomes by comparing residential students to non-residential students and LLP participants to non-LLP participants. Much is to be learned about specific factors that contribute to perceptions of growth in cognitive domains in LLP participants alone. Further review of the extant research on college environmental factors that contribute to learning and growth will be reviewed.

Review of Literature Related to Independent Variables

The following literature addresses the independent variables from the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) that may be related to cognitive outcomes. Specifically, the research that will be reviewed relates to the student background characteristics, curricular environment and co-curricular environment associated with cognitive outcomes.

Student Background and Pre-college Traits

Student background characteristics involve elements of an individual that are unchanging prior to and after a student's matriculation in to college (Astin, 1991, 1993). Common student background characteristics that are often taken in to account within educational research include factors related to demographics and prior academic achievement. Furthermore, the inclusions of such characteristics are essential to take in

38

to consideration because of potential differential effects of the impact of interventions and experiences in college on certain student populations (Pascarella, 2006).

Race and ethnicity.

Race and ethnicity commonly are characteristics that are taken in to consideration within educational research. However, Kugelmass and Ready (2011) noted that studies that examine racial and ethnic differences in academic growth are limited, with the exception of the exploration of racial/ethnic conditional effects in Pascarella and Terenzini's (2005) review of research related to cognitive development.

In terms of examining the effect of race and ethnicity on cognitive gains in postsecondary education, some research has focused exclusively on differences between African American and White students. Flowers and Pascarella (2003) offered that it is important to examine further the experiences of African American students in order to understand their experiences and interactions inside and outside of the curricular context. In their longitudinal, multi-institutional study on gains in cognitive skills between African American and White students, Flowers and Pascarella used data from the National Study of Student Learning and the Collegiate Assessment of Academic Proficiency to examine critical thinking, writing comprehension, and knowledge acquisition. This study yielded results that indicated African American students change less in their cognitive growth during college than White students. With regard to critical thinking, White students experienced greater gains in critical thinking compared to African American students during the first three years of college.

However, contrary results occurred in Flowers' (2003) study on self-reported learning gains among African American and White students. One element of learning that

was assessed included intellectual and writing skills. This study used College Student Experience Questionnaire data from a sample of approximately 97,000 African American and White students at 201 predominantly White institutions. Flowers concluded from the data that African American students reported more growth in intellectual and writing skills than White students. Although the Flowers and Pascarella (2003) and Flowers (2003) studies were conducted using different samples, it may be possible that the differential results of these studies could be attributed to differences in self-reported and standardized approaches to measuring outcomes.

Departing from comparison studies among solely African American and White students, Kugelmass and Ready (2011) took a different approach to examining racial/ethnic differences in cognitive outcomes. The researchers sought to understand the extent to which enrollment in college contributes to student learning by examining College Learning Assessment (CLA) data within a hierarchical linear modeling framework. The sample consisted of over 35,000 seniors at 245 colleges and universities who took the CLA in 2006, 2007, and 2008. Another important aspect of this study is that the sample included students who identified as African American, Asian, Hispanic, White, or other racial/ethnic background. The results of this study showed that the seniors from underrepresented racial/ethnic groups demonstrated weaker cognitive skills at the end of college, with the greatest differences between African American and White students. However, it is important to note that the results could be explained by academic disparities that were present at the start of college, particularly for African American and Hispanic students in the sample. Even more troubling is that the gap in learning widened between African American and White students over the course of college, indicating that

African American students learned less than White students. Meanwhile, the gap for Hispanic students remained consistent from the beginning of college to the senior year.

Another unique aspect of the Kugelmass and Ready (2011) study was the use of institutional characteristics in the study, namely the influence of peer socio-demographic variables. Additional results from their study showed that African American students benefitted in their learning more when attending more selective institutions, as measured by median SAT scores, with increased levels of African American enrollment. Indeed, Kugelmass and Ready (2011) and Flowers and Pascarella (2003) arrived at similar conclusions regarding differences between African American students' learning compared to White students. However, the inclusion of institutional variables in Kugelmass and Ready's study helps to contextualize student learning by acknowledging structural differences in postsecondary learning environments.

Gender.

When considering gender, modest at best, differences in cognitive skills and outcomes have been found in prior research. King, Wood, and Mines'(1990) research examined gender differences in cognitive development among 80 undergraduate seniors and graduate students. Cognitive development was measured using the Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1964 cited in King, et al.), Cornell Critical Thinking Test (Ennis & Millman, 1971 cited in King, et al.), and Reflective Judgment Interview. Results from their study indicated that men scored higher than women in all three cognitive metrics included in the study. Although a gender effect was found in their study, it is not clear if differences in cognition can be attributed solely to gender. Gender differences could be confounded by differences in academic ability

(King, et al.) or other variables such as other demographic characteristics or collegiate experiences. Additionally, this study only examined differences at one time point. Thus, it does not capture differences or growth in cognitive abilities over time.

The findings from the King et al. (1990) study have been supported in subsequent research studies. Li, Long, and Simpson's (1999) study of self-perceived gains in critical thinking demonstrated that women reported lower gains in critical thinking compared to men. Additionally, a study of self-reported change in problem solving and critical thinking skills by Appling (2001) found that men exhibited higher levels of academic self-concept than women. In turn, the study revealed that academic self-concept was positively linked to changes in problem solving and critical thinking. The research supports that there is a gender effect; however, it remains unclear how men and women differ.

More recent research continued to support the notion that there was variation in cognitive abilities according to gender. However, the gender difference has been that women have scored higher than men on their level of engagement in activities that promote cognitive growth. Pasque and Murphy's (2005) single-institution study on academic achievement and intellectual engagement among students residing in living-learning programs and traditional residence halls produced some results that indicated relationships between gender and sexual orientation and intellectual engagement. Within their study, Pasque and Murphy operationalized intellectual engagement through use of a scale consisting of questions related to critical thinking, socio-cultural discussions, and curricular and co-curricular faculty engagement. Findings from the study revealed that women exhibited higher levels of intellectual engagement compared to men. Although

42

the research of Pasque and Murphy exhibited differences between men and women in terms of intellectual engagement, their findings should be used cautiously due to the sample size and small effect sizes of the differences.

Socioeconomic status.

There appears to be limited research on connections between socioeconomic status and cognitive skill outcomes. Among students in campus residential environments, students from lower income backgrounds reported higher levels of intellectual engagement (Pasque & Murphy, 2005). Astin's (1993) work, however, provided somewhat contradictory information on the relationship between socioeconomic status and cognitive skills. The socioeconomic status of the peer environment was derived from the educational levels of mothers and fathers and parental income of freshman students within the institution. Astin found that the socioeconomic status of the peer environment in college had a positive effect on critical thinking abilities, meaning that higher socioeconomic statuses of the peer group resulted in an individual's ability to exhibit great critical thinking abilities. Although Astin demonstrated that there are direct effects between socioeconomic status and cognitive skills, research by Appling (2001) suggested that the relationship between socioeconomic status and cognitive skills is indirect. In Appling's study of problem-solving and critical thinking skills, using longitudinal data from the Cooperative Institutional Research Program, she revealed that socioeconomic status is a factor in students' participation in activities that are directly related to self-reported changes in problem solving and critical thinking.

An important dimension of socioeconomic status is parental education attainment, which has been examined in educational research at the college level. Parental education

has been hypothesized as playing a role in students' college experiences. Of particular interest is the experience of students who are considered first-generation, or students whose parents' highest completed educational experience is a high school degree. There does not appear to be research that supports any direct relationship between parental education levels and cognitive gains in college. For example, Kim and Sax (2009) reported that there was no difference among between first-generation and non-first-generation students in their critical thinking abilities when accounting for interaction with faculty. Although there was no direct effect with critical thinking abilities, it may be possible that parental education may influence students' propensity to engage with faculty inside and outside of the classroom because it is a beneficial form of social capital for learning about the college environment (Pascarella & Terenzini, 2005; Perna & Titus, 2005).

Prior academic achievement.

Another critical element of the students' pre-college experience is prior academic achievement. Standardized measures, such as the Scholastic Aptitude Test (SAT) and American College Test (ACT), and high school grade point averages have been used as proxies for pre-college academic achievement because they measure both verbal and quantitative skills, which are associated with cognitive skills in college (Appling, 2001; Astin, 1993; Klein, Kuh, Chun, Hamilton, & Shavelson, 2005; Li, et al., 1999; Pascarella & Terenzini, 2005). Appling found that seniors with higher SAT scores exhibited greater academic self-concept, which was linked to gains in self-reported changes in problem solving skills and critical thinking skills. This study suggested that prior academic

achievement is not directly linked to cognitive skill development. These measures may not only suggest achievement, but also academic preparedness.

Structural/Organizational Characteristics of Institutions

The broader institutional environment of a college or university may also be related to the development of certain cognitive skills. In their review of cognitive and intellectual growth, Pascarella and Terenzini (2005) examined literature related to institutional effects associated with critical thinking abilities. Pascarella and Terenzini demonstrated, through extant research, that institutional aspects of the college experience had inconsistent effects on critical thinking. The specific institutional aspects that were addressed were selectivity, size, type, and overall characteristic of the environment. Hu & Kuh's (2003) study that examined institutional differences in student gains among various Carnegie classification types supported the notion that there is a limited, small institutional effect on summative student gains. Within their study, gains were represented by a summative score in areas such as intellectual and vocational skills and general education. All in all, the literature suggests that there are limited effects of institutional characteristics on cognitive outcomes. While institutional characteristics account for minimal, if any, differences in cognitive outcomes, more proximal aspects of the college environment may have a more profound effect on students in cognitive domains.

Interactions with Agents of Socialization

A central aspect of the college impact literature is the role that environments contained within the institution play in affecting change in student outcomes. Some scholars have explicitly conceptualized these environments as consisting of individuals

and the socializing effect they have on students with the broader campus environment (Pascarella, 1985; Tinto, 1993; Weidman, 1989). Namely, the literature around socialization within the institutional environment points to the critical role that students' peers and faculty have on their development while in college. The specific aspects of socialization that will be explored further are the influences of the following environments: academic major, faculty, and peers.

Academic major.

One of the most salient aspects of the curricular environment among college students is the major course of study. This salience can be attributed to the fact that "major fields of study constitute academic subenvironments or contexts within which a substantial portion of students' academic experiences take place" (Paulsen & Wells, 1998, p. 366). Furthermore, the academic major is a conduit for interactions students have with faculty and peers.

Despite being well-studied, the relationship between the academic major cognitive outcomes is inconclusive (Pascarella & Terenzini, 2005). Using the Biglan (1973) typology for characterizing academic majors, Appling (2001) hypothesized that there would be a direct relationship between the academic major and changes in self-reported critical thinking and problem solving skills. Rather, the findings of her study yielded results that indicated there was not a relationship between majors and problem solving and critical thinking.

Rather than comparing different major courses of study, Brendal, Kolbert, and Foster (2002) explored cognitive outcomes within a specific course of study. By examining changes in moral reasoning and cognitive complexity among graduate

students over the course of a two-year master's degree program in counseling, Brendal et al. were able to determine that students' exhibited significant differences in their ability think more complexly. Meanwhile, there were no significant differences in their moral reasoning. The changes in cognitive complexity were suggested to have occurred because of the explicit programmatic focus on the development of complex cognitive skills and experiential learning. Although Brendal et al.'s research focused on a very specific graduate student population, there is much to learn from this study. The study suggested that intentionality in the design of a major is critical in order for the major course of study to serve as a conduit for advancing cognitive skills. Furthermore, Tapper's (2004) work on undergraduate students' perception of critical thinking within the academic major led to a similar conclusion. In Tapper's study, students perceived that they needed to think critically when instructors intentionally incorporated activities requiring the application of critical thinking skills as course expectations.

The concept that the major plays an indirect role in the development of cognitive skills is also supported in a previous study by Li et al. (1999). Through their study of perceived gains in the cognitive skills of critical thinking and communication, there were no differences in cognitive skill gains among different majors according to the Biglan (1973) typology. Rather, the academic major served as a means of promoting academic and social integration, both of which were linked to advancing gains in critical thinking within the study.

Although much of the literature associated with the proposed relationships between the academic major and cognitive skills does not point to defined positive or adverse relationships, Astin's (1993) study of undergraduate students drew conclusions

regarding the positive and negative effects certain majors have on cognitive skills. Students who majored in education or the arts experienced lower analytical and problem solving skills compared to their counterparts in other majors. Meanwhile, taking science and history courses had positive effects on critical thinking abilities.

Undoubtedly, the research on the connection between the academic major and cognitive skill development is not conclusive. The research on cognitive skill development primarily uses self-reported data from students. The use of self-reported data on studies concerning the academic major and cognitive growth, however, may be biased in that students from different majors may make meaning of cognitive skills differently (Astin, 1993).

Faculty.

Characteristics of the college environment related to faculty and the amount of interactions students have with faculty have been linked to numerous positive educational outcomes (Astin, 1993). What these student-faculty interactions entail depends on how they are understood by both students and faculty. Based upon data from a qualitative study using grounded theory, Shaw and Creamer (1984) developed a typology of students and how they are led to interact with faculty by using grounded theory as the methodological frame for studying 26 students at a large university. This typology and subsequent theoretical model for student-faculty interaction was derived from the data conceptualized student-faculty interactions as possessing two properties. First faculty interactions were characterized by the frequency of interaction, such that frequency was described as either being low or high. Secondly, student-faculty interactions were described according to the topical nature of discussions that occur within them. For

example, topics discussed during student-faculty interactions included areas such as course-related or career discussions. An important notion central to their model was that students' perceptions of the college environment influenced the motivations and degrees of interactions with faculty. Accordingly, more positive perceptions of the college environment, specifically the role of faculty, prompted more positive types of interactions with faculty. Shaw and Creamer's research provided a necessary frame for understanding that the nature of student-faculty interactions, which encompassed not only the type of interaction but also the duration of interaction.

Although student-faculty interactions may come in a variety of forms, they have often been commonly understood as interactions that occur either within or outside of the classroom and formally or informally (Astin, 1993; McHugh Engstrom, 2008; Thompson, 2001). McHugh Engstrom noted that whether student-faculty interactions occur within or outside the classroom context, they both provide opportunities that will help advance students' success in college. The research on student-faculty interactions is vast in terms of how these interactions in multiple contexts advance student learning.

Student-faculty interaction outside of the classroom has been studied frequently in higher education research. Interaction with faculty outside of the classroom context, such as time spent with faculty in their homes, has been positively related to gains in critical thinking abilities (Astin, 1993). Astin further found that there was a positive relationship between student-faculty interaction and growth in analytical and problem solving skills. Other research by Thompson (2001) arrived at similar conclusions regarding the benefit of interaction with faculty. Using data obtained through the Community College Student Experiences Questionnaire (CSEQ), Thompson examined the influence of informal

interaction with faculty on the quality of effort students exercised in mathematics and science courses in the community college setting. Within this study, informal interaction constituted "the amount of time a student communicates with faculty members apart from the general classroom interaction" (p. 41). From his analysis, Thompson found that greater amounts of informal student-faculty interaction was beneficial in that was directly associated with positive gains in students' perceptions of their educational gains in their courses.

In their recent longitudinal study of student-faculty interaction, Kim and Sax (2009) explored the relationship between student-faculty interaction and series of educational outcomes, one being critical thinking, among the following demographic characteristics: gender, race, social class, and first-generation student status. The types of student-faculty interaction of interest in this study were research- and course-related faculty interaction. Wholly, the results of their study indicated that interacting with faculty through research projects or within the classroom contexts related positively to critical thinking. However, research-related faculty interaction only resulted in greater critical thinking gains for middle- and upper-class students. Additionally, course-related faculty interaction was significantly and positively related to gains in critical thinking among Latino and Asian American students and not for African American and White students. In contrast to previous findings suggesting that student-faculty interaction is generally beneficial, Kim and Sax's findings suggested that student-faculty interaction is actually conditionally beneficial.

Cruce et al. (2006) examined broader aspects of learning domains such as cognitive development and orientations by using elements of Chickering and Gamson's

(1987) seven principles for good practice in undergraduate education. From their multi-institutional study, Cruce et al. used data from a sub-sample of nearly 3,900 first-year students in Fall 1992 and Spring 1993 data collections involving data from the Collegiate Assessment of Academic Proficiency (CAAP), CSEQ, and National Study of Student Learning. Their study yielded interesting findings related to faculty interaction and student learning. When examining effective teaching practices and interaction with faculty, they found that they had significant positive total and direct effects on critical thinking gains, as measured by the CAAP, and openness to diversity and challenge.

Peers.

Even though faculty are by default positioned to influence student learning by their roles inside the classroom, students' peers can also play a critical role in reported learning gains. Researchers have noted that one of the most influential elements of the college environment is students' peer groups, with peers having effects within academic and social contexts of the college experience (Astin, 1993; Pascarella & Terenzini, 2005). For example, Rugutt and Chemosit (2009) demonstrated in their single-institution study of nearly 2,200 students that greater interactions with peers was related to an increased motivation to learn. Similar results related to motivational aspects of learning were found when considering interactions with diverse peers (Nelson Laird, 2005) and conversations about racial and ethnic issues (Astin, 1993). In particular, interactions with diverse peers resulted in positive gains in students' openness to consider multiple perspectives within a study that examined subscales of the California Critical Thinking Dispositions Inventory (Nelson Laird). An even more important finding that emerged from Nelson Laird's study was the importance of the quality of diversity interactions. Students who reported

positive diversity interactions had a positive effect on confidence in critical thinking abilities. Meanwhile, negative diversity interactions resulted in a negative effect on critical thinking confidence. These findings are critical given the importance of effects of socio-cultural influences on perceptual aspects of learning such as confidence and motivation.

Involvement in co-curricular experiences such as student organizations has been a hallmark of social aspects of the peer environment. Co-curricular involvement with peers may occur with individuals or in group settings. Student organizations are a common and important type of group-oriented student involvement experience, since they constitute a specific type of microenvironment for promoting learning (Whipple & Sullivan, 1998).

Greek-lettered organizations are one example of student organizations that has a small body of research examining their relationships to cognitive growth. Results from the National Study of Student Learning showed that fraternity men demonstrated small gains in critical thinking during the first year of college compared to men who were not in fraternities (Pascarella, 2001). These effects were not found to persist after the first year of college. Similar negative impacts were found when taking into consideration openness and confidence in critical thinking (Nelson Laird, 2005). However, Nelson Laird's study revealed that this negative effect was for involvement in fraternities and sororities, while Pascarella (2001) found no differences between women in sororities and those not in sororities. What remains unclear from studies on the relationship between involvement in these organizations and learning are the specific aspects of fraternity and sororities that may inhibit or promote learning within specific domains.

Furthermore, Cruce et al.'s (2006) study of the effects of good practices on cognitive development took in to a more holistic approach to examining the effects of peers on student learning. In their study, they used a composite measure to operationalize peer interaction. Their measure of peer interaction encompassed interactions that students have with one another in curricular and co-curricular settings such as cooperative learning and cultural and interpersonal involvement. The results of Cruce et al.'s study revealed that interactions with peers had significant total and direct effects on learning related to higher-order cognitive tasks learning for self-understanding.

Quality of Effort

Within the curricular environment, there are specific activities associated with students' participation in that environment. Pace (1984) coined the concept of quality of effort, asserting that "all learning and development require an investment of time and effort by the student" (p. 5). Within the quality of effort concept, time involved the frequency or duration of engagement in an activity and effort encompassed the quality of the educational activity (Pace, 1982, 1984). The notion of quality of effort became important because it attempted to promote a more shared responsibility for learning. From a quality of effort standpoint, institutions have the responsibility to provide resources to students that support learning, while students are responsible for the "amount, scope, and quality of effort they invest in their own learning and development" (Pace, 1982, p. 2).

Quality of effort has been associated with activities that were curricular and co-curricular in nature. Through the creation of the quality of effort scale in the College Student Experiences Questionnaire, Pace (1984) indicated that quality of effort related to

activities such as course-related learning, use of campus facilities, peer and faculty interaction, and co-curricular involvement. More recently, however, Hu and Kuh (2003) associated quality of effort with student engagement in that "student engagement represents the quality of effort students expend on using the institution's resources and facilities, such as the amount of time they spend studying or using the library" (p. 185).

Course-related activities related to quality of effort are of special importance as they are often associated with levels of cognitive effort, such that greater levels of effort in this regard are believed to promote knowledge and understanding (Pace, 1982). An example of one of these activities is studying and the completion of homework. Astin's (1993) study of undergraduate students produced results that indicated studying and doing homework had a positive relationship with critical thinking abilities and analytical and problem solving skills, meaning, the more students studied or did homework, the more they were able to demonstrate gains in the cognitive skills.

Using the College Student Experiences Questionnaire, Hu and Kuh (2003) explored the relationships among institutional differences, quality of student effort, and student gains by testing a learning productivity model. Hu and Kuh used a sample consisting of 44,238 first-time, full-time undergraduate students at 120 four-year colleges and universities. From their study, they concluded that "the amount of time [students] devote to their studies and other educationally purposeful activities remains important to valued outcomes of college" (p. 197). Furthermore students are more likely to have increased quality of effort when they have educationally socially supportive peers and faculty.

Reconceptualizing the Assessment of Student Learning

The General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) proposed that learning is a function of structural institutional characteristics, student background characteristics, agents of socialization, the institutional environment, and quality of effort that a student. A positive aspect of this model is that it is a empirically-driven framework for identifying specific aspects of the college environment that may be conducive to learning and development. Four issues about this model are necessary to consider in its application. These concerns relate to the distal nature of institutional characteristics, the exclusion of student affairs in learning, and absence of a fully operationalized institutional environment.

In his model, Pascarella (1985) proposed that structural and organizational characteristics of institutions indirectly affected learning and development. Research that has explored the relationship between these characteristics and learning in cognitive domains remains inconsistent (Hu & Kuh, 2003; Kugelmass & Ready, 2011; Pascarella & Terenzini, 2005). The lack of consistent and compelling findings from these inquiries might be attributed to the distal nature of institutional characteristics. Examining more collective characteristics of proximal environments to the student experience might yield more compelling results.

Living-learning program involvement is one example of a learning environment that is proximal to the learning experience and incorporates curricular and co-curricular aspects of the total college environment. As Masterson (2008) noted, LLPs call for academic and student affairs to engage in partnerships in order to accomplish the goals of

55

the LLP. Furthermore, to promote success in student learning "student affairs professionals [and] academic faculty…must develop collaborative partnerships that share values, goals, and a commitment to comprehensive and seamless educational environments" (Frost, Strom, Downey, Schultz, & Holland, 2010, p. 38). Through these partnerships there may be multiple ways in which faculty and student affairs professionals jointly interact with LLP participants to produce beneficial outcomes.

There are a variety of ways in which faculty and student affairs staff might interact within the context of an LLP to promote learning. Baker and Griffin (2010) asserted that learning is a "social process" that relies on relationships. Two formal means in which the social process is enacted in education are advising and mentoring—both roles that can be held by faculty and student affairs professionals alike.

Advising is central to curricular experience for college students and can be approached from a variety of ways. From a traditional standpoint, advising is relegated to information sharing about degree requirements, course scheduling, and degree completion (Baker & Griffin, 2010). However, several scholars have called for new means and purposes of advising. For example, Hemwall and Trachte (1999) and Laff (2006) specifically called for advising practices that are more aligned with liberal education aims within postsecondary education such as problem solving and critical analysis. By engaging in advising that promotes liberal education goals, advisors take the act of advising beyond the curriculum and into the real world experiences of students.

Mentoring, on the other hand, might occur more easily across the curriculum and co-curriculum than advising. Interestingly, there does not appear to be a consistent definition of mentoring within the higher education community (Crisp & Cruz, 2009).

However, Baker and Griffin (2010) contend that mentoring involves "an emotional commitment…rooted in a mentor's long-term caring about a student's personal *and* professional development" (p. 4, italics in original text). Despite the lack of a consistent definition for mentoring, some scholars (Behar-Horenstein, Roberts, & Dix, 2010; Zalaquett & Lopez, 2006) support that mentoring leads to positive learning and developmental outcomes. For example, Behar-Horenstein et al. concluded in their multi-case narrative analysis that the mentoring of undergraduate researchers by faculty helped facilitate the development of cognitive skills such as analyzing and questioning information.

A third limitation of the Pascarella's (1985) model is that learning and development are grouped together as one outcome. As explained previously in this chapter, learning and development are "inextricably intertwined and inseparable" (ACPA, 1996, ¶ 6). Thus, they are neither the same process or activity, nor are they mutually exclusive. Although the grouping of learning and development seems appropriate from a theoretical perspective, it could pose challenges when operationalizing learning and development in a research context.

A final limitation of the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (1985) is that it does not explicitly define elements of the institutional environment. Within this model, the institutional environment consists of contributing characteristics such as structural and organizational elements and the students themselves. However, it may not be enough to understand the institutional environment in this way. From a theoretical perspective, student perceptions of the campus environment are of great

importance to understanding growth in learning. Experiential assessments of the institutional environment are important because they can allude to students' involvement in and subsequent effort that they make in their college experience (Astin, 1999; Tinto, 1993).

In order to reconcile some of the limitations of Pascarella's (1985) model, an adapted framework may be used. This framework (Figure 2.2) addresses the need to examine more proximal environments, incorporate student affairs professionals, and reconsider the operationalization of the institutional environment. A more extensive explanation of this framework is presented in Chapter 3.

Figure 2.2. Adapted framework based on Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development
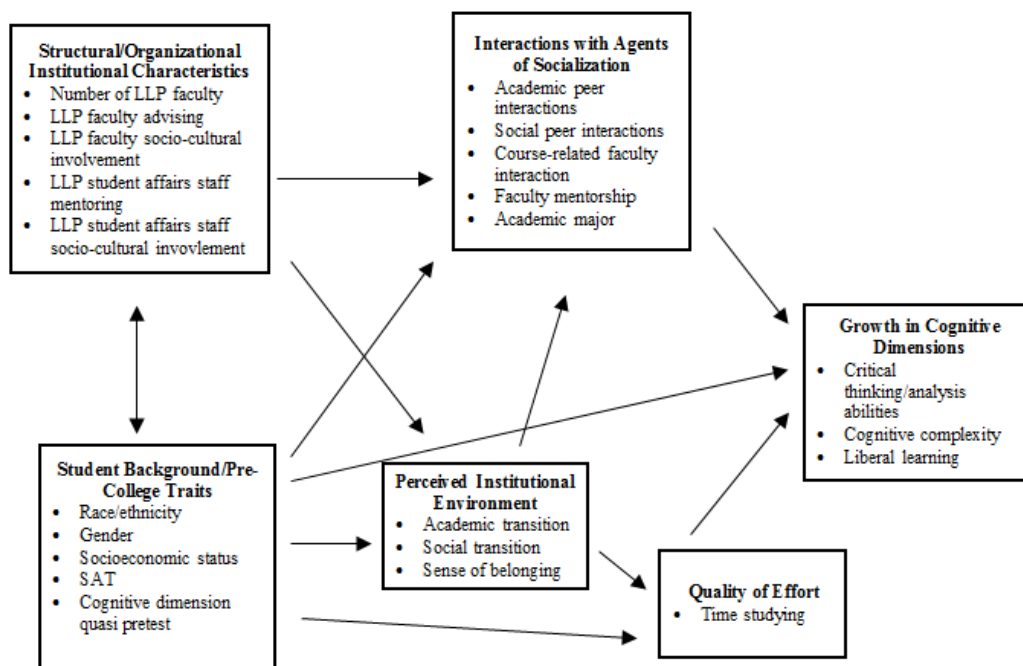
Summary

Learning and development have been central aspects of the student experience within higher education. Foundational works related to learning and development offered that learning is like an acquired object (Vygotsky, 1978). However, others suggested the learning is action-oriented, suggesting that is more of a process rather than an object (Dewey, 1938; Joint Taskforce on Student Learning, 1998). The process orientation and complexity of learning and development is further substantiated through empirically established theories related to cognitive development (Baxter Magolda, 1992; Belenky et al., 1997; Perry, 1970, 1981; Piaget, 2001). These theories have provided necessary frameworks for understanding the progression toward more complex ways of thinking and knowing. Yet, they do not provide direction in identifying the specific stimuli for advancing in cognitive domains. On the other hand, college impact literature on the other hand can assist in determining the college environments that may move students toward more complex thinking.

In particular, the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive (Pascarella, 1985) is one college impact model that can be used to examine further what contributes to learning in college. Pascarella's model provides direction in identifying the specific elements of college environments to consider when studying what affects learning, while it does not provide direction in how learning can be measured. Maki (2004) and Suskie (2009) offered that there are several approaches to assessing learning. Through their individual works on the assessment of student learning, they asserted that direct and indirect measures may be used to assess student learning. Through the application of Pascarella's

model research associated with aspects of the college environment that are believed to promote learning was examined.

Numerous factors relating to individual students and the environments in which they interact have been shown, through prior research, to have relationships with gains in cognitive domains. Research on the roles of student background characteristics demonstrated distinct differences in cognitive gains primarily between men and women and some with respect to racial and ethnic groups. Meanwhile, there has been limited research on the roles that parental education and socioeconomic status play in cognitive skill development. What research is available has failed to directly link parental education and socioeconomic status cognitive gains. Rather, the effects of these variables have been hypothesized to serve as a filtering method for students' participation in college environments. Additionally, previous research has linked pre-college academic achievement to students' academic self-confidence, which has shared a relationship to gains in critical thinking abilities. From the review of the literature, there is not a definitive answer as to how student background characteristics work in concert to influence growth in critical thinking and cognitive complexity.

The prior research on cognitive growth and skill development has established connections between development and the college learning environment. Although there are conflicting views on the roles that learning and development play, it is clear that colleges and universities consist of a broader institutional environment composed of numerous micro-environments. These micro-environments maintain an important position in promoting growth and development among college students, as they serve a socializing effect on students for prompting learning (Pascarella, 1985).

Research related to the academic major is vast and aims to establish links to the development of cognitive skills. This is mainly due to the fact that there are many ways in which the academic major can be structured. Aside from the academic major, the residential environment appears to be one of the most intentionally structured environments within the college campus. Through deliberative efforts such as LLPs, residential environments are transformed from living spaces to living *and* learning spaces (Inkelas & Weisman, 2003). From the research, however, there appeared not to be much known on the actual cognitive gains that be produced through LLPs, as there is not a prevalence of studies on the roles LLPs play in advancing cognitive skill development.

Moreover, the research on cognitive development and skills appears to be wholly positive in that many of the college environments in which students engage have positive effects on their developmental gains. Namely, the resounding impact of faculty and peers is echoed in numerous studies related to learning and cognitive gains (Astin, 1993; Cruce et al., 2006; Kim & Sax, 2009; Nelson Laird, 2005; Pascarella & Terenzini, 2005; Ruggut & Chemositt, 2009; Thompson, 2001). The exception, however, is the adverse effect of peer interaction through involvement in Greek-lettered socials organizations (Nelson Laird, 2005; Pascarella, 2001). Furthermore, the research demonstrated that the presence of supportive faculty and peers within the college environment is not enough. Rather, the amount and type of effort that students put in to their college experience is a critical aspect of learning (Hu & Kuh, 2003; Pace, 1984, 1982; Pascarella, 1985).

Previous studies on learning and cognitive skill development have focused primarily on the relationships among variables within the general campus environment and not within a specific campus environment. Living-learning programs are purported

to support and promote students' learning experiences, (Brower & Inkelas; 2010; Clark et al., 1998; Inkelas & Weisman, 2003; Masterson, 2008), with little empirical evidence to support what aspects of these programs indeed augment student learning. Therefore, further investigation in to what design elements of LLPs contribute to learning among students who participate in these programs is warranted. The extant research and the adapted General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) will be further used to investigate elements of LLPs that have an effect on student learning in the cognitive domains of critical thinking, cognitive complexity, and liberal learning.

CHAPTER III

To review, the purpose of this study was to examine the effects of faculty and staff roles within living-learning programs (LLPs) on perceptions of growth in critical thinking abilities and analysis, cognitive complexity, and liberal learning among undergraduate students in LLPs. An *ex post facto* multilevel correlational research design was employed in order to address the following research questions guiding this study:

- What key curricular and co-curricular student experiences are associated with students' perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- What faculty and student affairs staff roles within LLPs are directly associated with differences in student perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- Do faculty and student affairs staff roles within LLPs account for differential relationships between students' perceptions of and experience in college and self-perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

This research design consisted of an exploratory secondary analysis of data from the National Study of Living-Learning Programs. This study was exploratory in nature because it seeks to identify any possible relationships among LLP structural components, student experiences, and perceptions of learning rather than test a priori assumptions about these relationships.

As described more extensively in Chapter 2, Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development was the framework used to guide this study. However, Pascarella's (1985) model was adapted in the following ways (Figure 3.1). Although institutional characteristics play an integral role in Pascarella's model, this adapted framework primarily focused on the structural aspects of LLPs, such as the number of faculty involved in the LLP and faculty and student affairs professional staff roles, rather than institutional characteristics that shaped the college environment. Currently, the research on growth in cognitive complexity, critical thinking, and liberal learning has not shown profound direct effects of institutional characteristics (Pascarella & Terenzini, 2005). This study proposed that structured involvement of faculty and staff within LLPs may be more proximal environments in which students interact, thus sharing a relationship with students' perceptions of their growth in cognitive complexity, critical thinking abilities, and growth in liberal learning.

The research questions in this study also addressed the curricular and co-curricular experiences that were associated with the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985). Within the adapted form of the model, the curricular and co-curricular experiences were contained within the interaction with agents of socialization, institutional environment, and quality of effort blocks. The following compose the curricular experiences within the model: academic peer interactions, course-related faculty interaction, faculty mentorship, academic major, academic transition, and time spent studying. Additionally, social peer interactions and social transition are the co-

curricular variables used in this study.

Figure 3.1. Adapted framework based on Pascarella's (1985) General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development

Structural/Organizational Institutional Characteristics
- Number of LLP faculty
- LLP faculty advising
- LLP faculty socio-cultural involvement
- LLP student affairs staff mentoring
- LLP student affairs staff socio-cultural invovlement

Interactions with Agents of Socialization
- Academic peer interactions
- Social peer interactions
- Course-related faculty interaction
- Faculty mentorship
- Academic major

Growth in Cognitive Dimensions
- Critical thinking/analysis abilities
- Cognitive complexity
- Liberal learning

Student Background/Pre-College Traits
- Race/ethnicity
- Gender
- Socioeconomic status
- SAT
- Cognitive dimension quasi pretest

Perceived Institutional Environment
- Academic transition
- Social transition
- Sense of belonging

Quality of Effort
- Time studying

Data Source

Data from the Spring 2007 baseline study of the National Study of Living-Learning Programs (NSLLP) was used to examine students' perceptions of their growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. The NSLLP is a multi-institutional study that addresses the impact of LLPs on student outcome measures through the use of survey research. In 2007, the broader NSLLP study

consisted of a baseline study and a follow-up study to obtain longitudinal data from 2004 to 2007. The NSLLP was grant-funded by the National Science Foundation, Association of College and University Housing Officers International, ACPA: College Student Educators International, and NASPA: Student Affairs Administrators in Higher Education . Participants in the study were undergraduate students who resided in LLPs or traditional residence hall environments. For the purposes of NSLLP, LLPs were defined as "programs in which undergraduate students live together in a discrete portion of a residence hall (or the entire hall) and participate in academic and/or extra-curricular programming designed especially for them" (Inkelas & Associates, 2008, pp. I-2).

The conceptual framework that undergirded the 2007 baseline study of the NSLLP was the Input-Environment-Outcome (I-E-O) Model (Astin, 1991, 1993) for examining the impact of college. Pursuant to the I-E-O model, inputs consisted of background characteristics that students possess prior to starting college. Meanwhile, the environment encompassed structural and experiential aspects of college. Lastly, outcomes were criterion variables in which change is expected to occur as a result of attending college.

The 2007 NSLLP study included student background variables such as demographic characteristics, prior achievement, and motivations for attending college. The college environment is the central aspect of the NSLLP since the focus of the study is primarily on the residential environment, in particular the living-learning experience. In order to capture student perceptions of the campus environment, the study contained student experiences related to the academic major, quality of effort in campus activities, co-curricular involvement, and peer and faculty interactions. The outcomes included in

the study involved participants' perceptual measures such as intellectual abilities and growth, self-confidence in college activities, and academic and social transitions to college.

In addition to individual student reported data regarding their backgrounds and perceptions of campus environments and educational outcomes, the 2007 study included data pertaining to structural and organizational aspects of LLPs in the study. These data were reported by campus administrators responsible for working with LLPs using the 2007 Living-Learning Programs Survey.

Sample

The sample consisted of LLP participants from the 2007 baseline study of the NSLLP. A total of 49 institutions participated in the 2007 data collection year of the NSLLP; however, only 48 institutions participated in the baseline study. Participating institutions were categorized according to Carnegie classification types. The 2007 study primarily included research universities with a very high amount of research conducted (45%), 29% high research universities, 14% masters larger, 8% research universities, 2% masters small, and 2% baccalaureate arts and sciences. The largest proportion of institutions (57%) had less than 10 LLPs. Meanwhile, 31% of institutions had 10 to 20 LLPs, and 12% contained more than 20 (Inkelas & Associates, 2008).

Sample groups from the 2007 study were obtained through randomly selected or all students in LLPs at each participating institution and students from traditional residence hall (TRH) environments within each participating institution who were matched to the LLP sample at the same institution by gender, race/ethnicity, academic class standing, and residence hall occupancy. The total sample consisted of 110,682

students. The overall response rate for the 2007 baseline study was 20.3%, constituting a total of 22,519 respondents. Data were weighted since the response rate from the 2007 baseline study was low. This allowed researchers to guarantee that respondent characteristics reflected the characteristics of the sample. Of the respondents, 11,606 resided in LLPs and the remaining 10,913 resided in TRHs (Inkelas & Associates, 2008).

In addition to the sample of students, this study also took in to consideration the sample of institutions within the study due to the interest in examining structural and organizational effects of LLPs at different institutions. Although there were 48 institutions represented in the 2007 baseline study, the sample of institutions will be limited to 26 due to the number of student cases and LLP data available for each institution. The 26 institutions contained at least 100 students who completed the survey in order to conduct multilevel analyses in this dissertation research. There were 364 LLPs across the 26 selected institutions. Table 3.1 contains a complete listing of the proportion of LLPs within the analytic sample, guided by a thematic typology of LLPs by theme (Inkelas & Associates, 2008). This thematic typology for the 2007 NSLLP study was an extension of a previously developed typology of LLPs within the 2004 NSLLP survey administration. In order to develop the 2007 thematic typology, researchers examined 555 LLPs in order to arrive at 17 broad categories for which LLPs were grouped. The largest proportion of LLP types were discipline-based programs in areas such as business, education, humanities, and the sciences (25.8%). The next greatest representation of LLP types were those with cultural (12.9%), fine and creative arts (9.1%), civic/social leadership (8.5%), honors (7.4%), and transition (5.5%) themes. Within the analytic sample, 9.9% of the LLPs did not have a type specified.

Table 3.1

Descending Percentages of Types of Living-Learning Programs in Analytic Sample

Program Type	N	Percentage
Discipline (e.g., business, education, humanities, sciences, interdisciplinary)	94	25.8
Cultural (e.g., international, language, diversity)	47	12.9
None/Program Not Listed	36	9.9
Fine & Creative Arts	33	9.1
Civic/Social Leadership	31	8.5
Honors	27	7.4
Transition (e.g. first-year students, career exploration, transfer)	20	5.5
Women's (e.g. women in leadership, STEM)	15	4.1
Wellness/Healthy Living	14	3.8
Political Interests	14	3.8
General Academic	9	2.5
Residential Colleges	5	1.4
Leisure	5	1.4
ROTC	5	1.4
Multi-Disciplinary	3	0.8
Outdoor Recreation	3	0.8
Program Type	N	Percentage
Upper-Division	2	0.5

Note: n = 364.

The analytic sample of participants will consist of only respondents who participated in LLPs at the 30 selected institutions (n = 8,543). The racial/ethnic composition of the sample is 74.7% White (n = 6,380), 9.1% Asian American (n = 781), 6.7% Multiracial (n = 574), 5.2% African American (n = 381), 3.3% Hispanic (n = 286), 0.9% Other (n = 77), and less than 1% American Indian (n = 20). Meanwhile, over half of the sample were women (56.2%) and 43.8% men. The average SAT score within the sample was 1263 (SD = 128.57).

Instrumentation

The 2007 NSLLP baseline instrument was composed of 65 questions and items sets related to student background characteristics, perceptual measures of campus environments, and educational outcomes. The student background information on the survey instrument included demographic (e.g., race/ethnicity, gender, sexual orientation, family characteristics), prior achievement (e.g., high school grades, SAT/ACT scores) and perception of academic preparedness (e.g., preparation in math, science, and writing courses). With regard to campus environments and experiences, the survey instrument included individual items and factor-based scales related to students' involvement on campus and their perceptions of their interactions with peers and faculty, residence hall resources and climate, diversity interactions and climate, and influences of participating in an LLP. Lastly, the outcomes on the survey instrument included students' perceptions of their transition to college, intellectual abilities and growth, diversity appreciation, civic engagement, satisfaction, alcohol-related experiences, and self-confidence.

All factor-based scales in the survey instrument were created by using principal axis factoring with Varimax rotation. The factor analyses for scale construction yielded 28 scales (Inkelas, Vogt et al., 2006). Composite scores were then created using the individual items of each scale. The scales in the NSLLP consisted of three to six items.

In addition to student-level data, the 2007 NSLLP baseline study included data about characteristics of the LLPs at each participating institution. The 2007 Living-Learning Program Survey (LLPS) was composed of 27 individual items or item sets and three additional items sets for LLPs with a focus on science, technology, engineering, and math disciplines. The general individual items and item sets included questions related to structural and organizational characteristics of the LLPs such as the relative importance of specific outcomes in programs' goals or objectives (e.g. application of knowledge, transition to college, analysis of information), number of students participating in the LLP, criteria for participation, budgetary allocations, faculty and staff roles, and programming opportunities.

Validity

The validity of the items on the 2007 NSLLP baseline survey instrument was initially demonstrated by establishing face and construct validity for items from the 2003 pilot study administered at four large, public research universities. Upon creating items for each scale, skilled researchers involved in the pilot study determined the appropriateness of the items composing each scale. In order to establish the face validity of the scale-based constructs, researchers involved in the 2003 pilot study identified LLP directors from different institutions to examine items that composed constructs within the survey instrument (Inkelas, Vogt, et al., 2006).

Additionally, researchers involved in the 2003 pilot study established construct validity for items on the survey instrument. Construct validity was established by computing intercorrelations between scales that were thought to be theoretically linked. For example, Inkelas et al. (2006) cited that there was a high correlation between academic peer discussions and peer discussions pertaining to sociocultural issues.

Reliability

In order to develop scales used in the 2007 NSLLP baseline survey instrument, tests of internal consistency were used to establish reliability of scales within the pilot studies (Inkelas, Vogt, et al., 2006). Reliability was established for all factor-based scales associated with the campus environment and educational outcomes within the 2007 NSLLP baseline study by using the Cronbach alpha statistic for internal consistency. The internal reliability of scales within the 2007 baseline study ranged from .652 to .927. The criterion variables in this study will be students' self-reported critical thinking/analysis abilities, growth in cognitive complexity, and growth in liberal learning. Within the 2007 baseline study, the Cronbach alpha for the critical thinking/analysis abilities scale was .724 and .818 for the growth in cognitive complexity scale. Meanwhile, the Cronbach alpha for the growth in liberal learning scale was .805. Additional information regarding the specific reliabilities for scale-based variables within the analytic sample of LLP participants appear below in the variables section. Chronbach alpha were calculated for the students in the 26 institutions used in this study.

<div align="center">

Data Collection

</div>

The 2007 NSLLP baseline survey instrument was administered electronically via the Internet during the 2007 spring semester. Prior to the administration of each study,

participating institutions were required to obtain approval from their respective

Institutional Review Boards in order to administer the survey instrument on their

campuses and pay a fee to participate in the administration of NSLLP. Each participating

institution provided a list of students in its sample to Survey Sciences Group, LLC (SSG).

The sample lists contained student data such as names, demographics characteristics, and

contact information. In order to administer the 2007 NSLLP baseline instrument, SSG

sent e-mails to students to invite them to participate in the study. Students selected to

participate in the study received up to three follow-up e-mails if they had not responded

to the surveys. In order to encourage students to complete the surveys, some institutions

offered incentive items such as electronic gift items and gift cards for participating in the

study. The data collection window lasted approximately three weeks at each

participating institution (Inkelas & Associates, 2008).

Data collection for the LLPS also occurred during the 2007 spring semester. The

primary contact at each participating institution for the 2007 NSLLP baseline study was

asked to complete the LLPS for each LLP at the institution. Additionally, campus

contacts had the option to appoint a designee to complete the LLPS for LLPs on their

campuses. However, the campus contact or the directors of the respective LLPs

completed the LLPS questionnaire. Typically, either the campus contact or the directors

of the respective LLPs responded to the LLPS survey questions.

Data Analysis

Hierarchical data structures naturally occur in behavioral and social research, with

high prevalence in educational research (Raudenbush & Bryk, 2002). The hierarchical

nature of data implies that individual data are nested within other groups of data.

Another way to consider data in social research is by understanding that phenomena of interest are contextualized (Luke, 2004). In the case of this study, the adapted General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) framework suggested that individual student attributes and experiences influence learning and cognitive development. However, individual student attributes were not the sole focus. Rather, organizational and institutional structures, in which students are nested, were believed to play a role in producing differential results for student learning and cognitive outcomes. Within this adapted framework, the postsecondary institution provided context for learning. The influence of contexts (e.g., campus environments) in shaping student experiences and outcomes is at the core of higher education research related to understanding the college environment. Given the nested nature of the framework, hierarchical linear modeling (HLM) was used as the primary method of analysis in this study in order to examine the institutional and LLP contexts in which LLP participants are situated.

Pedhazur (1997) best explained HLM as consisting of stages of regression. The research in this study will be conducted using a two-level HLM analysis. Within a two-level HLM analysis, Pedhazur described the first stage as consisting of regressing an outcome variable on independent variables at the first level of analysis. The independent variables at the first level of analysis are composed of selected variables characteristic of the individual study participant. Pedhazur went on to explain the second stage of HLM as consisting of regressing regression coefficients from level-one on independent variables related to group characteristics. At this second level, regression coefficients

from the first level are now dependent variables such that the analysis will explain how the relationships between level-one independent variables and outcomes may vary across groups.

Traditionally, ordinary least squares (OLS) regression would be used instead of HLM to examine the controlled relationships between independent variables (e.g., student-level and institutional-level variables) and a particular outcome of interest when seeking to examine the effects of a college environment at multiple institutions (Astin & Denson, 2009). However, the unit of analysis issue arises with the application of OLS regression for nested data.

Haney (1980) described the unit of analysis as "the primary entity in terms of which data are analyzed in an evaluation or other study" (p. 1). In the application of OLS regression, the units of analysis are confounded in that variables pertaining to group-level data associated are attributed to individual cases. Such confounding of individual- and group-level variables can lead to aggregation bias and imprecise standard errors (Raudenbush & Bryk, 2002). However, Astin and Denson (2009) argued that the use of OLS regression or multilevel modeling does not necessarily produce markedly different results in their analysis of statistical methods for studying college impact in multi-institutional studies. Despite Astin and Denson's findings, a multilevel analysis will be used in this study because the relationships between students' perceptions of and experiences in college and their perceptions of their cognitive growth are hypothesized to vary across LLPs at different institutions (Raudenbush & Bryk).

By using data at the individual student and LLP program data aggregated within each institution, separate hierarchical linear models were constructed for students'

perceptions of their growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. In addition to model building, descriptive statistics (e.g., means, standard deviations) concerning student and LLP aggregated data were included in the data analysis.

In order to employ the data analyses described above, two statistical software packages were used. First, the Statistical Package for Social Science (SPSS), version 17, was used to obtain descriptive analyses and manipulate variables to proceed with further HLM analyses. For the purpose of conducting multi-level linear modeling, the HLM software program, version 7, was used.

<div align="center">

Variables

</div>

Following are detailed descriptions of the variables used in the analyses (see Appendix). The variable descriptions are organized according to how they will be used in the analysis. The specific types of variable categories include outcome, student-level, institutional LLP aggregate-level, and control.

Outcome Variables

The outcome variables for this study were growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. Each outcome was a scale-based, self-reported measure. Factor loadings, in addition to Cronbach alpha statistics for internal consistency for each scale are contained in Table 3.2.

The critical thinking/analysis abilities scale was composed of five items in which respondents indicated their level of agreement. Study participants indicated their level of agreement with statements pertaining to exploring meanings of facts and discussing viewpoints different from their own. The response choices for each item consisted of a

four-point Likert scale ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*). The

reliability of the critical thinking/analysis abilities scale was .724.

Table 3.2

Cronbach Alpha Reliabilities and Items for the Critical Thinking/Analysis Abilities, Cognitive
Complexity, and Liberal Learning Scales

Scale	α
Critical Thinking/Analysis Abilities	.726
1. I frequently challenge professors' statements and ideas before I accept them as "right" 2. There have been times when I have disagreed with the author of a book or article that I am reading 3. I enjoy discussing issues with people who don't agree with me 4. I try to explore the meaning and interpretations of the facts when I am introduced to a new idea 5. A good way to develop my own opinions is to critically analyze the strengths and limitations of different points of view	
Growth in Cognitive Complexity	.817
1. Ability to put ideas together and to see relationships 2. Ability to critically analyze ideas and information 3. Learning more about things that are new to you	
Growth in Liberal Learning	.801
1. Openness to views that you oppose 2. Ability to discuss controversial issues 3. Motivation to further explore ideas presented in class	

Note: Reliabilities computed using the study sample (n = 8,543).

In order to obtain self-reported measures of growth in cognitive complexity, study

participants responded to the following prompt in order to gauge the extent to which they

felt they have grown in their abilities to learn more about new topics, critically analyze

information and see relationships between ideas. Participants responded to three items

for this scale, using a four-point Likert scale response choices that ranged from 1 (*Not*

grown at all) to 4 (*Grown very much*). The reliability for internal consistency for this

scale was .814.

The third outcome variable of interest in this study was students' perceptions of

their growth in liberal learning. This variable was a three-item composite measure in

which study participants indicated how much they grew areas such as their ability to

discuss controversial issues, openness to opposing viewpoints, and motivation to explore

further ideas from classes. The reliability measure of internal consistency for this scale

was .804. In order to respond to the scale prompts, study participants responded to the

scale items using a four-point Liker scale ranging from 1 (*Not grown at all*) to 4 (*Grown*

very much).

Student-level Variables

The student-level variables included in the HLM analyses are described in the

following sections. Each student-level variable was organized according to the scheme

used in Pascarella's (1985) general causal model: agents of socialization, institutional

environment, and quality of effort. All of the measures at the student-level were self-

reported by study participants who completed the 2007 NSLLP baseline survey

instrument.

Agents of socialization.

Three types of environments within the college environment served as measures

of agents of socialization within Pascarella's (1985) General Causal Model for Assessing

the Effects of Differential College Environments on Student Learning and Cognitive

Development. For the purpose of this study, peers, faculty, and the academic major are identified as primary socializing agents. The peer and faculty interaction variables were scale-based measures, upon which composite measures were derived (Table 3.3).

Table 3.3

Cronbach Alpha Reliabilities and Items for Faculty and Peer Interaction Scales

Scale	α
Discussed Academic and Career Issues with Peers	.800
1. Discussed something learned in class	
2. Talked about current news events	
3. Shared your concerns about classes and assignments	
Discussed Socio-Cultural Issues with Peers	.882
1. Held discussions with students whose personal values were very different from your own	
2. Discussed major social issues such as peace, human rights, and justice	
3. Held discussions with students whose religious beliefs were very different from your own	
4. Discussed your views about multiculturalism and diversity	
5. Held discussions with students whose political opinions were very different from your own	
Course-Related Faculty Interaction	.735
1. Asked for information related to a course you were taking	
2. Visited informally before or after class	
3. Made an appointment to meet in his/her office	
4. Worked on a research project	
Faculty Mentorship	.748
1. Visited informally during a social occasion	
2. Discussed your career plans and ambitions	
3. Discussed personal problems or concerns	

Note: Reliabilities computed using the study sample (n = 8,543).

Within the NSLLP 2007 baseline study, data were collected regarding academic and social peer interactions. The academic peer interaction variable was a three-item composite variable to acquire information regarding the degree to which respondents discussed academic and career issues with peers. The other type of peer interaction in which data were obtained concerned social peer interactions. This five-item composite variable dealt with questions related to discussing socio-cultural issues (e.g. personal values, social issues, and diversity) with peers outside of class. Response choices for these items ranged from 1 (*Never*) to 4 (*Once or more a week*). The reliabilities for the social and peer interaction scales were .800 and .833, respectively.

The other primary agents of socialization within this study were faculty. This study took into consideration course-related interactions students had with their faculty and mentorship by faculty. The course-related faculty mentorship, with a reliability of .740, consisted of a four-item composite variable in which study participants indicated how often they have done a series of activities (e.g. visiting informally, working on a research project, seeking information related to course) with an instructor. Faculty mentorship was measured by a three-item composite measure relating to the degree to which study participants engaged in activities such as discussing career plans or personal problems or concerns. The reliability of the faculty mentorship scale was .746. Response choices for the faculty interaction survey items ranged from 1 (*Never*) to 4 (*Once or more a week*).

The third type of college environment that was considered an agent of socialization is the academic major. The major course of study served as a means of socialization because it can play a role in exposure to certain forms of pedagogies for the

application of academic-oriented skills and promotion of different types of learning. On the 2007 NSLLP baseline survey instrument, study participants were instructed to indicate a primary major. If study participants indicated that they had more than one major, the primary major course of study was used in the analysis. Since the academic major is a categorical variable, it will be coded according to the Biglan (1973) typology of major characteristics. The Biglan typology consisted of four types of academic majors: hard pure, soft pure, hard applied, and soft applied. Hard-pure types consisted of majors such as chemistry, mathematics, and chemistry. Hard-applied majors included those majors that are related to mathematics and science, yet they involve a high degree of application. These types of majors include agriculture, architecture, and engineering. Soft-pure majors included majors such as English, philosophy, and religion. Lastly, soft-applied majors included disciplines such as social and behavioral sciences, education, and professional studies. Since LLPs mostly consist of first-year students, not all students in the study will have declared a major. Students who did not indicate a primary major will be classified as "undecided."

Perceived institutional environment.

The General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (1985) does not explicitly define elements of the institutional environment. Rather the institutional environment consists of contributing characteristics such as structural and organizational elements and the students themselves. Although this is the case within the model, the adapted model employed in this study included three measures that would contribute to

understanding how study participants responded to the institutional environment. These three measures included two variables related to students' perceptions of their transition and sense of belonging. These measures are students' assessment of their experiences within the campus environment, which are not captured in Pascarella's (1985) model for student learning. From a theoretical perspective, however, these particular student perceptions were of great importance to understanding growth in learning, as they allude to students' level of commitment to their participation within the institution (Tinto, 1993). Moreover, these experiential assessments of the institutional environment were important to the study because they could relate to students' involvement in and subsequent quality of effort that a student makes in their college experience (Astin, 1999).

The perceived institutional environment was operationalized in this study using a set of transition variables and measure of sense of belonging. The transition variables contained information about students' perceptions of their academic and social transitions to college (Table 3.4). The academic transition variable was a scale-based composite measure (α = .747) consisting of three items that gauged the ease study participants felt in engaging in academic activities such as study groups, help-seeking, and communicating with instructors. Meanwhile, the social transition scale-based composite measure (α = .673) consisted of three items related to study participants' ease with making friends and getting to know people in their residence halls. Response choices for each of these measures ranged from 1 (*Very difficult*) to 6 (*Very easy*).

The third institutional environment measure was a perceptual, composite variable regarding study participants' sense of belonging. The sense of belonging scale was

composed of four statements related to how well study participants felt they were a

member of the campus community. The response choices for each statement ranged from

1 (*Strongly disagree*) to 4 (*Strongly agree*). The reliability for this scale was .884.

Table 3.4

Cronbach Alpha Reliabilities for Perceptions of the Institutional Environment

Scale	α
Ease with Academic Transition to College	.745

1. Seeking academic or personal help when you need it
    2. Communicating with instructors outside of class
    3. Forming study groups	

Ease with Social Transition to College	.674

1. Making new friends
    2. Getting along with your roommate(s)
    3. Getting to know other people in your residence hall	

Overall Sense of Belonging	.885

1. I feel comfortable on campus
    2. If I had to do it over again, I would choose the same college or university
    3. I feel that I am a member of the campus community
    4. I feel a sense of belonging to the campus community	

Note: Reliabilities computed using the analytic sample (n = 8,543).

Quality of effort.

Due to the limited nature of quality of effort variables, as defined by Pascarella

(1985), within the NSLLP baseline survey instrument, only one measure of quality of

effort will be used. The specific item used was the time study participants spent studying

on their own during a typical week during the last semester/quarter. Response choices

for this item ranged from 1 (*Never*) to 4 (*Very often*).

Institutional LLP Aggregate Measures

The institutional variables used in this study are aggregate measures of the LLPs

at each institution. The LLP measures were aggregated to the institutional level due to

unequal numbers of respondents across LLPs within each institution. Aggregate measures

of the LLPs at the institution level produced estimates of LLP effects. The significance of

effects of other characteristics of institutions such as size, faculty to student ratio, and

control was inconclusive in affecting cognitive growth (Pascarella & Terenzini, 2005),

they were excluded in this model. The NSLLP study relied on each LLP to designate a

representative to complete the LLPS instrument. Since LLP representatives at each

institution within the study could have determined how to complete the questionnaire

differently, aggregates of LLP characteristics will be used at the second level of analysis.

These aggregate measures will serve as estimates of differential LLP effects across

institutions. After a thorough review of literature (see Chapter 2), there appears to be

scant empirical research on the optimal structural characteristics that may have an impact

on the students within LLPs. Given this lack of literature and the exploratory nature of

this study, aggregate data of LLPs across institutions will provide needed information

related to optimal structural-involvement characteristics of LLPs that may have an effect

on student learning outcomes.

One component of the LLP environment is the number of faculty who are

involved in it. Within the LLPS survey instrument, program administrators reported the

approximate number of faculty that played a direct role in the administration of the LLP.

Program administrators designated the number of faculty involved by endorsing one of the following categories: 0 (*None*), 1 (*1*), 2 (*2-3*), 3 (*4-5*), 4 (*6-10*), 5 (*11 or more*).

A critical component of LLP structures is the faculty and student affairs professional staff who participate in them. Four variables will be used to measure faculty and staff involvement in the LLPs. For faculty, two variables will include the average degrees to which faculty serve as academic advisors to participants and conduct social/cultural outings for the LLPs. In order to determine the capacity in which faculty were involved in the LLP, program administrators responded to a list of roles. This list specifically included a role "as academic advisors to participants" and "conduct[ing] social/cultural outings (e.g., going to live performances, museums, etc.)" with students.

The remaining two measures will include the degrees to which student affairs staff member serve as mentors to participants and conduct social/cultural outings for the LLPs. Similar to the faculty roles prompt in the LLPS, program administrators indicated the degree to which student affairs staff "serve as mentors to participants" and "conduct social/cultural outings (e.g., going to live performances, museums, etc.)" with LLP participants. Response choices for how often faculty and student affairs staff engaged in these roles included 0 (*Never*), 1 (*Once or more a year*), 2 (*Once or more a term*), 3 (*Once or more a month*), and 4 (*Once or more a year*).

There are other key individuals involved in the administration of LLPs that were not included within this study. According to the LLPS survey instrument program administrators were also asked to endorse the level of involvement within the LLP among other agents such as graduate student employees and academic affairs staff. Due to

incomplete data across institutions on variables such as these, they were not included

within the study.

Control Variables

Student demographic and background characteristics were used in the analyses as

control variables. By including these variables purely as controls, the analyses will not

be concerned with how students of different background characteristics vary across

institutions.

The specific student background and demographic variables included

race/ethnicity, gender, and socioeconomic status. Referent groups were identified for all

categorical variables in the analyses, such that a dummy coding scheme was be followed

(Pedhazur, 1997). For the race/ethnicity and gender variables, referent groups for

race/ethnicity and gender were White and female students, respectively. With respect to

race/ethnicity designations, survey participants were asked to mark all of the

race/ethnicity categories that applied to them. These categories included African

American/Black (not of Hispanic origin), Asian or Pacific Islander (includes the Indian

sub-continent), American Indian or Alaskan Native, Hispanic/Latino (Spanish culture or

origin), White/Caucasian (Persons not of Hispanic origin, having origins in any of the

original peoples of Europe, North African, or the Middle East), Race/ethnicity not

included above. Socioeconomic status was a manually computed variable that is the

product of students' highest level of parental education and self-reported family income.

In addition to student demographic background characteristics, this study utilized

SAT composite scores as a measure of prior academic achievement. The survey

instrument allowed for study participants to indicate whether or not they took the SAT or

ACT. For both the ACT and SAT composite scores, study participants were instructed to self-report their scores by entering a numeric value of their composite score. Participants who only indicated taking the ACT had their ACT composite scores converted to SAT composite scores using the ACT-SAT concordance guide (ACT Inc., 2008).

Astin (1993) asserted that "the ideal study of college impact on cognitive development would also include before-and-after assessments of such specific skills" (p. 221). Accordingly, quasi pre-test measures of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning were used in the analyses. The measure is called a quasi pre-test since the design of this study is not longitudinal. For these measures, study participants reflected back on their perception of the importance of certain items prior to starting college. Each quasi pre-test measure consisted of a single item, which was the highest loading item for each respective factor. The quasi pre-test measure for student perceptions of critical thinking/analysis abilities was an item in which study participants responded to their perception of the importance to critically analyze ideas and information before starting college. Additionally, students responded to their perceptions of the importance of exploring the meanings of facts when introduced to new ideas in order to obtain a quasi pre-test measure of growth in cognitive complexity. Furthermore, the quasi pre-test item for student perceptions of their growth in liberal learning asked respondents to indicate the importance of openness to views that the respondent opposes. Response choices for all three quasi pre-test items ranged from 1 (*Not at all important*) to 4 (*Very important*).

HLM Analyses

The HLM analyses consisted of three components. First, information regarding the fully unconditional models for the three outcome measures (growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning) were constructed in order to determine the viability of subsequent modeling procedures. For outcomes with subsequent modeling capabilities, within- and between-institution models were be constructed.

Fully unconditional Model

Fully unconditional models were obtained for each outcome in order to determine the viability for further modeling of each outcome at each level of the two-level HLM analysis (Raudenbush & Bryk, 2002). The fully unconditional models provided the appropriate information regarding whether or not there are differences in each outcome among institutions. Using a chi-square distribution, significance testing will occur at the alpha level of $p < .10$ for each fully unconditional model. The significance level is not stringent because the study is exploratory in nature. The fully unconditional models are represented below.

The fully unconditional model at the within-institution level is a one-way ANOVA with random effects such that the outcomes in the analyses were predicted by each institution's mean outcome. The fully unconditional model at level-1 (within-institution) is represented by the following:

$Y_{ij} = \beta_{0j} + r_{ij}$, such that

Y_{ij} was the student's perception of the cognitive outcome during spring 2007;

β_{0j} was the average student's perception of the cognitive outcome during spring 2007 within the institution; and

r_{ij} was the individual student effect.

Meanwhile, the second level of the fully unconditional model was represented by $\beta_{0j} = \gamma_{00} + u_{0j}$, such that

γ_{00} was the average student's perception of the cognitive outcome during spring 2007 across all institutions; and

u_{0j} was the individual institution effect.

Through substitution, the combined fully unconditional model is represented by the following $Y_{ij} = \gamma_{00} + u_{0j} + r_{ij}$.

The fully unconditional models yielded critical information pertaining to the amount of variance in the outcomes that occurs within and between institutions. This information was contained in the intraclass correlation coefficient (ICC), a criterion for determining the proportion of variance in an outcome that occurs between groups in a multilevel analysis (Raudenbush & Bryk, 2002). The ICC (ρ) was represented by $\rho = \frac{\tau_{00}}{(\tau_{00} + \sigma^2)}$, where τ_{00} was the between-institution variance and σ^2 was the within-institution variance in each student's perception of the cognitive outcome. Significance testing for the between-institution variance (τ_{00}) occurred at an alpha level of .10 due to the exploratory nature of this study.

Finally reliability estimates for each outcome variable were obtained. The reliability estimate is an indicator of the stability of the variable. Reliability estimates closer to one are desirable for multilevel modeling because they can indicate that there is substantial variability in the mean outcome across groups at level-2 (Raudenbush & Bryk, 2002). In the case of this study, level-2 groups consisted of institutions.

Within-institution Model

The within-institution model consisted of student-level variables, such that each outcome variable is regressed on them. In order to construct the within-institution model, centering decisions were made. Therefore, student demographic and prior achievement variables will be included in each within-institution model as statistical controls through group-mean centering with fixed effects. The within-institution model will be conceptually rendered by the following equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j}\left(RACE - \overline{RACE}_{.j}\right) + \beta_{2j}\left(GENDER - \overline{GENDER}_{.j}\right) +$$

$$\beta_{3j}\left(SES - \overline{SES}_{.j}\right) + \beta_{4j}\left(SAT - \overline{SAT}_{.j}\right) + \beta_{5j}\left(PCOGOUT - \overline{PCOGOUT}_{.j}\right) +$$

$$\beta_{6j}\left(ACADPEER\right) + \beta_{7j}\left(SOCPEER\right) + \beta_{8j}\left(MENTFAC\right) + \beta_{9j}\left(CRSFAC\right) +$$

$$\beta_{10j}\left(MAJOR - \overline{MAJOR}_{.j}\right) + \beta_{11j}\left(ACADTRAN\right) + \beta_{12j}\left(SOCTRAN\right) +$$

$$\beta_{13j}\left(SENSBEL\right) + \beta_{14j}\left(STUDY - \overline{STUDY}_{j}\right) + r_{ij}, \text{ where}$$

Y_{ij} was the student's perception of the cognitive outcome during spring 2007;

β_{0j} was the average student's perception of the cognitive outcome during spring 2007 within the institution;

β_{1j} was the fixed effect of for a student's race;

β_{2j} was the fixed effect of for a student's gender;

β_{3j} was the fixed effect of for a student's SES;

β_{4j} was the fixed effect of a student's SAT score;

β_{5j} was the fixed effect of a student's quasi pre-test;

β_{6j} was the random effect of a student's perception of the academic peer environment;

β_{7j} was the random effect of a student's perception of the social peer

environment;

β_{8j} was the random effect of a student's perception of mentoring faculty

interactions;

β_{9j} was the random effect of a student's perception of course-related faculty

interactions;

β_{10j} was the fixed effect of a student's academic major;

β_{11j} was the random effect of a student's perception of ease with the academic

transition to college;

β_{12j} was the random effect of a student's perception of ease with the social

transition to college;

β_{13j} was the random effect of a student's perception of a sense of belonging;

β_{14j} was the fixed effect of a student's amount of time spent studying; and

r_{ij} was the individual student effect.

Significance testing occurred at the alpha level of $p < .10$ for the within-institution

model. All random effects that are statistically significant will be retained for future

analyses within the between-institutions model. Again, reliability estimates for each

outcome and random effect will be inspected at this point in the analyses.

Between-institutions Model

First, the average student perception of the cognitive outcome within institutions

was represented by the intercept (β_{0j}) from the within-institution model. The modeling

of student perceptions of the cognitive outcomes within institutions is represented by the

following equation:

$$\beta_{0j} =$$

$$\gamma_{00} + \gamma_{01}(\text{LLPFAC}) + \gamma_{02}(\text{FACADV}) + \gamma_{03}(\text{FACOUT}) + \gamma_{04}(\text{SAMENT}) +$$

$$\gamma_{05}(\text{SAOUT}) + u_{0j}, \text{ where}$$

β_{0j} was the average student perception of the cognitive outcome within an

institution;

γ_{00} was the average student perception of the cognitive outcome across all

institutions;

γ_{01} was the student-faculty ratio effect;

γ_{02} was the aggregate LLP effect of faculty advising;

γ_{03} was the aggregate LLP effect of faculty interaction through social/cultural

outings;

γ_{04} was the aggregate LLP effect of student affairs mentorship;

γ_{05} was the average student perception of the cognitive outcome within the

institution; and

u_{0j} was the individual institution effect.

Additionally, each statistically significant random effect from the within-institutions model will be modeled using the institutionally aggregated student and faculty role variables. All random effects viable for modeling will follow a similar modeling scheme as described above. The following general modeling equation will be used for each significant random effect:

$$\beta_{ij} = \gamma_{i0} + \gamma_{i1}(\text{LLPFAC}) + \gamma_{i2}(\text{FACADV}) + \gamma_{i3}(\text{FACOUT}) + \gamma_{i4}(\text{SAMENT}) +$$

$$\gamma_{i5}(\text{SAOUT}) + u_{ij}, \text{ where}$$

β_{1j} was the relationship between the individual student perception of or experience in college and the individual cognitive outcome;

γ_{i0} was the average relationship between student perception of or experience in college and the cognitive outcome across all institutions;

γ_{i1} was the aggregate LLP effect of the number of faculty involved in the LLP;

γ_{i2} was the aggregate LLP effect of advising by faculty;

γ_{i3} was the aggregate LLP effect of faculty involvement in social/cultural outings;

γ_{i4} was the aggregate LLP effect of mentorship by student affairs staff;

γ_{i5} was the aggregate LLP effect of student affairs staff involvement in social/cultural outings; and

u_{ij} was the individual institution effect.

When conducting the between-institutions model for each outcome variable, all between-institution effects will be tested at an alpha level of $p < .10$.

In order to assess the fit of the between-institutions model, it will be compared to the within-institution model using the Bayesian information criterion (Schwarz, 1978). The BIC for each model will be calculated using the following formula: $BIC = D + \ln(n)*p$, where

D is the deviance statistic for the model of interest;

n is the number of within-institution units; and

p is the number of parameters estimated in the model of interest.

A lower BIC for the between-institutions model will indicate that the model fits the data better than the purely within-institution model. Model comparisons using the BIC will be conducted for all three outcome variables.

Missing Data

In order to treat missing data within the study, multiple imputation (MI) (Rubin, 1976) was used for student-level variables. Generally, the MI process uses existing data within a dataset to predict missing values. In predicting missing values, MI allows researchers to create copies of data called imputations, such that each copy contains a plausible value for any missing observation. Royston (2004) noted that using three or five imputations is sufficient for data analysis. Within this study, five imputations were created using SPSS. In addition to variables included with the study, two other variables related to social and academic residential experiences from the NSLLP were used to impute missing data for agents of socialization, institutional environment, and quality of effort variables. Student perceptions of students' academic and social residence hall environments were included because of their strong relationship to outcomes in the NSLLP (Inkelas & Associates, 2008). Data regarding student background characteristics and dependent variables were not imputed. Cases missing data regarding background characteristics and dependents variables were excluded in the analysis.

Additionally, there were missing data regarding LLP characteristics due to inconsistent reporting of data within the LLPS instrument that LLP program administrators completed. Due to the level of inconsistent reporting, missing data techniques to identify plausible values for measures were variables in which no value was available. In order to accommodate the degree of missing data, institutions from the 2007 study were excluded. Therefore, only 26 institutions, which contained available data on the LLP aggregate measures, were retained for analyses.

Summary

94

This chapter provided information regarding the quantitative methods that will be employed in this study. An adapted framework of the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985) will be used to explore the effects of faculty and student affairs staff roles in LLPs on students' perceptions of their growth in cognitive complexity, critical thinking and analysis abilities, and liberal learning. Data regarding faculty and staff roles and the number of faculty were aggregated to the institutional level in order to estimate LLP environment effects. The data for this study will be obtained from the 2007 NSLLP baseline study, which includes student and LLP structural/organizational data. In order to analyze the multi-level NSLLP data, hierarchical linear modeling (Raudenbush & Bryk, 2002) will be used.

CHAPTER IV

The purpose of this *ex post facto* multilevel study was to examine the effects of faculty and student affairs staff roles within living-learning programs (LLPs) on perceptions of learning among undergraduate students in LLPs. These perceptual measures consisted of learning related to growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. The following research questions guided the study:

- What key curricular and co-curricular student experiences are associated with student perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- Which roles played by faculty and student affairs professional staff within LLPs are directly associated with differences in student perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

- Do faculty and student affairs staff roles within LLPs account for differential relationships between students' perceptions of and experience in college and self-perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning?

The results of the study are framed according to descriptive results and hierarchical linear modeling (HLM) analyses. Both the descriptive results and HLM analyses consist of data organized by the individual cognitive domain—critical thinking/analysis abilities, cognitive complexity, and liberal learning.

Descriptive Results

The final analytic sample used in this study consisted of multiply imputed data at the student-level. Since the data were multiply imputed, using five imputations, the means and standard deviations for each domain were pooled. Additionally, the number of cases in the analyses varied in order to retain cases due to missing data that could not be imputed. Namely, these data consisted of missing values for key demographic data, such as race/ethnicity and gender, and dependent variables. The range of cases used in the analysis was 7,421 to 7,483. Although the number of cases in the analyses for each dependent variable varied, the pooled means and standard deviations only varied slightly across the critical thinking/analysis abilities, cognitive complexity, and liberal learning domains.

The descriptive results consist of a presentation of the means and standard deviations for growth in critical thinking/analysis abilities (Table 4.1), cognitive complexity (Table 4.2), and liberal learning (Table 4.3) at the student level. On average, students in the analysis consisted of similar proportions of demographic characteristics. Regarding race/ethnicity, the analyses were primarily composed of White students (75.9%-76.7%) followed by Asian American (8.7%-8.9%), Multiracial (6.5%-6.6%), African American (3.7%-3.9%), Hispanic (3.2%-3.3%), Other (0.8%-0.9%), and American Indian (0.3%) students. Additionally, women (64.8%-65.4%) represented over half of students in the analyses and the average SAT score ranged from 1257 to 1259.

Table 4.1

Unstandardized Pooled Means and Standard Deviations of Variables in the Critical
Thinking/Analysis Abilities Analytic Sample

	M	SD
Outcome		
Critical thinking/analysis abilities	14.664	2.278
Student Background Characteristics		
Race/Ethnicity		
Race/Ethnicity: African American	0.039	0.193
Race/Ethnicity: Asian American	0.089	0.285
Race/Ethnicity: American Indian	0.003	0.051
Race/Ethnicity: Hispanic	0.033	0.179
Race/Ethnicity: Multiracial	0.065	0.246
Race/Ethnicity: Other	0.009	0.094
Race/Ethnicity: White (referent group)	0.759	0.428
Gender	0.352	0.478
Gender: Male		
Gender: Female (referent group)	0.648	0.478
Socioeconomic status	10.918	3.600
SAT	1257.133	146.329
Critical thinking/analysis abilities pre-test	3.300	0.715
Interactions with Agents of Socialization		
Peers: Academic and career conversations	9.863	2.076
Peers: Social and cultural conversations	12.915	4.036
Course-related faculty interaction	7.808	2.479
Faculty mentorship	4.500	1.688
Academic major	0.152	0.359
Academic major: Hard pure		
Academic major: Hard applied	0.292	0.454
Academic major: Soft pure	0.088	0.283
Academic major: Soft applied (referent)	0.469	0.499
Institutional Environment		
Academic transition	11.340	3.025
Social transition	12.894	3.292
Sense of belonging	12.708	2.426

	M	SD
Quality of Effort		
Time spent studying	3.520	0.677

n = 7, 421

Table 4.2

Unstandardized Pooled Means and Standard Deviations of Variables in the Growth in Cognitive Complexity Analytic Sample

	M	SD
Outcome		
Growth in cognitive complexity	8.692	1.893
Student Background Characteristics		
Race/Ethnicity		
Race/Ethnicity: African American	0.037	0.189
Race/Ethnicity: Asian American	0.087	0.282
Race/Ethnicity: American Indian	0.003	0.052
Race/Ethnicity: Hispanic	0.032	0.177
Race/Ethnicity: Multiracial	0.066	0.248
Race/Ethnicity: Other	0.008	0.089
Race/Ethnicity: White (referent group)	0.767	0.423
Gender		
Gender: Male	0.347	0.476
Gender: Female (referent group)	0.653	0.467
Socioeconomic status	10.898	3.600
SAT	1259.311	146.071
Growth in cognitive complexity pre-test	2.910	0.765
Interactions with Agents of Socialization		
Peers: Academic and career conversations	9.926	2.102
Peers: Social and cultural conversations	12.982	4.092
Course-related faculty interaction	7.774	2.515
Faculty mentorship	4.450	1.714
Academic major		
Academic major: Hard pure	0.154	0.361
Academic major: Hard applied	0.289	0.454
Academic major: Soft pure	0.090	0.286

	M	SD
Academic major: Soft applied (referent)	0.466	0.499
Institutional Environment		
Academic transition	11.386	3.024
Social transition	12.951	3.315
Sense of belonging	12.770	2.438
Quality of Effort		
Time spent studying	3.550	0.671

n = 7,459

Table 4.3

Unstandardized Pooled Means and Standard Deviations of Variables in the Growth in Liberal Learning Analytic Sample

	M	SD
Outcome		
Growth in liberal learning abilities	8.22	2.052
Student Background Characteristics		
Race/Ethnicity		
Race/Ethnicity: African American	0.037	.190
Race/Ethnicity: Asian American	0.087	0.281
Race/Ethnicity: American Indian	0.003	0.052
Race/Ethnicity: Hispanic	0.032	0.177
Race/Ethnicity: Multiracial	0.066	0.248
Race/Ethnicity: Other	0.008	0.090
Race/Ethnicity: White (referent group)	0.767	0.423
Gender		
Gender: Male	0.346	0.476
Gender: Female (referent group)	0.654	0.476
Socioeconomic status	10.893	3.600
SAT	1259.253	146.057
Growth in liberal learning pre-test	2.980	0.787
Interactions with Agents of Socialization		
Peers: Academic and career conversations	9.921	2.107
Peers: Social and cultural conversations	12.968	4.095

	M	SD
Course-related faculty interaction	7.769	2.515
Faculty mentorship	4.447	1.712
Academic major		
Academic major: Hard pure	0.154	0.361
Academic major: Hard applied	0.291	0.454
Academic major: Soft pure	0.090	0.286
Academic major: Soft applied (referent)	0.466	0.499
Institutional Environment		
Academic transition	11.303	3.025
Social transition	12.949	3.315
Sense of belonging	12.768	2.440
Quality of Effort		
Time spent studying	3.550	0.676

n = 7,483

In addition to student-level data, the descriptive results consisted of data at the institutional level. Within this study, 26 institutions were used to determine if between-institution variance existed between the cognitive domain dependent variables. Again, the data at the institutional level consisted of LLP aggregate measures related to degree of involvement related to student affairs mentorship, student affairs socio-cultural activities, faculty advising, and faculty socio-cultural activities (Table 4.4). Additional characteristics of these institutions also showed that the average budget for LLPs across these institutions was $21,676. The numerous LLPs within each institution possessed different funding sources. Most institutions (80.8%) had LLPs where 100% of their funding came solely from student affairs units. Nearly half (46.2%) of the institutions had LLPs in which funding was equally split between academic and student affairs units, while only 19% of institutions had LLPs solely funded by academic affairs. Furthermore, at a rate of 96.2%, most institutions had LLPs that reported directly to a residential life or

housing office. More than half of institutions also had LLPs that reported directly to

Academic Administrative units (69.2%), academic departments or colleges (65.4%), and

other student affairs units (53.8%).

Table 4.4

Unstandardized Means and Standard Deviations of LLP Aggregate Measures with Score Ranges

	M	SD
Student affairs mentorship (0-4)	2.41	1.02
Student affairs socio-cultural (0-4)	2.07	0.78
Faculty advising (0-4)	1.89	0.78
Faculty socio-cultural (0-4)	2.12	0.63
Number of LLP faculty (0-5)	1.69	0.89
Average critical thinking/analysis abilities (5-20)	14.74	0.32
Average growth in cognitive complexity (3-12)	8.67	0.24
Average growth in liberal learning (3-12)	8.20	0.23

n = 26

Correlations between the LLP student affairs and faculty aggregate measures

(Table 4.5) indicated that most of the measures were not highly correlated, with ranges

between 0.53 and .348. The most highly correlated variables at the LLP aggregate level

were student affairs mentorship and student affairs staff involvement in socio-cultural

activities, with a correlation of .725. This relationship was significant at the $p < .01$ level.

Even though these mentorship and socio-cultural involvement variables were highly

correlated, they were retained as separate variables in the analysis to explore if they

behave differently in the HLM modeling procedures.

Table 4.5

Correlations Between LLP Student Affairs and Faculty Aggregate Measures

Measures	1	2	3	4	5
1. Student affairs mentorship	−				
2. Student affairs socio-cultural	.725***	−			
3. Faculty advising	.324	.257	−		
4. Faculty socio-cultural	.348	.203	.172	−	
5. Number of LLP faculty	.153	.257	.053	.085	−

*p < .1, **p < .05, ***p < .01, ****p < .001 (two-tailed)

HLM Analyses

The HLM analyses consisted of fully unconditional, within-institution, and between-institution models in order to address the research questions for this study. The reporting of these results consists of standardized regression coefficients in order to ease interpretation of the fixed and random effects at the student- and institution-levels. Additionally, the results of each modeling scheme are reported according to the cognitive domain dependent variable.

Critical Thinking/Analysis Abilities

Fully unconditional model.

The fully unconditional model, in which no predictors are entered in to the model, provided information necessary to determine the viability of modeling the critical thinking/analysis abilities measure of student learning. As a stated in Chapter III, significance testing for all inferential statistics occurred at the alpha-level .100. The

critical thinking/analysis abilities measure is, indeed, viable due to its high reliability ($\rho =$

.775), as indicated in Table 4.6.

Table 4.6

Reliability Estimate of Critical Thinking/Analysis Abilities

Random level-1 coefficient	Reliability estimate
Average critical thinking/analysis abilities	0.775

Additional inspection from the fully unconditional model (Table 4.7) revealed

that significant between-institution variance in critical thinking/analysis abilities existed

among the study institutions ($X^2 = 169.858$, df $= 25$, $p < .001$). Additionally, the

intraclass correlation coefficient (ICC) ($\tau = .015$, $\sigma^2 = .981$) was .015. This indicated that

only 1.5% of the variance in critical thinking/analysis abilities can be explained by

differences in institutions. Although there is little variance between institutions, further

modeling occurred due to the presence of a statistically significant between-institution

variance component for the outcome.

Table 4.7

Fully Unconditional Model (Between-Institution)

Fixed Effects		Coefficient	SE	
Average institution mean, γ_{00}		0.015	0.123	
Random Effects	*Variance*	*Df*	X^2	*p*-value
Institution mean, u_0	0.015	25	169.858	$< .001$
Level-1 effect, σ^2	0.981			

Within-institution model.

The within institution model (Table 4.8) consisted of student-level variables

within the adapted form of Pascarella's General Causal Model of Differential College

Effects of Student Learning and Cognitive Development (1985). This model included

student background and pre-college characteristics as statistical controls, consisting of race/ethnicity, gender, socioeconomic status, SAT, and a quasi pre-test variable for critical thinking/analysis abilities. Of these background and pre-college variables, most of them had statistical significance. With regard to race/ethnicity, being African American (β = .105, p = .058) or Multiracial (β = .087, p = .03) had a positive effect on critical thinking/analysis abilities. However, being Asian American (β = -.177, p < .001) had a negative relationship with the outcome when compared to White students. Furthermore, among these effects, being Asian American resulted in the greatest change in critical thinking/analysis abilities.

When considering gender, there was a significant positive relationship between being male and growth in critical thinking/analysis abilities (β = .221, p < .001). Positive relationships between this outcome and other background and pre-college characteristics included prior achievement as measured by SAT scores (β = .136, p <.001) and the quasi pre-test (β = .168, p < .001). On the other hand, having a higher SES (β = -.026, p = .014) contributed to the model by a slight 2.6% standard deviation decrease in growth in critical thinking/analysis abilities.

The interactions with agents of socialization component of the model was represented by five types of variables: academic peer interactions, social peer interactions, course-related faculty interaction, faculty mentorship, and the academic major. Significant relationships existed between growth in critical thinking/analysis abilities and many of the variables in this part of the model. Both forms of peer interactions—academic (β = .033, p = .019) and social (β = .307, p < .001)—had positive relationships, with social peer interactions being the strong predictor. Of the faculty

interaction variables, only course-related faculty interactions ($\beta = .066$, $p < .001$) had statistically significant predictive power, although minimal.

The academic major, coded according to the Biglan typology, consisted of three dummy variables representing hard pure, hard applied, and soft pure majors. Within this coding scheme soft applied variables served as the referent group. When comparing the dummy variables to soft applied majors, all of the major variables in the model were statistically significant with different directionality of the relationships. Being in a hard pure major ($\beta = -.095$, $p = .002$) decreased perceptions of growth in critical thinking/analysis abilities by nearly a 10% standard deviation. Similarly, the same held true for students in hard applied majors ($\beta = -.131$, $p < .001$). However, majoring in a soft pure field ($\beta = .151$, $p < .001$) positively affected growth in critical thinking/analysis abilities at the student-level.

Proxies for the institutional environment included academic and social transitions and students' sense of belonging within their respective institutions. Out of these three measures, only the academic transition ($\beta = .044$, $p = .001$) was statistically significant. Again, similar to many variables included in the within-institution model, this variable had a minimal positive contribution to growth in critical thinking/analysis abilities.

The final predictor from the adapted framework was quality of effort, which was represented by the amount of time a student spent studying alone. The time spent studying ($\beta = .043$, $p < .001$) variable made a small, positive contribution to growth in critical thinking skills within the within-institution model.

Table 4.8

Within-Institution Model

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	.022 (.025)	0.896
Race/Ethnicity: African American, γ_{10}	.105 (.055)	1.896*
Race/Ethnicity: Asian American, γ_{20}	-0.177 (.037)	-4.717****
Race/Ethnicity: American Indian, γ_{30}	.075 (.194)	0.384
Race/Ethnicity: Hispanic γ_{40}	.070 (.058)	1.203
Race/Ethnicity: Multiracial, γ_{50}	.087 (.041)	2.122**
Race/Ethnicity: Other, γ_{60}	.119 (.112)	1.060
Gender: Male, γ_{70}	0.221 (.022)	10.23****
Socioeconomic status, γ_{80}	-.026 (.011)	-2.448**
SAT, γ_{90}	.136 (.012)	11.398****
Critical thinking/analysis abilities pre-Test, γ_{100}	.168 (.010)	16.151****
Academic peer interaction, γ_{110}	.033 (.013)	2.503**
Social peer interaction, γ_{120}	.307 (.016)	19.251****
Course-related faculty interaction, γ_{130}	.066 (.015)	4.345****
Faculty mentorship, γ_{140}	-.006 (.016)	-0.375
Major: Hard pure, γ_{150}	-.095 (.030)	-3.154***
Major: Hard applied, γ_{160}	-.131 (.025)	-5.284****
Major: Soft pure, γ_{170}	.151 (.037)	4.071****
Academic transition, γ_{180}	.044 (.012)	3.713***
Social transition, γ_{190}	-.014 (.014)	-0.980

Fixed Effects	Coefficient (S.E.)	t-ratio
Sense of belonging, γ_{200}	.021 (.014)	1.484
Time studying, γ_{210}	.043 (.010)	4.157****

Random Effects	Variance component df = 25	Chi-square
Institution mean, u_0	.013	179.147****
Academic peer interaction, u_{11}	<0.001	14.092
Social peer interaction, u_{12}	.002	29.938
Course-related faculty interaction, u_{13}	.001	29.369
Faculty mentorship, u_{14}	.002	34.787*
Academic transition, u_{18}	<.001	17.623
Social transition, u_{19}	.001	31.110
Sense of belonging, u_{20}	.002	33.779
Level-1 effect, σ^2	.731	

*p < .10, **p < .05, ***p < .01, ****p < .001.

Since this study also addressed how certain curricular and co-curricular experiences might vary across institutions according to the emphasis of involvement with faculty and student affairs staff in their LLPs, select interactions with agents of socialization, institutional environment randomly varied across the 26 institutions in the study. As such, pertinent data regarding statistical significance of random effects were obtained (Tables 4.8 and 4.9). The results showed that the only significant random effect within the within-institution model was the intercept of critical thinking/analysis abilities, which is the unadjusted institutional mean for the outcome ($X^2 = 179.147$, df = 25, $\rho = .792$, $p < .001$). Additionally, reliability estimates for the other randomly varying variables related to agents of socialization, institutional environment, and quality of effort were low with ρ ranging from .017 to .344. Furthermore, none of these random effects were statistically significant within the within-institution model.

Table 4.9

Reliability Estimates for Random Effects in the Within-Institution Model

Random level-1 coefficient	Reliability estimate
Average institution critical thinking/analysis abilities	.792
Academic peer interactions	.053
Social peer interactions	.282
Course-related faculty interaction	.149
Faculty mentorship	.255
Academic transition	.012
Social transition	.234
Sense of belonging	.321

Fully conditional model.

Since the intercept and faculty mentorship were the only significant random effects within the within-institution model, their slopes were modeled using the institution-level variables of interest in the study to determine if estimates of LLP effects existed (Table 4.10). When modeling the intercept and faculty mentorship slope with student affairs mentorship, student affairs socio-cultural involvement, faculty advising, faculty socio-cultural involvement, and number of LLP faculty, no statistically significant results occurred. These findings suggested that the faculty and student affairs staff involvement measures do not have an effect on the average critical thinking/analysis abilities within the sample and that these measures do not affect the relationship between faculty mentorship and critical thinking/analysis abilities. Despite no significant variance in average critical thinking/analysis abilities ($X^2 = 57.646$, df = 20, $p < .001$) and faculty mentorship ($X^2 = 31.834$, df = 20, $p = .045$) across institutions was not explained by the LLP faculty and student affairs staff involvement variables, they still continued to vary across institutions (Tables 4.10 and 4.11).

Table 4.10

Fully Conditional Model for Growth in Critical Thinking/Analysis Abilities

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	.011 (.017)	0.672
Student affairs mentorship, γ_{01}	.021 (.026)	0.799
Student affairs socio-cultural, γ_{02}	.031 (.025)	1.256
Faculty advising, γ_{03}	$<.016$ (.018)	-0.866
Faculty socio-cultural, γ_{04}	.019 (.019)	1.036
Number of LLP faculty, γ_{05}	$<-.016$ (.018)	-0.884
Race/Ethnicity: African American, γ_{10}	.101 (.055)	1.819*
Race/Ethnicity: Asian American, γ_{20}	-.175 (.038)	-4.664****
Race/Ethnicity: American Indian, γ_{30}	.036 (.194)	0.185
Race/Ethnicity: Hispanic γ_{40}	.065 (.058)	1.109
Race/Ethnicity: Multiracial, γ_{50}	.090 (.041)	2.201**
Race/Ethnicity: Other, γ_{60}	.134 (.113)	1.189
Gender: Male, γ_{70}	.225 (.022)	10.422****
Socioeconomic status, γ_{80}	-.027 (.011)	-2.616***
SAT, γ_{90}	.135 (.012)	11.415****
Critical thinking/analysis abilities pre-Test, γ_{100}	.166 (.010)	15.914****
Academic peer interaction, γ_{110}	.029 (.013)	2.291**
Social peer interaction, γ_{120}	.311 (.013)	23.775****
Course-related faculty interaction, γ_{130}	.067 (.014)	4.906****

	Coefficient (S.E.)	t-ratio
Fixed Effects		
Faculty mentorship, γ_{140}	-.003 (.016)	-.217
Student affairs mentorship, γ_{141}	.021 (.026)	.799
Student affairs socio-cultural, γ_{142}	.031 (.025)	1.256
Faculty advising, γ_{143}	-.016 (.018)	-.866
Faculty socio-cultural, γ_{144}	.019 (.019)	1.036
Number of LLP faculty, γ_{145}	-.016 (.018)	-.884
Major: Hard pure, γ_{150}	-.095 (.030)	-3.150***
Major: Hard applied, γ_{160}	-.136 (.025)	-5.485****
Major: Soft pure, γ_{170}	.148 (.037)	4.009****
Academic transition, γ_{180}	.045 (.012)	3.823****
Social transition, γ_{190}	-.017 (.012)	-1.380
Sense of belonging, γ_{200}	.016 (.011)	1.427
Time studying, γ_{210}	.166 (.010)	15.914****

Random Effects	Variance component df = 19	Chi-square
Institution mean, u_0	.004	57.646****
Faculty mentorship, u_{14}	.001	31.834**
Level-1 effect, σ^2	.736	

*p < .10, **p < .05, ***p < .01, ****p < .001.

Table 4.11

Reliability Estimate of Critical Thinking/Analysis Abilities

Random level-1 coefficient	Reliability estimate
Average critical thinking/analysis abilities	.582
Faculty mentorship	.304

Although the primary purpose of the fully conditional model was to examine the

effects of faculty and student affairs staff involvement with LLPs across institutions, the

analysis continued to yield results related to the relationship between critical

thinking/analysis abilities and student background and pre-college characteristics, agents

of socialization, institutional environment, and quality of effort variables. Within the

fully-conditional model all of these variables representing these areas of the within-

institution model remained statistically significant.

Model fit summary.

The within-institution and fully conditional models were statistically different (X^2

= 74.644, df = 33, $p < .001$). The BICs (Table 4.12) for the within-institution and fully

conditional models were 18526.122 and 19027.667, respectively. The smaller BIC index

for the within-institution model indicated that it was a better fit for the data.

Table 4.12

Critical Thinking/Analysis Abilities Model Fit Data for the Bayesian Information
Criterion (BIC)

	Deviance	Parameters	BIC
Within-institution model	18197.375	37	18526.122
Fully conditional model	18992.019	4	19027.667

n = 7,421

Growth in Cognitive Complexity

Fully unconditional model.

The fully unconditional model for growth in cognitive complexity (Tables 4.13

and 4.14) yielded a stable reliability estimate (ρ = .775). Additionally, for the outcome

growth in cognitive complexity, statistically significant between-institution variance (X^2

= 94.694, df = 25, $p < .001$) resulted. However, the ICC ($\tau = .015$, $\sigma^2 = .981$) for this outcome variable was relatively small at .011.

Table 4.13

Reliability Estimate of Growth in Cognitive Complexity

Random level-1 coefficient	Reliability estimate
Average growth in cognitive complexity	0.775

Table 4.14

Fully Unconditional Model (Between-Institution) for Growth in Cognitive Complexity

Fixed Effects		Coefficient	SE	
Average institution mean, γ_{00}		-.011	.024	
Random Effects	*Variance*	*Df*	X^2	*p*-value
Institution mean, u_0	.011	25	94.694	$< .001$
Level-1 effect, σ^2	.991			

Within-institution model.

The within-institution model for growth in cognitive complexity (Table 4.15 provided a wealth of information regarding significant predictors for the outcome. Within this model, four of the five variable types within the student background characteristics component of the theoretical framework were statistically significant predictors. When compared to White students, African American ($\beta = .101$, $p = .088$), Asian American ($\beta = .146$, $p < .001$), and Hispanic ($\beta = .108$, $p = .080$) students demonstrated increased scores in their cognitive complexity, with being Asian American having the greatest positive effect on growth.

Although being a member of certain racial/ethnic groups positively contributed to growth in cognitive complexity, other student background characteristics did not. For

113

example, being male (β = -.064, p = .005) negatively contributed to growth in cognitive complexity. Meanwhile, the higher a student scored on the SAT (β = -.078, $p < .001$) resulted in nearly an 8% standard deviation decrease in the outcome for every unit increase. Again, for this outcome in particular, higher scores on the cognitive complexity quasi pre-test (β = .085, $p < .001$) resulted in higher perceptions of growth in cognitive complexity.

Nearly all of the variables constituting agents of socialization contributed positively to growth in cognitive complexity within institutions. Both academic (β = .059, p = .002) and social interactions (β = .121, $p < .001$) with peers made positive effects within the study, with social peer interaction having a greater effect. With respect to interactions with faculty, both course-related interaction (β = .119 = $p < .001$) and mentorship (β = .037, $p < .001$) positively related to growth in cognitive complexity with a stronger effect for interactions related to courses. Meanwhile, there was only one statistically significant relationship between growing in cognitive complexity with one type of academic major. Compared to students in soft applied majors, being in a soft pure major (β = .067, p = .085) had a minimal positive contribution to the outcome. No effects occurred for students in hard pure and hard applied majors.

Proxy measures of the institutional environment and quality of effort yielded interesting results in that both academic and social aspects of the environment were statistically significant. The academic transition to college was a modest contributor of growth in cognitive complexity. Of the two transition variables, the academic transition (β = .053, p = .002) to college was statistically significant while the social transition measure was not. Additionally, a greater sense of belonging (β = .179, $p < .001$) for

114

students resulted in substantially increased perceptions of growth in cognitive complexity. Unsurprisingly, the amount of time spent studying alone ($\beta = .062$, $p < .001$) also contributed positively to growth in the outcome.

Table 4.15

Within-institution Model for Growth in Cognitive Complexity

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	-.012 (.023)	-0.539
Race/Ethnicity: African American, γ_{10}	.101 (.059)	1.706*
Race/Ethnicity: Asian American, γ_{20}	.146 (.039)	3.694****
Race/Ethnicity: American Indian, γ_{30}	.194 (.207)	0.347
Race/Ethnicity: Hispanic γ_{40}	.108 (.062)	1.750*
Race/Ethnicity: Multiracial, γ_{50}	.016 (.043)	0.374
Race/Ethnicity: Other, γ_{60}	-.184 (.119)	-1.545
Gender: Male, γ_{70}	-.064 (.023)	-2.815***
Socioeconomic status, γ_{80}	.007 (.011)	.665
SAT, γ_{90}	-.078 (.014)	-5.406****
Critical thinking/analysis abilities pre-Test, γ_{100}	.085 (.011)	7.693****
Academic peer interaction, γ_{110}	.059 (.017)	3.417***
Social peer interaction, γ_{120}	.121 (.018)	6.679****
Course-related faculty interaction, γ_{130}	.119 (.017)	7.086****
Faculty mentorship, γ_{140}	.037 (.016)	2.332**
Major: Hard pure, γ_{150}	-.010 (.032)	-.305
Major: Hard applied, γ_{160}	-.026 (.026)	-1.007

	Coefficient	t-ratio
Fixed Effects	(S.E.)	
Major: Soft pure, γ_{170}	.067	1.722*
	(.039)	
Academic transition, γ_{180}	.053	3.425***
	(.015)	
Social transition, γ_{190}	.020	1.281
	(.016)	
Sense of belonging, γ_{200}	.179	11.029****
	(.016)	
Time studying, γ_{210}	.062	5.637****
	(.011)	
Random Effects	Variance component	Chi-square
	df = 25	
Institution mean, u_{0j}	.010	102.921****
Academic peer interaction, u_{11j}	.003	28.705
Social peer interaction, u_{12j}	.003	27.067
Course-related faculty interaction, u_{13j}	.001	22.270
Faculty mentorship, u_{14j}	.001	21.096
Academic transition, u_{18j}	.002	30.054
Social transition, u_{19j}	.002	28.640
Sense of belonging, u_{20j}	.003	35.745*
Level-1 effect, σ^2	.826	

*p < .10, **p < .05, ***p < .01, ****p < .001.

Table 4.16

Reliability Estimates for Random Effects in the Growth in Cognitive Complexity Within-Institution Model

Random level-1 coefficient	Reliability estimate
Average institution growth in cognitive complexity	.739
Academic peer interactions	.339
Social peer interactions	.354
Course-related faculty interaction	.203
Faculty mentorship	.179
Academic transition	.282
Social transition	.277
Sense of belonging	.411

In addition to identifying statistically significant fixed effects, the within-institution model provided information regarding significant random effects. The results of the within-institution model showed that intercept (X^2 = 102.921, df = 25, ρ = .739, p < .001) for average growth in cognitive complexity and the sense of belonging slope (X^2 = 35.745, df = 25, ρ = .411, p = .075) varied across institutions. Meanwhile, the other random effects related to interactions with agents of socialization and the institutional environment randomly varied.

Fully conditional model.

The fully conditional model for growth in cognitive complexity (Table 4.17) tested both randomly and non-randomly varying effects between and within institutions, respectively. Specifically, this model used LLP aggregate measures to predict the average growth in cognitive complexity across institutions and the sense of belonging slope. After modeling the average institutional growth in cognitive complexity, the fully conditional model revealed that it was not significant within the model. Despite its lack of significance within this model, several of the LLP aggregate measures significantly predict the intercept. First, involvement among student affairs professional staff in mentoring relationships (γ = -.063, p = .024) negatively predicted the average institutional growth in cognitive complexity. Meanwhile, student affairs socio-cultural involvement (γ = .057, p = .030) and faculty socio-cultural involvement (γ = .036, p = .066) positively predicted the average growth in the outcome. Of these two socio-cultural involvement variables, student affairs involvement had a slightly stronger relationship to the intercept than the similar type of faculty involvement.

The second random effect modeled was the sense of belonging slope. The intercept for this slope ($\gamma = .183$, $p < .001$) was significant, indicating that sense of belonging was a positive predictor of growth in cognitive complexity. Similar to the intercept of the fully conditional model, LLP aggregate measures had significant effects on the sense of belonging slope. Within this model, increased involvement among student affairs professionals through mentoring ($\gamma = .077$, $p < .001$) increased the sense of belonging slope, thus magnifying the positive effect of sense of belonging on growth in cognitive complexity. On the other hand, both socio-cultural involvement by faculty ($\gamma = -.034$, $p = .024$) and student affairs staff ($\gamma = -.055$, $p = .008$) decreased the sense of belonging slope.

Modeling the random effects in this model using the LLP aggregate measures across institutions aimed to variance between-institution variance in average growth in cognitive complexity and sense of belonging (Tables 4.15 and 4.16). After accounting for these LLP aggregate measures, the random effect of the intercept ($X^2 = 44.644$, df = 20, $\rho = .525$, $p = .002$) remained significant. However, the sense of belonging slope ($X^2 = 23.006$, df = 20, $\rho = .214$, $p = .288$) lost significance once entering the LLP aggregate measures in to the model.

Other fixed effects within the model continued to be significant predictors of growth in cognitive complexity. Many of the variables to account for race/ethnicity were statistically significant in the model. According to the fully conditional model, students who identified as African American ($\beta = .107$, $p = .071$), Asian American ($\beta = .137$, $p < .001$), Hispanic ($\beta = .107$, $p = .083$), or Other ($\beta = -.198$, $p = .097$) were statistically different from White students in terms of growth in cognitive complexity. African

American, Asian American, and Hispanic students reported more growth in cognitive complexity than White students, while students who identified as Other reported nearly a 20% standard deviation decrease in growth in cognitive complexity.

Among the other student background characteristics, being male (β = -.065, p = .005) negatively affected reported growth in cognitive complexity compared to women. A similar effect also occurred for students who reported higher scores on the SAT (β = -.077, p < .001), which resulted in nearly an 8% standard deviation decrease in growth in cognitive complexity for every unit increase on the SAT. Additionally unit increases in reported ability to analyze information (β = .084, p < .001) as the quasi pre-test resulted in an 8.4% standard deviation increase in growth in cognitive complexity.

With the exception of the academic major, all of the agents of socialization—faculty and peers—positively predicted growth in cognitive complexity. Having greater perceptions of academic (β = .060, p < .001) and social (β = .127, p < .001) peer interactions resulted in greater growth in cognitive complexity. In particular, social peer interaction had a greater effect on the outcome. Moreover, greater course-related faculty interaction (β = .116, p < .001) and faculty mentorship (β = .040, p = .004) resulted in greater growth in cognitive complexity. Again, there was a stark difference in terms of the magnitude of the contribution of faculty interaction, as course-related interaction more strongly contributed to the model than mentorship.

The other non-randomly varying proxy measures of the institutional environment and quality of effort were student perceptions of their academic and social transitions to college and time spent studying alone. According to the fully conditional model, having a more favorable academic transition (β = .053, p < .001) to college resulted in greater

growth in cognitive complexity. In terms of the social transition to college, there was not

a statistically significant relationship between it and growth in cognitive complexity.

Finally, time spent studying alone ($\beta = .061$, $p < .001$) was a significant predictor of

growth in cognitive complexity. The more time spent studying alone resulted in

approximately a 6% standard deviation increase in cognitive complexity.

Table 4.17

Fully Conditional Model for Growth in Cognitive Complexity

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	-.013 (.017)	0.672
Student affairs mentorship, γ_{01}	-.063 (.026)	-2.433**
Student affairs socio-cultural, γ_{02}	.057 (.025)	2.336**
Faculty advising, γ_{03}	-.025 (.018)	-1.397
Faculty socio-cultural, γ_{04}	.036 (.018)	1.945*
Number of LLP faculty, γ_{05}	-.015 (.017)	0.833
Race/Ethnicity: African American, γ_{10}	.107 (.059)	1.804*
Race/Ethnicity: Asian American, γ_{20}	.137 (.040)	3.478****
Race/Ethnicity: American Indian, γ_{30}	.169 (.207)	0.816
Race/Ethnicity: Hispanic γ_{40}	.107 (.062)	1.731*
Race/Ethnicity: Multiracial, γ_{50}	.012 (.043)	0.276
Race/Ethnicity: Other, γ_{60}	-.198 (.119)	-1.661*
Gender: Male, γ_{70}	-.065 (.023)	-2.837***
Socioeconomic status, γ_{80}	.007 (.011)	0.605
SAT, γ_{90}	-.077 (.015)	-5.248****

Fixed Effects	Coefficient (S.E.)	t-ratio
Growth in cognitive complexity pre-test, γ_{100}	.084	7.603****
	(.011)	
Academic peer interaction, γ_{110}	.060	4.463****
	(.013)	
Social peer interaction, γ_{120}	.127	8.974****
	(.014)	
Course-related faculty interaction, γ_{130}	.112	7.963****
	(.015)	
Faculty mentorship, γ_{140}	.040	2.873***
	(.014)	
Major: Hard pure, γ_{150}	-.010	-0.323
	(.032)	
Major: Hard applied, γ_{160}	-.027	-1.030
	(.026)	
Major: Soft pure, γ_{170}	.061	1.555
	(.039)	
Academic transition, γ_{180}	.053	4.229****
	(.012)	
Social transition, γ_{190}	.016	-1.251
	(.013)	
Sense of belonging, γ_{200}	.183	13.386****
	(.014)	
Student affairs mentorship, γ_{201}	.077	3.884****
	(.020)	
Student affairs socio-cultural, γ_{202}	-.055	-2.946***
	(.019)	
Faculty advising, γ_{203}	-.008	-0.596
	(.014)	
Faculty socio-cultural, γ_{204}	-.034	-2.443**
	(.014)	
Number of LLP faculty, γ_{205}	.019	1.470
	(.013)	
Time studying, γ_{210}	.061	5.608****
	(.011)	
Random Effects	Variance component df = 20	Chi-square
Institution mean, u_0	.004	44.643****
Sense of belonging, u_{20}	.001	23.006
Level-1 effect, σ^2	.832	

*p < .10, **p < .05, ***p < .01, ****p < .001.

Table 4.18

Reliability Estimate of Growth in Cognitive Complexity

Random level-1 coefficient	Reliability estimate
Average growth in cognitive complexity	.525
Sense of belonging	.214

Model fit summary.

Hypothesis testing between the within-institution and fully conditional models showed that the two were statistically different ($X^2 = 68.442$, df $= 33$, $p < .001$). The growth in cognitive complexity within-institution model yielded a BIC of 20246.509, and the BIC for the fully conditional model was 20020.684 (Table 4.19). Given the lower BIC for the fully conditional model, this model fits the data better than the within-institution model.

Table 4.19

Growth in Cognitive Complexity Model Fit Data for the Bayesian Information Criterion (BIC)

	Deviance	Parameters	BIC
Within-institution model	19916.573	37	20246.509
Fully conditional model	19985.015	4	20020.684
n = 7,459			

Growth in Liberal Learning

Fully unconditional model.

For the outcome growth in liberal learning, the fully unconditional model (Table 4.20) showed that the reliability estimate was moderately low ($\rho = .672$). Furthermore, there was statistically significant between-institution variance (Table 4.21) for the

outcome (X^2 = 82.969, df = 25, $p < .001$). Although statistically significant between-institution variance existed, the ICC (τ = .009, σ^2 = .993) was nearly negligible at .009.

Table 4.20

Reliability Estimate of Growth in Liberal Learning

Random level-1 coefficient	Reliability estimate
Average growth in liberal learning	0.672

Table 4.21

Fully Unconditional Model (Between-Institution) for Growth in Liberal Learning

Fixed Effects		Coefficient	SE	
Average institution mean, γ_{00}		-.009	.022	
Random Effects	*Variance*	*df*	X^2	*p*-value
Institution mean, u_0	.009	25	82.969	< .001
Level-1 effect, σ^2	.993			

Within-institution model.

Results from the within-institution model (Table 4.22) revealed that the student background characteristics used as controls were significant predictors of growth in liberal learning. With respect to race/ethnicity, compared to White students, being African American (β = .129, p = .025), Asian American (β = .204, $p < .001$), American Indian (β = .355, p = .081), or Hispanic (β = .105, p = .085) contributed positively toward reporting greater growth in liberal learning. Among these variables, being Asian American or American Indian had the strongest relationship by increasing growth in liberal learning by a 20.4% and 35.5% standard deviation, respectively. However there was not a statistically significant relationship between growth in liberal learning and identifying as Multiracial or Other.

On the other hand, gender and SAT scores shared negative relationships with growth in liberal learning. Compared to women, men (β = -.056, p = .014) demonstrated nearly a 6.0% standard deviation decrease in growth in liberal learning, while holding all else constant. Similarly, increased reported scores on the SAT (β = -.130, p < .001) resulted in a 13% decrease in reported growth in liberal learning.

Unsurprisingly, having an increased openness to new ideas (β = .118, p < .001), which served as the quasi pre-test, resulted in an 11% standard deviation increase in growth in liberal learning while holding all other variables in the model constant. It remained however that there was not a significant relationship between socioeconomic status and growth in liberal learning.

Many of the interactions with agents of socialization variables were statistically significant in the model as well. Of the two measures of peer interactions, social peer interaction had a positive relationship with growth in liberal learning while academic peer interaction did not. A unit increase in social peer interaction (β = .214, p < .001) was substantial in that it resulted in a little over a 21% standard deviation increase in growth in liberal learning. Within institutions, interactions with faculty through mentorship (β = .072, p < .001) or courses (β = .081, p < .001) also contributed positively to liberal learning. However, the magnitude of the increase for the outcome was less for faculty interaction than social interaction among peers.

Finally, among the academic majors as a means of socialization only one was statistically significant. Compared to students in soft applied majors, students in hard applied majors (β = -.064, p = .013) had a slight decrease in their growth in liberal learning while holding all other variables in the model constant. Meanwhile, there were

no statistically significant differences for students majoring in hard pure or soft pure

majors.

Among the three variables composing the institutional environment, two had a

significant relationship with reported growth in liberal learning. Having a more positive

academic transition ($\beta = .043$, $p = .012$) to college resulted in a 4.3% standard deviation

increase in liberal learning. However, the social transition to college did not have a

statistically significant effect. Even though the social transition to college was not a

significant variable in the model, sense of belonging was significant. An increase in sense

of belonging ($\beta = .159$, $p < .001$) resulted in an increase in growth in liberal learning.

Finally, the quality of effort variable measured by the self-reported time spent studying

alone ($\beta = .023$, $p = .030$) was a significant predictor for the outcome as well.

Table 4.22

Within-Institution Model for Growth in Liberal Learning

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	-.008 (.021)	-0.362
Race/Ethnicity: African American, γ_{10}	.129 (.057)	2.237**
Race/Ethnicity: Asian American, γ_{20}	.204 (.039)	5.219****
Race/Ethnicity: American Indian, γ_{30}	.355 (.204)	1.744*
Race/Ethnicity: Hispanic γ_{40}	.105 (.061)	1.722*
Race/Ethnicity: Multiracial, γ_{50}	.008 (.043)	0.178
Race/Ethnicity: Other, γ_{60}	-.066 (.117)	-0.562
Gender: Male, γ_{70}	-.056 (.023)	-2.464**
Socioeconomic status, γ_{80}	-.001 (.011)	-0.107

Fixed Effects	Coefficient (S.E.)	t-ratio
SAT, γ_{90}	-.130 (.013)	-10.027****
Growth in liberal learning pre-test, γ_{100}	.118 (.011)	10.727****
Academic peer interaction, γ_{110}	.001 (.018)	0.031
Social peer interaction, γ_{120}	.214 (.022)	9.601****
Course-related faculty interaction, γ_{130}	.081 (.018)	4.614****
Faculty mentorship, γ_{140}	.072 (.018)	4.046**
Major: Hard pure, γ_{150}	-.018 (.032)	-.568
Major: Hard applied, γ_{160}	-.064 (.023)	-2.484**
Major: Soft pure, γ_{170}	.058 (.039)	1.498
Academic transition, γ_{180}	.043 (.016)	2.713**
Social transition, γ_{190}	.019 (.015)	1.226
Sense of belonging, γ_{200}	.159 (.016)	9.765****
Time studying, γ_{210}	.023 (.011)	2.173**
Random Effects	Variance component df = 25	Chi-square
Institution mean, u_{0j}	.008	86.376****
Academic peer interaction, u_{11}	.003	28.705
Social peer interaction, u_{12}	.007	51.837***
Course-related faculty interaction, u_{13}	.002	28.821
Faculty mentorship, u_{14}	.003	34.506*
Academic transition, u_{18}	.002	29.260
Social transition, u_{19}	.002	28.980
Sense of belonging, u_{20}	.003	44.924***
Level-1 effect, σ^2	.805	

*p < .10, **p < .05, ***p < .01, ****p < .001.

In terms of the between-institution variance, four of the random effects tested were statistically significant (Tables 4.22 and 4.23). The random effect for the intercept (X^2 = 86.376, df = 25, ρ = .696, $p < .001$) was statistically significant, suggesting that the average growth in liberal learning differed across institutions. Likewise, the within-institution model supported that the slopes for social peer interaction (X^2 = 51.837, df = 25, ρ = .555, $p = .002$), faculty mentorship (X^2 = 34.506, df = 25, ρ = .324, $p = .097$), and sense of belonging (X^2 = 44.924, df = 25, ρ = .417, $p = .009$) varied across institutions.

Table 4.23

Reliability Estimates for Random Effects in the Within-Institution Model

Random level-1 coefficient	Reliability estimate
Average institution growth in liberal learning	.696
Academic peer interactions	.373
Social peer interactions	.555
Course-related faculty interaction	.282
Faculty mentorship	.324
Academic transition	.333
Social transition	.252
Sense of belonging	.417

Fully conditional model.

The primary point of interest within the fully conditional model (Table 4.24) was to model the intercept and slopes for social peer interaction, faculty mentorship, and sense of belonging by using LLP aggregate measures across institutions. Following are the results of between-institution modeling of the significant random effects from the within-institution model followed by an overview of the remaining significant predictors included in the fully conditional model.

The intercept ($\gamma = -.007$, $p = .691$), average institutional mean for growth in liberal learning, was not significant within the fully conditional model. However, when modeling the average institutional mean using the LLP aggregate measures, two were statistically significant. First, increased involvement of student affairs professional staff in mentoring activities ($\gamma = -.051$, $p = .073$) resulted in a slight decrease in the average institutional growth in liberal learning. On the other hand, involvement of student affairs professional staff in socio-cultural activities ($\gamma = .059$, $p = .034$) yielded a slight increase in average institutional growth in liberal learning. These results indicated that, although slight, involvement in LLPs among student affairs staff professionals matters when considering growth in liberal learning.

The second random effect tested involved the social peer interaction slope. The intercept for the social peer interaction ($\gamma = .209$, $p < .001$) was significant, suggesting that this predictor is significant and should be retained in the fully conditional model. However, none of the LLP aggregate measures had statistically significant effects on the relationship between social peer interaction and growth in liberal learning, with the exception of the average number of LLP faculty ($\gamma = .024$, $p = .102$) involved in LLPs at the institution, which was marginally non-significant. This result possibly implies that greater numbers of LLP faculty slightly increases the social peer interaction slope. In essence, when greater numbers of faculty are involved in the LLP, on average, more positive perceptions of peers result in an even greater increase in growth in liberal learning. The other random effect associated with agents of socialization was faculty mentorship. Within the fully conditional model, only the intercept ($\gamma = .073$, $p < .001$) was statistically significant, while none of the LLP aggregates were significant.

The final slope modeled within the fully conditional model was sense of belonging, the only significant random effect among the institutional environment proxies. When modeling the sense of belonging slope, the intercept ($\gamma = .158$, $p < .001$) and average student affairs professional staff involvement related to mentorship ($\gamma = .041$, $p = .082$) were statistically significant. This result indicated that a unit increase in the frequency of involvement among student affairs professional staff increased the sense of belonging slope by roughly 4%. Essentially, when there is a greater amount of involvement related to mentorship by student affairs professionals in the LLP, students who have a greater sense of belonging have greater growth in liberal learning.

Among the non-randomly varying variables within the fully conditional model, most of them remained significant. When considering the student background characteristics variables, students who identified as African American ($\beta = .137$, $p = .018$), Asian American ($\beta = .201$, $p < .001$), or Hispanic ($\beta = .105$, $p = .085$) reported greater growth in liberal learning compared to White students. Unlike in the within-institution model, there was no statistical difference between American Indian and White students within the fully conditional model.

The remaining student background characteristics were statistically significant within fully conditional model that were significant in the within-institution model. Within the current model, being male remained significant. Male students ($\beta = -.056$, $p = .012$) reported nearly a 6% standard deviation decrease in growth in liberal learning compared to female students. Increase scores on the SAT ($\beta = -.127$, $p < .001$) continued to have a negative effect on growth in liberal learning. Finally, students who reported greater growth in openness to new ideas ($\beta = .119$, $p < .001$) as the quasi pre-test, had

nearly a 12% standard deviation increase in growth in liberal learning while holding all else constant.

When considering agents of socialization, one of the academic majors was a significant predictor of growth in liberal learning in the model. Students in hard applied majors ($\beta = -.068$, $p = .009$) demonstrated a 6.8% standard deviation decrease in growth in liberal learning compared to students in soft applied majors. Additionally, course related faculty interaction ($\beta = .083$, $p < .001$) was positively related to growth in liberal learning, with a unit increase that resulted in an 8.3% standard deviation increase in the outcome.

Meanwhile, only one non-randomly varying measure of the institutional environment was significant within the fully conditional model. Students who had a more positive academic transition ($\beta = .041$, $p = .001$) to college had slightly higher perceptions of growth in liberal learning. This difference yielded a 4.1% standard deviation increase in the outcome for every unit increase in the academic transition measure. Furthermore, the quality of effort measure time spent studying alone ($\beta = .024$, $p = .026$) also resulted in a slight 2.4% standard deviation increase in growth in liberal learning for every increase unit increase in time spent studying.

Table 4.24

Fully Conditional Model for Growth in Liberal Learning

Fixed Effects	Coefficient (S.E.)	t-ratio
Intercept, γ_{00}	-.007 (.018)	-0.403
Student affairs mentorship, γ_{01}	-.051 (.027)	-1.889*

Fixed Effects	Coefficient (S.E.)	t-ratio
Student affairs socio-cultural, γ_{02}	.059 (.026)	2.278**
Faculty advising, γ_{03}	-.013 (.019)	-0.704
Faculty socio-cultural, γ_{04}	.022 (.019)	1.156
Number of LLP faculty, γ_{05}	.021 (.018)	1.152
Race/Ethnicity: African American, γ_{10}	.137 (.058)	2.374**
Race/Ethnicity: Asian American, γ_{20}	.206 (.039)	5.277****
Race/Ethnicity: American Indian, γ_{30}	.318 (.204)	1.558
Race/Ethnicity: Hispanic γ_{40}	.105 (.061)	1.721*
Race/Ethnicity: Multiracial, γ_{50}	.003 (.042)	0.080
Race/Ethnicity: Other, γ_{60}	-.084 (.117)	-0.716
Gender: Male, γ_{70}	-.058 (.023)	-2.521**
Socioeconomic status, γ_{80}	< .001 (.011)	0.008
SAT, γ_{90}	-.127 (.013)	-9.708****
Growth in liberal learning pre-test, γ_{100}	.119 (.011)	10.763****
Academic peer interaction, γ_{110}	.008 (.013)	0.572
Social peer interaction, γ_{120}	.209 (.016)	12.764****
Student affairs mentorship, γ_{121}	.025 (.021)	1.203
Student affairs socio-cultural, γ_{122}	.003 (.019)	0.146
Faculty advising, γ_{123}	< .001 (.015)	0.028
Faculty socio-cultural, γ_{124}	.005 (.015)	0.303
Number of LLP faculty, γ_{125}	.024 (.014)	1.716
Course-related faculty interaction, γ_{130}	.083 (.014)	5.747****

Fixed Effects	Coefficient (S.E.)	t-ratio
Faculty mentorship, γ_{140}	.073 (.017)	4.196****
Student affairs mentorship, γ_{141}	.012 (.024)	0.528
Student affairs socio-cultural, γ_{142}	-.019 (.022)	-0.860
Faculty advising, γ_{143}	-.009 (.016)	-0.523
Faculty socio-cultural, γ_{144}	-.010 (.017)	-0.598
Number of LLP faculty, γ_{145}	.001 (.015)	0.050
Major: Hard pure, γ_{150}	-.018 (.032)	-0.582
Major: Hard applied, γ_{160}	-.068 (.026)	-2.619***
Major: Soft pure, γ_{170}	.060 (.039)	1.554
Academic transition, γ_{180}	.041 (.012)	3.273***
Social transition, γ_{190}	.020 (.013)	1.600
Sense of belonging, γ_{200}	.158 (.015)	10.268****
Student affairs mentorship, γ_{201}	.041 (.022)	1.828*
Student affairs socio-cultural, γ_{202}	-.022 (.021)	-1.019
Faculty advising, γ_{203}	-.012 (.016)	-0.784
Faculty socio-cultural, γ_{204}	-.020 (.016)	-1.275
Number of LLP faculty, γ_{205}	.026 (.015)	1.727
Time studying, γ_{210}	.024 (.011)	2.225**

Random Effects	Variance component df = 20	Chi-square
Institution mean, u_0	.005	48.693****
Social peer interaction, u_{12}	.001	28.637*
Faculty mentorship, u_{14}	.002	32.242**
Sense of belonging, u_{20}	.002	33.418**
Level-1 effect, σ^2	.811	

*p < .10, **p < .05, ***p < .01, ****p < .001.

The results of the fully conditional model (Tables 4.24 and 4.25) tested whether or not the intercept ($X^2 = 48.693$, df = 20, $\rho = .574$, $p < .001$) and the social peer interaction ($X^2 = 28.637$, df = 20, $\rho = .265$, $p = .095$), faculty mentorship ($X^2 = 32.242$, df = 20, $\rho = .394$, $p = .041$), and sense of belonging ($X^2 = 33.418$, df = 20, $\rho = .385$, $p = .030$) slopes varied across institutions after including LLP aggregate measures in the model. Indeed, the intercept and all of the slopes were statistically significant. This result suggests that between-institution variance exists; however, the LLP aggregate measures for institutions do not explain the variance.

Table 4.25

Reliability Estimates of Growth in Liberal Learning

Random level-1 coefficient	Reliability estimate
Average growth in liberal learning	.574
Social peer interaction	.265
Faculty mentorship	.394
Sense of belonging	.385

Model fit summary.

The within-institution and fully conditional models used to model growth in liberal learning were statistically different ($X^2 = 128.573$, df = 26, $p < .001$). The BIC for the growth in liberal learning within-institution model was 20134.821, and the BIC for

the fully conditional model was 20031.464 (Table 4.26). These BIC results indicated that the fully conditional model was a better fit for the data.

Table 4.26

Growth in Liberal Learning Model Fit Data for the Bayesian Information Criterion (BIC)

	Deviance	Parameters	BIC
Within-institution model	19804.767	37	20134.821
Fully conditional model	19933.340	11	20031.464

n = 7,483

Summary

The results of this study provided the information needed to answer the three research questions guiding this study of the effect of faculty and student affairs professional staff roles on growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning among students in LLPs. The first research question that guided this study related to discovering the curricular and co-curricular student experiences associated with student perceptions of learning. The second and third questions attempted to determine which roles played by faculty and student affairs professional staff accounted for direct differences in the three outcomes, as well as any differential relationships between significant curricular and co-curricular experiences and the outcomes.

The results of this study showed that students' growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning differed slightly depending upon the dependent variable of interest. The within-institution model indicated that academic and social interactions with agents of socialization positively contributed to critical thinking/analysis abilities. These agents specifically consisted of majoring in a soft pure

discipline compared to a soft applied discipline, academic and career related peer interactions, social peer interactions, and course-related faculty interaction. Additional positive contributions to this outcome included a more favorable academic transition during the first year of college and spending time studying alone. On the other hand, majoring in hard pure and hard applied majors, compared to soft applied majors, contributed negatively to growth in critical thinking/analysis abilities.

When considering the curricular and co-curricular experiences that related to growth in cognitive complexity, the results suggested that the significant predictors among these experiences all increased growth in the outcome for students. Academic and social interactions with peers, course-related faculty interaction, faculty mentorship, and majoring in a soft pure major positively contributed to growth in cognitive complexity. Moreover, certain elements of the institutional environment also positively related to the outcome. These variables included the academic transition to college and sense of belonging. Among these agents of socialization and the institutional environment, social interactions with peers and course-related faculty interactions maintained the strongest relationships with growth in cognitive complexity.

Finally, numerous student experiences within and outside of the classroom shared a relationship with growth in liberal learning. For this outcome more favorable interactions with peers around socio-cultural issues, faculty related to courses, and mentorship by faculty increased perceptions of growth in this area. Similarly, a positive academic transition to college, sense of belonging, and time spent studying alone also positively contributed to liberal learning. However, the results showed that majoring in a hard applied major negatively contributed to liberal learning. Interestingly, more social

in nature interactions with peers and sense of belonging were two of the strongest predictors of growth in liberal learning for students in the study.

The study used LLP aggregate measures of faculty and student affairs staff involvement roles within institutions to determine which of the roles directly related to differences in student perceptions of growth in the three cognitive domains. The results of this study concluded that none of the LLP aggregate measures directly contributed to student perceptions of growth in critical thinking/analysis abilities across institutions. Yet, the results indicated that increased involvement among student affairs staff professionals regarding mentorship decreased the average growth in cognitive complexity and liberal learning across institutions. Conversely, student affairs staff involvement associated with socio-cultural activities increased the average growth in the two outcomes. Finally, increased involvement in LLP socio-cultural activities among faculty increased the average growth in cognitive complexity only. Although there were some significant effects among the LLP aggregate measures in terms of direct associations with the average outcomes, the magnitude of their contributions were modest.

For the critical thinking/analysis abilities model, the relationship between faculty mentorship and the outcome varied across institutions. Similar to the direct effects testing for LLP aggregate measures on critical thinking/analysis abilities, none of the LLP aggregates accounted for any differential relationships for the faculty mentorship slope. However, the same did not hold true for the LLP aggregates for slopes associated with growth in cognitive complexity and liberal learning.

With respect to growth in cognitive complexity, the relationship between sense of belonging and the outcome varied across institutions. When modeling this relationship,

136

the results indicated that greater involvement among student affairs professional staff augmented the relationship between sense of belonging and growth in cognitive complexity. On the other hand, increased involvement among student affairs staff and faculty related to socio-cultural activities diminished the sense of belonging slope.

Furthermore, several slopes varied when considering growth in liberal learning. First, the relationship between social peer interaction and the outcome varied. However, the LLP aggregate measures related to faculty and student affairs staff involvement were not statistically related to the social peer interaction slope. The same was results occurred for the relationship between growth in liberal learning and faculty mentorship. The sense of belonging slope differed from the other slopes in that increased involvement among student affairs staff in mentorship roles modestly increased the slope, those intensifying the contribution of a positive perception of sense of belonging to growth in liberal learning.

In sum, this study revealed that both curricular and co-curricular experiences make significant contributions to LLP participants' perceptions of their learning in critical thinking/analysis abilities, cognitive complexity, and liberal learning. Additionally, not only are direct curricular and co-curricular experiences important, but how students perceive their environment also bears on their learning. Finally, the study indicated that some roles played by faculty and student affairs staff within LLPs do contribute to directly and indirectly to students' perceptions of learning in the three cognitive domains.

Chapter V

        The current research on living-learning programs (LLPs) is void when attempting

to understand exactly what about their composition contributes to student learning. As

Andrade (2007) noted in her review of learning communities, inclusive of living-learning

programs, more research is needed to understand what features of program contribute to

their stated outcomes. This dissertation research aimed to explore dimensions of the

make-up of LLPs by studying two aspects of LLP structural composition—faculty and

student affairs staff involvement. This study of living-learning programs (LLPs) used

data from the National Study of Living-Learning Programs (NSLLP) to examine the

effects of faculty and student affairs professional staff involvement on LLP participants'

perception of their learning and other curricular and co-curricular experiences related to

learning. The perceptual measures of learning within this study included the cognitive

domains of critical thinking/analysis abilities, cognitive complexity, and liberal learning.

The specific faculty and student affairs staff roles examined were somewhat related. The

faculty roles of interested included advising and involvement with students in socio-

cultural events. Meanwhile, student affairs involvement consisted of mentorship and

participation in socio-cultural events with LLP participants. The research questions used

to conduct this study were

- What key curricular and co-curricular student experiences are associated
  with student perceptions of growth in critical thinking/analysis abilities,
  cognitive complexity, and liberal learning?
- Which roles played by faculty and student affairs professional staff within
  LLPs are directly associated with differences in student perceptions of

138

growth in critical thinking/analysis abilities, cognitive complexity, and

liberal learning?

- Do faculty and student affairs staff roles within LLPs account for

    differential relationships between students' perceptions of and experiences

    in college and self-perceptions of growth in critical thinking/analysis

    abilities, cognitive complexity, and liberal learning?

In order to address the research questions guiding this study, the NSLLP data

included information reported by students and LLP program administrators. The data

were considered nested because they consisted of data from individual students and LLP

program administrators about the LLPs in which the students participated. Given that the

data were nested at two levels (student and LLP program), analyses were completed

using hierarchical linear modeling (HLM). The results of this multi-level study (see

Chapter IV) will be discussed further in this chapter by using the research questions as a

guide.

Discussion of Findings

The findings from this study suggested that there are both individual and

structural aspects of the LLP experience that contributed to how students perceive their

learning in critical thinking/analysis abilities, cognitive complexity, and liberal learning.

By using an adaption of the General Causal Model for Assessing Differential Effects of

Student Learning Cognitive Development (Pascarella, 1985), the study addressed specific

structural elements of LLPs, in addition to student experiences. The remainder of this

discussion addresses the ways in which key LLP participant experiences and the roles of

139

faculty and student affairs professionals affect student perceptions of their learning in the three cognitive outcome areas.

Effects of Student Perceptions/Experiences on Cognitive Domains

By examining influential student perceptions and experiences across different types of domains, it is possible to uncover the nuances of various forms of learning. While on the whole, there were many similarities in terms of student experiences within and perceptions of college across critical thinking/analysis abilities, cognitive complexity, and liberal learning, there were some stark differences. A summary of the directionality of significant relationships between these variables is contained in Table 5.1. Although this table contains the directionality of all significant relationships of variables at the student-level, the first research question in this study only addressed specific curricular and co-curricular experiences that contributed to student learning. This aspect of the findings suggested that, indeed, certain characteristics of student experiences do contribute differently cognitive dimensions of learning. The findings from this study suggested that multiple variables related to student background characteristics, interactions with agents of socialization, the institutional environment, and quality of effort shared relationships with critical thinking/analysis abilities, cognitive complexity, and liberal learning.

Table 5.1

Final Significant Variables in Model at the Student-Level

	Cognitive Domains		
	Critical thinking/analysis abilities	Cognitive complexity	Liberal learning
Variables			
Student Background Characteristics			
Race/Ethnicity: African American	+	+	+
Race/Ethnicity: Asian American	−	+	+
Race/Ethnicity: American Indian			
Race/Ethnicity: Hispanic		+	+
Race/Ethnicity: Multiracial	+		
Race/Ethnicity: Other		+	
Gender: Male	+	−	−
Socioeconomic status	−		
SAT	+	−	−
Cognitive domain pre-test	+	+	+
Interactions with Agents of Socialization			
Peers: Academic and career conversations	+	+	+
Peers: Social and cultural conversations	+	+	+[*]
Course-related faculty interaction	+	+	+
Faculty mentorship		+[*]	+[*]
Academic major: Hard pure	−		
Academic major: Hard applied	−		−
Academic major: Soft pure	+		

	Cognitive Domains		
	Critical thinking/analysis abilities	Cognitive complexity	Liberal learning
Academic transition	+	+	+
Social transition			
Sense of belonging		+[*]	+[*]
Quality of Effort			
Time spent studying	+	+	+

+ Positive relationship with the outcome
− Negative relationship with the outcome
[*]Significant random effect at the institutional level

Most notably, Astin (1993) and Pascarella and Terenzini (2005) claimed that the greatest influence on the college experience for students is their peer group. Other researchers (Cruce et al., 2006; Nelson Laird, 2005; Pascarella 2001; Rugutt & Chemosit, 2009) also upheld this stance in relation to the influence of curricular and co-curricular peer interactions on experiences and behaviors directly associated with learning. The results of this study further supported the important contribution that interactions with peers plays on the student experience, with cognitive outcomes in particular. Furthermore, the findings not only support the importance of academic peer interaction related to student learning, but they also affirm the necessity of out of class interactions with peers related to social and cultural conversations. Interestingly, both of these curricular and co-curricular interactions with peers contributed positively to all of the domains in this study – critical thinking/analysis abilities, cognitive complexity, and liberal learning.

Another aspect of the findings related to peer interactions was how the effects of these interactions varied across institutions within the study. The relationship shared

between liberal learning and social and cultural conversations with peers differed across study institutions. This finding possibly suggested that there are differences in how these interactions occur or even potentially the quality of these interactions for promoting growth in liberal learning. Another possibility for this finding is that there are different aspects about the institutional or LLP experience that facilitate students' perception of both their growth in liberal learning and attitudes toward social and cultural conversations with peers. Indeed, research has supported that different aspects of an institution can affect the extent to which students engage and work collaboratively with their peers inside and outside of class (Astin, 1993; Pike, Smart, Kuh, & Hayek, 2006; Porter, 2006). For example, Pike et al.'s (2006) research on institutional characteristics affecting student engagement showed that increased amounts of financial resources expended on academic and institutional support promoted more curricular and co-curricular interactions among students. Furthermore, the level of affluence among students at institutions has proved to have positive and negative effects for student learning and peer interactions (Astin, 1993; Porter, 2006).

The literature on student-faculty interaction proposed that these interactions may occur formally and informally with in the college environment (Astin, 1993; McHugh Engstrom, 2208; Thompson, 2001). This study examined different ways in which students might interact with their faculty in informal and formal ways by considering LLP participants' perceptions of their interactions associated with course-related activities and mentorship by faculty. Greater amounts of faculty interaction appeared to contribute positively to students' perceptions of their learning. In particular, course-related faculty interaction was wholly positive across all three domains. However,

participation in mentorship activities only positively contributed to growth in cognitive complexity and liberal learning. Given that the two different forms of faculty interaction yielded different results in terms of the types of outcomes they affected, there may be something markedly different about these interactions and their relationship to different outcomes. As Pascarella and Terenzini (2005) noted, cognitive complexity relies on intellectual skill such as communication. Additionally, cognitive growth in the area of liberal learning is also considered an integrative form of learning reliant upon appreciation for differences and application of skills across contexts (Chezchowski, 2003; Laff, 2006; Schneider, 2004). Both cognitive complexity and liberal learning might be more relational forms of learning in which these forms can be maximized when students engage in activities that require interaction and other social processes.

Regarding the academic major, Pascarella and Terenzini (2005) asserted that effects of the academic major on cognitive domains were inconclusive. The findings of this study, however, lend support to recent evidence regarding the differential nature of the academic major on cognitive gains. Arum and Roksa (2011) claimed that students in traditional liberal arts majors experienced greater growth in critical thinking and reasoning skills than students in more applied majors. Within the context of this study of LLP participants, the academic major mattered for all major variables when considering critical thinking/analysis abilities. Students in hard pure, hard applied, and soft pure majors were compared against students in soft applied majors. Being in one of these three major types resulted in decreased reported growth of critical thinking/analysis abilities compared to peers in soft applied majors.

The above finding that there may be something unique about being in a soft applied major that would lend to increased critical thinking/analysis abilities compared to students in hard pure and hard applied majors. For example students in soft applied majors include those in areas of education, psychology, sociology, and other social and behavioral studies. Students in these majors may be more inclined, through their coursework and socialization in to those professions, to engage in tasks such as drawing conclusions, making meaning, and reflecting about facts and arguments (Inkelas, Vogt, et al., 2006; Jones et al, 1995 cited in Erwin, 2000; Pascarella & Terenzini; Suskie, 2009). In doing so, they likely engage in applications of learning most conducive to growth in this area.

Certainly, academic experiences within the college environment produce growth in various forms of student learning. However, not only do specific forms of interactions with the curriculum through the course of study (Brednal et al., 2002; Tapper, 2004), faculty (Astin, 1993; Cruce et al., 2006; Kim & Sax, 2009; Thompson, 2001), or peers (Astin; Cruce et al.; Nelson Laird; 2005; Pascarella & Terenzini, 2005; Rugutt & Chemosit, 2009) have effects on growth in different cognitive domains, but also the overall assessment of the academic transition to college has an effect. More favorable assessments of the academic transition to college increased perceptions of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning. Possibly, students who perceived the transition more favorably might also be students who felt more acclimated to the academic expectations of college, which in turn contributed to being a more engaged student. Additionally, students with a positive academic transition

may be more likely to also have increased instances of positive interactions with faculty and peers in curricular settings, thus contributing to growth in cognitive domains.

Although the other measures of social engagement by the LLP participants were important factors in increasing perceptions of growth in the different domains, the social transition was not significant. Despite not having predictive capacities for the three outcomes, social aspects of the college environment were still integral to perceptions of growth in cognitive complexity and liberal learning. The concept of sense of belonging entails aspects of the student experience that may be highly personal and social for a student. Interesting still, a greater sense of belonging contributed positively to the two abovementioned domains.

Unsurprisingly, sense of belonging and academic transition were important experiences linked to student learning, given prior theory and research about the positive outcomes of positive transition and integration experiences (Goldrick-Rab, Carter, & Wagner, 2007; Johnson, Soldner, Leonard, Alvarez, et al., 2007; Tinto, 1993; Weidman, 1989). In their description of sense of belonging, Bollen and Hoyle (1990) noted that individuals who feel connected to an institution experience "feelings of morale [which] provide motivation…to engage in social task-related group activities" (p. 483). The LLP experience calls on students to interact in smaller settings with peers and faculty inside and outside of the classroom (Inkelas & Weisman, 2003; MacGregor et al., 1997). According to Bollen and Hoyle's description of sense of belonging, it is clear why participating in a college experience such as the LLP might facilitate the establishment of a sense of belonging, and subsequently, promote engagement for learning. Within the case of the LLP participant experience, a more positive sense of belonging resulted in an

146

increased perception of learning. Thus, students in LLPs might feel more inclined to engage more meaningfully in LLP activities that promote growth in cognitive complexity and liberal learning.

The final variable within this study was time spent studying alone, which served as a proxy for quality of effort. Spending more time studying alone positively contributed to perceptions of growth in all three cognitive domain areas. Perhaps, students who are more inclined to study alone might be more engaged in their curricular experience, thus promoting more favorable perceptions of their learning. A key component of the LLP context is that the learning experience extends beyond the classroom, such that learning and habits related to learning such as studying may be more likely to occur within the residential environment. In particular, institutions, and possibly LLPs, who attract more studious students, support peer effects that promote students who are more engaged in their learning (Hu & Kuh, 2002; Rugutt & Chemosit, 2009).

Although the purpose of this study was not to examine differential effects of student background characteristics on the three cognitive domains, they yielded findings necessary to acknowledge. Students among various underrepresented racial and ethnic groups different across all three domains. For example, African American students had greater perceptions of their growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning compared to White students. Among other groups, however, these differences did not occur across all three domains. Asian American and Hispanic students perceived greater sense of cognitive complexity and liberal learning compared to their White peers. Meanwhile, Multiracial and Other students perceived their learning to be greater compared to White students in critical thinking/analysis

147

abilities and cognitive complexity, respectively. Aside from the more favorable

perceptions of growth in the above areas, Asian American students were lower in their

perceptions of growth in critical thinking/analysis abilities compared to their White peers.

These findings regarding the effects of race and ethnicity, coupled with

differences in results from studies by Flowers (2003) and Flowers and Pascarella (2003),

reinforce the need to consider the type of measures that are used to research learning. As

the Flowers study indicated, African American students self-reported higher amounts of

growth in intellectual skills compared to White students. Data from the NSLLP, too,

consisted of self-reported data. Therefore, some of these differences among racial and

ethnic groups could also be attributed to differences in self-reporting patterns. Future

studies using different measures of learning, such as direct measures, or even a non-LLP

sample may yield different results. For example, participants in LLPs may differ from the

broader college student population with respect to motivational attributes and academic

achievement. These potential differences in student populations could contribute to how

students assess their cognitive growth.

Prior research suggested that women tend to score and self-rate themselves lower

on critical thinking measures (Appling, 2001; King et al., 1990; Li et al., 1999). The same

reigned true within this study of LLP participants, with being male positively

contributing to self-reported growth in critical thinking/analysis abilities. On the other

hand, more recent research from Pasque and Murphy (2005) suggested that women in

LLPs and traditional residence hall environments demonstrated higher levels of

intellectual engagement, which included activities such as involvement in socio-cultural

discussions. Consistent with the Pasque and Murphy research, female LLP participants in

this study reported more growth in cognitive complexity and liberal learning, which is similar to the types of learning most closely aligned with their operationalization of intellectual engagement.

Research on learning and the role SES plays in it was limited in the literature. What does exist suggested that there is not enough consistent evidence to support that differences in SES account for differences in some cognitive outcomes (Kim & Sax, 2009), yet some studies showed that are differences (Appling, 2001; Astin, 1993; Pasque & Murphy, 2005). The findings from this study possibly rested in both research-based perspectives on the relationship between SES and learning because being from a higher SES background negatively contributed to reported growth in critical thinking/analysis abilities. Meanwhile, no differences were exhibited when considering growth in cognitive complexity and liberal learning. Another possible reason why there may not have been SES effects for cognitive complexity and liberal learning is because of a ceiling effect. High SES and high achieving students may have higher perceptions of growth in cognitive complexity and liberal learning. Consistently higher ratings of growth in the outcomes among these students would decrease the variability of these students on the outcomes.

Prior academic achievement was operationalized in this study according by including self-reported SAT scores or their ACT equivalent. High scores on the SAT contributed positively to self-reported growth in critical thinking/analysis abilities. However, higher scores negatively affected growth in cognitive complexity and liberal learning. These results give credence to other research (Kaufman, Agars, & Lopez-Wagner, 2008; Nasim, Roberts, Harrell, & Young, 2005; Ransdell, 2001; Tracey &

Sedlacek, 1984, 1987), which suggests that cognitive variables prior to college are not entirely the most important factors that promote learning or college success. While demonstrating prior academic achievement or a propensity for college success vis-à-vis the SAT, or other standardized measures, may be advantageous for some forms of learning, it is not for others that rely on students to use skills like those contained within cognitive complexity and liberal learning domains. Finally, the skills related to cognitive complexity and liberal learning are skills that are not typically learned or reinforced prior to college. Thus, students who excel academically in high school may not be accustomed to or comfortable demonstrating those skills during the early years of college.

Effects of Aggregated LLP Involvement on Learning

Much of the literature on LLPs consisted of descriptions of what LLPs are composed of and what they should look like. These descriptions included the necessary partnership of academic affairs and student affairs (Masterson, 2008) and their key players including faculty and residential life staff from student affairs. The second research question in this study extended the prior literature on LLPs by examining the potential aggregated effects of faculty and student affairs staff involvement on the average perception of critical thinking/analysis abilities, cognitive complexity, and liberal learning among LLP participants in the study (Table 5.2). More specifically, involvement consisted of faculty involved in roles that included advising and socio-cultural activities. On a similar note, student affairs staff involvement included mentoring and socio-cultural activities. Finally, the last LLP aggregate measure consisted of the average number of LLP faculty involved across the LLPs at each institution within the study.

The results of modeling the average perceptions of the cognitive domains at the LLP aggregate level were inconsistent across the three domains (Table 5.2). For example, there was no relationship between the LLP aggregate measures and critical thinking/analysis abilities. Yet, relationships varied between certain LLP aggregate measures and the cognitive complexity and liberal learning domains. These LLP aggregate measures included mentorship by student affairs professional staff and socio-cultural involvement among faculty and student affairs staff.

Interestingly, the more involvement in terms of student affairs mentorship within LLPs decreased average cognitive complexity and liberal learning within institutions, a finding somewhat difficult to explain. Mentorship implies that there is a close connection with students, usually on a one-on-one basis (Baker & Griffin, 2010). While the results of this study cannot conclude any causal relationship between student affairs mentorship and these outcomes, they can characteristically say something about their relationships. Current literature on LLPs stated that LLPs are geared toward first-year students and those LLPs cover a wide range of foci, including academic disciplines, career interests, and even at-risk populations (Andrade, 2007; Shapiro & Levine, 1999). Potentially, LLPs in which the intensity of involvement among student affairs professionals in mentorship relationships are ones that attract student populations that might have a lower sense of cognitive complexity and liberal learning. An alternative meaning of this finding might be that student affairs professional staff may be more involved in LLPs in which first-year students are most prominent. College student development theory supports that students early in their college careers may require more input from staff in positions of authority, thus using less complex ways of thinking and knowing (Baxter Magolda, 1992;

151

Belenky et al., 1997; Perry, 1971, 1980). For these students, mentorship from student

affairs professionals associated with their LLPs may play a pivotal role in helping them to

more through their cognitive development. Moreover, if learning demonstrated through

cognitive complexity and liberal learning encompasses skills that students may not be

introduced to prior to college, this association would be expected.

Table 5.2

Final Significant Variables at the LLP Aggregate/Institutional Level for Intercepts

	Cognitive Domains		
	Critical thinking/analysis abilities	Cognitive complexity	Liberal learning
Intercept			
Student affairs Mentorship		−	−
Student affairs socio-cultural		+	+
Faculty advising			
Faculty socio-Cultural		+	
Number of LLP Faculty			

+ Positive relationship with the intercept

− Negative relationship with the intercept

On the other hand, socio-cultural involvement in LLPs among student affairs staff

contributed positively to the average growth in cognitive complexity and liberal learning.

Again, as in the case of modeling within specific institutions, this may be an expected

finding given that the type of learning associated with cognitive complexity and liberal

learning may be more closely aligned with socio-cultural involvement in general. Socio-

cultural involvement within this context specifically involved social and cultural outings

that LLP participants have with either faculty or student affairs professional staff. Similar

research has supported that certain kinds of interactions across diverse experiences and

people promote learning when considering interactions with peers (Astin, 1993; Nelson Laird, 2005). However, the same may be true for interacting with and across difference with faculty and student affairs professionals.

The result of faculty socio-cultural involvement was consistent in this way when considering cognitive complexity. However, the finding diverged with there being no relationship between faculty socio-cultural involvement and liberal learning. If socio-cultural involvement is in line with learning such as growth in cognitive complexity, then faculty might be more adept to engage students in activities that would be related to this outcome in which it may be easier to draw a curricular connection. For this type of learning, it might be easier to facilitate activities within the curricular aspect of the LLP in which students are encouraged to practice cognitive complexity independently through analytic and learning skills (Inkelas, Vogt, et al., 2006).

Interestingly, there were two LLP aggregate measures that did not have relationships with any outcomes. Those measures were faculty advising and the number of LLP faculty. While it was unclear in the study what was encompassed in advising roles, the literature about advising contended that advising in its most traditional form is concerned with providing information to students about their course of study such as requirements and schedules (Baker & Griffin, 2010). However, the National Academic Advising Association (2006) described in its *Concept of Academic Advising* that advising is more than providing students with appropriate information regarding the academic major. Rather, the organization described advising pedagogy for "[cultivating] the intellectual habits that lead to a lifetime of learning" (NACADA, p. 2), which aligns with the outcomes investigated in this study. If advising deviates from NACADA's

pedagogical emphasis, it is not unexpected that there is not a relationship between faculty advising and any of the three cognitive domain areas. Particularly, within the context of high research institutions, traditional forms of advising most likely would occur due to the institutional emphasis on graduate education instead of the undergraduate experience (Pike et al., 2006; Porter, 2006). With this type of advising, the relationship between students and faculty is more transactional, thus not allowing opportunities for students and faculty to dialogue in ways that would promote more complex was of thinking.

A final important finding from examining the effects of the LLP aggregate measures on the cognitive domains was the absence of an effect from the number of faculty involved in the LLP. Since there was not a number of LLP faculty effect, the finding perhaps suggested that number of faculty involved with the LLP is not as important to consider as the type or quality of interaction. In this case, the quality of involvement among faculty that was most influential was involvement in socio-cultural activities, which in turn related to growth in cognitive complexity and liberal learning.

Effects of Aggregated LLP Involvement on Variable Relationships

The final research question in this study was concerned with understanding how LLP aggregate measures might affect certain relationships between students' experiences/perceptions and their perceptions of learning related to the three cognitive domain areas. On the whole, findings (see Table 5.3) from this study showed that the relationships between the critical thinking/analysis abilities and student experiences and perceptions did not vary across each institution to which the LLP measures were aggregated. In other words, the results showed that there was nothing markedly different about the institutions in this regard. The types of students who participate in LLPs may

154

be more similar than dissimilar across institutions, which might explain why there was no

variation in critical thinking/analysis abilities. However, relationships varied across

institutions for the growth in cognitive complexity and liberal learning outcomes, which

possibly may have occurred because of the more similar nature of these outcomes

compared to critical thinking/analysis abilities.

Table 5.3

Final Significant Variables at the LLP Aggregate/Institutional Level for Random Effects

	Cognitive Domains		
	Critical thinking/analysis abilities	Cognitive complexity	Liberal learning
Slopes Social and cultural conversations with peers			
Intercept			+
Student affairs mentorship			
Student affairs socio-cultural			
Faculty advising			
Faculty socio-cultural			
Number of LLP faculty			
Slopes Faculty Mentorship			
Intercept			
Faculty advising			
Faculty socio-cultural			
Number of LLP faculty			
Sense of belonging			
Intercept		+	+
Student affairs mentorship		+	+

	Cognitive Domains		
	Critical thinking/analysis abilities	Cognitive complexity	Liberal learning
Student affairs socio-cultural		−	
Faculty advising			
Faculty socio-cultural		−	
Number of LLP faculty			

+ Positive relationship with the slope
− Negative relationship with the slope

For the growth in liberal learning outcome (defined broadly as an openness to new ideas [Inkelas, Vogt et al., 2006]), the relationships between it and social peer interactions, faculty mentorship, and sense of belonging varied. Although these relationships were different for three variables within the models, there were no LLP aggregate effects for the social peer interaction and faculty mentorship relationships. In other words, the relationships were different across the institutions, yet the LLP aggregate measures did not explain their variations. Although the LLP aggregate measures did not explain differences across institutions, it is possible that there are other aspects of LLPs, or even institutional characteristics, which might explain some of their differences.

Despite no LLP aggregate effects for the relationships between growth in liberal learning and social peer interactions and faculty mentorship, there were several relationships among LLP aggregate measures and the relationships between sense of belonging and growth in cognitive complexity and liberal learning. First, there was a positive effect for student affairs mentorship and the relationship between sense of belonging and cognitive complexity and liberal learning. Essentially, the greater the involvement among student affairs professional staff in mentorship roles heightened the

relationship between students' sense of belonging and their perceptions of growth in these two outcome areas. Having more opportunities to engage with student affairs professional staff increased the return on these outcomes because students felt that they were more a part of the fabric of the campus. The research on sense of belonging has shown that this perceptual measure is powerful because of its link to positive student outcomes, as referenced previously in this chapter. Furthermore, institutions where students have a greater sense of belonging tend to feel more invested in their education, and in turn, may be more inclined to fully participate in curricular and co-curricular aspects of their learning (Pike et al., 2006).

Although student affairs mentorship had a positive effect on the relationship between sense of belonging and both growth in cognitive complexity and liberal learning, socio-cultural involvement among faculty and student affairs staff weakened the relationship between sense of belonging and growth in cognitive complexity only. It is unclear what to make of this finding given the vast amount of research on the connection between sense of belonging and positive student outcomes and its contradictory nature from the Pike et al. (2006) study supporting the value of institutional efforts to influence positive perceptions of the college environment. Typically, sense of belonging would be influenced by connections students make within the institution, such as relationships with students, faculty, and staff. The weakening of this relationship supports the idea that having faculty involved with students in outside of class activities helps to offset differences in learning between students who have a greater sense of belonging and those that do not. In essence, this effect of faculty socio-cultural involvement prevents a lower sense of belonging from being as relatively consequential for students who may have a

less favorable sense of belonging. The diminishment of this relationship positions faculty and student affairs staff to be important conduits for engaging students in dissonance promoting activities for learning, rather than placing the task of developing complex thinking on students and their perceptions of their environment.

Limitations

This exploratory study of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning was bounded by several limitations. First, the instrument used to measure cognitive growth and skills relied on self-reported perceptual measures. Thus, the study might have been affected by social desirability associated with perceived growth in college. A recent study by Gonyea and Miller (2011), however, suggested that self-reported gains in college likely are not plagued by social desirability, particularly among first-year student populations.

Another limitation of this study was that the sample only consisted of students at large research universities. The results of this study may not be generalizable to other institutional types containing LLPs. This study was also bound by variables available within the NSLLP baseline study. Perhaps, there may be other variables that will have significant effects on students' perceptions of their learning.

Another limitation of this study was the lack of variables from the 2007 baseline study questionnaire and LLPS survey instrument. At the individual student level, there was not a question solely related to mentorship or other experiences with student affairs professional staff. Additionally, at the LLP level, there was no information on the LLPS survey to indicate the number of student affairs professionals directly involved in the LLP. A related limitation of the study was that the LLPS survey instrument does not

define what is meant by being faculty or a student affairs administrators. Given the nature

of the seamless environments that LLPs create, some student affairs administrators might

serve in faculty roles within the LLP. Without further articulation of these positions

within the context of an LLP, clear cut distinctions of what it means to be faculty or

student affairs administrators cannot be made.

Additionally, this study was limited by the variables used to assess learning.

Student learning in college has been assessed using direct and indirect measures (Maki,

2004; Suskie, 2009). Since this study used NSLLP data, direct measures of student

learning via standardized instruments were not available. Therefore, the outcome

variables used in this study were indirect measures of student learning, as characterized

by student perceptions of growth in critical thinking/analysis abilities, cognitive

complexity, and liberal learning. Indirect measures of learning tend to be less accurate

than direct measures because college students are not always introspective and may lack

a realistic self-awareness necessary assess learning (Bowman & Seifert, 2011).

Additionally, several studies have called into question the validity of self-reported gains

in outcomes because student self-ratings of growth may not be as accurate as longitudinal

gains in outcomes, nor are they highly correlated (Bowman, 2010; Bowman, 2011).

While some researchers have recently into question the use of self-reported data,

others provide evidence and support for using self-reported data responsibly and

alongside direct measures of learning when available (Gonyea & Miller, 2011; Maki,

2004). In a study comparing different measures of student learning, Anaya (1999) also

concluded that self-reported cognitive gains, standardized test scores, and college grades

can all be valid measures of learning when they are used to assess the appropriate college

environments and experiences. Finally, given the debate regarding self-reported learning, future studies might validate the accuracy of the data by incorporating other available student records in analyses (Fowler, 1995).

Finally, the primary limitation of this study was that it was only be possible to glean estimates of LLP effects since data were aggregated at the institutional level due to missing data from the LLPS data collection. Aggregation of these measures to 26 institutions also produced small ICCs, thus creating challenges in finding effects across the LLP estimated effects. Although the aggregation of LLP faculty and staff characteristics muted the results of the study, it remained imperative to carry out the study as such in order to advance understandings of the importance of LLP structures for research purposes.

Implications for Practice

Several implications for practice can be drawn from the present study. The results of this study yielded small between-institution effects for the LLP aggregate measures due to the small ICCs obtained previously in Chapter IV. Despite their small effects, the relationships between faculty and student affairs staff aggregate measures were statistically significant and provide the study of LLPs with additional information regarding the importance of their structural characteristics. These implications address practical ways of addressing student learning by drawing upon knowledge gained about LLP structures and student experiences and perceptions. The ways in which this study can inform practice consists of LLP structures and practice, socialization agents (e.g., peers, faculty, curricular contexts), and institutional environments.

LLP Structures and Practices

Prior to the NSLLP, little was known from the prior empirical research about optimal ways to structure LLPs in order to advance their stated goals and outcomes prior (Andrade, 2007). The present study, however, points to some important implications for practice related to LLP structures and practices to affect student learning. By design, some LLPs might be more equipped than others to meet learning outcomes proposed in their missions. However, it cannot be assumed that LLPs will do just that. This study showed that, from a curricular standpoint, being in different major courses of study had different effects for some of the cognitive domain outcomes. Given that the LLP is often linked to students' current or intended academic major, LLP administrators might consider structuring their programs differently based on the type of academic programs with which they are associated. In doing so, LLP faculty, staff, and, program administrators can adjust the LLP curriculum and co-curriculum to meet the needs of those academic populations to promote learning. For example, an LLP focused on STEM fields may need to provide a curriculum and co-curriculum slightly different than an LLP focused on academic disciplines such as education, sociology, or psychology, in order to meet student learning goals related to different cognitive domains.

Another implication for LLPs that this study yielded is the positioning of faculty and student affairs professional staff roles. This study showed that student affairs professionals and faculty uniquely contribute to how students perceive their growth. From a design perspective, LLP programs may need to be explicit about the type of involvement that faculty and student affairs professionals have within the program, while keeping in mind that these structures may differ across programs. Given that student

affairs professionals and faculty lend unique contributions to student learning, it is important to have them positioned in the appropriate mentorship, teaching, and socio-cultural activities to achieve LLP participant learning goals.

Ultimately, the success of the LLP related to learning goals can only be determined if proper assessment of the LLP occurs. This study only examined two roles held by faculty and student affairs professional staff. Furthermore, this study provided encouraging results, which speak to the need for examining the roles that individuals play within the LLP to determine if human resources involved in the LLPs are optimal for promoting learning among LLP participants. Doing so requires that LLPs both articulate the specific quality-enhancing roles that individuals play in the administration of the program, rather than focusing on the number of individuals involved, and identify the appropriate means for determining their effectiveness.

Student Experiences with Peers, Faculty, and Student Affairs Professionals

By examining students experiences with and perceptions of their college experience, this study led to important information to consider for practice associated with the roles of peers, faculty, and student affairs professionals in students' lives. Regarding the significance of peer relationships, LLPs should work to engage students in activities with peers that are both curricular and co-curricular in nature to promote cognitive growth and analytic skills. Such opportunities might include more applied learning techniques where students take what they learn and translate it to issues outside of the classroom. Also, this study gave support to incorporating collaborative learning within LLPs where students interact with and learn from one another through purposeful group-centered learning activities (Millis, 2010; Shimazoe & Aldrich, 2010).

A key finding from this study was the critical nature of the relationships students had with faculty. The findings suggested that both curricular and co-curricular forms of involvement with students contributed to how they viewed their growth in the three cognitive domain areas. In order to inspire growth in students in the aforementioned areas, action should be twofold. First, LLPs, and more generally institutions, can intentionally create opportunities for faculty to meaningfully engage with students in their courses. This can be accomplished by using pedagogy that moves away from a "banking" (hooks, 1994) concept and focuses on ways that students can co-create knowledge such as described in the Learning Partnerships Model (Baxter Magolda, 2004). In particular, the latter form of pedagogy would be more conducive to promoting learning, especially learning to promote more complex ways of thinking and knowing.

Increasing ways for faculty to engage with students outside of class is also an important implication from this study. This study in particular examined students' perceptions of mentorship by faculty. Mentorship is an important form of co-curricular interaction between students and faculty because it allows room for formal and informal relationships. As such, institutions can be explicit about expectations for faculty to interact with undergraduate students in ways that promote or enforce this kind of relationship. This can be accomplished through formal programming such as faculty mentors, faculty in-residence programs within LLPs, or participation on research projects. A challenge, however, might exist at high research institutions where LLPs are most prominent due to faculty reward structures.

Furthermore, student affairs professional staff involvement was one structural aspect of the LLPs that promoted cognitive growth. Program administrators within LLPs

163

can be intentional about designing ways in which student affairs staff can serve in integral roles within the LLP to promote this form of learning, which requires more complex ways of thinking. As evidenced in this study, student affairs involvement in mentorship and socio-cultural activities affected how students perceived the college environment. This finding supported the importance of student affairs professionals as agents for learning within the experiences of LLP participants. In being such an important agent for learning, student affairs professionals can design a purposeful co-curriculum that coincides well with the learning goals of curricular components of LLPs. Doing so may help students transfer cognitive skills beyond the domains of their curricular learning, thus facilitating meaning-making processes that draw connections between and among other concepts (Halpern, 1998). This would require that LLPs be constructed as a true partnership between academic affairs and student affairs in which the LLP curriculum and co-curriculum align.

Finally, this study alluded to the importance of multiple forms of interaction with student affairs professionals, as represented by mentorship and socio-cultural involvement with LLP participants. While this study did not define the nature of mentorship or socio-cultural involvement, these roles played by student affairs staff may speak to the importance of one-on-one and group-oriented relationships for affecting learning. In order to promote learning through student affairs professional staff involvement, LLPs can be intentional about incorporating formal and informal mentoring components and creating opportunities for student affairs staff to work closely with students in social and cultural activities associated with LLP co-curricula.

Interdisciplinary Approaches to Learning

Another implication for the curricular context relates to the role of the academic major. The findings from this study suggest that it may not be the major itself that promotes or hinders certain types of learning, but perhaps it is what student *do* in their majors courses that affect learning. Since the major course of study may not fully address learning such as the types that were described in this study, general education curricula are all the more important to achieve learning goals that students may be less inclined to meet in their major courses. However, institutions can take the notion of general education curricula a step further by finding ways to promote more interdisciplinary and integrated learning opportunities. For example, academic programs related to the hard sciences might consider partnering with other academic programs to focus on social applications of their studies. In turn, doing so may encourage students to learn and apply skills related to cognitive domains that they might not acquire or practice in their major course of study alone.

Influencing Student Perceptions of the Environment

An important takeaway from this study is that learning is not just about cognitive skills, but rather non-cognitive skills and experiences (e.g., transition, interactions with individuals) are essential as well. Creating an environment in which students feel supported or encouraged to participate in their learning is also a critical element. As evidenced in this study, favorable academic transitions to college contributed to growth in perceptions of learning. Having a positive academic transition to college can allow the first-year experience to feel less taxing, thus helping students establish a commitment to the academic experience. While some students may naturally have a more positive

165

academic transition, others may not. In order to assure that students are entering a collegiate experience with the best chances for a favorable transition to college, institutions should provide the proper programmatic efforts to advance this goal. Appropriate efforts might include participation in LLPs and adequate first-year advising that can help students identify courses that meet their needs or assist students with non-cognitive skills such as time management, learning to communicate needs to faculty and advisors, and improving academic self-efficacy.

Moreover, the value of a broader connection to the college campus to increase perceptions of learning was evidenced by the effect of a positive sense of belonging on all three outcome measures. The importance of sense of belonging further challenged what it means to be a successful learner in college. As such, LLPs can reinforce a feeling of community for its participants. Since it might be possible for some LLPs to foster insular environments, it is necessary to overcome that type of environment by encouraging participation in the broader community as well. By doing so, students may establish meaningful connections within and outside of LLP, thus creating a positive perception of the campus and promoting learning.

Directions for Future Research and Theory

The results from this study lead to further inquiry in to research and theory related to student learning. Namely, important questions can be asked about characteristic elements of LLPs, student development theory, and various measures for learning.

The present study used self-assessments of growth in critical thinking/analysis abilities, cognitive complexity, and liberal learning as outcome measures. However, future research on LLP participants' learning could use multiple measures for student

learning to determine the contributions of LLP participation. For example, future research might ask a similar question of how faculty and student affairs professional staff contribute to learning measured by standardized assessments such as the Collegiate Learning Assessment or Collegiate Assessment of Academic Proficiency. A different approach to guide future research related to the contribution of LLP participation is to use a framework based assessment of learning such as the *Degree Qualifications Profile* (Lumina Foundation, 2011), which covers a wide range of skills students should be able to perform at the undergraduate level.

An additional direction for the research is to examine characteristic elements of LLPs and their relation to learning through comparative research. First, this type of research on LLPs might be beneficial to understanding the value-added nature of certain LLPs to learning based upon structural elements. This type of research could further examine the roles that individuals play within the LLP by comparing LLPs with certain role compositions (e.g., advising, mentoring) compared to LLPs without faculty and staff in those roles. Doing so would also allow for further exploration in to other key roles such as graduate assistants, teaching assistants, and resident assistants involved in LLPs. Furthermore, comparative research on different LLP themes would provide information on whether or not LLP participation makes more sense for certain types of learning or courses of study. Research on LLPs such as the ones described above would also provide for more data on the longer range return of LLP involvement. By gathering longitudinal data on students beyond first-year LLP involvement the higher education community can identify if there is a lasting differential effect for LLP participants.

Additionally, this study demonstrated that proximal structures (i.e. LLP environment) within student environments affected students' perceptions of learning. An appropriate adaption of future iterations of Pascarella's (1985) model could include structural components of specific environments (e.g., residence halls, academic programs) that serve as intermediaries between the student and broader institutional context (e.g., student-faculty ratio, enrollment). Adapting the model in this way acknowledges that students participate in multiple and potentially influential microenvironments and provides additional structure for researching these environments.

Another future direction relates to student learning theory. Many of the conceptual and theoretical models related to learning and intellectual growth (Baxter Magolda, 1992; Belenky et all, 1997; Perry, 1970, 1981) focus on trajectories for learning. Meanwhile the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985), which guided this study, focused on variables related to the college experience to promote learning and development. Ideally, future theoretical and conceptual models might incorporate college experiences that move students through different stages of development. A more integrated approach to theory would help identify optimal experiences and circles of influence within the college environment that may be more tailored to intellectual growth.

A final intriguing aspect of this study was the use of three cognitive outcomes: critical thinking/analysis abilities, cognitive complexity, and liberal learning. While this study did not address how these outcomes build upon one another or work in concert with one another, future research could examine their interplay. According to Halpern (1998)

critical thinking is among higher order skills, which "are relatively complex; require judgment, analysis, and synthesis; and are not applied in a rote or mechanical manner. Higher order thinking is thinking that is reflective, sensitive to the context, and self-monitored" (p. 451). The revision of Bloom's Taxonomy of Educational Objectives (Krathwol, 2002) also associates skills related to critical thinking, such as analysis and evaluation, with more advanced cognitive processes. Meanwhile, cognitive complexity was defined as the acquisition of information and understanding relationships among concepts (Inkelas, Vogt et al., 2006), which Krathwol associated with lower order thinking. Additionally, liberal learning, which is encapsulated by an openness to viewing ideas differently (Inkelas, Vogt et al., 2006; Inkelas & Weisman, 2003), might be the precursory dispositional and attitudinal component (Halpern, 1998; Pascarella & Terenzini 2005) needed to engage in critical thinking.

This proposed arrangement of these outcomes suggests that cognitive complexity and liberal learning are intermediate cognitive outcomes that promote critical thinking. If critical thinking is a higher order cognitive skill as Halpern (1998) and Krathwol (2002) suggested, then it may not be an appropriate outcome to examine growth in among students during their first few semesters of college. Rather, the first year of college may be more important for gathering baseline data on critical thinking and developing lower order cognitive skills. Through complex analysis such as structural equation modeling using longitudinal data, researchers might be able to test the suggested relationship among the outcomes and examine how they relate for students at the beginning and end of their college careers.

Conclusion

This dissertation research examined LLP participants and their learning related to growth in three cognitive domains: critical thinking/analysis abilities, cognitive complexity, and liberal learning. More specifically, the purpose of this study was to examine the contributions of faculty and student affairs professional staff involvement roles within LLPs on LLP participants' perceptions of learning to the abovementioned cognitive domains. Meanwhile, a secondary purpose of this study was to identify LLP participants' collegiate experiences and perceptions that affected their perceptions of learning.

In order to address the purpose of the study, the study was organized according to an adapted format of the General Causal Model for Assessing the Effects of Differential College Environments on Student Learning and Cognitive Development (Pascarella, 1985). This adaptation of Pascarella's learning and development focused on the LLP as an environment in which students participate and included student perceptual measures of the broader institutional environment. Data from 26 institutions that participated in the 2007 NSLLP baseline study was used to obtain data about LLP participants, their experiences, and perceptions. Since this dissertation research also examined characteristic elements of LLPs such as faculty and student affairs professional staff involvement, it used data from the LLPS Survey, an instrument that obtained programmatic information from LLP program administrators. Given the use multi-level structure of data at student- and program-levels, data analysis consisted of hierarchical linear modeling along with accompanying descriptive statistics.

Upon conducting data analysis, key findings were drawn from this study at both the student and program levels. When considering the data among the LLP participants, there was a profound effect of increased interactions with peers and faculty within and outside of the classroom across all three cognitive dimensions. Likewise, students' favorable perceptions of their academic transition to college and time spent studying also contributed positively toward their learning in each area. Furthermore, an additional perception of the institutional environment by means of sense of belonging was also a key indicator of growth in cognitive complexity and liberal learning.

On the other hand, the examination of faculty and student affairs professional staff involvement within the LLP led to a variety of effects. On the whole, student affairs mentorship and socio-cultural environment appeared to account for more direct and indirection differential effects on student learning for growth in cognitive complexity and liberal learning. Additionally, there were a couple of differential effects due to the amount of faculty involvement in socio-cultural activities for growth in cognitive complexity.

This study clearly showed that the roles assumed by student affairs professional staff more consistently affected growth in cognitive complexity and liberal learning. Moreover, this study also demonstrated that the type and extent of involvement by faculty or staff is perhaps more important than purely the number involved in the LLP, a key finding from this research. Although there were some key effects of faculty and student affairs professional staff involvement in LLPs, more evidence is needed to support how these he effects of involvement among these key players fully contributes to LLP

outcomes such as student learning. Despite some inconclusive results, this study leads to

other important considerations for continuing the study of LLPs and their effectiveness.

Description of variables used in the analysis.

Variable Name	Description
Outcome Variables	
Critical thinking/analysis abilities	Composite measure with scale index from 5-20, with high value indicating greater level of critical thinking/analysis abilities
Growth in cognitive complexity	Composite measure with scale index from 3-12, with high value indicating higher level of growth in cognitive complexity
Growth in liberal learning	Composite measure with scale index from 3-12, with high value indicating higher level of growth in liberal learning

Student-Level Variables

Student Background Characteristics	
Race/Ethnicity: African American	0 = no, 1 = yes
Race/Ethnicity: Asian American	0 = no, 1 = yes
Race/Ethnicity: American Indian	0 = no, 1 = yes
Race/Ethnicity: Hispanic	0 = no, 1 = yes
Race/Ethnicity: Multiracial	0 = no, 1 = yes
Race/Ethnicity: Other	0 = no, 1 = yes
Race/Ethnicity: White	Referent group
Gender: Male	0 = no, 1 = yes
Gender: Female	Referent group
Socioeconomic status	Measure of socioeconomic status computed using the product of a student's highest level of parental education and self-reported family income.
SAT	Self-reported score on the SAT or an equivalent using self-reported ACT score
Quasi pre-test: Critical thinking/analysis abilities	Item from 1-4, with higher value indicating greater importance of critically analyzing ideas and information before college

Variable Name	Description
Quasi pre-test: Growth in cognitive Complexity	Item from 1-4, with higher value indicating importance of exploring the meanings of facts when introduced to new ideas
Quasi pre-test: for Growth in liberal learning	Item from 1-4, with higher value indicating importance of openness to oppositional views
Agents of Socialization	
Peers: Academic and career conversations	Scale index from 3-12, with higher value indicating higher frequency of conversations
Peers: Social and cultural conversations	Scale index from 5-20, with higher value indicating higher frequency of conversations
Faculty: Course-related interaction	Scale index from 4-16, with higher value indicating higher frequency of interaction
Faculty: Non-course-related mentorship	Scale index from 3-12, with higher value indicating higher frequency of interaction
Academic major: Hard pure	0 = no, 1 = yes
Academic major: Hard applied	0 = no, 1 = yes
Academic major: Soft pure	0 = no, 1 = yes
Academic major: Soft applied	Referent group
Institutional Environment	
Academic transition to college	Scale index from 3-18, with higher value indicating a more favorable academic transition to college
Social transition to college	Scale index from 3-18, with higher value indicating a more favorable social transition to college
Sense of belonging	Scale index from 4-16, with higher value indicating a greater sense of belonging
Quality of Effort	
Time spent studying alone	Item from 1-4, with higher value indicating more time spent studying alone

LLP Aggregate/Institution-Level

Variable Name	Description
Number of LLP Faculty	Item from 0-5, with higher value indicating more faculty involved in the LLP 0 = None 1 = 1 2 = 2-3 3 = 4-5 4 = 6-10 5 = 11 or more
Faculty Advising	Item from 0-4, with higher value indicating higher degree of activity with LLP participants 0 = Never 1 = Once or more a year 2 = Once or more a term 3 = Once or more a month 4 = Once or more a week
Faculty Socio-cultural Involvement	Item from 0-4, with higher value indicating higher degree of activity with LLP participants 0 = Never 1 = Once or more a year 2 = Once or more a term 3 = Once or more a month 4 = Once or more a week
Student Affairs Mentorship	Item from 0-4, with higher value indicating higher degree of activity with LLP participants 0 = Never 1 = Once or more a year 2 = Once or more a term 3 = Once or more a month 4 = Once or more a week
Student Affairs Socio-cultural Involvement	Item from 0-4, with higher value indicating higher degree of activity with LLP participants 0 = Never 1 = Once or more a year 2 = Once or more a term 3 = Once or more a month 4 = Once or more a week

References

ACPA: College Student Educators International (1996). *The student learning imperative: Implications for student affairs*. Washington, DC: ACPA. Retrieved from http://www.myacpa.org/sli/sli.htm

ACT, Inc. (2008). *ACT-SAT concordance*. Retrieved from http://www.act.org/aap/concordance/pdf/reference.pdf

Allen, K. E., & Cherrey, C. (2000). *Systemic leadership*. Lanham, MD: University Press of America.

Anaya, G. (1999). College impact on student learning: Comparing the use of self-reported gains, standardized test scores, and college grades. *Research in Higher Education, 40*, 499-526.

Andrade, M. S. (2007). Learning communities: Examining positive outcomes. *Journal of College Student Retention, 9*(1), 1-20.

Appling, S. A. (2001). *A model of influences on students' self-rating of change in problem solving and critical thinking abilities after four years of college*. Washington, DC: ERIC Clearinghouse on Higher Education.

Association of American Colleges and Universities. (2007). *College learning for the new global century: A report from the national leadership council for liberal education & America's promise*. Washington, DC: Association of American Colleges and Universities.

Association of American Colleges and Universities. (2011). *Mission statement*. Retrieved from http://www.aacu.org/about/mission.cfm

Association of American Colleges and Universities Greater Expectations National Panel.

    (2002). *Greater expectations: A new vision for learning as a nation goes to*

    college. Washington, DC: Association of American Colleges and Universities.

Astin, A. W. (1991). *Assessment for excellence: The philosophy and practice of*

    assessment and evaluation in higher education. New York, NY: American

    Council on Education/Macmillan.

Astin, A. W. (1993). *What matters in college: Four critical years revisited*. San

    Francisco, CA: Jossey-Bass.

Astin, A. W. (1999). Student involvement: A developmental theory for higher education.

    Journal of College Student Development, 40, 518-529.

Astin, A. W., & Denson, N. (2009). Multi-campus studies of college impact: Which

    statistical method is appropriate? *Research in Higher Education*, 50, 354-367.

    doi:10.1007/s11162-009-9121-3

Baker, V. L., & Griffin, K. A. (2010, January/February), Beyond mentoring and advising:

    Toward understanding the role of faculty "Developers" in student success. *About*

    Campus, 2-8. doi: 10.1002/abc.20002

Banta, T. W., & Kuh, G. D. (1998). A missing link in assessment. *Change, 30*(2), 40-46.

    doi:10.1080/00091389809602606

Baxter Magolda, M. B. (1992). *Knowing and reasoning in college: Gender-related*

    patterns in students' intellectual development. San Francisco, CA: Jossey-Bass.

Behar-Horenstein, L. S., Roberts, K. W., and Dix, A. C. (2010). Mentoring undergraduate

    researchers: An exploratory study of students' and professors' perceptions.

Mentoring & Tutoring: Partnership in Learning, 18(3), 269-291. doi:

10.1080/13611267.2010.492945

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., & Tarule, J. M. (1997). *Women's*

ways of knowing: The development of self, voice, and mind. New York, NY: Basic

Books.

Biglan, A. (1973). The characteristics of subject matter in different academic areas.

Journal of Applied Psychology, 57(3), 195-203.

Blake, J. H. (2007). The crucial role of student affairs professionals in the learning

process. In E. L. Moore (Ed.), *Special Issue: Student affairs staff as teachers*

(New Directions for Student Services no. 117, pp. 65-72). San Francisco, CA:

Jossey-Bass. doi: 10.1002/ss.234

Bollen, K. A., & Hoyle, R. H. (1990). Perceived cohesion: A conceptual and empirical

examination. *Social Forces, 69*(2), 479-504.

Bonner, J. L. (2009, April 25). In 'living-learning programs' professors call dorms home.

USA Today. Retrieved from http://www.usatoday.com/news/education/2009-04-

25-dorms-professors_N.htm

Bowman, N. A. (2010). Can 1st-year college students accurately report their learning and

development? *American Educational Research Journal, 47*(2), 466-496. doi:

10.3102/0002831209353595

Bowman, N. A. (2011). Validity of college self-reported gains at diverse institutions.

Educational Researcher, 40(1), 22-24. doi: 10.3102/0013189X10397630

Bowman, N. A., & Seifert, T. A. (2011). Can college students accurately assess what

    affects their learning and development? Journal of College Student Development,

    52(3), 270-290.

Brendel, J. M., Kolbert, J. B., & Foster, V. (2002). Promoting student cognitive

    development. *Journal of Adult Development, 9*(3), 217-227.

Brower, A. M., & Inkelas, K. K. (2010). Living-learning programs: One high-impact

    educational practice we know a lot about. *Liberal Education, 96*(2), 36-43.

Council for the Advancement of Standards. (2008). Council for the Advancement of

    Standards Learning and developmental outcomes. Retrieved from

    http://www.cas.edu/wp-content/uploads/2010/12/Learning-and-Developmental-

    Outcomes-2009.pdf

Council for the Advancement of Standards. (2010). Learning and developmental

    outcomes. Retrieved from http://www.cas.edu/index.php/learning-and-

    developental-outcomes/

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in

    undergraduate education. *AAHE Bulletin*, 3-7.

Chickering, A. W., & Reisser, L. (1993). *Education and identity* (2nd ed.). San Francisco,

    CA: Jossey-Bass.

Clarke, J. H., Miser, K. M., & Roberts, A. O. (1988). Freshman residential programs:

    Effects of living-learning structure, faculty involvement, and thematic focus. *The

    Journal of College and University Student Housing, 18*(2), 7-13.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods

    approaches* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

Crisp, G., & Cruz, I. (2009). Mentoring college students: A critical review of the literature between 1990 and 2007. *Research in Higher Education, 50*, 525-545. doi: 10.1007/s11162-009-9130-2

Crocker, L., & Algina, J. (2006). *Introduction to classical and modern test theory*. Mason, OH: Cengage Learning.

Cruce, T. M., Wolniak, G. C., Seifert, T. A., & Pascarella, E. T. (2006). Impacts of good practices on cognitive development, learning orientations, and graduated degree plans during the first year of college. *Journal of College Student Development, 47*(4), 365-383. doi: 10.1353/csd.2006.0042

Czechowski, J. (2003, Summer). An integrated approach to liberal learning. *PeerReview*, 4-7.

Dewey, J. (1938). *Experience and education*. New York, NY: Touchstone.

Drechsler, M. J., Komives, S. R., & Fincher, J. (in press). Learning outcomes in academic disciplines: Identifying common ground. *Journal of Student Affairs Research and Practice*.

Erwin, T. D. (2000). *The NPEC sourcebook on assessment, volume 1: Definitions and assessment methods for critical thinking, problem solving and writing* (NCES 2000-195). Washington, DC: U.S. Government Printing Office.

Ewell, P. T. (2009). *Assessment, accountability, and improvement: Revisiting the tension* (NILOA Occasional Paper No. 1). Urbana, IL: National Institute for Learning Outcomes Assessment.

Flowers, L. A. (2004). Effects of living on campus on African American students' educational gains in college. *NASPA Journal, 41*(2), 277-293.

Flowers, L. A., & Pascarella, E. T. (2003). Cognitive effects of college: Differences between African American and Caucasian students. *Research in Higher Education, 44*(1), 21-49.

Fowler, F. J., Jr. (1995). *Improving survey questions: Design and evaluation*. Thousand Oaks, CA: Sage Publications.

Frost, R. A., Strom, S. L., Downey, J., Schultz, D. D., & Holland, T. A. (2010, Spring). Enhancing student learning with academic and student affairs collaboration. *The Community College Enterprise,* 37-51.

Fusani, D. S. (1994). "Extra-class" communication: Frequency, immediacy, self-disclosure, and satisfaction in student-faculty interaction outside the classroom. *Journal of Applied Communication Research, 22*, 232-255.

Giancarlo, C. A., & Facione, P. A. (2001). A look across four years at the disposition toward critical thinking among undergraduate students. *The Journal of General Education, 50*(1), 29-55. doi:10.1353/jge.2001.0004

Goldrick-Rab, S., Carter, D. F., & Wagner, R. W. (2007). What higher education has to say about the transition to college. *Teachers College Record, 109*(10), 2444-2481.

Gonyea, R. M., & Miller, A. (2011). Clearing the AIR about the use of self-reported gains in institutional research. In S. Herzog, & N. A. Bowman, *Special issue: Validity and limitations of college student self-report data* (New Directions for Institutional Research, No. 150, pp. 99-111). San Francisco, CA: Jossey-Bass. doi: 10.1002/ir.392

Halpern, D. F. (1998). Teaching critical thinking for transfer across domains: Dispositions, skills, structure training, and metacognitive monitoring. *American Psychologist, 53*(4), 449-455.

Haney, W. (1980). Units and levels of analysis in large-scale evaluation. In K. H. Roberts & L. Burstein (Eds.), *Issues in aggregation* (pp. 1-6). San Francisco, CA: Jossey-Bass.

Heller, D. E. (2001). Introduction: The changing dynamics of affordability, access, and accountability in public higher education. In D. E. Heller (Ed.), *The states and public higher education policy: Affordability, access, and accountability* (pp. 1-10). Baltimore, MD: The Johns Hopkins University Press.

Hemwall, M. K., & Trachte, K. C. (1999). Learning at the core: Toward a new understanding of academic advising. *NACADA Journal, 19*(1), 5-11.

hooks, b. (1994). *Teaching to transgress: Education as the practice of freedom*. New York, NY: Routledge, Taylor, & Francis Group.

Hu, S., & Kuh, G. D. (2002). Being (dis)engaged in educationally purposeful activities: The influences of student and institutional characteristics. *Research in Higher Education, 43*(5), 555-575.

Hu, S., & Kuh, G. D. (2003). Maximizing what students get out of college: Testing a learning productivity model. *Journal of College Student Development, 44*(2), 185-203. doi: 10.1353/csd.2003.0016

Inkelas, K. K., & Associates. (2008). *National study of living-learning programs: 2007 report of findings*. Retrieved from http://www.livelearnstudy.net/images/2007_NSLLP_Final_Report.pdf

Inkelas, K. K., Johnson, D., Lee, Z., Daver, Z., Longerbeam, S. D., Vogt, K., et al. (2006). The role of living-learning programs in students perceptions of intellectual growth at three large universities. *NASPA Journal, 43*(1), 115-143.

Inkelas, K. K., & Longerbeam, S. (2008). Working toward a comprehensive typology of living-learning programs. In G. Luna & J. Gahagan (Eds.), *Learning initiatives in the residential setting* (pp. 29-42). Columbia, SC: National Resource Center for The First-Year Experience and Students in Transition.

Inkelas, K. K., & Soldner, M. (2011). Undergraduate living-learning programs and student outcomes. In J. C. Smart & M. B. Paulsen (Eds.), Higher Education: Handbook of Theory and Research (Vol. 26), pp. 1-55. New York, NY: Springer Science+Business Media.

Inkelas, K. K., Vogt, K. E., Longerbeam, S. D., Owen, J., & Johnson, D. (2006). Measuring outcomes of living-learning programs: Examining college environments and student learning and development. *The Journal of General Education, 55*(1), 40-76. doi:10.1353/jge.2006.0017

Inkelas, K. K., & Weisman, J. (2003). Different by design: An examination of outcomes associated with three types of living-learning programs. *Journal of College Student Development, 44*(3), 335-368.

Jaasma, M. A., & Koper, R. J. (2001). Talk to me: An examination of the content of out-of-class interaction between students and faculty. A paper presented at the Annual Meeting of the International Communication Association: Washington, DC.

Johnson, D., Soldner, M., Leonard, J. B., Alvarez, P., Inkelas, K. K., Rowan-Kenyon, H. T., et al. (2007). Examining sense of belonging among first-year undergraduates

from different racial/ethnic groups *Journal of College Student Development, 48*(5), 525-542.

Joint Taskforce on Student Learning. (1998). Powerful partnerships. Retrieved from http://www.myacpa.org/pub/documents/taskforce.pdf

Kaufman, J. C., Agars, M. D., & Lopez-Wagner, M. (2008). The role of personality and motivation in predicting early college academic success in non-traditional students at a Hispanic-serving institution. *Learning and Individual Differences, 18*, 492-496.

Keeling, R. P. (Ed.). (2004). *Learning reconsidered*. Washington, DC: National Association of Student Personnel Administrators and American College Personnel Association.

Kellogg Commission on the Future of State and Land-grant Universities (1999). Returning to our roots: The engaged institution. Retrieved from http://www.cpn.org/topics/youth/highered/pdfs/Land_Grant_Engaged_Institution. pdf

Kim, Y. K., & Sax, L. J. (2009). Student-faculty interaction in research universities: Differences by student gender, race, social class, and first-generation status. *Research in Higher Education, 50*, 437-459. doi:10.1007/s11162-009-9127-x

King, P. M., Wood, P. K., & Mines, R. (1990). Critical thinking among college and graduate students. *The Review of Higher Education, 13*(2), 167-186.

Kinzie, J. (2010). *Perspectives from campus leaders on the current state of student learning outcomes assessment: NILOA focus group summary 2009-2010*. Urbana, IL: National Institute for Learning Outcomes Assessment.

Klein, S. P., Kuh, G. D., Chun, M., Hamilton, L., & Shavelson, R. (2005). An approach
    to measuring cognitive outcomes across higher education institutions. *Research in
    Higher Education, 46*(3), 251-276. doi: 10.10007/s11162-004-1640-3

Krathwol, D. R. (2002). A revision of Bloom's taxonomy: An overview. *Theory Into
    Practice, 41*(4), 212-218.

Kugelmass, H., & Ready, D. D. (2011). Racial/ethnic disparities in collegiate cognitive
    gains: A multilevel analysis of institutional influences on learning and its
    equitable distribution. *Research in Higher Education, 52*, 323-348. doi:
    10.1007/s11162-010-9200-5

Kuh, G. D. (1991). *Involving colleges: Successful approaches to fostering student
    learning and development outside the classroom*. San Francisco, CA: Jossey-Bass
    Publishers.

Kuh, G. D. (1996). Guiding principles for creating seamless learning environments for
    undergraduates. *Journal of College Student Development, 37*(2), 135-148.

Kuh, G. D. (2001). Assessing what really matters to student learning: Inside the National
    Survey of Student Engagement. *Change, 33*(3), 10-17.
    doi:10.1080/00091380109601795

Kuh, G. D. (2008). *High-impact educational practices: What they are, who has access to
    them, and why they matter*. Washington, DC: Association of American Colleges
    and Universities.

Laff, N. S. (2006). Teachable moments: Advising as liberal learning. *Liberal Education,
    96*(2), 36-41.

Li, G., Long, S., & Simpson, M. E. (1999). Self-perceived gains in critical thinking and communication skills: Are there disciplinary differences? *Research in Higher Education, 40*(1), 43-60.

Luke, D. A. (2004). *Multilevel modeling*. Thousand Oaks, CA: SAGE Publications, Inc.

Lumina Foundation. (2011). *Degree qualifications profile*. Retrieved from http://www.luminafoundation.org/publications/The_Degree_Qualifications_Profile.pdf

Luna, G., & Gahagan, J. (2008). Residence halls--the classroom expanded. In G. Luna & J. Gahagan (Eds.), *Learning initiatives in the residential setting* (pp. 1-6). Columbia, SC: University of South Carolina, National Resource Center for The First-Year Experience and Students in Transition.

Lundberg, C. A., & Schreiner, L. A. (2004). Quality and frequency of faculty-student interaction as predictor of learning: An analysis by student race/ethnicity. *Journal of College Student Development, 45*, 549-565. doi:10.1353/csd.2004.0061

Maki, P. L. (2004). *Assessing for learning.* Sterling, VA: Stylus.

Masterson, J. T. (2008). Academic/student affairs partnerships in residential settings: Principles and practices. In G. Luna & J. Gahagan (Eds.), *Learning initiatives in the residential setting* (pp. 19-28). Columbia, SC: University of South Carolina, National Resource Center for The First-Year Experience and Students in Transition.

McHugh Engstrom, C. (2008). Curricular learning communities and unprepared students: How faculty can provide a foundation for success. New Directions for Teaching and Learning, *115,* 5-19, doi: 10.1002/tl.322

Meiklejohn, A. (2001). *The experimental college*. Madison, WI: University of Madison
Press.

Millis, B. J. (2010). Why faculty should adopt cooperative learning approaches. In B. J.
Millis (Ed.), *Cooperative learning in higher education: Across the disciplines,
across the academy* (pp. 1-10). Sterling, VA: Stylus.

Nasim, A., Roberts, A., Harrell, J. P., &Young, H. (2005). Non-cognitive predictors of
academic achievement for African Americans across cultural contexts. *The
Journal of Negro Education, 74*(4), 344-358.

National Academic Advising Association. (2006). *Concept of academic advising*.
Retrieved from
http://www.nacada.ksu.edu/clearinghouse/advisingIssues/Concept-advising-
introduction.htm

Nelson Laird, T. F. (2005). College students' experiences with diversity and their effects
on academic self-confidence, social agency, and disposition toward critical
thinking. *Research in Higher Education, 46*(4), 365-387. doi:10.1007/s11162-
005-2966-1

New Leadership Alliance for Student Learning and Accountability. (2010). *New
leadership for student learning and accountability: A statement of principles,
commitments to action*. Retrieved from
http://www.newleadershipalliance.org/images/uploads/new%20leadership%20pri
nciples.pdf

Pace, C. R. (1982). *Achievement and the quality of student effort*. A paper presented at a
meeting of the National Commission on Excellence in Education, Washington,

DC. Retrieved from

http://www.learningoutcomesassessment.org/documents/CSEQ-

AchievementAndTheQualityOfStudentEffort.pdf

Pace, C. R. (1984). *Measuring the quality of college student experiences: An account of the development and use of the college student experiences questionnaire*. Los Angeles, CA: Higher Education Research Institute, Graduate School of Education, University of California, Los Angeles.

Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 1), pp. 1-61. New York, NY: Agathon.

Pascarella, E. T. (2001). Cognitive growth in college: Surprising and reassuring findings. *Change, 33*(6), 20-27. doi:10.1080/00091380109601823

Pascarella, E. (2006). How college affects students: Ten directions for future research. *Journal of College Student Development, 47*(5), 508–520. doi:10.1353/csd.2006.0060

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students*. San Francisco, CA: Jossey-Bass.

Pasque, P. A., & Murphy, R. (2005). The intersections of living-learning programs and social identity as factors of academic achievement and intellectual engagement. *Journal of College Student Development, 46*(4), 429-441. doi:10.1353/csd.2005.0041

Paulsen, M. B., & Wells, C. T. (1998). Domain differences in the epistemological beliefs of college students. *Research in Higher Education, 39*(4), 365-384.

Pedhazur, E. J. (1997). *Multiple regression in behavioral research* (3rd ed.). Orlando, FL: Hartcourt Brace.

Perna, L. W., & Titus, M. A. (2005). The relationship between parental involvement as social capital and college enrollment: An examination of racial/ethnic group differences. *The Journal of Higher Education*, 76(5), 485-518. doi:10.1353/jhe.2005.0036

Perry, W. G., Jr. (1970). *Forms of ethical and intellectual development in the college years: A scheme*. San Francisco, CA: Jossey-Bass.

Perry, W. G., Jr. (1981). Cognitive and ethical growth: The making of meaning. In A. W. Chickering & Associates (Ed.), *The Modern American College* (pp. 76-116). San Francisco, CA: Jossey-Bass.

Piaget, J. (2001). *The psychology of intelligence*. New York, NY: Taylor & Francis.

Pike, G. R., Smart, J. C., Kuh, G. D., & Hayek, J. C. (2006). Educational expenditures and student engagement: When does money matter? *Research in Higher Education, 47*(7), 847-872.

Pizzolato, J. E. (2006). Meaning making inside and outside the academic arena: Investigating the contextuality of epistemological development in college students. *The Journal of General Education, 55*(2), 228-251.

Porter, S. R. (2006). Institutional structures and student engagement. *Research in Higher Education, 47*(5), 521-558. doi: 10.1007/s11162-005-9006-z

Ransdell, S. (2001). Predicting college success: The importance of ability and non-cognitive variables. *International Journal of Educational Research, 35*, 357-364.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.

Royston, P. (2004). Multiple imputation of missing values. *The Stata Journal, 4*(3), 227-241.

Rubin, D. B. (1976). Inference and missing data (with discussion). *Biometrika, 63*, 581-592.

Rugutt, J., & Chemosit, C. C. (2009). What motivates students to learn? Contribution of student-to-student relations, student-faculty interaction and critical thinking skills. *Educational Research Quarterly, 32*(3), 16-28.

Sax, L. J., Bryant, A. N., & Harpter, C. E. (2005). The differential effects of student-faculty interaction on college outcomes for women and men. *Journal of College Student Development, 46*(6), 642-657. doi: 10.1353/csd.2005.0067

Schneider, C. G. (2004). Practicing liberal education: Formative themes in the reinvention of liberal learning. *Liberal Education, 90*(2), 2-7.

Schussler, D. L., & Fierros, E. G. (2008). Students' perceptions of their academics, relationships, and sense of belonging: Comparisons across residential learning communities. *Journal of The First-Year Experience & Students in Transition, 20*(1), 71-96.

Schwarz, G. (1978). Estimating the dimension of a model. *Annals of Statistics, 6*(2), 461-464.

Shapiro, N. S., & Levine, J. H. (1999). *Creating learning communities: A practical guide to winning support, organizing for change, and implementing programs*. San Francisco, CA: Jossey-Bass.

Shaw, R., & Creamer, D. G. (1984). *A theoretical model of student-faculty interaction*. Washington, DC: ERIC Clearinghouse on Higher Education.

Shimazoe, J., & Aldrich, H. (2010). Group work can be gratifying: Understanding & overcoming resistance to cooperative learning. *College Teaching, 58*(2), 52-57.

Smith, B. L. (2003). *Learning communities and liberal learning*. Retrieved from http://www.aaup.org/AAUP/pubsres/academe/2002/JF/Fea/Smith.htm?PF=1

Stassen, M. L. A. (2003). Student outcomes: The impact of varying living-learning community models. *Research in Higher Education, 44*(5), 581-613. doi: 10.1023/A:1025495309569

Suskie, L. A. (2009). *Assessing student learning: A common sense guide* (2nd ed.). San Francisco, CA: Jossey-Bass.

Tapper, J. (2004). Student perceptions of how critical thinking is embedded in a degree program. *Higher Education Research & Development, 23*(2), 199-222. doi: 10.1080/0729436042000206663

Terenzini, P. T., & Pascarella, E. T. (1994). Living myths: Undergraduate education in America. *Change,* 28-32.

Thelin, J. R. (1996). Historical overview of American higher education. In S. R. Komives & D. B. Woodard, Jr. (Eds.), *Student services: A handbook for the profession* (3rd ed, pp. 3-21). San Francisco, CA: Jossey-Bass.

Thompson, M. D. (2001). Informal student-faculty interaction: Its relationship to educational gains in science and mathematics among community college students. *Community College Review, 29*(1), 35-57.

Tinto, V. (1993). *Leaving college: Rethinking the causes and cures of student attrition* (2nd ed.). Chicago, IL: The University of Chicago Press.

Tinto, V. (2003). Learning better together: The impact of learning communities on student success. *Higher Education Monograph Series* (2003-1). Syracuse, NY: Higher Education Program, School of Education, Syracuse University.

Tracey, T. J., & Sedlacek, W. E. (1984). The relationship of noncognitive variables to academic success by race over four years. College Park, MD: University of Maryland.

United States Department of Education. (2006). *A test of leadership: Charting the future of U. S. higher education*. Retrieved from http://www.ed.gov/about/bdscomm/list/hiedfuture/reports/final-report.pdf

Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.

Weidman, J. C. (1989). Undergraduate socialization: A conceptual approach. In j. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. V). New York, NY: Agathon Press.

Welte, S. L. (1997). Transforming educational practice: Addressing underlying epistemological assumptions. *The Review of Higher Education, 20*(2), 199-213. doi:10.1353/rhe.1996.0008

Whipple, E. G., & Sullivan, E. G. (1998). Greek letter organizations: Communities of learners? In E. G. Whipple (Ed.), *New challenges for Greek letter organizations:*

Transforming fraternities and sororities into learning communities (New

Directions for Student Services, No. 81, pp. 19-27). San Francisco, CA: Jossey-

Bass. doi:10.1002/ss.8101

Zalaquett, C. P., & Lopez, A. D. (2006). Learning from the stories of successful

undergraduate Latina/Latino students: The importance of mentoring. *Mentoring &*

Tutoring, 14(3), 337-353. doi: 10.1080/13611260600635563