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Keith Wurtz

has been found to be complete and satisfactory in all respects,
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Walden University
2014

Abstract

Effects of Learning Communities on Community College Students' Success: A Meta-Analysis

by

Keith Wurtz

M.A., CSU, Fullerton, 1997

B.S., California Polytechnic University, Pomona, 1990

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Psychology

Walden University

December 2014

Abstract

Low graduation rates are a significant issue for colleges. The majority of higher education institutions in the United States offer learning communities (LCs), which have been found to be effective for improving course success and persisting to the next semester. However, there is a gap in the literature regarding the effectiveness of LCs with different types of populations and different types of LCs. The purpose of this meta-analysis was to identify the most effective types of LCs. Research questions addressed the effects of different types of LCs on different student success outcomes for community colleges. The study was based on Tinto's interactionist model of student departure and Astin's model of student involvement. Studies examining the relationship between student success and participation in college LCs provided the data for the meta-analysis. A random effects model was used to generate the average effect size for 39 studies and 50 individual effect sizes. The results showed that LCs are most effective with community college students when they include additional support strategies, counseling is available to students, one of the linked courses is an academic skills course, at least one of the linked course is developmental, and the focus is on increasing course success or student engagement. The implications for positive social change suggest that LC programs implement two linked courses, include an academic skills course, focus on developmental courses, and provide access to a counselor and additional student support strategies. In addition, LC programs are most effective when the goals of the program are student engagement and course success.

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Chapter 1: Introduction

There were over 20 million students enrolled in degree-granting institutions in 2009, an increase of 38% in the last 10 years (National Center for Education Statistics [NCES], 2011). Moreover, the percent of Hispanic students has increased from 3% to 12%, and the percent of Black students has increased from 9% to 14%. The level of educational attainment for Americans is extremely important; in 2009, those 25 years old or older who had more education also reported higher median earnings (NCES, 2011).

Educators continue to strive to make higher education accessible to historically underrepresented groups including low-income students, women, and students of color (Keup, 2005). In addition, many college students no longer attend one institution of higher education; they typically attend two or three different institutions to earn one degree, and many are working full- or part-time jobs as well (Smith et al., 2004). Community college educators have long held the belief that all students have the potential to reach their goals if they are given the opportunity and the correct type of support (Potts, Schultz, & Foust, 2004).

As a major segment of the U.S. higher education system, community colleges enroll over 6.2 million students, representing 35% of all postsecondary students (NCES, 2008). In Fall 2005, 1.4 million students were enrolled in the California community college system, making it the largest community college system in the United States (about 23% of the community college students nationwide). The community college segment in higher education has the potential to have a large impact on higher education (Killacky, Thomas, & Accomando, 2002).

Community colleges serve a higher proportion of low-income, nontraditional, and minority students than 4-year colleges (NCES, 2008). For instance, Hispanic, Native American, African American, low-income, women, and older students are more likely to enroll in community colleges than Caucasian students (Bailey, Jenkins, & Leinbach, 2005). In addition, community colleges have a growing population of students who need remedial courses in math, writing, and reading. Students entering community colleges for the first time are often lacking in basic skills (Minkler, 2002). Research indicates that students who enter community colleges at the developmental or basic skills level are less likely to reach their goals (Barnes & Piland, 2010; Goldberg & Finkelstein, 2002). Community college students have to overcome many challenges (Dillon, 2003; Killacky, Thomas, & Accomando, 2002), including their diverse educational backgrounds and educational goals (Barnes & Piland, 2010; Goldberg & Finkelstein, 2002; Smith, 2010; Smith, MacGregor, Matthews, & Gabelnick, 2004). Additionally, age, socioeconomic status (SES), and ethnicity are all areas where community college students differ widely (Smith, 2010).

Most of the students entering community colleges immediately after graduating high school enter with the intention to earn a bachelor's degree (NCES, 2008). Students also attend community colleges for many reasons; these include to earn degrees, gain certificates, improve their basic skills, and for personal growth. Community colleges are under pressure to improve student performance because a low percentage of students persist to bachelor's degree completion (Barnes & Piland, 2010; Goldberg & Finkelstein, 2002; Keup, 2005; Soldner, Lee, & Duby, 1999). Due to the low graduation rates, in the

last decade there has been a dramatic increase on the focus by states and institutions on ways to improve graduation and persistence (Eck, Edge, & Stephenson, 2007; Tinto, 2006). Many community colleges around the country are searching for effective and efficient programs that improve student persistence (Johnson, 2000; Keup, 2005; Soldner, Lee, & Duby, 1999). Colleges have employed a variety of strategies to increase persistence, including learning communities (LCs), academic counseling, new student orientations, developmental education, success or tutoring centers, peer advising, and early alert programs (Goldberg & Finkelstein, 2002; Johnson, 2000; Keup, 2005).

An LC is defined as the same group of students who take two or more courses together where the instruction from the courses are blended together and students are encouraged to interact formally through assignments and informally around intellectual and personal topics (Andrade, 2007; Barnes & Piland, 2010; Dodge & Kendall, 2004; Keup, 2005; Levine, 1998; Malnarich, 2005; Price & Lee, 2005; Smith et al., 2004; Tinto, 1997a). LCs can be thought of as primarily student-centered learning rather than teacher-centered (Duffy, Duffy, & McKean, 2004; Janusik & Wolvin, 2007). In student-centered learning, students take a more active role in learning. Research has indicated that LCs are offered at 57% of the higher education institutions in the United States and that 74% of public higher education institutions provide LCs as an option for college students (Barefoot, Griffin, & Koch, 2012). In addition, as the size of higher educational institution increases, so does the likelihood that an institution offers an LC. For instance, 25% of institutions with a college population of 1,000 or fewer offer LCs, and 89% of

institutions with 20,001 or more students offer LCs. LCs are also more likely to be offered to first-year students than any other group of students.

The implementation of LCs has recently increased because of research indicating the effectiveness of LCs with diverse learners and first year college students (Dodge & Kendall, 2004; Dunlap & Petitt, 2008; Hesse & Mason, 2005; Jehangir, 2009). LCs are being used by colleges to help expand the connections among students, faculty, and the institution (Price & Lee, 2005). In addition to connecting students, faculty, and the institution, LCs also help integrate and connect instruction across disciplines (Dodge & Kendall, 2004). Research into the effectiveness of LCs has indicated that students who participate in LCs are more likely to complete their courses successfully, to persist to the next semester, to improve critical thinking skills, and to develop into active learners (Andrade, 2007; Baker & Pomerantz, 2000; Price & Lee, 2005; Soldner, Lee, & Duby, 1999). However, the type of LC as well as the population the LC serves may also have an impact on student learning.

Educators need to know how to identify the most effective types of LCs so that they can help as many students as possible with the available resources that they have at their disposal. For instance, Jones, Laufgraben, and Morris (2006) examined whether or not LCs were beneficial for certain types of students. They found that LCs are not beneficial for every type of student. Dewey (1895/1964a), Tinto (2006), and Astin (1999) have argued that the most important challenge that educators face is to translate research and theory into practices that are effective and can be implemented to help as many students as possible stay in college and reach their goals. Accordingly, the research

conducted here helps institutions determine whether or not LCs are likely to be effective at their institution and the type of LCs that are likely to be most effective at their institution.

Background

While researchers know more than ever about how people learn, the biggest challenge is how to implement effective teaching strategies (Smith et. al, 2004). Moreover, in the last 10 to 20 years, large gains in persistence and graduation have been difficult to achieve (Tinto, 2006). The challenge educators face is to translate research and theory into practices that are effective. For instance, Dewey (1895/1964a) argued that educators need to be intimately aware of effective classroom strategies identified by research and apply those strategies in the classroom. Dewey wrote, "To know these things is to be a true psychologist and a true moralist, and to have the essential qualifications of the true educationist" (p. 198).

The initial development of LCs as a strategy to connect students to college was rooted in the work of Meiklejohn and Dewey (Smith, MacGregor, Matthews, & Gabelnick, 2004). Meiklejohn (2001/1932) developed and implemented the experimental college in the 1920s, creating one of the first LCs of entering college students at the University of Wisconsin. Much of Dewey's work emphasized teaching based on evidence and on the principles of cooperative learning (Smith et al., 2004).

One of the biggest challenges higher education faces is to identify and implement the strategies that are the most effective at helping students to reach their goals (Darabi, 2006). These strategies need to be practical, be cost effective, and lead to successful

outcomes because resources are limited (Darabi, 2006). For instance, one college freshmen LC program cost approximately $135,000 (Hotchkiss, Moore, & Pitts, 2006). Another college paid a $3,000 stipend to each faculty participating in an LC (Meinhold, Rohler, & Walker, 2004). Accordingly, research is needed to identify the types of LCs that are most effective with different types of students. In addition to LCs being costly, they can also be time intensive to develop (Mac Kinnon, 2006). For instance, faculty members require time prior to the start of the linked courses to link the curriculum, assignments, and themes as well as to interact with classes in the LC.

Statement of the Problem

When community colleges were originally established, the purpose was to provide 2 years of college education to any student, regardless of his or her background or skill level (Malnarich, 2005). The idea of open access to anyone is a unique characteristic of community colleges (Killacky, Thomas, & Accomando, 2002). A question that has been raised as a result of providing open access is the extent to which community colleges have been able to turn access for anyone into academic success (Malnarich, 2005). To date, the research on the effectiveness of a system that provides open access is mixed, and the high rate of attrition among community college students may threaten the economic future of the United States (Malnarich, 2005; Shulock & Moore, 2007). Consequently, in the last 20 years, there has been a shift in how educators think about community colleges from an emphasis on access to providing access and academic achievement (Bailey & Morest, 2006a). The combined effort to provide both access and academic achievement is called equity (Bailey & Morest, 2006b). Equity

refers to providing the same educational opportunity to any person who wants to pursue a college education (Malnarich, 2005). The greatest challenge for community colleges is balancing open access with the needs of the underprepared community college student population (Malnarich, 2005).

Not meeting the needs of the community college population may have consequences for society (Killacky, Thomas, & Accomando, 2002). Recent research in California suggests that the low rate of completion by community college students threatens the economic future of California because of increased demand for a knowledge-based workforce (Shulock & Moore, 2007). Consequently, educators need to develop methods that engage a diverse group of students (Feldman, Smart, & Ethington, 2004). Students who are actively engaged with faculty, staff, and other students, along with the academic subject matter, are more likely to be academically successful (Community College Survey of Student Engagement [CCSSE], 2006; Eck et al., 2007). Students often leave college before they have achieved their educational goals because of a lack of goal commitment and financial resources and because they have not developed a connection with the campus community (Eck et al., 2007; Johnson, 2000).

Past research on engagement has consistently indicated that students who are more involved at college are more satisfied and more likely to persist (Baker & Pomerantz, 2000; Eck et al., 2007). However, the research is not clear on whether the same factors that influenced 18 to 20 year old traditional college students also influence the emergent students who are 18 to 20 years old but work 20 or more hours a week and do not see themselves as primarily students (Baker & Pomerantz, 2000). The challenge is

that community college educators need to meet the needs of a diverse population; in order to meet that need, they need to develop strategies that address multiple community college student populations. Accordingly, different types of LCs may be more or less effective with students of different backgrounds.

Study Purpose

The purpose of this study was to use the techniques of meta-analysis to help educators identify the type of LC that will best help students at colleges with diverse cultures attain their goals and to be successful (Demaris & Kritsonis, 2007; Rocconi, 2011). LCs can be costly and may result in different student success outcomes. In addition, the success of LCs might also be related to the type of students they are implemented with and how they are implemented (Hotchkiss et al., 2006).

Research Questions and Hypothesis

Research Question 1

Are community college students more likely to be successful when they participate in an LC than 4-year college students who participate in an LC? The hypotheses of the study for Research Question 1 were:

H_{01}: Community college students who participate in an LC are not more likely to pass their courses with a C, B, or A grade than 4-year college students who participate in an LC.

H_{A1}: Community college students who participate in an LC are more likely to pass their courses with a C, B, or A grade than 4-year college students who participate in an LC.

H_{02}: Community college students who participate in an LC are not more likely to be retained from term to term than 4-year college students who participate in an LC.

H_{A2}: Community college students who participate in an LC are more likely to be retained from term to term than 4-year college students who participate in an LC.

H_{03}: Community college students who participate in an LC are not more likely to have a higher GPA than 4-year college students who participate in an LC.

H_{A3}: Community college students who participate in an LC are more likely to have a higher GPA than 4-year college students who participate in an LC.

H_{04}: Community college students who participate in an LC are not more likely to score higher on self-reported learning outcomes than 4-year college students who participate in an LC.

H_{A4}: Community college students who participate in an LC are more likely to score higher on self-reported learning outcomes than 4-year college students who participate in an LC.

Research Question 2

What student success outcomes do LCs have the largest effect on among community college students? The hypotheses of the study for Research Question 2 were:

H_{01}: Community college students who participate in an LC are less likely to have higher rates of course success than retention from term to term, GPA, and self-reported learning outcomes when compared to community college students did not participate in an LC.

H_{A1}: Community college students who participate in an LC are more likely to have higher rates of course success than retention from term to term, GPA, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{02}: Community college students who participate in an LC are less likely to have higher rates of retention from term to term than course success, GPA, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{A2}: Community college students who participate in an LC are more likely to have higher rates of retention from term to term than course success, GPA, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{03}: Community college students who participate in an LC are less likely to have higher GPA than course success, retention from term to term, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{A3}: Community college students who participate in an LC are more likely to have higher GPA than course success, retention from term to term, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{04}: Community college students who participate in an LC are less likely to have higher rates of self-reported learning than course success, and retention from term to term when compared to community college students who did not participate in an LC.

H_{A4}: Community college students who participate in an LC are more likely to have higher rates of self-reported learning than course success, and retention from term to term when compared to community college students who did not participate in an LC.

Research Question 3

To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)? The hypotheses of the study for Research Question 3 were:

H_{01}: The effects of LCs on community college student success will not differ by the type of LC (i.e. number of linked courses, and type of linked courses).

H_{A1}: The effects of LCs on community college student success will differ by the type of LC (i.e. number of linked courses, and type of linked courses).

Research Question 4

To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (i.e., additional support services and strategies, student characteristics, contextualized curriculum and the size of the college)? The hypotheses of the study for Research Question 4 were:

H_{01}: The effects of LCs on community college student success will not differ by the characteristics of how the LC was implemented (i.e., additional support services and strategies, student characteristics, contextualized curriculum and the size of the college).

H_{A1}: The effects of LCs on community college student success will differ by the characteristics of how the LC was implemented (i.e., additional support services and strategies, student characteristics, contextualized curriculum and the size of the college).

Theoretical Foundation

Interest in LCs has increased in the last 20 years because of its ability to facilitate interdisciplinary learning and to help engage students (Dunlap & Pettitt, 2008; Johnson, 2000; Killacky et al., 2002; Price & Lee, 2005). The guiding framework for this study was the idea from Dewey (1895/1964a) that educators need to continuously strive to discover the most effective strategies identified through research and apply those to how students are educated.

The two most cited approaches to LCs are Tinto's (1975) interactionist model of student departure and Astin's (1999) model of student involvement, both of which are explored in greater depth in Chapter 2 (Milem & Berger, 1997). Tinto's (1975) theory of student departure seeks to explain why some students drop out of college and why others persist. His theory, based on Durkheim's theory of suicide, is that students choose to stay in college based on a cost-benefit analysis involving institutional and noninstitutional factors (Tinto, 2975). Tinto wrote that the students stay in college or leave college based on the types of interactions they have with other students, faculty, and staff. Accordingly, students will be more likely to stay in college and persist if they are integrated both academically and socially at the institution (Tinto, 1997b). Other factors that influence how well students are integrated include a student's experiences and characteristics, external commitments, and the fact that all students share the classroom

as the center of their college experience (Tinto, 2000, 2008). LCs help to integrate students both academically and socially at the institution (Tinto, 2000, 2008).

Like Dewey (1895/1964a), Astin (1999) believed theories need to be practical and useful for educators. A key component of the theory of student involvement is the behavior of the student and focuses on the amount of energy a student invests into his or her education. Student learning, therefore, is related to the quality of a program, the quantity of time in a program, and practices in the program that increase student involvement. As a result, educators need to create programs and implement strategies that help to increase student involvement. Identifying the most effective types of LCs in which students can be most effective can help universities help students reach their goals.

In Chapter 2, the body of research reviewed on the relationship between LCs and student outcomes is discussed in more detail. In brief, the results indicate that LCs help students to feel engaged (Baker & Pomerantz, 2002; Dunlap & Pettitt, 2008; Johnson, 2000; Keup, 2005; Killacky et al., 2002; Price & Lee, 2005; Smith, 2010) and are related to student achievement (Andrade, 2007; Baker & Pomerantz, 2000; Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Johnson, 2000; Soldner et al., 2009). The evidence for a relationship between LCs and student success is mixed (Goldberg & Finkelstein, 2002; Keup, 2005; Potts et al., 2004); in addition, different types of LCs may be related to different student outcomes (Andrade, 2007; Dunlapp & Pettitt, 2008; Smith, 2010). As a result, a study on LCs was needed to identify the most effective aspects of LCs (Andrade, 2007). Specifically, different forms of LCs are implemented in order to meet the unique demands of college, and evidence suggests that different combinations of services may

lead to different outcomes. For example, students who participated in LCs with tutoring were more likely to persist than students participating in an LC without tutoring (Andrade, 2007).

Nature of Study

The investigative technique chosen to answer the questions posed in this analysis was meta-analysis. Meta-analysis is a statistical technique that allows the researcher to synthesize results quantitatively from multiple studies on a specific topic, such as the effectiveness of LCs, for the purpose of integrating the results from each study (Borenstein, Hedges, Higgins, & Rothstein, 2009; Glass, 1976; Ioannidis & Lau, 1999). The meta-analysis technique, first named by Glass (1976), for synthesizing the results from multiple studies arose in the 1970s (Lipsey & Wilson, 1993). Specifically, the research technique views research studies as the population that is sampled, and the results from the studies are quantified, categorized, and statistically analyzed.

Traditional literature reviews often provide mixed results that are usually not conclusive but force researchers to reach a conclusion based on these mixed results (Lipsey & Wilson, 1993). Through the calculation of an effect size, the process of conducting a meta-analysis provides the researcher the ability to draw conclusions about the most effective treatments and strategies (Borenstein et al., 2009; Glass, 1976). In this case, the intent was to draw conclusions about the most effective type of LCs by college population and type. Specifically, this study examined the effects of LC type on student outcomes. The dependent variable was student outcome, which included course performance, retention, and self-reported learning outcomes. The independent variables

in the study, also known as moderator variables in a meta-analysis, included the following:

- higher education segment,
- type of student outcome,
- college size,
- number of linked courses in the LC,
- number of additional strategies included with the LC,
- type of linked courses, and
- whether or not the LC was with first-year college students.

In addition to the moderator variables listed above, the study also included the following moderator variables used to control for limitations that can occur when conducting a meta-analysis:

- source publication type (e.g., peer reviewed, etc.),
- source sample type (i.e., random or nonrandom),
- sample size,
- representativeness of study,
- source controlled for confounding variables (e.g., self-selection), and
- type of outcome variable (e.g., continuous or dichotomous).

The need for meta-analysis in educational research is greater now more than ever (Glass, 1976). The abundance of research studies on specific topics makes it practically impossible to simply conduct a literature review on over 400 studies on LCs and generate any meaningful results (Ioannidis & Lau, 1999). Meta-analysis allows the researcher to

combine quantitatively both the *p* values for statistical significance and an effect size (Borenstein et al., 2009) generated from individual studies. As an illustration, examining 20 studies on a particular research topic individually might show that five of the 20 studies had a statistically significant finding. On the other hand, a meta-analysis can account for differences in sample sizes and allow the researcher to combine studies in a quantitative way.

In addition to quantitatively combining the results from multiple studies, meta-analysis can also help with educational policy by identifying if LCs are effective, in what situations they are effective, if certain LCs work better with different populations, and the best type of outcome that LCs might affect (Ioannidis & Lau, 1999). For instance, if a community college is in the process of examining different strategies to increase the rate at which students successfully complete a course and the rate at which students are retained from one semester to the next, a meta-analysis on LCs would be able to identify the outcome that LCs have the greatest impact on. In addition, the meta-analysis would also identify if LCs have a greater impact on first-year students or students from diverse backgrounds. Accordingly, as stated by Ioannidis and Lau, "meta-analysis is a powerful methodology for sorting out bias from true diversity in evidence-based decision making" (p. 466).

Definitions

Academic performance: Academic performance refers to how well students perform academically. Depending on the study, academic performance may refer to course success (Barnes & Piland, 2013), retention from one semester to the next

(Weissman et al., 2012), GPA (Popidek & Eilman, 2013), or self-reported learning outcomes (Laanan et al., 2014). Specifically in this study, academic performance focused on determining if students who participated in an LC were more likely to complete a course successfully with a C grade or better (i.e., course success), were more likely to stay in college because of the LC, had a higher GPA, or were more likely to feel like they learned something more because they participated in an LC.

College size: A moderator variable used to answer Research Questions 3 and 4 by identifying whether the referenced study was conducted at a college with a small (< 4,500), medium (4,500–7,999), large (8,000–14,999), or extra-large (> 15,000) student population as defined by CCSSE (2012) and Integrated Postsecondary Education Data System (IPEDS, Cohen, 2003; Tinto, 1975).

Course success: Students who earn a passing grade in the course of A, B, C, or P (CR) divided by the total number of grades earned: A, B, C, D, F, I (Incomplete), P (Passing or Credit), NP (Not Passing or No Credit), or W (Withdrawal). This measure is also commonly known as the course success rate (California Community Colleges Chancellor's Office [CCCCO], 2012)

Effect size: Effect size is the strength or magnitude of a relationship between two variables. It is also the unit of analysis in a meta-analysis (Borenstein et al., 2009). The effect size is a simple way of quantifying the difference between two groups.

First-year college students: A moderator variable used to answer Research Questions 3 and 4 by identifying whether the LC included students who were attending

college for their first year as stated in the article being reviewed (Dunlap & Petitt, 2008; Killacky et al., 2002; Keup, 2005; Levine, 1998; Smith, 2010).

*Learning community (LC)***:** For this study a learning community was established when students are enrolled in two or more courses together and they are encouraged to interact around intellectual and personal topics (Andrade, 2007; Barnes & Piland, 2010; Dillon, 2003; Hegler, 2004; Keup, 2005; Levine, 1998; Price & Lee, 2005; Smith, MacGregor, Matthews, & Gabelnick, 2004; Tinto, 1997a).

Retention: For the purposes of the present study, retention referred to term over term persistence. Thus, students are defined as retained when they are enrolled in one term and then enrolled in a subsequent term (Heaney & Fisher, 2011).

Self-reported learning outcome: In addition to course success and retention, research on LCs has consistently indicated that LCs are related to increased student interaction with other students, student interaction with faculty, student satisfaction, improved critical thinking, helping students to grow from passive to active learners, and providing supportive environments (Andrade, 2007; Baker & Pomerantz, 2000; Dunlap & Pettitt, 2000; Edwards & Walker, 2007; Keup, 2005; Killacky et al., 2002; Levine, 1998; Malnarich, 2005; Price & Lee; Smith, 2010; Soldner, Lee, & Duby, 1999). Self-reported learning outcomes refer to outcomes where the student completed a survey and/or assessment to determine whether or not they felt more engaged, satisfied, supported, or like they learned something from participating in the LC.

Assumptions

The first assumption was that researchers using methodologically-sound approaches can reach different conclusions when examining the same literature because of human judgment (Wanous et al., 1989). Wanous et al. identified 11 steps when conducting a meta-analysis, and 8 of those 11 steps involved judgments made by the researchers. Some examples of judgments made in a meta-analysis included establishing criteria for including studies, how the search for relevant studies is conducted, selecting the final set of studies, extracting data on the variables of interest, coding study characteristics, deciding how to include multiple measures of independent and dependent variables within a study, and selecting potential moderator variables.

Second, the coding of studies included in the meta-analysis was based on the information provided in each manuscript (Bangert-Drowns, 1997; Glass, 1977; Sim & Hlatky, 1996). If the manuscript reviewed did not provide all of the information or did not provide the information clearly, then the coding of the information in the meta-analysis may not be correct. Moreover, the primary researchers may not have described the characteristics of their study in sufficient detail in order to identify setting characteristics like whether the students were first-year college students of the number and type of strategies implemented in addition to LC (Bangert-Drowns, 1997).

The final assumption was that meta-analyses provide a conclusive answer to research questions because they aggregate results across studies (Wanous et al., 1989). In reality, the inability to examine all of the research on a specific topic, human judgment, and differences in coding meta-analyses leads to, at best, speculative conclusions about

how variables are related (Bangert-Drowns, 1997; Sim & Hlatky, 1996; Wanous et al., 1989).

Delimitations

Four delimitations were appropriate for this study. The first delimitation involved the extensive search of electronic indexes, databases, and the Internet. An emphasis was placed on obtaining studies published in peer-reviewed journals; however, studies published electronically by institutional research offices were also sought because institutional research offices are responsible for obtaining data at community colleges and including studies of this type might help with publication bias (Borentstein et al., 2009; Lipsey & Wilson, 1993; Morest & Jenkins, 2007). Second, the studies on LCs had to be completed or published from 1985 to 2013. The study publication date was limited to 1985 because LCs started to be implemented differently in 1985 (Smith, 2001). At that time, LCs began to be linked with other strategies that also promoted active learning and led to changes in LC pedagogy.

Third, while it would be valuable for educators to know the most effective alternative learning strategies for institutions with similar characteristics (CSS & RP Group, 2007), the focus of the study was on one alternative learning strategy, LCs. LCs are a common (and relatively popular) strategy chosen by educators in the college setting (Dunlap & Petitt, 2008; Price & Lee, 2005). Finally, the studies published on LCs had to examine the effects of LCs on success, completion, persistence, a self-reported outcome, or GPA.

Limitations

Peer-reviewed studies on LCs are assumed to be representative of the research conducted on LCs. Many institutional research offices at higher educational institutions have conducted their own research on LCs; as a result, peer-reviewed studies collected for the meta-analysis may not be a complete representation of all of the research conducted on LCs since many institutional research offices at higher educational institutions have conducted their own research on LCs (Morest & Jenkins, 2007). This is often referred to as the file drawer problem or publication bias (Borenstein et al., 2009). Accordingly, a comprehensive search was made for both peer-reviewed research and studies not published in a peer-reviewed journal (Bangert-Drowns, 1997; Wanous, Sullivan, & Malinak, 1989). However, contacting institutional research offices in higher education was beyond the scope of this study.

Significance

Community colleges serve a higher proportion of low-income, nontraditional, and minority students than 4-year colleges (NCES, 2008). Moreover, community colleges also serve a higher proportion of Hispanic, Native American, African American, low-income, women, and older students than Caucasian students (Bailey, Jenkins, & Leinbach, 2005). Students entering community colleges are often lacking in basic academic skills, are less likely to reach their goals, have diverse backgrounds, and often have to overcome many challenges (Barnes & Piland, 2010; Killacky et al., 2002; Minkler, 2002; Smith, 2010; Smith et al., 2004).

Community colleges face pressure to improve student performance (Barnes & Piland, 2010; Keup, 2005; Soldner et al., 1999; Tinto, 2006). Thus, colleges continue to seek effective and cost-efficient programs that improve student persistence (Johnson, 2000; Keup, 2005; Soldner et al., 1999). In order to be able to choose programs that are the most likely to be successful, colleges need to be able to identify programs that are the best fit for their unique cultures and students. The results of this study can contribute to advancing college practice and policy around whether or not to implement LCs and to implement LCs if they are related to student success.

The results of this research have the potential to advance the knowledge of the current theories on student engagement and LCs. The purpose of an LC is to engage students with the college community, foster a collaborative learning environment, and ultimately facilitate student performance (Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Hegler, 2004; Levine, 1998; Mac Kinnon, 2006; Mohoney & Schamber, 2011; Soldner et al., 1999; Tinto, 1997a). Moreover, an identified strength of an LC is that they can be adapted to almost any type of educational environment and have been identified as a powerful model for change (Hesse & Mason, 2005; Matthews, 1986).

Research on LCs has strongly indicated a relationship between participation in an LC and student engagement, and between student engagement and student success (Fayon, Goff, & Duranczyk, 2010; Pomerantz, 2000; Rocconi, 2011; Smith, 2010; Wilmer, 2009), but the relationship between LCs and student success has been an indirect relationship at best (Rocconi, 2011). The research conducted here will help to determine

whether or not LCs are an effective strategy to help increase student success and whether or not it is more effective to implement LCs in a certain way by population and setting.

Connecting students academically and socially with other students, faculty, and staff improves the likelihood that students will be successful and persist (Reason, Terenzini, & Domingo, 2006). The challenge is to find strategies that work with the diverse range of students who come from varying SES backgrounds and cultures (Bailey & Morest, 2006b). There is strong evidence to support that LCs integrate students with the campus communities and increase the likelihood that students persist; however, not all of the evidence supports the effectiveness of LCs, and there may be certain types of LCs that have better outcomes than other types of LCs (Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Levine, 1998; Soldner, Lee, & Duby, 1999; Tinto, 1997a).

Chapter Summary

The purpose of the study was to determine the effectiveness of LCs on the student success of community college students through the use of meta-analysis. Previous research suggests that students who participate in LCs are more likely to complete their courses successfully and persist to the next semester. However, the type of LC may also have an impact on community college student learning. Chapter 2 includes a summary of the literature on educational research related to and philosophy of LCs, as well as the most recent findings on the relationship between LCs and college student success. Chapter 3 describes the methodology used in the meta-analysis, Chapter 4 presents the results from the meta-analysis, and Chapter 5 summarizes the results, highlights the most useful findings for colleges, and discusses the implications of the findings.

Chapter 2: Literature Review

One of the greatest challenges for community colleges is balancing open access with the needs of the underprepared student population (Killacky et al., 2002). In the last 20 years, a shift has occurred among community college educators from a focus on providing access to anyone who wants a college education to a focus on balancing access with academic achievement (Bailey & Morest, 2006a).

Past research has indicated that students who are connected to the faculty, students, and campus are more satisfied and more likely to persist; however, the research is not clear on whether the same factors that influence traditional college students also influence the diverse group of students found at community colleges (Baker & Pomerantz, 2000). The challenge for community colleges is to find strategies that are effective with students from diverse backgrounds. Therefore, the purpose of this study was to provide information to community college educators that would help them apply LCs in the most effective way and with as many students as possible, as recommended by Rocconi (2011).

This chapter includes an extensive review of research on LCs at 4-year universities and community colleges. The first section examines the theoretical context for how learning takes place and begins with a discussion of education philosophers. Next is an explanation of several psychoeducational theories including current prevailing theories about how people learn. The second section includes a review of the research on LCs at 4-year and community colleges. The last section includes a description of themes

that emerge from the research on LCs, LC types, and challenges faced by community colleges when trying to implement LCs.

Literature Search Strategy

The strategies used to conduct the literature review included searching peer-reviewed journals, examining the history of educational psychology in relation to learning theory, and using references to find other references, also known as *treeing backwards*. The databases searched were Education Research Complete, ERIC, ProQuest Central, PsychINFO, ProQuest Dissertations and Theses-Full Text (Legacy Platform), Expanded Academic ASAP, PsycARTICLES, Academic Search Complete, and SocINDEX with Full Text. Manual searches were performed in the *Journal of College Student Retention, Community College Journal of Research & Practice, Community College Review, Journal of Applied Research in the Community College*, and *Journal of Developmental Education*. Generally, search terms included *learning community, college, community college*, and variations of those terms by using OR and an AND statements. The focus of the research was on studies published between 1985 and 2014 because LC began to be linked with other strategies that also promoted active learning and led to changes in LC pedagogy (Smith, 2001). In addition, institutional research office websites, college and community college research organizations and foundations, and the Internet were also searched for research findings on LCs using the terms described above.

Theoretical Foundation

An area where educational psychologists have begun to focus in the last 20 years is how motivation is related to learning (O'Donnell & Levin, 2001). Quintillian (2001b/AD 1), Vives (1531/1971), Hall (1965c/1900; 1965e/1885), and Dewey (1895/1964a) all argued that one of the best teaching methods is to motivate students to learn. For instance, Quintillian felt that teaching needed to include fun and games and positive reinforcement, and associations needed to be created between the topic and something that was interesting to the student; Vives believed that knowledge is based on a person's experiences; Hall believed that best way to teach is to associate the topic with something that a student was interested in; and Dewey argued that the concept being taught needs to be connected to student interest or the reason for why the concept is being taught.

In the 1960s, researchers started to move out of the laboratory and into the classroom (Graham & Weiner, 1996). In the 1980s, this shift helped to facilitate a greater interest in motivation and how it relates to student learning (O'Donnel & Levin, 2001). The belief was that understanding motivation might help to improve student performance and learning (Graham & Weiner, 1996). Rather than focusing on learning, a focus on motivation involved understanding the reasons why students remained in a situation where they could be taught. Accordingly, educational psychologists began to examine how individual students uniquely interpreted a variety of stimuli, such as praise, criticism, success, failing, feedback, cooperation, competition, reward, and punishment.

Educational psychologists need to use research to learn what is most effective in the classroom (Thorndike, 1910). There has been 100 years of research in educational psychology; one of Thorndike's main ideas is that research should be used to inform teaching. Such a pragmatic approach continues to be the guiding principle among educational researchers (O'Donnel & Levin, 2001; Zimmerman, 2005). The following section summarizes some of the research conducted in the last 100 years on learning in different educational settings. Specifically, the learning strategies identified in a meta-analysis of over 2,000 studies in the K–12 setting, information from brain research on learning, and the relationship between learning styles and learning are examined. Much of the information learned from these studies is captured through the use of LCs as a strategy in the college setting and is examined in the last section of Chapter 2.

Learning Communities

The interest in LCs has increased in the past 20 years because of its potential to facilitate interdisciplinary learning for first-year college students and for students in their second year of college (Dunlap & Pettitt, 2008). Colleges and universities have begun to expand the use of LCs to help increase the connections among students, students and faculty, and students and the institution (Price & Lee, 2005). LCs are often thought of as effective strategies for increasing the opportunities for students to feel included and connected to other students and faculty at an institution (Dunlap & Pettitt, 2008; Johnson, 2000; Killacky et al., 2002). The premise behind LCs is that learning is enhanced by the quality of relationships that LCs help to build (Hesse & Mason, 2005; James, Bruch, & Jehangir, 2006; Janusik & Wolvin, 2007). Specifically, LCs are more effective when

faculty develop assignments where students are encouraged to work together. In addition, LCs can also help to contextualize developmental courses like English and math because these skills can be taught in the context of a discipline (Mahoney & Schamber, 2011).

Past research on the relationship between LCs and student success has consistently indicated that LCs positively impact student interaction with other students, student interaction with faculty, student satisfaction, and student success (Andrade, 2007; Baker & Pomerantz, 2000; Edwards & Walker, 2007; Price & Lee; Soldner, Lee, & Duby, 1999). Moreover, LCs have also been identified as strategies to help the needs of developmental students, improve critical thinking, and help students grow from passive to active learners (Dunlap & Pettitt, 2000; Killacky et al., 2002; Malnarich, 2005). LCs are also used as a method for helping new students transition to the college environment by providing supportive environments (Keup, 2005; Levine, 1998; Smith, 2010). Namely, first-year college students are less likely to feel isolated when they participate in an LC (Keup, 2005).

Definition of Learning Communities

An LC is a group of students who take two or more courses together and in which those students are purposively encouraged to interact around intellectual and personal topics (Andrade, 2007; Barnes & Piland, 2010; Hesse & Mason, 2005; James et al., 2006; Keup, 2005; Levine, 1998; Price & Lee, 2005; Smith et al., 2004; Tinto, 1997a). Accordingly, students in an LC take the same classes and have the same professors (Soldner, Lee, & Duby, 1999). LCs can also be built around a theme that is used to

generate assignments in the courses participating in the LC (Levine, 1998; Soldner, Lee, & Duby, 1999; Tinto, 1997a). The creation of a central theme is a common strategy used in the development of LCs because this strategy helps promote a deeper type of learning (Tinto, 2000). A broader definition of an LC involves the expectation that LCs are collaborative, interdisciplinary, and require that students work together generating assignments that illustrate the connection between two different fields of study (Dunlap & Pettitt, 2008).

Two important aspects of implementing effective LCs are that course instructors have to collaborate and communicate frequently and that the institution needs to enroll students in every section of the LC, sometimes referred to as block scheduling (Levine, 1998; Soldner, Lee, & Duby, 1999). An example of enrolling students in every section of LC is when a college offers a LC that includes two courses—math and chemistry—all of the students enrolled in the math section are also enrolled in the chemistry section. In order to be in one section of the LC (i.e., math), the student also has to be in the other section (i.e., chemistry) of the LC. The purpose of LCs is to connect students with the college community, foster a collaborative learning environment, and facilitate student performance by improving teaching and learning (Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Jones et al., 2006; Levine, 1998; Soldner, Lee, & Duby, 1999; Tinto, 1997a). LCs accomplish this by emphasizing teamwork and the use of cooperative and collaborative learning (Barnes & Piland, 2010; Levine, 1998; Soldner, Lee, & Duby, 1999). Moreover, LCs also help to provide students with access to a network of other familiar students and faculty, and students usually describe the experience as positive and

feel that they are provided an advantage over other students (Soldner, Lee, & Duby, 1999). When students are enrolled in the same courses they are more likely to interact and become familiar with other students in the course even if the contact in the LC is not organized to require students to work together on projects (Andrade, 2007).

A strength of LCs is that they can be adapted to almost any type of educational environment, including educational environments that have a diverse student population (Matthews, 1986). Moreover, LCs can be created by combining existing courses without the need for drastic program expansion.

Theoretical Framework

The development of LCs is rooted in the work of Meiklejohn and Dewey from the 1920s (Smith et al., 2004). Meiklejohn (2001/1932) developed the experimental college (EC) concept to reform an undergraduate program and improve teaching; he felt that the current approach to teaching was failing. This work has served as a foundation to the development of LC programs (Smith et al., 2004). The purpose of the EC was to develop a methodology for teaching undergraduate students in their first 2 years of college, test the developed method of teaching under experimental conditions, and to identify suggestions for the improvement of teaching undergraduate students (Guyotte, 2001). In developing the EC, Meiklejohn worked from the premise that students would be more likely to learn if they were part of a community of students and faculty (Guyotte, 2001). In addition, Meiklejohn (2001/1932) also saw the EC as a way to connect students with diverse backgrounds. For instance, students who participated in the EC were from families with both low and high incomes, students had different ethnic and religious

backgrounds, and some students were either interested or not interested in joining a fraternity.

Meiklejohn organized the EC into a community where all of the students participating in the EC were in the same dormitory with a small library and faculty offices (Guyotte, 2001). Meiklejohn abolished the traditional lecture, examinations, and the teaching of single subjects and replaced these with readings, papers, weekly meetings with faculty (whom he called advisors); students rotated between faculty every 6 weeks. In addition, the material covered in each year was centered on a theme. In this model, students were treated as adults who had something valuable to contribute to the process of learning.

Meiklejohn (2001/1932) believed that the purpose of education was to cultivate learning. He called this intelligence or the ability to be ready for any situation, and no matter the circumstance, the ability to respond in the best possible way. Also important is the sociological imagination, the ability to look at a familiar situation in new or different ways (Mills, 1959). Mieklejohn suggested that intelligence involved identification of possibilities and that intelligent people are at least familiar with multiple fields of study. Given this, Meiklejohn felt that in the first 2 years of college, students needed to be taught *intelligence* for the purpose of improving the human condition.

To begin, Meiklejohn defined a college as a group of people who all read the same books and who are all working together to try and solve the same problems. The EC was developed around this framing thought of a college with the purpose of helping students become a member of the college community. The professors (termed *advisors*)

agreed that the course of study for the incoming graduates would be integrated. Meiklejohn and the EC advisors integrated the curriculum so that students could see how each area of study was interconnected. Meiklejohn used the interconnected curriculum as a strategy to help students generalize information and not focus only on one small aspect of an issue.

The concept of the LC is also based on the work of Dewey who wrote about the teaching and learning process (Price & Lee, 2005; Smith et al., 2004). Dewey focused on elementary and secondary education in his work, and his ideas have been widely influential. Specifically, Dewey argued for teaching that was based on evidence and cooperative learning. Similar to Meiklejohn (2001/1932), Dewey (1895/1964a) also felt that students spent too much time acquiring facts instead of understanding what the facts mean. Dewey argued for a research-based approach to correctly identify and apply teaching techniques. Dewey believed that the best teachers adapted their teaching to the student's environment. He felt that a good teacher helped students make connections to information through the past and current experiences and relationships.

The interactionist model of student departure (Tinto, 1975) and the model of student involvement (Astin, 1999) are two of the most cited approaches to college persistence in higher education (Milem & Berger, 1997). Much of the research on LCs is informed by the work of Tinto and Astin (Barnett et al., 2009; Dillon, 2003; Dodge & Kendall, 2004; Edwards & Walker, 2007; Ellis & Berry, 2012; Goldberg & Finkelstein, 2002; Heaney & Fisher, 2011; Hotchkiss et al., 2006; Howles, 2009; James et al., 2006;

Jones et al., 2006; Malnarich, 2005; Beachboard, Beachboard, Li, & Adkinson, 2011; Pastors, 2006; Pike, Kuh, & McCormick, 2010;).

Tinto sought to develop a theory to explain why college students drop out of college. Specifically, he wanted to distinguish between college students who failed academically and those who chose to leave college voluntarily. His theory of student departure describes the interaction between the institution and the individual that is needed for persistence. The student departure theory is grounded in Durkheim's theory of suicide and on the idea that individuals choose to stay or leave college based on a cost-benefit analysis. Durkheim's (1951) theory of suicide posits that people are more likely to commit suicide if they do not feel integrated into society. Durkheim (1951) defined four types of suicide: altruistic, anomic, fatalistic, and egotistical. He argued that the most common type of suicide was egoistic, or where individuals did not become integrated with the community. In developing his theory of egoistic suicide, Durkheim (1951) examined the relationship between suicide and religion, marriage, and political society in the 19th century. He reasoned that when people are integrated through religion, marriage, and politics they are more likely to help each other, support each other, and less likely to commit suicide.

Tinto's (1976) model of student departure hypothesizes that students are more likely to drop out of college if they do not feel integrated with the campus community. Institutions where students are integrated socially and academically will have lower rates of departure (Tinto, 1987). Research supports the view that engagement through collaborative learning and feeling supported predicts graduation rates and that learning

and persistence are associated with being engaged in college (Center for Community College Student Engagement, 2013; Price & Tovar, n.d.).

Tinto (1975) argued that persistence in college is dependent on six factors. First, Tinto argued that students who do not interact with others at college and make connections are not integrated into the social system. As a result, students who are not integrated will be more likely to leave. Therefore, colleges need to promote shared learning and community by implementing LCs, collaborative learning, and classroom assessment (Tinto, 1997a). These strategies are based on the assumption that in higher education, the classroom is the center of educational activity, especially for students who commute or have multiple obligations outside of college (Tinto, 1997b).

Second, Tinto also distinguished between academic and social commitment. He argued that a student is more likely to stay in college if he or she is integrated both academically and socially. For instance, students only integrated academically and not socially into the institution would be less likely to stay in college. Moreover, being integrated academically and socially needs to be balanced. Spending too much time in the social sphere or on academics can lead to a student dropping out as well.

The third aspect of his theory is that a student's educational background, experiences, characteristics, and motivation are related to a student's likelihood of dropping out. Tinto referred to a student's educational background as educational goal commitment and believed that these are important predictors of how a student interacts in the college environment. Namely, a student's high school experiences, career and educational expectations, ethnicity, and gender all affect a student's commitment to their

education. Tinto's fourth postulate is the idea that educational goal commitment and integration at the institution both affect persistence and whether or not a student is more or less likely to drop out of college. In other words, the more a student is connected with the college environment, the more likely it is that the student is committed to completing a goal and staying in college.

The fifth postulate from Tinto (1975) takes into account the external forces that may act on the individual college student and their decision to remain in college. Tinto argued that a person is more likely to stay in college when the benefits outweigh the costs of attendance. Example benefits perceived future earnings and friendships; costs are those associated with finances, time, and academic failure. The sixth and final postulate is based on the idea that a student's perceptions of reality influences his or her behavior. The perception of extent of integration into the institution is important. Moreover, perceptions are affected by a person's educational background, experiences, and characteristics as well as their experience at college.

The original model of student departure highlighted the effects of pre-entry attributes of family background, skills and abilities, and prior schooling on goal and institutional commitment (Tinto, 1975). The revised model (model of student persistence) includes student intentions and external commitments; pre-entry attributes not only effect goal and institutional commitments, but they also affect intentions and external commitments (Tinto, 1997b). External commitments refer to commitments like work and family or commitments that take students away from college and goal and institutional commitments refer to commitments that the student makes to the college and

their own educational goals (Tinto, 1987/193). As a result, intentions, goal and institutional commitments, and external commitments affect the student's interactions with the academic and social systems of the institution as well as interactions in the classroom.

Tinto (2000) again revised the model of student departure that later became the model of student persistence to include the effects of the classroom. He argued that the one experience that every student in college shares is the classroom. Accordingly, he reconstructed the model of student persistence to include classroom factors such as pedagogy and faculty. Tinto (2000) argued that if students commute to college, have numerous external interests and responsibilities, and are not engaged in the classroom setting, it is very likely that they will not be engaged. The classroom is the gateway to student involvement and learning.

Tinto (2000) argued that the importance of the LCs is that they help to build supportive peer groups, connect the academic and social divide, and increase involvement, effort, learning, and persistence. One of the main theoretical benefits of an LC is that students should be able to more easily transition to college because of the supportive relationships they develop in class. Specifically, LCs allow connection with other students; the same small group of students in the same class increases the likelihood of friendships developing than in a course that is not part of an LC. As a result, first-year college students are more likely to make friends and to want to stay in college even when college is challenging.

Second, LCs can help students integrate both the academic and social aspects of college without creating a struggle between the two (Tinto, 2000). As a result, students spend time outside of class with other students, get to know those students socially and develop friendships, and spend more time talking about and working with the course material (Tinto, 2000). Third, students in LCs spend more time studying, are more likely to learn the material, and more likely to persist and stay in college.

The theory of student involvement (Astin, 1999/1984) simplifies the factors involved in persistence. Astin expanded on Tinto's (1975) theory by including perspectives from psychoanalysis and classical learning theory. Moreover, his theory supports understanding factors faculty and administrators can influence to develop more effective strategies, and thus improve student learning.

Astin argued that student involvement is defined as the physical and psychological energy that a student dedicates to his or her academic experience (Astin, 1999). Involvement is active and refers to concepts like commitment, engagement, participation, enthusiasm, and interest. Student involvement includes the amount of energy a student invests into the academic experience, is on a continuum, varies by student, and includes both quantitative and qualitative characteristics. Student involvement can be increased by relating student learning to the quality and quantity of time in a program.

The two most important propositions of the theory are that student learning is related to the quality and quantity of time in a program and that effective practices in higher education should be driven by student involvement (Astin, 1999). He argued that

these are the most important because they can help administrators and faculty design effective programs for students. Administrators and faculty can design practices and programs that increase the quality and quantity of time students are involved in a program. Astin also related student involvement to the psychological concept of motivation; however, he preferred involvement to motivation because he believes that is easier to get a student involved than motivated. Specifically, involvement implies that a student is engaging in behavior rather than denoting a feeling or psychological state. It is easier to get students involved then to motivate them.

Astin (1999) demonstrated that research supports a positive relationship between strategies and student success, increases involvement; and a negative relationship between strategies and student success involvement. For instance, Astin cited living on campus, participating in extracurricular activities, and working part time on campus as examples of strategies that increase involvement and are related to student success. Students actively involved in the learning process are more likely to be successful (CCSSE, 2006; Eck et al., 2007).

Research has indicated support for Astin's student involvement theory. Specifically, research has indicated that there is a relationship between student employment and student success in college and living on campus and student success (Bozick, 2007; Dadgar, 2012; Mamiseishvili, 2010). The evidence suggesting that men and women drop out of college for different reasons is not as strong. One study found evidence indicating that females are more likely to drop out because of marriage and

doctor's orders than males, and that males were more likely to drop out because of military service, which could suggest boredom (Demos, 1968).

Astin (1984) also identified academic involvement as an important component to staying in college. He defined academic involvement through behaviors like working hard at studying, the number of hours spent studying, interest in courses, and good study habits. Other strategies that helped increase student involvement and therefore the likelihood that a student would persist are being in an honors program, interacting with faculty, and being involved with the college athletically. Research over the last 20 years supports Astin's theory by strongly indicating that college students are more successful when they are academically involved with other students, college faculty, and with the subject matter that they are studying (McClenney, Marti, Adkins, 2012). Most recently, Price and Tovar (in press) found that while controlling for institutional characteristics like the percent of developmental students, active and collaborative learning and support for learners predicted graduation rates. Academically involved learners who engage in active and collaborative learning are more likely to ask questions in class, work with other students outside of class on assignments, tutor other students, and discuss ideas outside of class from readings (Marti, 2009). Students identified as receiving support for learning are more likely to have contact with other students from diverse backgrounds, receive help to cope with non-academic responsibilities, and to receive academic advising.
The most important component of student involvement theory is that the focus is more about how much time and effort a student is devoting to learning (Astin, 1999/1984).
The two key components of Astin's theory are (a) that student learning and success are

directly related to the amount of time spent participating in an educational program and the quality of that program; and (b) that effectiveness of any program or policy is directly related to the ability of the program or policy to increase student involvement.

The theories by Tinto (1975, 1976, 1987, 2000) and Astin (1999) are consistent with LC concepts. LCs help to increase connections among students, students and faculty, and students and instructors (Andrade, 2007; Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Hesse & Mason, 2005; James et al., 2006; Janusik & Wolvin, 2007; Johnson, 2000; Killacky et al., 2002; Keup, 2005; Levine, 1998; Price & Lee, 2005; Smith et al., 2004; Tinto, 1997a). Tinto's (1975, 1976, 1987, 2000) models of student departure and persistence theorize that students are more likely to persist when students interact with other students and faculty and that they are more likely to drop out if they do not feel connected. Astin (1984, 1999) argued that strategies that increase involvement are related to student success and that involvement is likely to increase when students interact with other students and faculty. Both Tinto's and Astin's theories are consistent with the LC concept of increased connections lead to student success.

In addition, LCs also facilitate student learning (Andrade, 2007; Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Hesse & Mason, 2005; James et al., 2006; Jones et al., 2006; Keup, 2005; Killacky et al., 2002; Levine, 1998; Price & Lee, 2005; Mahoney & Schamber, 2011; Malnarich, 2005; Smith et al., 2004; Soldner et al., 1999; Tinto, 1997a; Tinto, 2000). Tinto (2000) also argued that the classroom is the gateway to student involvement and that students who participate in a LC are more likely to learn. Moreover, Astin (1999) also argued that the quality and quantity of time is related to

student learning and the LC concept suggests that learning is enhanced by the quality of relationships that develop in a LC (Hesse & Mason, 2005; James et al., 2006; Janusik & Wolvin, 2007). The following section examines the themes identified in the LC literature.

Themes in the Learning Communities Literature

An alternative learning strategy that incorporates many of the learning strategies identified by the educational research is the use of LCs in the college educational setting. Research has indicated that LCs help to connect students with the college community, foster a collaborative learning environment, create associations, and help to motivate students to want to learn (Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Levine, 1998; Soldner, Lee, & Duby, 1999; Tinto, 1997a). Aristotle, Quintilian, Vives, Locke, Hall, and Dewey all hypothesized that learning was more likely to occur through associations and Quintilian, Locke, and Thorndike hypothesized that positive reinforcement also helps people to learn (see Table 1). LCs are an alternative learning strategy that incorporates many of the strategies identified by educational philosophers and research conducted on education in the last 100 years.

Research on LCs indicates that LCs provide social support and recognition, opportunities for feedback, provide a connection between two or more subjects, and encourages students to become more involved in learning (James et al., 2006; Jones et al., 2006; Mahoney & Schamber, 2011). In addition, research strongly indicates that connecting student work through analogies, reinforcement, and feedback is related to student success (Marzano, Pikering, & Polick, 2001). LCs have helped students to

connect their learning to their own lives (James et al., 2006). The following illustrates themes identified in the literature on LCs including positive reinforcement, contextualized learning, student engagement, effectiveness of learning communities, multiple programs and the linking of courses.

Positive Reinforcement

One of the most effective teaching strategies identified by a meta-analysis conducted in the K-12 setting was the providing of recognition through different forms of praise (Marzano et al., 2001). This technique seeks to increase student motivation to learn through positive reinforcement. The focus here is on teaching students to realize that the effort that they put in to learning makes a difference and that the way to increase student effort is through positive reinforcement.

Research in neuroscience suggests there is a relationship between positive reinforcement and learning (Kim, Shimojo, & O'Doherty, 2006; Reynolds, Hyland, & Wickens, 2001; Small, Zatorre, Dagher, Evans, & Jones-Gotman, 2001). Specifically, Kim et al. (2006) suggested that learning is likely to occur when an aversive outcome, such as losing money, is used as a technique when teaching. Results indicated that the orbitofrontal cortex (OFC) portion of the brain was stimulated during the avoidance of an aversive outcome and during positive reinforcement. Moreover, learning was more likely to occur when the aversive outcome was avoided during positive reinforcement. The authors concluded that the participants were most likely to learn when they both received positive reinforcement and when they avoided an aversive outcome.

Students have described the experience of participating in an LC as providing social support through listening, disagreeing, and working together (James et al., 2006). The emotional support students receive from participating in the LC is a form of positive reinforcement and helps to connect students with the larger campus community. An example of how positive reinforcement works with an aversive outcome was described by Darabi (2006). Darabi described how students who participated in an LC knew when another student was going to be absent and why they were absent. When students attended class regularly they received positive feedback from other students. However, if a student was unexpectedly absent they would call them on their cell phones to track them down and get them to come to class.

Contextualized Learning

Research on LCs has also indicated that gains in persistence were more likely to occur when the faculty had worked together to develop common assignments and course content, which is also known as contextualized learning (Andrade, 2007). Smith (2010) examined the effectiveness of LCs by analyzing student self-reported data from the Pathways to College Success Project for 13 community colleges. The study focused on basic skills LCs, used a geographically diverse sample of students, and compared non-native English speakers with native English speakers. Basic skills LCs included at least one basic skills course. There could have been anywhere from two to five linked courses, but at least one had to have been a basic skills course. Because the data used in the study was based on self-reported information from a secondary data source, a limitation of the study was that colleges and faculty participating in the LC may have employed additional

strategies to support students that were not captured by the Pathways to College Success Project.

Self-reported learning outcomes were constructed by Smith from eleven questions on the survey. Students rated how the institution contributed to acquiring a broad general education, work-related knowledge, writing and speaking effectively, thinking critically, using computers, working effectively with others, learning effectively, contributing to the welfare of their community, developing career goals, and developing a sense of confidence. Students who participated in an LC were more likely than students in stand-alone courses to self-report that the LC had helped them to learn (Smith, 2010). In addition, students in the LC were also more likely to identify learning outcomes on the survey if they were 23 years old or older, African American, employed, and spent more than 5 hours preparing for class by oneself than students in standalone courses.

Barnes and Piland (2010) examined developmental education LCs at a community college of 15,000 students. Thirty-two percent of the students at the college were Hispanic and 13% were African American. The LCs had themes developed by the instructors where the curriculum in each course focused on the same topic, provided in-course tutors, and linked developmental English and reading courses. The authors sought to examine if LCs increased the likelihood of retention (i.e. completed the course with A-F grade or Incomplete) and persistence in developmental English courses and if there were any differences by gender and ethnicity.

Barnes and Piland (2010) designed the study so that both the LC and comparison group were taught by the same instructor to control for instructor variation. There was a

higher percentage of Hispanic and female students in the LC than in the comparison groups, which the authors did not statistically control for. The results indicated that students who participated in an LC were more likely to be retained, and that Hispanic students, males, and females who participated in the LC were also more likely to be retained. Students were more likely to persist if they were enrolled in the English LC that was two levels below transfer level English. Hispanic students, females, and males were also more likely to persist in the English LC from one semester to the next. Barnes and Piland concluded that research on LCs needs to identify whether LCs with linked courses, coordinated curriculum, faculty professional development, supplemental instruction, and/or collaborative learning are the most effective at improving student outcomes.

Student Engagement

LCs have also been found to help students feel connected to other students and faculty. Specifically, research has indicated that students who participate in LCs are more likely to feel that it is easy to get involved on campus, that the student handbook was helpful, that faculty are available, and that their college experience has met their expectations than students in comparison groups (Baker and Pomerantz, 2000). In addition, LC students also reported that they were more comfortable taking more risks, felt more connected to other students, and more willing to ask students and/or faculty for help. Baker and Pomerantz (2000) concluded that when students participate in an LC program they are more likely to feel motivated by instructors and that instructor's care about students, are excited about the subject, and help students exceed because LCs

provide more opportunities for students and faculty to interact with each other. In other words, LC programs helped students to be more engaged.

Effectiveness of Learning Communities

Soldner, Lee, and Duby (1999) examined the effectiveness of LCs within a first-year experience (FYE) program on academic performance. They controlled for self-selection bias and motivation by comparing the characteristics and the backgrounds of students who chose to participate in the LC and those who did not. The results of the study indicated that the first-year experience students were more likely to be in good academic standing and persist to their third and fourth semester's subsequent semesters. Consequently, students who participated in the FYE program with an LC are less likely to be on academic probation than students who did not participate in the FYE program.

Baker and Pomerantz (2000) examined the simplest form of LCs, those that are linked with the goal of identifying simple and cost effective methods of increasing the likelihood that students who participate in an LC will persist to the following semester. Linked LCs are the simplest form of LC, because the curriculum is not integrated; the only intervention is that students are enrolled in the same courses. Students in the control group were matched with students in the LC on gender, race, age, major, ACT composite score, and units enrolled. The outcome measures examined included GPA, persistence from fall to spring, units earned, probation status, percent on the Honors list, and number of courses dropped. LC students were more successful on all outcomes when compared to students in the control group.

When compared to other retention strategies, research indicated that LCs were the most effective at helping students to persist (Johnson, 2000). Equally important, students at risk for failing their courses who participated in an LC were more likely to persist than students participating in other retention programs who were not identified as at-risk students. Johnson (2000) hypothesized that LCs might be more effective at helping students to persist, because they provide more opportunities for faculty and students to interact, help students to formulate goals, and commit to college than the other programs.

Potts, Shultz, and Foust (2004) examined the relationship between persistence and participation in LCs among new freshmen college students at a 4-year university. Students were randomly assigned to two conditions (with and without an LC). In addition, the authors controlled for high school class rank, ACT scores, and whether students were in the residence hall or commuted. The results indicated that participation in an LC was not related to persistence. In spite of the small sample size, the results indicated that academic performance in the first semester and being in the residence hall were positively related to persistence.

In a review of the literature on LCs, Andrade (2007) found that even though LCs share similar features, institutions often vary how they offer an LC to meet the needs and demands of their unique student populations. She identified the four most common objectives sought by institutions that had implemented an LC: Persisting from one term to the next, successful course completions (that is, academic achievement), student engagement (involvement), and student satisfaction. Andrade (2007) found that a majority of the studies on LCs identified retention as an objective. The students in these

studies were more likely to self-select rather than be randomly selected. In the only study found reporting random selection, a relationship between LC participation and persistence was not found (Goldberg & Finkelstein, 2002). However, in the study with random selection the sample consisted of students who were older than traditional students in an electronic technician program and the study did find that students participating in an LC were more likely to feel connected to the campus than the students who had not participated in the LC. LCs that were most effective at increasing student persistence across the studies addressed academic skills, had integrated course work, and provided peer and/or faculty assistance (Andrade, 2007).

Dunlap and Pettitt (2008) presented the results from research studies conducted over the last 20 years on LCs at one community college. The institution first offered LCs in 1986 and as a result of the research they conducted from 1986 to 1993, they now require students to take at least two LCs prior to graduation because of increases in retention, and student and faculty satisfaction that come with the LC. The results from multiple focus groups, surveys, and research studies conducted at the institution indicated that students in LCs were more likely to experience their own culture within the context of other cultures (ethnorelativism), were better critical thinkers, were more likely to develop into independent learners, were more likely to have had serious conversations with students from a different race or ethnicity, were more likely to prepare two or more drafts of an assignment, and were more likely to have a higher GPA after transferring to a 4-year university.

Multiple Programs

There is also research indicating that LCs may be more effective when they are combined with other strategies for keeping students engaged and in school (Andrade, 2007; Keup, 2005). Keup (2005) analyzed secondary data (including information from Integrated Postsecondary Education Data System (IPEDS) to control for institutional characteristics) from 4-year universities to examine the relationships among participation in LCs, service learning activities, first-year seminars, and intent to re-enroll for another year at the same college. Biases in the sample include larger representation of private and religious institutions than public and 4-year colleges; in addition, women, African-Americans, and Hispanic students were under-represented. Keup also examined whether or not a combination of alternative strategies were related to intent to transfer to a 4-year university suggesting that interventions may be more effective when they are paired together.

The results of the study indicated that students participating in at least one of the interventions were less likely to feel isolated and were more likely to interact with faculty (Keup, 2005). Equally important, student's odds of intent to re-enroll increased if they spent more time studying, discussed course content outside of class with other students, and had a higher first-year GPA. Moreover, students who felt successful at getting to know faculty and who spent time studying with other students, felt that their general knowledge had increased and were more likely to express intent to re-enroll. Alone, participating in an LC did not increase the intent to re-enroll. However, students who participated in both an LC and a first-year experience seminar were more likely to have

intent to re-enroll. Limitations of the study included the outcome measure, intent to re-enroll, rather than examining students who actually re-enrolled and self-selection was not controlled for in the study. The types of LCs that have had the largest gains in persistence consisted of LCs that also offered peer mentoring, faculty mentoring, and/or group tutoring sessions (Andrade, 2007).

Linking Courses

Andrade (2007) also examined the characteristics of how LC courses were linked and found that in studies with retention identified as the main student outcome LCs were more often characteristic of having two to four courses that were linked. Most often, one of the courses focused on academic skills. Other combinations of linked courses involved general education courses, developmental courses, and honors courses. The number of linked courses in the LC did not appear to be related to persistence (Andrade, 2007).

Need for Additional Research on Learning Communities

In a literature review of LCs Andrade (2007) identified academic achievement, which refers to course grades, GPA, academic probation, and self-reports of learning, as being impacted by LCs. Of the nine studies reviewed, seven indicated gains in academic achievement because of LC participation. Overall, the seven studies indicated that LCs were effective with at-risk students, on commuter campuses, and with honors students. The results also indicated that peer and faculty support were key and that collaboration among students may be more important than the integration of course content. However, it is difficult to identify the most effective approach at increasing academic achievement

without examining the literature quantitatively (Lipsey & Wilson, 1993). For instance, five other studies examining the relationship between LC participation and academic achievement found evidence indicating that peer and/or faculty tutoring and integration of the course content were related to academic achievement.

It is clear from Andrade's (2007) findings that the results on the effectiveness of LCs make it difficult to identify the features of LCs that effectively increase the likelihood of student success. For instance, the most common features of LCs across all of the studies reviewed were the integration of course assignments, seminars, and peer and/or faculty mentors. LCs with only linked courses appeared to have some benefit to students. However, LC types that did not appear to increase the likelihood of student success examined the number of linked courses and what types of courses were linked rather than the integration of course assignments. Also, the length of the LC and activities to facilitate students connecting outside of class did not seem to help. A limitation of the review conducted by Andrade (2007) is that it is not clear which of the combinations of LC types are most effective at increasing the likelihood that students will persist.

Andrade (2007) concluded that there is no perfect combination of LC strategies that were apparent in the literature. She concludes that further research in the area of LCs needs to identify the specific features of LCs that are most effective. For instance, are LCs with a counseling component more effective than ones with peer tutoring? Does the number of linked courses make a difference in student performance? Is it better to link a developmental course with general education course? How does self-selection and

random selection relate to the effectiveness of LCs? Are LCs with integrated course content more effective than ones that use block scheduling?

LCs have become a popular option to support developmental students at community colleges and may even be more relevant for community college students (Smith, 2010). Even though implementing LCs can be challenging, the literature suggests that the advantages of LCs for community colleges far out way the challenges (Killacky, Thomas, & Accomando, 2002; Minkler, 2002). Specifically, students participating in LCs are more involved with the material being presented and are more likely to be engaged (Killacky et. al, 2002; Minkler; 2002). Moreover, students participating in LCs are more likely to persist, be satisfied with their classes, successfully complete their courses, and to develop intellectually (Killacky et. al, 2002; Minkler; 2002). Students attending community colleges are more likely to be commuter students, have jobs off campus, and many are only on campus during their classes. Students attending community colleges are more likely to lack a sense of engagement and connection with the college (Killacky et al., 2002; Minkler, 2002). A benefit to LCs is that they provide additional opportunities to see and interact with the same students, which can help to create a sense of community. In addition, LCs can help colleges meet stated general education outcomes.

Smith (2010) found that, when students feeling supported by the institution was added to the model, participating in an LC was no longer a statistically significant predictor of self-reported learning for non-native English speakers. From these results, she concluded that any alternative learning strategy that helps students develop close

relationships that foster feelings of support may increase the likelihood of student learning. Moreover, institutions need to find ways to support students working together. A limitation of Smith's (2010) study was the inability to examine the relationship between LC participation and student grades and persistence.

Dunlap and Pettitt (2008) also compared two different types of LC to see if students valued either linked or federated LCs more. Students in linked courses are enrolled in two or more courses together; whereas students in a federated LC are enrolled in several different courses and are only co-enrolled in one course. The results indicated that students valued linked courses more than federated courses, and the assignments in the linked courses were more helpful with the content areas than the federated courses.

Even though LCs are beneficial to students, they are also costly, upwards of $135,000 annually (Hotchkiss et al., 2006). As a result, institutions would want to know the type of LC that yields the highest gains in student success and persistence. However, at least one study found evidence indicating that LCs can be cost-effective. Johnson (2000) examined the cost effectiveness of LCs by examining both the cost of the program and the downstream revenue generated by the program. Specifically, the downstream revenue generated from one LC program was $350,000, and the annual cost of the program was $101,000. These results indicate that LCs are worth the investment, especially when at-risk students are involved, because LCs were more effective at retaining students than other programs and helped students to feel more connected to the college. Johnson reasoned that even though LCs were more costly to run then other

programs, the return on the investment in one or two years of retention was worth the initial cost.

Chapter Summary

Four themes were identified from the review of the literature on LCs for 4-year and two-year colleges: LCs help students to feel engaged, LCs are related to student achievement, the relationship between LCs and student success is mixed, and different types of LCs may be related to different student outcomes. LCs facilitate student engagement at both community colleges and 4-year universities. They help to engage students by connecting new information to what the student already knows or creating analogies by helping the student to connect to the information emotionally (Baker et al., 2004; Marzaono et al., 2001). LCs facilitate this process by the use of assignments and information that contextualizes the content of each course. In addition, LCs help students to connect to the information presented in a more emotional way because of the connection to other student's facilitated by the LC (Dunlap & Pettitt, 2008; Johnson, 2000; Killacky et al., 2002; Price & Lee, 2005). As a result, research has indicated that students who participated in LCs were more likely to be satisfied, feel connected to other students, are more willing to ask for help, are less likely to feel isolated, are more likely to interact with faculty, critically think, and feel supported by the institution (Baker & Pomerantz, 2002; Dunlap & Pettitt, 2008; Keup, 2005; Smith, 2010).

Second, LC participation was also related to differing academic outcomes like retention, persistence, and academic standing. For instance, students who participated in an LC at both 4-year and community colleges were more likely to persist, have good

academic standing, have a higher GPA, and have a higher 4-year university GPA after transferring from a community college (Andrade, 2007; Baker & Pomerantz, 2000; Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Johnson, 2000; Soldner et al., 2009). Accordingly, LCs might be more effective at achieving different types of outcomes (Barnes & Piland, 2010; Johnson, 2000; Potts et al., 2004). For instance, Johnson (2000) hypothesized that LCs are more effective at helping student to persist because they provide more opportunities for students to connect with other students and faculty. In addition, Andrade (2007) found that a majority of the studies on LCs have examined persistence as an outcome. As a result, Research Question 2 seeks to identify the student outcomes where LCs have the greatest impact.

Third, there was also conflicting results on the effectiveness of LCs, especially when the research methodology included random sampling. Specifically, when random selection was used, there was not a statistically significant relationship between LC participation and persistence (Goldberg & Finkelstein, 2002; Keup, 2005; Potts et al., 2004). However, one study included a small sample size (Potts et al., 2004); one found that if students participated in both an LC and a first-year experience program there was a positive relationship between LC participation and persistence (Keup, 2005); and one occurred in a select population of older students in a specialized program (Goldberg & Finkelstein, 2002). Similar to the research on learning styles and learning, the research on the effectiveness of LCs has been mixed; some researchers examining learning styles have suggested that a student's knowledge of their learning styles may increase their performance (Busato et al., 2000; Slemmer, 2002; Zapalska & Dabb, 2002). In addition,

students may be more likely to learn if the learning style is compatible with their brain (Harrison et al., 2003). Similarly, LCs may be more likely to be effective with certain student populations or students with unique characteristics (Andrade, 2007). For instance, LCs are often used as a method to help transition new students to the college environment (Keup, 2005; Levine, 1998; Smith, 2010; Soldner et al., 1999). Accordingly, Research Questions 1 and 4 explore whether or not LCs are more or less effective with students with different backgrounds and in different types of programs.

Interventions may also be more effective when they are paired together. For instance, as discussed previously, research has indicated that students participating in more than one learning strategy were less likely to feel isolated and were more likely to interact with faculty (Keup, 2005). Accordingly, an aspect of this investigation includes the relationship of how many interventions a student participated in (RQ 4) and how they related to educational outcomes (RQ 2). In addition, research has also indicated that the types of LCs with the largest gains in persistence consisted of LCs that also offered peer mentoring, faculty mentoring, and tutoring sessions (Andrade, 2007).

Finally, the fourth theme identified was the need to examine the effectiveness of the different types of LC combinations especially because of the cost associated with implementing LCs (Killacky et al., 2002; Minkler, 2002). Higher educational institutions often implement different forms of LCs in order to meet the unique demands of each college (Andrade, 2007). There is evidence to suggest that different types of combinations lead to different gains in student outcomes. For example, students participating in an LC with tutoring were more likely to persist than students participating

in an LC with common assignments or academic skills (Andrade). Andrade concluded that it is difficult to identify which LC combinations are most effective, and that more research is needed to explore the different combinations. Moreover, research at community colleges has indicated that students valued linked courses more than courses that were federated (Dunlapp & Pittitt, 2008), and Smith (2010) also included that she was unsure if differences in LC types made a difference. There were six categories of LC types identified from the literature review including number of linked courses, type of linked courses, additional alternative learning strategies, sample type, student demographics, and college type. The degree to which the LC has integrated assignments and the number of paired courses may also play a role in student outcomes and is being explored through Research Questions 3 and 4.

In Andrade's (2007) review of the literature on LCs, she concluded that there are mixed results when it comes to identifying when and with which populations LCs have a positive impact. It is difficult to identify the most effective approach for LCs without conducting a quantitative review (Lipsey & Wilson, 1993). Andrade concluded that the future research on LCs needs to identify the most effective aspects of LCs. As discussed previously, a meta-analysis was the statistical technique chosen to synthesize the results quantitatively and to identify the most effective approach with LCs.

Next, Chapter 3 describes the methodology used in the meta-analysis, Chapter 4 presents the results from the meta-analysis, and Chapter 5 summarizes the results, highlights the most useful findings for colleges, and discusses the implications of the findings.

Chapter 3: Research Method

In this chapter, I provided a detailed description of the methodology used in this study. The rationale for the research design provides an explanation for the use of meta-analysis to examine the effectiveness of LCs and the key variables used in the analysis. I also describe the five criteria used to decide whether to include a study in the meta-analysis as well as the process used to search the LC literature. The reasons for excluding studies are described in the exclusion criteria section. The reasons for choosing a random-effect model over a fixed-effects model are described next, followed by the reasons for the effect size metric used, and the use of the 95% confidence interval to report precision. Chapter 3 concludes with a description of how the dispersion of effect sizes might affect the analysis and how Cochrane's Q statistic was used to measure the homogeneity of the summary effect size.

The purpose of this meta-analysis study is to help educators identify the most effective type of LC to increase the likelihood the students reach their goals. This involves four questions:

1. Are community college students more likely to be successful when they participate in an LC than 4-year college students who participate in an LC?
2. Among community college students, for which student success outcomes do LCs have the largest effect?
3. To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)?

4. To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (e.g., additional support services and strategies, student characteristics, integration of the curriculum, and the size of the college)?

Research Design and Rationale

Meta-analysis refers to quantifying a group of statistical estimates of the treatment effects, regardless of statistical significance, for the purpose of integrating findings (Glass, 1976; Lipsey & Wilson, 1993). Specifically, meta-analysis is a research synthesis technique where studies are identified and the results from each are quantified and integrated quantitatively. Therefore, each study effect size, rather than individual participants, serves as a data point in the sample.

Using meta-analysis to assess the effectiveness of an intervention is valuable; since educational interventions are tested repeatedly and broadly conducted, it is important to examine the larger body of research rather than individual studies (Borenstein et al., 2009). Another major benefit of meta-analysis is that it not only answers the question of if the treatment works, but the analysis can provide insight into how it works (Lipsey & Wilson, 1993); thus, the researcher can identify factors that might be involved with treatment success (Borenstein et al., 2009). This is particularly important with LCs, because they can be costly and require a large time commitment to implement (Janusik & Wolvin, 2007). Moreover, a barrier to academic success in a higher education has been the idea that one approach will work for every student; conducting a meta-analysis on the effects of LCs can help to indicate where LCs will be

the most effective (Malnarich, 2005). In addition, it is important to examine the data and the academic issue to determine the type of LC intervention that is needed the most (Malnarich, 2005). In the case of LCs, research suggests that self-selection is an important variable when examining the effects of LCs; meta-analysis allows for control for the type of samples selected in LC studies and determine the impact of self-selection.

Key Variables

Dependent variables. The dependent variables in the study are measures of student outcomes. The outcomes of interest were: (a) course success; (b) term-to-term retention; (c) GPA; and (c) self-reported learning outcomes.

Course success is a dichotomous variable; those who complete a course with a grade of A, B, C, or Passing (Credit) grade (Nitecki, 2011) are coded as 1. Students who earn a grade of D, F, No Credit, Incomplete (I), or Withdraw (W) from the class have not successfully completed the course and were coded as 0. A grade of Withdraw was considered to be not successful because these grades are most often received by students who have remained in the course long enough to be required to pay for the course and most often withdraw to avoid receiving a failing grade (Howles, 2009).

Term-to-term retention is a dichotomous variable. A student who was enrolled in an initial term as well as a subsequent term (Heaney & Fisher, 2011; Hotchkiss et al., 2006; Howles, 2009; Purdie & Rosser, 2011; Waldron & Yungbluth, 2007) is coded as 1; those who were not retained were be coded as 0. Retention provides an indication of how LCs help to keep students in college and progressing towards their educational goals.

Grade point average (GPA) is a continuous variable. It is a measure of student success that includes work both within and beyond the courses included in the LC (Waldron & Yungbluth, 2007). GPA ranges from 0.00 to 4.00.

Self-reported learning outcomes refer to outcomes that are often indirect and measured by student self-perception. Specifically, research on LC participation has indicated that the effect on student success may be mediated through student engagement (Rocconi, 2011). Examples of possible self-reported learning outcomes that might indirectly influence student success include student engagement, experiences with faculty members, experiences with other students, student effort, student perceptions of their learning outcomes, and student learning attitudes (Fayon et al., 2010; Lee, 2010; Rocconi, 2011; Smith, 2010; Wilmer, 2009). In addition, self-reported learning outcomes might also include a pre-post assessment of learning; again, the common component is that the assessment was an indirect measure of student success (Barnett et al., 2009). The self-reported learning outcomes were identified during the analysis and are reported in Chapter 4.

Independent (moderator) variables. The independent variables in the study, referred to as moderator variables in a meta-analysis, were chosen to help control for factors that might bias effect sizes (Lipsey & Wilson, 1993) and to help answer the four research questions. The methodological quality of a study can be related to effect size (Jarde, Losilla, & Vives, 2012; Lipsey & Wilson, 1993). Accordingly, the four moderator variables used to help control for biased effect sizes (Appendix B) were publication type, sample type, sample size, and type of outcome.

Publication type. Publication type is used to categorize studies based on whether or not they were peer reviewed or published on a web site. Lipsey and Wilson (1993) found evidence that publication type and the availability of study vary with effect size. Each study was coded as either being from a peer reviewed journal or a website.

Sample type. The type of sample was categorized based on whether or not the researchers used random or non-random assignment, which has been found to have a moderate relationship with effect size. Random studies were shown to have a slightly higher effect size than non-random studies (Lipsey & Wilson, 1993).

Sample size. Lipsey and Wilson (1993) also found a moderate relationship between sample size and effect size. Accordingly, each study was coded as either having a sample that is less than 50, 51 to 100, or more than 100 to control for sample size.

Type of outcome. The type of outcome, whether or not the outcome variable is continuous or dichotomous, may be related to the effect size (Sanchez-Meca, Marin-Martinez, & Chacon-Moscoso, 2003). Accordingly, if there are differences between studies with continuous or dichotomous outcomes, it was suggested by Sanchez-Meca and colleagues to use two different types of effect size indices to reduce the likelihood of a biased effect size.

Research in a random sample of higher educational institutions in the United States indicated that the most common type of LC are those where the curriculum from the different courses participating in the LC is linked followed by one of the courses being a first-year seminar course, the LC being connected to residential living, the LC linked by a common intellectual theme, and where the student affairs professionals

deliver out-of-class experiences (Barefoot et al., 2012). Consequently, six moderator variables were developed to identify differences in the effectiveness of LCs by type: college size, number of linked courses in the LC, number of additional strategies, type of linked courses, whether or not the linked courses contextualized the curriculum, whether one of the additional strategies was counseling, and whether or not the LC was for first year college students.

Tinto's (1975) theory of student departure argues that students who are not integrated are more likely to leave. College size was examined as a moderator variable because the size of a college may be related to how well students are integrated with a college. In addition, colleges of different sizes have differing characteristics (Cohen, 2003). For instance, LCs may be more effective at larger colleges because they may help to connect students to the college more effectively. The four group sizes developed by the Community College Survey of Student Engagement (CCSSE, 2012) were used to categorize the fall semester enrollment size of each college that was included in the study. CCSSE bases the student enrollment sizes on the categories developed by the Integrated Postsecondary Education System (IPEDS). Next, research has indicated that LCs are effective with first year college students and with diverse learners; accordingly, two additional moderator variables that are included are whether or not the LC was implemented with first year college students and the type of linked courses in which the LC was implemented (Dunlap & Petitt, 2008; Killacky et al., 2002; Keup, 2005; Levine, 1998; Smith, 2010).

Alternative learning strategies like LCs, counseling, supplemental instruction, the number of linked courses, and the contextualizing of the curriculum can often be combined in first-year experience programs, which can make it difficult to determine which program has the largest relationship with success and persistence (Keup, 2005; Malnarich, 2005). Moreover, interventions may be more effective when they are paired together. Accordingly, four of the moderator variables examined include the number of additional strategies, the number of linked courses, whether or not the curriculum was contextualized, and if one of the additional strategies was counseling. Malnarich (2005) recommended that, to create effective LCs, the curriculum needs to be contextualized. For example, LCs with developmental linked courses will often include a developmental skills course like writing, reading, or mathematics. Assignments in these courses complement each other so that students learn the material in a subject like sociology by writing about sociology in an English course.

Astin (1984) theorized that involvement on campus was strongly related to student success outcomes. He suggested that involvement occurs on a continuum with dropping out anchoring one end and successfully completing a degree/certificate or transferring at the other end. Therefore, another moderator variable that may help to increase student involvement, according to Astin, is whether or not the LC program also includes counseling. Astin argued that this is an opportunity for the college to increase student involvement because counselors and other student service personnel often interact with students on a one-to-one basis.

Inclusion Criteria

Inclusion and exclusion criteria are very important in meta-analytic studies (Borenstein et al., 2009). Criteria that are broad allow a range of studies for the analysis. Diversity of included studies increases the likelihood that the analysis is more meaningful. Four inclusion criteria were applied in this study.

First, the studies on LCs had to be completed or published from 1985 to 2014. The study publication date was limited to 1985 because LCs started to be implemented differently in 1985 (Smith, 2001). At that time, LCs began to be linked with other strategies that also promoted active learning and led to changes in LC pedagogy. Second, the studies on LCs had to take place in a two or four year college setting. Learning communities occurring in K-12 institutions were not examined. Third, the studies on LCs had to include the examination of a quantitative effect of an LC on a variety of measures of student performance. This allows for computation of an effect size. Fourth, the LC studies had to include one of the following outcome measures included in the present study: course success, term-to-term retention, GPA, and learning outcomes.

Literature Search

A comprehensive literature search of empirical studies was conducted to identify relevant studies to help answer the major research questions. Literature for the meta-analysis was identified by using systematic review strategies suggested in the literature (Rothstein, Turner, & Lavenberg, 2004). In brief, the recommended strategies for a systematic review include including both published and unpublished studies, expanding the search beyond what is easy to find, extend every effort to find studies that are

relevant, keep in mind that electronic searchers are iterative and can change based on what is found, and to use multiple search terms and combinations. Published studies included studies published in academic journals, dissertations/theses, and conference materials. Unpublished studies included any research that could be found on the Internet and that was made available by Institutional Research Offices.

Studies were retrieved through a variety of sources including electronic indexes, databases or from the Internet. Important factors that can have an impact on the effect size are meta-analyses that only draw from research published in peer reviewed journals (Borenstein et al., 2009; Lipsey & Wilson, 1993). Many community colleges and 4-year universities have institutional research offices that sponsor research that is likely not published (Morest & Jenkins, 2007). Accordingly, the same search words that were used to search peer reviewed journals were also used to search the internet for works published electronically on LCs by institutional research offices. Institutional research offices were defined as the administrative area at community colleges responsible for obtaining and analyzing internal data (Morest & Jenkins, 2007). Including studies of this type might also help with the availability or publication bias that can artificially inflate findings resulting from the meta-analysis; studies selected from peer reviewed journals are more likely to show an effect (Borenstein et al., 2009; Lipsey & Wilson, 1993). The focus of many institutional research offices is to provide information to inform decision-making; consequently, studies completed by IR Offices may be more likely to include results that do not show an effect and will also be more difficult to obtain (Morest & Jenkins, 2007). A limitation was that it was beyond the scope of this research to contact IR Offices to

request studies on LCs. Research conducted by IR Offices was only included if it was found through one of the other described searchers.

The databases searched were Education Research Complete, ERIC, ProQuest Central, PsychINFO, ProQuest Dissertations and Theses-Full Text (Legacy Platform), Expanded Academic ASAP, PsycARTICLES, Academic Search Complete, and SocINDEX with Full Text. Manual searchers were performed in the Journal of College Student Retention, Community College Journal of Research & Practice, Community College Review, Journal of Applied Research in the Community College, and Journal of Developmental Education. Search terms included *learning community* or *learning communities*, in the title; *college* in any of the fields, and *students* in the title. Students were included in the title to focus the search on learning communities for students rather than on faculty learning communities or learning communities designed to help employees connect with an organization. The types of materials searched included academic journals, dissertations/theses, and conference materials while excluding magazines and news articles.

In total 462 peer reviewed research abstracts from published studies concerning LCs in college were examined, 506 abstracts from dissertations, and 67 from journals searched manually, and 27 web sites were searched manually for a total of 1,062. Unpublished sources included research that was not published in peer reviewed journals, but available at sites dedicated to improving student success. The list of college and community college research organizations and foundations was compiled from resources provided by the California Community College Research and Planning Group, the

Association of Institutional Research, and from a study on college retention programs conducted by Valentine et al. (2011). A list of the 42 websites searched is in Appendix A.

Exclusion Criteria

The researcher reviewed studies collected to date for inclusion based on the criteria. Of the 1,062 studies reviewed to date, 39 studies met all inclusion criteria and were included in the meta-analysis for LCs and 1,023 were excluded. Most of the studies were excluded from the meta-analysis because they examined professional learning communities (n = 454), followed by studies that did not examine LCs (n = 133), review and conceptual articles (n = 89), studies with violations LC definitions (n = 58), virtual learning communities (n = 52), living learning communities (n = 45), studies that did not include college students (n = 40), and case studies and qualitative studies (n = 35),. Studies were also excluded because they examined service learning (n = 23), did not assess outcomes specified in this dissertation (n = 22), were the article or book reviews (n = 18), the article was a news release (n = 7), insufficient statistical data (n = 6), the study only included aggregated data from multiple colleges (n = 6), information requested from the author was not provided (n = 5), the study was not available (n = 1), the study included data already reported from a prior study (n = 1), or because of multiple combinations of the reasons mentioned above (n = 28; see Appendix C).

Random Effects Model

Researchers conducting a meta-analysis need to determine whether or not to use a fixed or random effects model (Baguley, 2009; Borenstein, Hedges, & Rothstein, 2007;

Borenstein et al., 2009; Valentine et al., 2011). The fixed effects model assumes that there is only one true effect size and that the reason why each study has a different effect size is because of sampling error. A fixed-effect meta-analysis mathematically assumes that a common effect exists for every study and that there are not any statistical differences between studies (Cochrane Collaboration, 2002). Therefore, the only reason for differences between effect sizes is that each study had a different sample from the population (Pigott, n.d.). In contrast, a random effects model assumes that effect sizes have a distribution and that they vary from study to study (Borenstein et al.).

An effect size might be lower or higher because of the type of students who attend a 4-year university versus a community college, or because of the backgrounds of students, and so on. The purpose of the analysis in a random-effects model is to estimate the mean and the variance of the population of effect sizes (Pigott, n.d.). In a random-effects model, effect sizes are assumed to vary because of sampling error and because of the underlying distribution of effect sizes.

The fixed-effects model ignores information in smaller studies because there is one true effect size and there is already better information in the larger studies (Borenstein et al., 2009). Because the fixed-effects model assumes one common effect size exists for every study, the studies with a larger sample have better information about the effect size. As a result, the CI effect size range in a fixed-effects model will always be the same or smaller than the range in a random-effects model (Valentine et al., 2001). The result of choosing a fixed-effect model means that the studies with a larger sample are weighted more than in a random-effects model when calculating the summary effect

(Borenstein et al., 2009). There is a much wider range between weights in the fixed-effect model because larger studies are given much larger weights and smaller studies are given much smaller weights.

In contrast, since the random-effects model seeks to estimate the mean of a distribution of effect sizes in the population, both the small and larger studies are included in the summary effect. A random-effects model, studies with a smaller sample were weighted more than in fixed-effects model and have more influence on the summary effect. In addition, the random-effects model did not weight smaller studies too low and larger studies too high because the random effects model did not discount a small study or give too much weight to a large study because it contains information about an effect that another study has not estimated (Borenstein et al., 2009).

Choosing between a random and fixed effects models can be done empirically or conceptually (Valentine et al., 2001). For instance, when choosing an empirical approach, researchers test for homogeneity of variance. If the homogeneity of variance test shows that the variance among studies differs statistically, then researchers will choose the random effects model. However, there are reasons to choose a random effects model even when the variances among the chosen studies are homogeneous (Hedges & Vevea, 1998). A random effects model is appropriate when the researcher seeks to make inferences beyond the studies observed in the meta-analysis. The only source for variation in a fixed-effects model is assumed to be sampling error. Accordingly, when studies are very similar, use the same procedures, and the same measures the assumption that the variation is only due to sampling error is plausible. However, a random-effects

model also assumes that the variation in effect sizes are a result of differences in participants and because of how the studies were conducted. The random-effects model is a common choice for researchers conducting meta-analyses, because studies vary for many reasons (Pigott, n.d.). Accordingly, the random-effects model was chosen for this meta-analysis in order to generalize the results from the meta-analysis and because the studies on LCs widely differ on the procedures and measures used to assess the relationship between LCs and college student success.

Effect Size Metric

Effect size is the difference in means between two groups divided by the standard deviation (Bloom & Lipsey, 2004; Borenstein et al., 2009; Coe, 2000; Durlak, 2009). Effect size is a common metric that allows for the mean differences across studies to be compared (Sanchez-Meca et al., 2003).

In educational research, it is common to find outcomes reported as continuous and dichotomous variables. For instance, grades are often reported as an outcome in the form of a continuous variable like GPA and in many cases are reported as a dichotomous outcome. Sanchez-Meca et al. (2003) used Monte Carlo simulation to identify the effect size with the least amount of bias when the outcome is dichotomized. The results of their analysis suggested that with non-normal distributions, standardized mean differences like Hedges *g* might not be the most accurate effect size to reveal differences between two populations (Sanchez-Meca et al., 2003). Sanchez-Meca and colleagues recommended that researchers include a moderator variable to test the effect size differences between continuous and dichotomous outcomes. As a result, one of the moderator variables used

in the analysis distinguishes between whether or not an outcome variable was continuous or dichotomous, the type of outcome. If there is a difference, Sanchez-Meca et al. suggests that rather than using an effect size metric like Hedges' g, a log odds effect size metric should be used and two effect sizes metrics should be reported, one for the outcomes that are continuous and one for outcomes that are dichotomous. In effect, if there is a substantial difference between continuous and dichotomous outcomes, two effect sizes will be reported one for the studies with a continuous outcome and one for studies with a dichotomous outcome. In essence, the meta-analysis will be treated as two separate studies and the effect size for each outcome will be reported separately as if two meta-analyses were conducted. Substantial effect size differences for Hedges' *g* are defined as .20 or higher (Cohen, 1992). Moreover, according to Cohen (2008) an effect size expressed as Cohen's *d* or Hedges' *g* is small if it is equal to .20, medium if it is equal to .50, and large if it is equal .80. Translating these to OR, a small effect size is 1.4, a medium effect size is 2.5, and large effect size is 4.3. It was not necessary to treat the meta-analysis as two separate studies, as the dichotomous and continuous outcomes identified in Chapter 4 were not substantially different.

Accordingly, the effect sizes included Cohen's *d*, Hedges' *g*, the log odds ratio, and the odds ratio. All effect sizes were converted to Hedges g or a log odds ratio using Comprehensive Meta-Analysis (CMA 2.0) software. The software first computes the standardized mean difference, Cohen's *d*, and then computes Hedges' *g* or the log odds ratio from *d*. Cohen's *d*, or the standardized mean difference, can be computed using the

formula below where $\overline{X_1}$ and $\overline{X_2}$ are the sample means from each group (Borenstein et al., 2009).

$$d = \frac{\overline{X_1} - \overline{X_2}}{S_{within}}$$

The denominator S_{within} refers to the within-groups pooled standard deviation across both groups, where n_1 and n_2 are the sample sizes in each group, and S_1 and S_2 are the standard deviations in each group.

$$S_{within} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 -)S_2^2}{n_1 + n_2 - 2}}$$

Cohen's d slightly overestimates the effect size in small samples (Borenstein et al., 2009; Hedges, (1981); Wilcox, (2006). This overestimation can be removed with a simple correction which results in an unbiased estimate of the effect size, called Hedges' *g*. To convert *d* to *g*, a correction factor, *J*, is used, where the degrees of freedom (df) from the S_{within} estimate ($n_1 + n_2 - 2$) for two independent groups is used to calculate *J* (Borenstein et al., 2009; Hedges, 1981).

$$J = 1 - \frac{3}{4df - 1}$$

J is then multiplied by d to generate the correction, Hedges' *g*. To convert *d* to the log odds ratio, *d* is multiplied by pi divided by the square root of 3 (Borenstein et al.).

$$LogOddsRatio = d\frac{\pi}{\sqrt{3}}$$

Effect sizes were only converted to the log odds ratio if a substantial difference was found between studies with dichotomous and continuous outcomes. According to

Sanchez-Meca et al. (2003), two effect sizes are calculated—log odds ratio and Hedges' *g*—only if a substantial difference was found between studies with dichotomous and continuous outcomes. If the studies with dichotomous outcomes do not have a substantial different effect size from the studies with a continuous outcome then the log odds ratio should not be calculated. The studies with dichotomous outcomes were not found to be substantially different from the studies with continuous outcomes and the log odds ratio was not calculated.

Borenstein et al. (2009) recommends that when choosing an effect size it needs to be interpretable. Accordingly, the odds ratio (OR) effect size metric was chosen for this meta-analysis because it enabled the findings to be discussed in terms of the odds of students achieving the specified outcome. The OR was calculated by using the exponent of the log odds (Borenstein et al.).

Precision

In individual studies, precision refers to a range of values that most likely contain the true effect (Borenstein et al., 2009). When referencing precision it can refer to the variance, standard error, or the confidence interval (CI). Precision is usually reported as the standard error or the confidence interval. American Psychological Association (2010) states that "confidence intervals…are…the best reporting strategy because they combine information of location and precision and can be used to indicate statistical significance" (pp. 34). CI provide information about statistical significance as well as substantial or practical significance (Nakagawa & Cuthill, 2007). Thus, the 95% CI was reported in the appropriate effect size metric for each individual study.

When the studies are synthesized in the meta-analysis, studies with a smaller CI range are weighted higher when combining studies in the meta-analysis because they contain more information and are more likely to represent population parameters (Borenstein et al., 2009; Borenstein et al., 2007). Studies with a larger sample size are more likely to generate a smaller CI range and be more representative of the population.

Heterogeneity

When interpreting an average effect size across a number of studies it is important to consider the dispersion of effect sizes and to know whether or not the effect size was homogenous (Borenstein et al., 2009). Cochrane's *Q* statistic was used to test the homogeneity of the summary effect size, or the ratio of the observed variation in the study effect sizes to the within-study error in the study effect sizes. *Q* is defined as

$$Q = \sum_{i=1}^{k} W_i (Y_I - M)^2$$

W_i is the weight of the study by the inverse-variance for the particular study, Y_i is the effect size of the study, M is the summary effect of all the studies, and k is the number of studies. If the effect sizes are found to be consistent across the studies using Cochrane's *Q* statistic then the focus of the meta-analysis was on the average effect size. On the other hand, if the Cochrane's *Q* statistic is statistically significant, then the focus of the meta-analysis shifted to how the effect sizes are different allowing the research to conclude that the studies do not have common effect sizes.

The I^2 statistic was used to express the proportion of variance that reflects differences in the effect sizes (Borenstein et al., 2009). If the proportion of variance is high then it indicates that there are differences among the effect sizes and that it makes

sense to explore the effect sizes further by examining moderator variables. I^2 is computed with the following formula. I^2 is the ratio of excess dispersion to total dispersion.

$$I^2 = \left(\frac{Q - df}{Q} \right) * 100\%$$

The independence of samples within each study can also have an effect on the homogeneity of the effect sizes (Borenstein et al., 2009; Green, 2012; Kim, 2000; Landman & Dawes, 1982). The statistical assumption of independence refers to the idea that each observation, in this case an effect size within a study, does not influence another observation, in this case an effect size for another outcome within the same study (Grimm & Yarnold, 2000). Due to this, the summary effect that is computed assigns more weight to the study with two or more outcomes. Assigning more weight to a study with two or more outcomes leads to precision being estimated incorrectly because the outcomes are treated as independent by the meta-analysis (Borenstein et al.). Accordingly, studies that examined multiple like outcomes with the same sample were not treated as multiple studies. The effect sizes were pooled across all of the outcomes for one study, and then one average effect size was calculated for each of the studies where one sample was used to examine the effects on multiple outcomes (Borenstein et al., 2009; Kulik, Kulik, & Cohen, 1979a). An example of multiple like outcomes is where a study reports the results for participant averages on multiple self-reported learning outcomes like self-efficacy. The following formulas were used to combine effect sizes for studies reporting multiple like outcomes within the same study and sample (Borenstein et al.). The

composite effect size for the study was computed by calculating the average effect size where *m* represents the number of outcomes within a study.

$$\bar{Y} = \frac{1}{m}(\sum_{j}^{m} Y_j)$$

The variance of the composite effect size was computed with the following formula, where *m* represents the number of outcomes within a study, *r* is the correlation between outcomes and *V* is the variance for each outcome.

$$V_{\bar{Y}} = \left(\frac{1}{m}\right)^2 \text{var}\left(\sum_{j=1}^{m} Y_i\right) = \left(\frac{1}{m}\right)^2 \left(\sum_{j=1}^{m} V_i + \sum\nolimits_{j \neq k} \left(r_{jk}\sqrt{V_j}\sqrt{V_k}\right)\right)$$

CMA 2.0 assumes that $r = 1$ or that the outcomes are completely dependent on each other. Assuming that $r = 1$ is a more conservative approach because it underestimates the precision (Borenstein et al.).

Research Question 2 seeks to identify the student success outcomes that LCs have the largest effect on among community college students. Many studies examine two or more of the outcomes identified in Research Question 2: course success, term-to-term retention, GPA, and self-reported learning outcomes (Tharp, 2009; Weissman et al., 2011). In addition to combining outcomes within a study, it is also possible to compare or investigate differences between outcomes within a study (Borenstein et al., 2009). First, instead of calculating the average effect size, the difference between two outcomes is calculated.

$$Y_{diff} = Y_1 - Y_2$$

With the variance, the two variances of each outcome were computed and then the correlated error was subtracted from the sum of the variances.

$$V_{Y_{diff}} = V_{Y_1} + V_{Y_2} - 2r\sqrt{V_{Y_1}}\sqrt{V_{Y_2}}$$

In studies that reported two outcomes, the difference was computed, and the outcome with the highest effect size was reported for the moderator variable, student outcome. In studies where there were 3 or more outcomes reported, the composite effect size was computed for the outcomes with the lowest effect size, and then the difference from the outcome with the highest effect size was computed.

Kulik, Kulik, and Cohen (1979b) also argued that a single average effect size should not be calculated for different types (i.e. dichotomous and continuous) of outcomes within a study. The two types of outcomes traditionally found in social science educational research include grades outcomes and self-reported learning outcomes. In order to reduce the likelihood of heterogeneity and increase the likelihood of meeting the assumption of independence, multiple outcomes that are of similar type were combined, and if outcomes of different types are identified, an effect size of each type was included in the meta-analysis unless the same sample was used to examine multiple outcomes of different types. In cases where one sample was used to examine multiple outcomes of different types, these studies were excluded from the analysis.

Data Analysis Plan

Each hypothesis for each research questions is listed below, and a description of the data analyses is included for each. If the inclusion criteria were met for the

hypotheses in Research Questions 1–4, then Hedges g was calculated to test each hypothesis.

Research Question 1. Are community college students more likely to be successful when they participate in an LC than 4-year college students who participate in an LC? The hypotheses of the study for research question 1 were:

H_{A1}: Community college students who participate in an LC are more likely to pass their courses with a C, B, or A grade than 4-year college students who participate in an LC.

H_{A2}: Community college students who participate in an LC are more likely to be retained from term to term than 4-year college students who participate in an LC.

H_{A3}: Community college students who participate in an LC are more likely to have a higher GPA than 4-year college students who participate in an LC.

H_{A4}: Community college students who participate in an LC are more likely to score higher on self-reported learning outcomes than 4-year college students who participate in an LC.

Each study was reviewed to identify whether or not it meets the inclusion criteria. The dependent variable for H_{A1} is course success rate, for H_{A2} it is retention rate, for H_{A3} it is GPA, and for H_{A4} it is self-reported learning outcomes. The independent variable for hypotheses H_{A1} through H_{A4} was college type, community or 4-year college. The moderator variables that were examined in hypotheses H_{A1} through H_{A4} include publication type, sample type, sample size, representativeness, statistics and data analysis, and outcome variable type.

Finally, the results of each outcome were recorded based on how each study collected the information. For instance, a study might have compared the mean for independent groups in which case the treatment and comparison means and sample sizes were recorded along with the independent p-value. In other cases the sample size and p-value were recorded or the information the number of events and the total number of participants were recorded for both treatment and comparison groups.

Research Question 2

What student success outcomes do LCs have the largest effect on among community college students? The hypotheses of the study for research question 2 are:

H_{A1}: Community college students who participate in an LC are more likely to have higher rates of course success than retention from term to term, GPA, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{A2}: Community college students who participate in an LC are more likely to have higher rates of retention from term to term than course success, GPA, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{A3}: Community college students who participate in an LC are more likely to have higher GPA than course success, retention from term to term, and self-reported learning outcomes when compared to community college students who did not participate in an LC.

H_{A4}: Community college students who participate in an LC are more likely to have higher rates of self-reported learning than course success, and retention from term to term when compared to community college students who did not participate in an LC.

If the study inclusion criteria were met for the hypotheses in Research Question 2, then Hedges g was calculated to test each hypothesis. The dependent variables for H_{A1} through H_{A4} are course success rate, retention rate, GPA, and self-reported learning outcomes. The independent variable for hypotheses H_{A1} through H_{A4} was whether or not a student participated in an LC. The moderator variables that were examined in hypotheses H_{A1} through H_{A4} included publication type, sample type, sample size, representativeness, statistics and data analysis, and outcome variable type.

Finally, the results of each outcome were recorded based on how each study collected the information. For instance, a study might have compared the mean for independent groups in which case the treatment and comparison means and sample sizes were recorded along with the independent p-value. In other cases the sample size and p-value were recorded or the information the number of events and the total number of participants was recorded for both treatment and comparison groups.

Research Question 3

To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)? The hypotheses of the study for research question 3 were:

H_{A1}: The effects of LCs on community college student success will differ by the type of LC (i.e. number of linked courses, and type of linked courses).

If the inclusion criteria are met for the hypotheses in Research Question 3, then Hedges g was calculated to test each hypothesis. The dependent variable for H_{A1} is community college student success. The independent variable for hypotheses H_{A1} is type of LC (i.e. number of linked courses, and type of linked courses). The moderator variables that were examined in hypothesis H_{A1} includec publication type, sample type, sample size, representativeness, statistics and data analysis, outcome variable type, college size, number of linked courses, and type of linked courses.

Finally, the results of each outcome was recorded based on how each study collected the information. For instance, a study might have compared the mean for independent groups in which case the treatment and comparison means and sample sizes were recorded along with the independent p-value. In other cases the sample size and p-value was recorded or the information the number of events and the total number of participants was recorded for both treatment and comparison groups.

Research Question 4

To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (e.g. additional support services and strategies, student characteristics, contextualized curriculum and the size of the college)? The hypotheses of the study for research question 4 were:

H_{A1}: The effects of LCs on community college student success will differ by the characteristics of how the LC was implemented (i.e. additional support services and strategies, student characteristics, and the size of the college).

The dependent variable for H_{A1} is community college student success. The independent variable for hypotheses H_{A1} is how the LC was implemented (i.e. additional support services and strategies, student characteristics, and the size of the college). The moderator variables that were examined in hypothesis H_{A1} included publication type, sample type, sample size, representativeness, statistics and data analysis, outcome variable type, college size, number of additional strategies, additional strategies, additional strategy was counseling, and whether the students were first year college students.

The results of each outcome were recorded based on how each study collected the information. For instance, a study might have compared the mean for independent groups in which case the treatment and comparison means and sample sizes were recorded along with the independent p-value. In other cases the sample size and p-value were recorded or the information the number of events and the total number of participants were recorded for both treatment and comparison groups.

Chapter Summary

In summary, I chose meta-analysis as the investigative technique in this study because it allows the researcher to synthesize the results from multiple studies quantitatively (Borenstein et al., 2009; Glass, 1976; Ioannidis & Lau, 1999). Specifically, the calculation of an effect size allows the researcher to draw conclusions about the most effective types of LCs (Borenstein et al., 2009; Glass, 1976). This chapter illustrates the process in how the moderator variables were chosen to help answer each research question, the criteria for including and excluding studies, how the literature

search was conducted, and the process involved in choosing a random effects model, how the effect size metric was calculated, precision, and heterogeneity. Chapter 4 includes the results of the meta-analysis.

Chapter 4: Results

The purpose of this study was to use the techniques of meta-analysis to help community college educators identify the type of LC that will best help students attain their goals and to be successful. It is important for colleges to be aware of the type of LCs that will be most effective at their unique institutions because LCs can be costly and time-consuming to implement (Hotchkiss et al., 2006; Mac Kinnon, 2006). Identification of the type of LCs that work best for different college's and student populations will help increase the likelihood that students will successfully achieve their educational goals.

This chapter presents findings on the LC outcomes for 51,819 college students, 29,652 of whom were community college students. The students were participants in 39 studies that yielded 50 effect sizes. This chapter explains the procedures for data collection and the systems and processes used for managing the data. In addition, I describe the studies included in the meta-analysis and the results of the meta-analysis, including the subgroup and moderator analysis and publication bias.

Data Collection

Procedures for Data Collection

I conducted a systematic review of published journal articles, dissertations, and unpublished studies identified in Chapter 3 providing original data on LCs and college students. To begin, I retrieved studies through electronic indexes and manual searches of journals and web sites and entered the author, title, and abstract of each study that possibly met the inclusion criteria into a Microsoft Excel database; this provided information to determine whether or not to review the entire document. Included on the

database were reasons for including or excluding a study, method for entering the effect size into the meta-analysis, process for contacting study authors, and any responses to requests for additional information. In addition, I used the program CMA 2.0 to record all of the effect size data, independent, dependent, and moderator variables.

Studies were included in the meta-analysis if they met the inclusion criteria described in Chapter 3:

1. The study was completed or published from 1985 to 2014.
2. The study participants were students at a two or 4-year College.
3. The study was quantitative.
4. The study examined one of the following outcome measures: course success, term-to-term retention, GPA, or self-reported learning as an outcome.

The literature search resulted in the examination of 1,062 references (see Figure 1). The abstract reviews resulted in the identification of 156 studies for full-text review. The full-text review resulted in the identification of 39 studies meeting the inclusion criteria for the meta-analysis. Twenty-two of the studies were from peer-reviewed journals, 7 were from dissertations, 5 were from manually browsing journals that publish articles specific to community college research only, and 5 were from unpublished studies found on one of the websites listed in Appendix A.

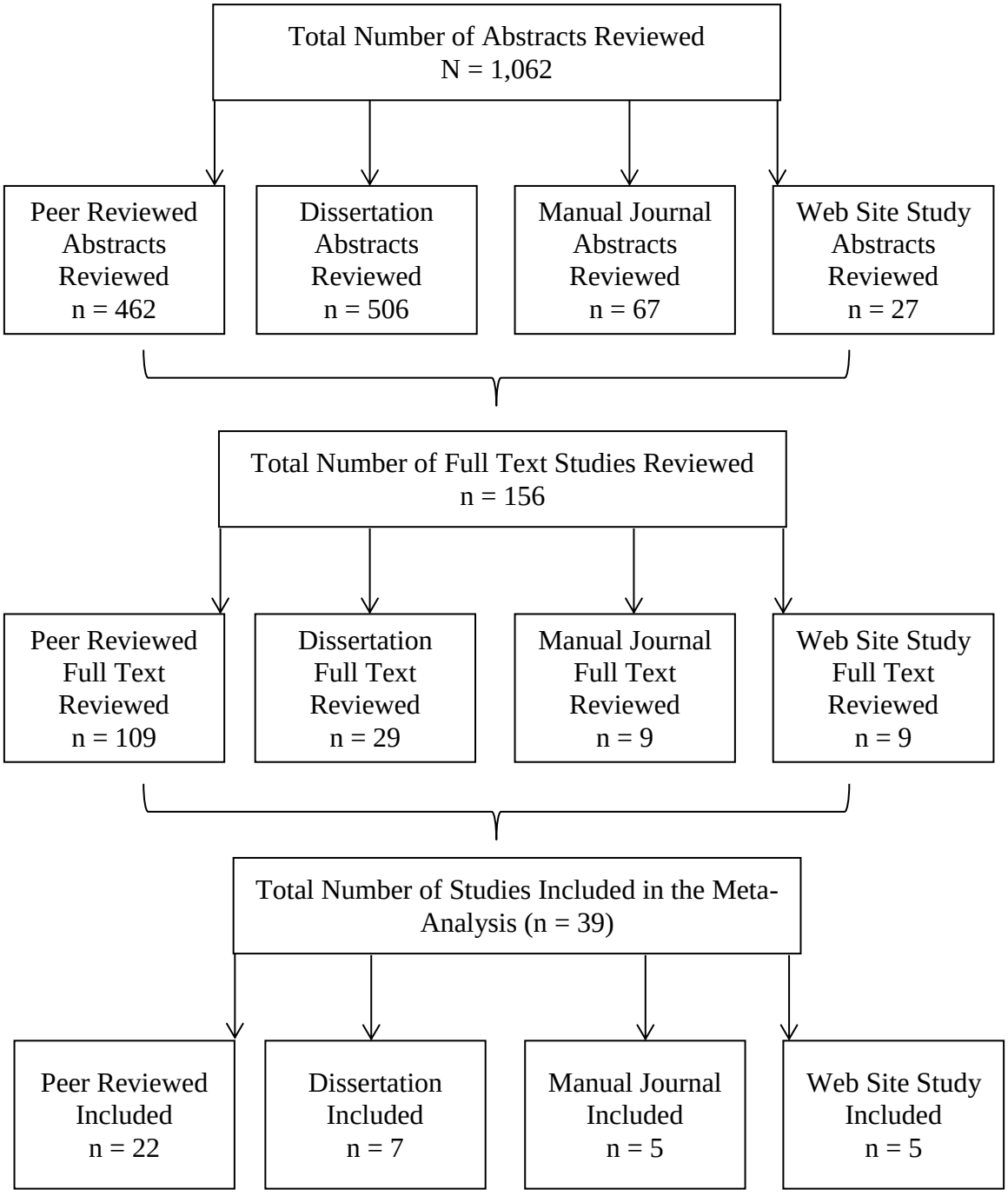

Figure 1. Flow chart of studies excluded and included in the meta-analysis.

Table 1 illustrates the categories, numbers, and percentages of the excluded studies for every full-text study identified for review. The most common reason for excluding a study after a full-text review was because it was a review and conceptual article (*n* = 23), followed by studies with violations of LC definitions (*n* = 20), and that the study did not assess an outcome specified in the dissertation (*n* = 13).

Table 1

Excluded Studies for Every Full-Text Study Identified for Review

Category	Excluded Studies	
	#	%
Case Studies and Qualitative Studies	9	7.7%
Did not assess outcomes specified in dissertation	13	11.1%
Did not study college students	3	2.6%
Did not study learning communities	3	2.6%
Reference Not Available	1	0.9%
Information Requested from Author and Not Provided	5	4.3%
Insufficient Statistical Data	6	5.1%
Living Learning Community	5	4.3%
Multiple Colleges	6	5.1%
Multiple Reasons	2	1.7%
News Release/Article	4	3.4%
Professional Learning Community (PLC)	12	10.3%
Review and Conceptual Articles	23	19.7%
Studies with violations of LC definitions	20	17.1%
Virtual Learning Community	4	3.4%
Total	117	100.0%

Table 2 shows a study example of each exclusion category, a description of the exclusion category, and the study author and title.

Table 2

Study Example of each Category excluded by Category, Category Description, Author, and Title

Study #	Category	Study	Category Description
A_12	Case Studies and Qualitative Studies	Ancar, Freeman, & Field (2007)	Qualitative study using group discussions and weekly summaries from students.
A_109	Did not assess outcomes specified in dissertation	Finley (2008)	Examined alcohol use and depression as outcomes.
A_17	Did not study college students	Atkinson & Atkinson (2007)	Examined special needs 6th, 7th, and 8th graders.
A2_432	Did not study learning communities	Dunbar (2006)	Author examined impact of students from three different classes participating on a project together.
A_419	Reference Not Available	Avens & Zelly (1990)	The article was referenced in ERIC but was not unavailable at the time of the analysis, and I was unable to find the author.
A2_552	Information Requested from Author and Not Provided	Moore (2000)	Email was sent to the author twice requesting additional data to calculate the effect size and no response was received.
A_248	Insufficient Statistical Data	Pastors (2006)	Only summary data was provided, which was not enough to calculate an effect size.

(table continues)

Study #	Study # Category	Study # Cat	Study # Category
A3_744	Multiple Colleges	Smith (2010)	The data provided aggregated results from 13 community colleges.
A2_40	Multiple Reasons	Freeman (2004)	Did not examine LC outcomes specified in dissertation, examined living LCs, and was a qualitative study.
A_367	News Release/Article	Learning communities for commuter students (2004)	The abstract referred to two pilot LCs and the benefits of LCs, but was an announcement of future LCs.
A_276	Professional Learning Community (PLC)	Buch & Spauldinig (2008)	The study examined the impact of professional LCs on participant's academic performance.
A_346	Reported Data already reported from prior publication	Weiss, Visher, & Weissman (2012)	MDRC is a company that conducts and publishes a lot of higher educational research. In some cases, results from a study are published in multiple documents.
A3_765	Review and Conceptual Articles	Fredericksen (1998)	The article explored why LCs are useful, but did not report any quantitative research.
A3_714	Studies with violations of LC definitions	McPhail, McKusick, & Starr (2006)	The focus of the article was on master learners and the support they provided to students in LCs.
A_304	Virtual Learning Community	Hall & Herrington (2010)	Examined online LCs among Arabic students.

Details of Studies Included in the Meta-Analysis

Table 3 illustrates some of the most important characteristics and moderator variables from the meta-analysis. There were 39 studies included in the meta-analysis resulting in 50 effect sizes. In total, 51,819 college students were included in the meta-analysis on LCs. The number of total cases for each study included in the meta-analysis ranged from 19 to 7,249. Eight of the studies reported data for multiple cohorts separately and generated two to four effect sizes (Dodge, 2004; Gerkin, 2009; Hansen et al., 2013; Minkler, 2000; Tharp, 2009; Weiss, Visher, & Washington, 2010; Weissman et al., 2011; Weissman et al., 2012). For instance, Dodge (2004) reported data separately for three different cohorts, resulting in three effect sizes.

Answering Research Questions 1 and 2 required information for two moderator variables, higher education segment and student outcome (see Appendix B).

1. Are community college students more likely to be successful when they participate in an LC than 4-year college student who participate in an LC?
2. Among community college students, for which student success outcomes do LCs have the largest effect?

The proportion of effect sizes from community and 4-year colleges was similar, with 48% from community colleges and 52% from 4-year colleges (see Table 3). Similarly, the proportion of effect sizes was fairly evenly distributed across student outcomes. Thirty percent were self-reported learning outcomes, 26% were GPAs, 26% were retention outcomes, and 18% were success outcomes.

The moderator variables collected to answer Research Questions 3 and 4 included the number of linked courses, type of linked courses, additional support services and strategies, student characteristics, integration of the curriculum, and the size of the college (see Appendix B).

3. To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)?
4. To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (e.g., additional support services and strategies, student characteristics, integration of curriculum, and the size of the college)?

I obtained the number of linked courses for 47 of the 50 effect sizes. Most of the LC programs, 58%, implemented LCs with two linked courses, followed by 26% with 3 linked courses, 4% with four, and 6% with 3. The type of linked courses was also only obtained for 47 of the 50 effect sizes.

Thirty percent of the LCs were implemented in transfer level courses only, 24% in developmental courses only, 22% in a combination of developmental and transfer level courses and 18% with at least one academic skills course. Strategies in addition to LCs were components of LC programs for 54% (n = 27) of the effect sizes, and 12 of those 27 effect sizes included counseling as a strategy. A number of additional strategies ranged from 1 to 12, with the three additional strategies being the most common with 18% of the effect sizes, 16% had two additional strategies, 14% had 1, and 2% had 5 and 12 additional strategies.

Seventy-six percent of the effect sizes recorded had LCs that included first-year college students at the college where the study was taking place (see Table 3). In addition, 72% of the effect sizes were calculated from studies that identified integrated or contextualized curriculum among the linked courses as a strategy. Four percent stated that there was a mixture of linked courses that integrated curriculum and those that did not, and 22% did not identify integrated curriculum as a component of the LCs at the specified college. Most of the effect sizes calculated were generated from studies where LCs were most likely implemented at large (8,000-14,999) or extra-large colleges (>15,000). Forty percent of the effect sizes were from extra-large colleges and 40% were from large colleges, 12% were from small colleges (<4,500), and 8% were from medium-sized colleges (4,500-7,999).

Table 3

Major Characteristics of the Studies Included in the Learning Community Analysis

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Howles (2009)	567	Combined	Peer	Non-Random	Dichotomous	4-year College	Retention	Yes	No
Barnet et al. (2009)	90	Combined	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	No	Yes
Rocconi (2011)	241	Combined	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Arnett & Horn (2009)	97	No	Peer	Non-Random	Continuous	4-year College	GPA	Yes	Yes
Bloom & Sommo (2005)	387	No	Web Site	Random	Dichotomous	Community College	Retention	Yes	Yes
Dillon (2003)	3,229	No	Peer	Non-Random	Dichotomous	4-year College	Retention	Yes	Yes

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Dodge (2004)	165	No	Peer	Non-Random	Dichotomous	Community College	Course Success	No	Yes
Dodge (2004)	320	No	Peer	Non-Random	Dichotomous	Community College	Course Success	No	Yes
Dodge (2004)	255	No	Peer	Non-Random	Dichotomous	Community College	Course Success	No	Yes
Edwards (2007)	70	No	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Ellis & Berry (2012)	507	No	Peer	Non-Random	Dichotomous	4-year College	Course Success	No	Yes
Fayon et al. (2010)	48	No	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Hotchkiss et al. (2006)	7,249	No	Peer	Non-Random	Continuous	4-year College	GPA	Yes	Yes
Huerta (2006)	564	No	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Scrivener et al. (2008)	1,534	No	Web	Random	Dichotomous	Community College	Retention	Yes	Yes
Snowden (2004)	19	Combined	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Spiker (2011)	25	Combined	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Stefanou & Salisbury-Glennon (2002)	160	Combined	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	No	Yes
Visher & Teres (2011)	854	No	Web	Random	Dichotomous	Community College	GPA	No	Yes
Weiss, Visher, & Wathington (2010)	532	No	Web	Random	Dichotomous	Community College	GPA	Yes	No

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Weiss, Visher, & Wathington (2010)	299	No	Web	Random	Dichotomous	Community College	GPA	Yes	Yes
Weissman et al. (2011)	433	Difference	Web	Random	Dichotomous	Community College	Course Success	Yes	No
Weissman et al. (2011)	501	Difference	Web	Random	Dichotomous	Community College	Course Success	Yes	Yes
Weissman et al. (2011)	139	No	Web	Random	Dichotomous	Community College	Course Success	Yes	No
Weissman et al. (2011)	633	No	Web	Random	Dichotomous	Community College	Course Success	Yes	Yes
Weissman et al. (2012)	1,424	No	Web	Random	Dichotomous	Community College	Retention	Yes	Yes
Weissman et al. (2012)	1,083	No	Web	Random	Dichotomous	Community College	Retention	Yes	Yes

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Wilmer (2009)	120	Combined	Peer	Non-Random	Continuous	Community College	Self-Reported Learning Outcome	Yes	Yes
Waldron & Yungbluth (2007)	251	No	Peer	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	Yes
Tharp (2009)	84	Difference	Dissertation	Non-Random	Dichotomous	4-year College	Retention	Yes	Yes
Tharp (2009)	90	Combined & Difference	Dissertation	Non-Random	Dichotomous	4-year College	Retention	Yes	No
Higgs (2006)	1,258	No	Dissertation	Non-Random	Continuous	4-year College	Retention	Yes	No
Humphrey (2004)	308	Difference	Dissertation	Non-Random	Continuous	4-year College	GPA	Yes	No
Barnard (2001)	72	Combined	Dissertation	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	Yes	No
Minkler (2000)	1,286	Combined	Dissertation	Non-Random	Continuous	Community College	GPA	No	Mixed
Minkler (2000)	1970	Combined	Dissertation	Non-Random	Continuous	Community College	GPA	No	Mixed

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Halloran (2000)	350	No	Dissertation	Non-Random	Continuous	4-year College	Self-Reported Learning Outcome	No	No
Chonko (1999)	113	Combined & Difference	Dissertation	Non-Random	Continuous	4-year College	GPA	Yes	No
Laanan et al. (2014)	189	Combined	Peer	Non-Random	Dichotomous	Community College	Self-Reported Learning Outcome	Yes	Unknown
Barnes & Piland (2013)	1295	No	Peer	Non-Random	Dichotomous	Community College	Course Success	Yes	Yes
Popiolek & Eilman (2013)	920	Combined	Peer	Non-Random	Continuous	Community College	GPA	No	Yes
Dunlapp & Pettitt (2008)	405	Combined	Peer	Non-Random	Continuous	Community College	Self-Reported Learning Outcome	No	Yes
Romero (2012)	927	No	Peer	Non-Random	Continuous	Community College	Self-Reported Learning Outcome	Yes	Yes

(table continues)

Citation	Total N	Multiple Outcome	Publication Type	Sample Type	Outcome Variable Type	College Type	Student Outcome	First-year College	Contextualized Curriculum
Huber (2006)	5,393	No	Web	Non-Random	Dichotomous	4-year College	Retention	Yes	No
Gerkin (2009)	6,804	Combined	Dissertation	Non-Random	Dichotomous	Community College	Retention	Yes	Yes
Gerkin (2009)	7,177	Combined	Dissertation	Non-Random	Dichotomous	Community College	Retention	Yes	Yes
Hansen et al. (2013)	109	No	Peer	Non-Random	Continuous	4-year College	GPA	Yes	Yes
Hansen et al. (2013)	29	No	Peer	Non-Random	Continuous	4-year College	GPA	Yes	Yes
Zobac et al. (2014)	1,092	Difference	Peer	Non-Random	Continuous	4-year College	GPA	Yes	Yes
Rodriguez & Buczinsky (2013)	152	Combined	Peer	Non-Random	Dichotomous	4-year College	Retention	Yes	Yes

Effect Size Data Entry

Each selected article meeting the inclusion criteria was carefully reviewed to identify the study characteristics to record the moderator variable information (see Appendix B). The effect sizes were calculated based on information provided in each source and from information requested from the author when necessary. Table 4 illustrates the data formats used to extract the meta-analysis data and calculate the effect sizes. There were 205 separate calculations of effect size. There are more than 50 effect sizes, because many of the studies provided multiple outcome data. As an illustration, Stefanou and Salisbury-Glennon (2002) provided self-reported motivation results from 12 subscales for the same participants. The effect sizes were calculated by using the Paired Groups (difference, *p*) data format. The most common data format used to calculate effect sizes was the cohort 2x2 events data format (30%) followed by the paired groups (difference, *p*) format (27%). The Hedges' *g*, variance data format includes duplicate data formats for 22 of the 23 effect sizes, because CMA 2.0 was used to first combine multiple outcomes in a separate database and then recorded in the main CMA 2.0 meta-analysis database using the data format (Barnard,2001; Barnet et al.,2009; Chonko,1999; Dunlapp & Pettitt,2008; Gerkin,2009; Humphrey,2004; Laanan et al.,2014; Minkler,2000; Popiolek & Eilman,2013; Rocconi,2011; Rodriguez & Buczinsky,2013; Snowden,2004; Spiker,2011; Stefanou & Salisbury-Glennon,2002; Tharp,2009; Waldron & Yungbluth,2007; Weissman et al.,2011; Wilmer,2009; Zobac et al.,2014). Table 4 also shows the data formats used for the students with multiple and

combined outcomes. The only study where the Hedges' *g*, Variance data format was used directly from the study was the Waldron & Yungbluth (2007) study.

Table 4

Frequency and Percent by Effect Size Entry Format

Data Format	#	%
Change, *F* for diff in change	1	0.5
Cohen's *d*, Variance	3	1.5
Cohort 2x2 (Events)	62	30.2
Fisher's *Z*, *N*	10	4.9
Hedges' *g*, Variance	23	11.2
Independent groups (means, *p*)	15	7.3
Independent groups (means, *SD's*)	22	10.7
Independent groups (means, *t*)	1	0.5
Independent groups (std difference)	1	0.5
Means, *SD* difference in each group	1	0.5
Paired groups (difference, *p*)	56	27.3
Paired groups (*N*, *t*-value)	10	4.9
Total	205	100.0

Issues during the Process of Effect Size Data Entry

Many of the articles presented a challenge in abstracting the data. The challenges in abstracting the data included not having enough information, the reporting of beta weights, and converting data to an effect size. Additional challenges included capturing the number of participants in the meta-analysis, working with the outcomes, calculating of composite effect sizes for studies with multiple outcomes, and multiple comparison groups. Thirteen authors were contacted to obtain additional information, and the requested information was received from six of the authors (Dillon, 2003; Laanan et al., 2014; Barnes & Piland, 2013; Romero, 2012; Zobac et al., 2014; Rodriguez & Buczinsky, 2013). As an illustration, Romero (2012) did not report all of the beta weights in the stepwise regression analysis, and I was unclear on some of the moderator information. The author provided all of the requested information.

Five of the research studies conducted regression analyses and reported beta weights (Higgs, 2006; Hotchkiss et al., 2006; Huerta, 2006; Rocconi, 2011; Romero, 2012). In order to include the beta weights in the meta-analysis they were transformed to Fisher's *Z* using the following formula (Bowman, 2012; Hedges & Olkin, 1985).

$$ES_z = .5 * \log_e \left[\frac{1+r}{1-r} \right]$$

The $\log_e$ is the natural logarithm (*ln*) and *r* is the correlation coefficient. Microsoft Excel was used to write the Fisher's *Z* transformation formula and checked for accuracy using data provided as an example in Bowman (2012).

One of the research studies compared the LC group to three different comparison groups (Barnet et al., 2009). The students who did not receive any strategies were chosen as a comparison group because this provided the most methodologically sound option for identifying the relationship between LC students and non-LC students.

In four of the studies it was difficult to find a method for converting the provided data to an effect size (Barnard, 2001; Edwards, 2007; Fayon et al., 2010; Halloran, 2000). For example, in Edwards (2007) a pre-post assessment was conducted for both the LC and non-LC groups to determine if LCs lowered communication apprehension. A lower score indicated improvement. The data format used for the Edwards study to calculate the effect size statistic was means and standard deviation difference in each group. Accordingly, the pre-post treatment and comparison group means were entered along with the difference in standard deviations (SD) from pre to post for both groups. I calculated the difference in SDs manually.

To track the number of study participants I recorded the numbers of participants in CMA 2.0 from three of the studies included in the meta-analysis (Snowden, 2004; Spiker, 2011; Stefanou & Salisbury-Glennon, 2002). Each of the three studies provided results for multiple outcomes and were combined and converted to Hedges' *g*. Snowden (2004) conducted a pre-post assessment. The total sample was 19. Ten were entered into the treatment group and nine into the comparison group for a total of 19. Adding the cases to the model did not impact the calculation of the effect size. Spiker (2011) also conducted a pre-post assessment. Out of a total of 25 participants, I entered 12 cases for the treatment group and 13 for the comparison group. Stefanou and Salisbury-Glennon

(2002) also conducted a pre-post assessment on a total of 160 participants. I entered 80 in the treatment group and 80 in the comparison group.

Another challenge with the effect size data entry and entry was working with some of the outcomes from five studies, which impacted eight effect sizes (Scriverner et al., 2008; Tharp, 2009; Visher & Teres, 2011; Weiss et al., 2010; Weissman et al., 2012). Scriverner et al. (2008), Visher & Teres (2011), and Weiss et al., (2010), all reported GPA in categories rather than as a ratio. Due to this I collapsed the data for GPA into two categories and reported it in the meta-analysis as a dichotomous variable: 1.9 or less and 2.0 or higher. Tharp (2009) reported fall-to-fall retention rates. The number retained was calculated by multiplying the rate by the total N. Weissman et al. (2012) also reported the retention rates and the total sample size, which was also used to calculate the number retained using the same method described for Tharp (2009).

Perhaps the most challenging aspect during the process of entering effect sizes was working with studies that contained multiple outcomes. Treating multiple outcomes for the same sample violates the assumption of independence and would assign more weight to the study sample and lead to an improper estimate of precision (Borenstein et al., 2009; Grimm & Yarnold, 2000). Accordingly, as described in Chapter 3, studies with multiple like outcomes with the same sample were pooled across all of the outcomes for one study using CMA 2.0. Fourteen studies and sixteen effect sizes provided multiple like outcomes and were combined into one effect size using a second CMA 2.0 database and then entered into the main CMA 2.0 database using the Hedges' *g* and Variance data format (Barnard; 2001; Barnet et al.; 2009; Dunlapp & Pettitt; 2008; Gerkin; 2009;

Gerkin; 2009; Howles; 2009; Laanan et al.; 2014; Minkler; 2000; Minkler; 2000; Popiolek & Eilman; 2013; Rocconi; 2011; Rodriguez & Buczinsky; 2013; Snowden; 2004; Spiker; 2011; Stefanou & Salisbury-Glennon; 2002; Wilmer; 2009). Similarly, four studies and five effect sizes examined two different outcomes identified for the meta-analysis (Humphrey, 2004; Tharp, 2009; Weissman et al., 2011; Zobac et al., 2014). In these instances, the formulas for calculating the difference between two outcomes was used. After calculating the difference, the outcome with the largest effect size was used to determine which outcome type to choose for the moderator variable indicating which outcome appears too impacted more by LCs. Two of the studies reported outcome information for three or more outcomes (Chonko, 1999; Tharp, 2009). In these instances, the procedures for calculating composite and difference scores were combined. As an illustration, Chonko (1999) provided six self-reported learning outcomes and GPA. I calculated a composite effect size for the self-reported learning outcomes; and the difference effect size and variance between GPA and the self-reported learning outcome. GPA was recorded as the outcome type because it had a larger effect on LCs than the self-reported learning outcomes.

Meta-Analysis Results

The purpose of this meta-analysis was to identify the most effective types of LCs and help to increase the likelihood that college students will obtain their educational goals. The effect size statistic reported for assessment of the quality of studies was Hedges' g and for the subgroup and moderator analysis was the odds ratio (OR), both include 95% confidence intervals and p values. I choses the OR for the subgroup and

moderator analysis because it is easier to interpret in terms of how many more times the LC participant is likely to achieve the outcome. CMA 2.0 was used to generate the meta-analysis results and calculate the effect sizes for each study, including all subgroup analyses. As discussed in detail in Chapter 3, the random effects model was used for every analysis, assuming that the true effect varies from study to study and that the effect sizes have a distribution (Borenstein et al., 2009). Alpha was set at less than .05, indicating statistical significance. A substantial effect was a Hedges' *g* equal to or greater than .20 (Cohen, 1992). Cohen (1988) defined a small effect size as being equal to .20, a medium effect size equal to .50, and a large effect size equal .80. Translating these to OR, a small effect size is 1.4, a medium effect size is 2.5, and large effect size is 4.3.

I assessed heterogeneity with the *Q* Statistic; a statistically significant result allows the researcher to conclude that the studies have different effect sizes (Borenstein et al., 2009). In addition, the proportion of variance was expressed with I^2 and reflects differences in the effect sizes. If the proportion of variance is high, then it indicates that there were differences among the effect sizes and that it makes sense to explore the effect sizes further by examining moderator variables through a subgroup analysis.

It is often useful to conduct a sensitivity analysis to see the overall results on the average effect size when one study is removed from the meta-analysis (Borenstein et al., 2009). The purpose of conducting the sensitivity analysis was to determine if the removing a single study from the analysis would dramatically change the average effect size.

Meta-analytic studies can overestimate effect sizes because of publication bias (Borenstein et al., 2009; Lipsey & Wilson, 1993). Publication bias can artificially inflate findings, because the most accessible and published studies are studies that have a statistically significant finding. The funnel plot is one method used to explore how study size is related to effect size (Borenstein et al.). Larger studies appear towards the top of the plot, and smaller studies are near the bottom. If there is no evidence of bias, the effect sizes will be distributed symmetrically around the average effect size. In funnel plots, the smaller sample size studies will appear at the bottom. If there is a concentration of studies in the lower right, more so than on the lower left, it suggests that the non-significant studies are missing from the analysis.

Interpreting a funnel plot is subjective, and because of this one additional method was used to assess publication bias, Orwin's Fail-safe N (Borenstein et al., 2009). Orwin's Fail-safe N calculates the number of studies with no effect that would need to be added to the meta-analysis in order to obtain an average effect that was trivial (Borenstein et al.). A trivial OR was defined 1.05 (Borenstein et al.). Rosenthal's (1979) formula for calculating a threshold of unpublished studies was used, $5k + 10$, where k refers to the number of effect sizes. Rosenthal reasoned that it was unlikely that researchers had filed away more than five times the studies in the meta-analysis and 10 refers to the minimum number of studies that could have been unpublished when k is equal to 1 at 15.

Quality Assessment of the Studies

Four moderator variables were used to categorize information to inform the methodological quality of the study: sample size, publication type, sample type, and

outcome variable type (see Appendix B). Eighty-six percent (n = 43) of the effect sizes reported the numbers of students included in the study as being larger than 100, 8% (n = 4) had 51-100 students, and 6% (n = 3) had less than 50. Most of the effect sizes were from peer-reviewed publications (54%, n = 27), 24% (n = 12) were from a website, and 22% (n = 11) were dissertations (see Table 3). When examining the sample type, 22% (n = 11) used random samples and 78% (n = 39) used non-random samples. I reported all of the random samples for effect sizes for studies occurring at community colleges only (Bloom & Sommo, 2005; Scriverner et al., 2008; Visher & Teres, 2011; Weiss, Visher, & Wathington, 2010; Weissman et al., 2011; Weissman et al., 2012). Fifty percent of the effect sizes included in the meta-analysis were continuous outcomes, and 50% were dichotomous.

Sample size moderator. Most of the effect sizes included sample sizes above 100 suggesting that the categories chosen prior to the meta-analysis process do not adequately reflect the actual distribution of cases. However, when examining the average effect sizes for each sample category, the effect sizes do not appear to be substantially different, .20 or higher as defined by Cohen (1992). Three effect sizes had an N less than 50 and the random effects model indicated that the LC participants were statistically significantly and substantially more likely to achieve the study outcomes than students in the comparison groups (g = .45, $\pm$ .37, p = .018). The four effect sizes with sample sizes from 51 to 100 also indicated that the LC participants were statistically significantly and substantially more likely to achieve the study outcomes than students in the comparison groups (g = .67, $\pm$ .56, p = .019). Forty-three studies had effect sizes with sample sizes

greater than 100 while the random effects estimate was positive, indicating that LC participants were more likely to achieve the study outcomes than non-LC students, the difference was not statistically significant (g = .22, ± .26, p = .019). Comparing the between group difference indicated that the studies with different sample sizes are not statistically significantly different, Q (2) = 2.491, p = .288. Accordingly, all of the studies were included in the analyses based on the sample sizes.

Publication type moderator. Most of the effect sizes that included the publication type were from peer-reviewed journals and approximately the same number were from websites and dissertations. Twenty-seven effect sizes were from a peer-reviewed publication, and the random effects model indicated that the LC participants were substantially more likely to achieve the study outcomes than students in the comparison groups, but this difference was not statistically significant (g = .41, ± .42, p = .057). Eleven studies had effect sizes published in dissertations indicating that there was almost no effect among LC participants on the study outcomes (g = -.005, ± .14, p = .943). On the other hand, the 12 effect sizes published in websites indicated that the LC participants were statistically significantly more likely to achieve the study outcomes than students in the comparison groups (g = .17, ± .14, p = .018). Comparing the between group difference indicated that the studies with different publication types were not statistically significantly different, Q (2) = 5.116, p = .077. Accordingly, all of the studies were included in the analyses based on publication type.

Sample type moderator. Sample type tracked whether or not the researcher used random assignment or not. Eleven effect sizes reported that the studies used random

assignment, and all were from studies conducted at community colleges. The random effects estimate for studies with random assignment indicated that the LC participants were statistically more likely to achieve the study outcomes than students in the comparison groups (g = .17, ± .16, p = .032). Conversely, LC participants in the non-random assignment studies appear to be more likely to achieve the study outcomes than non-LC participants, but the difference was not statistically significant (g = .29, ± .32, p = .072). Comparing the between group difference indicated that the studies with different sample types were not statistically significantly different, Q (1) = .426, p = .514. Accordingly, all of the studies were included in the analyses based on publication type.

Outcome variable type moderator. Outcome variable type compared the results for effect sizes with dichotomous outcomes to the results of effect sizes with continuous outcomes. Past research has indicated that the type of outcome may be related to the effect size (Sanchez-Meca et al., 2003). Half of all the effect sizes were either dichotomous or continuous. The random effects model indicated that the LC participants were substantially more likely to achieve the study outcomes than students in the comparison groups, but this difference was not statistically significant (g = .32, ± .44, p = .149). On the other hand, a dichotomous outcome indicated that LC participants were statistically significantly more likely to achieve the study outcomes than students in the comparison groups, but the difference was not substantial (g = .18, ± .09, p < .001). Comparing the between group difference indicated that the studies with different outcome types were not statistically significantly different, Q (1) = .372, p = .542. Accordingly, all of the studies were included in the analyses based on publication type.

The moderator variable analysis to control for sample size, publication, sample, and outcome variable type all resulted in none of the studies being excluded from the analysis. Past research has indicated that sample size, publication, sample, and outcome variable type can all bias effect sizes (Jarde et al., 2012; Lipsey & Wilson, 1993; Sanchez-Meca et al., 2003). However, the moderator variable analysis conducted here did not indicate that any of these characteristics biased the effect size.

Research Question 1

Are community college students more likely to be successful when they participate in an LC than 4-year college students who participate in an LC?

Figures 2 and 3 illustrate the results of the meta-analysis for community and 4-year college students who participated in an LC respectively. The 24 OR effect sizes from community colleges ranged from .60 to 9.2 for 21,135 students. Similarly, 26 effect sizes were calculated for 4-year colleges ranging from .41 to 87.1. Seventeen of the 24 community college and 21 out of the 26 4-year college effect sizes were 1 or higher, indicating that LC participation was positively related to the study outcomes. The results indicate that for both community and 4-year colleges' students are more likely to be successful when they participate in an LC.

College segment comparisons. The random effects model indicated that the LC community college participants were 1.3 times more likely to achieve the study outcomes than students in the comparison groups, which was statistically significant (OR = 1.3, ± .19, p = .002); the effect size is small (Cohen, 1988). In addition, the Conchran's Q and the I^2 statistic indicate that there is enough variation among the effect sizes to examine

community colleges in more depth, Q (23) = 105.859, $p < .001$, I^2 = 78.3%. 4-year college LC participants were two times as likely to achieve the study outcomes than students in the comparison groups, but the difference was not statistically significant (*OR* = 1.98, ± 1.1, p = .096). The between group difference analysis indicated that the studies with different outcome types were not statistically significantly different, Q (1) = 1.056, p = .304, indicating that there was not a difference between the effectiveness of LCs at community and 4-year colleges.

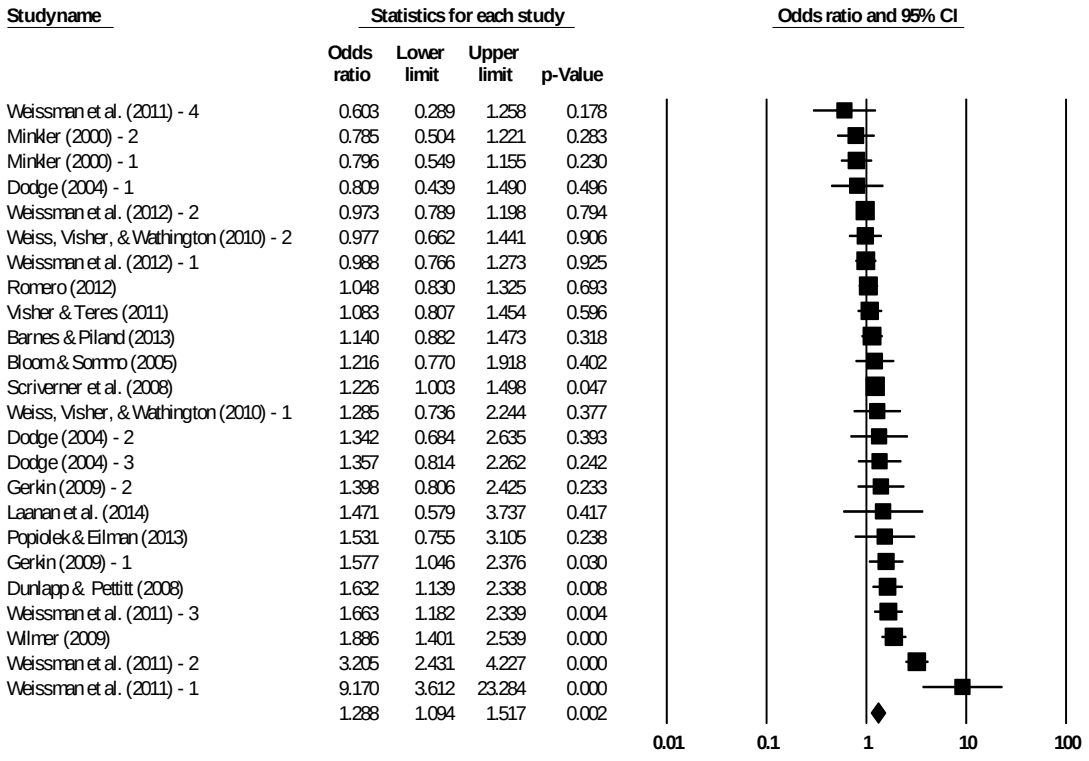

Figure 2. Forest plot of the OR effect sizes for community colleges.

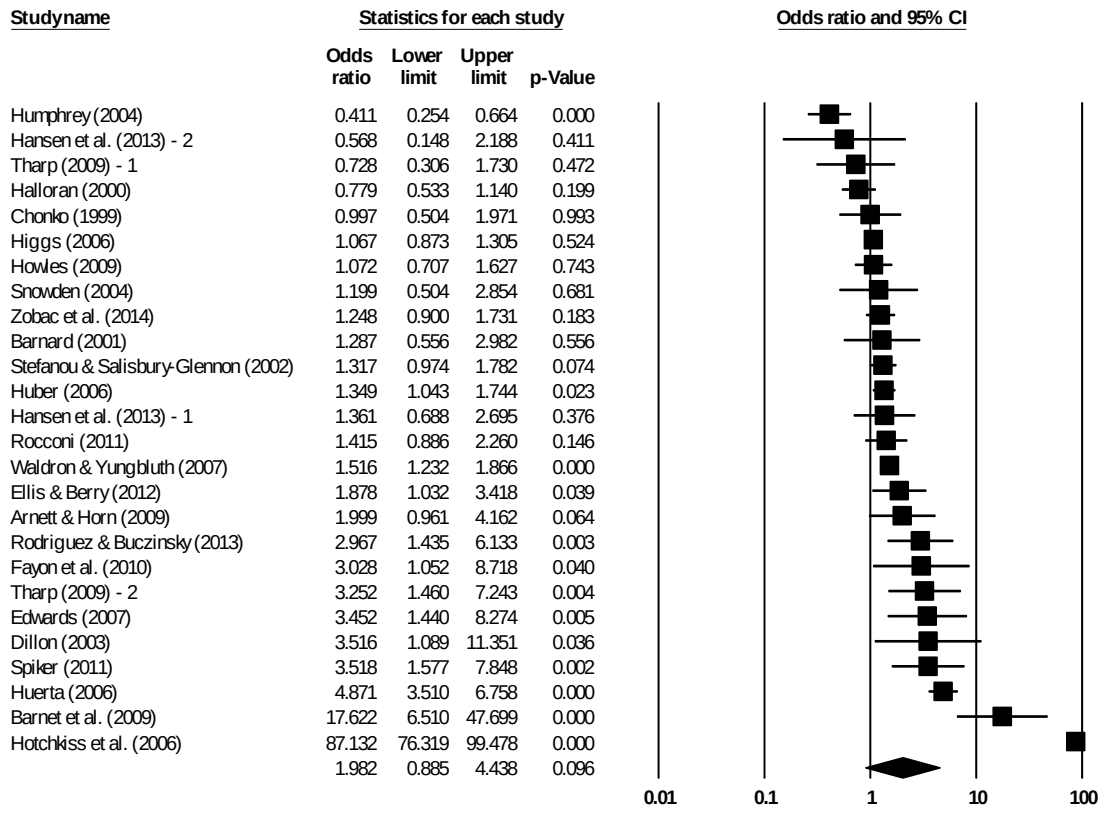

Figure 3. Forest plot of the OR effect sizes for 4-year colleges.

Sensitivity analysis for the college segment comparisons. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the college comparison analysis. The OR ranged from 1.4 to 1.7, after removing one study at a time, indicating that removing each study and recalculating the effect size did not dramatically impact the results; the average effect size with all 50 was 1.6.

Publication bias for the college segment comparisons. I assessed publication bias for the college comparison analysis with a funnel plot and Orin's Fail-Safe *N*. The Funnel Plot indicates that there are non-significant unpublished studies because the

bottom left quadrant studies are missing (see Figure 4). However, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 is 855, indicating that there is not a substantial publication bias. Using Rosenthal's formula (*5k + 10*) for the file drawer study tolerance level the threshold of 260 [5(50) + 10 = 250] was exceeded.

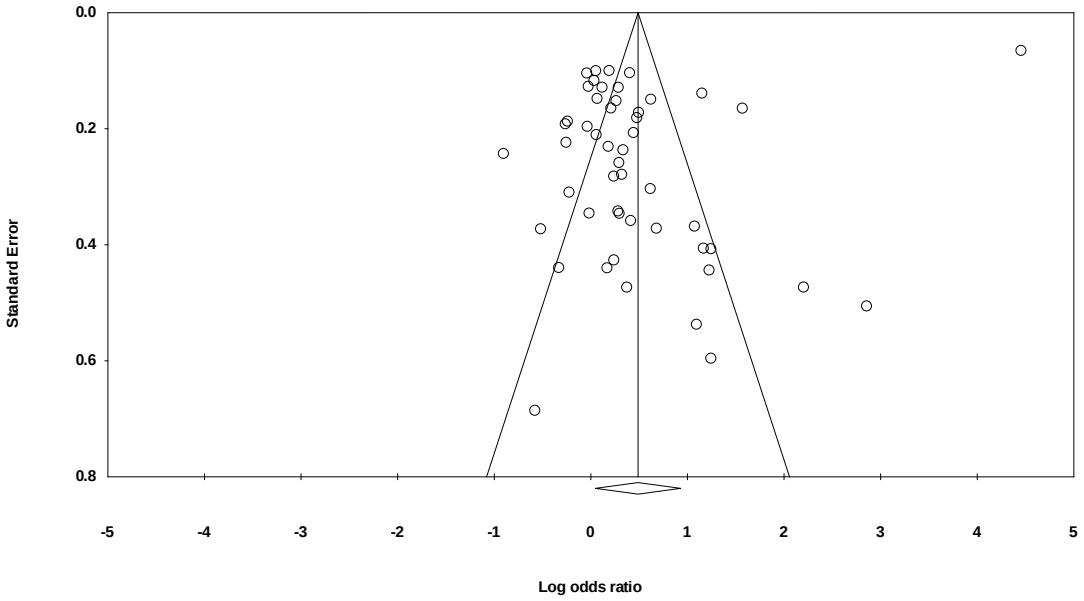

Figure 4. Funnel plot of standard error by log odds ratio for all 50 effect sizes.

Research Question 2

What student success outcomes do LCs have the largest effect on among community college students?

Figures 5-8 illustrate the outcomes that LCs impact the most among community college students for course success, retention, GPA, and self-reported learning outcomes. The eight course success effect sizes ranged from .6 to 9.2 for 3,741 students. The six effect sizes for course retention ranged from .9 to 1.6 for 18,409 students. GPA had six

effect sizes ranging from .8 to 1.5 for 5,861 students, and self-reported learning outcomes included four effect sizes ranging from 1.0 to 1.9 for 1,641 students. Two of the course success and retention effect sizes and three GPA effect sizes indicated that LC participation was negatively related to the study outcomes. All of the self-reported learning outcomes effect sizes indicated a positive relationship with LC participation.

Outcome Type Comparisons

The random effects model indicated that community college students who participated in an LC were 1.6 times more likely to complete their course successfully than students in the comparison group, which was statistically significant (OR = 1.6, ± .57, p = .045). Community college students who participated in an LC were 1.1 times more likely to be retained to a subsequent term than students in the comparison group, which was not statistically significant (OR = 1.1, ± .15, p = .075). Community college students who participated in an LC and those in the comparison group were equally likely to earn a higher GPA (OR = .987, ± .15, p = .880). Community college students who participated in an LC were 1.5 times more likely to achieve a self-reported learning outcome than students in the comparison group, which was statistically significant (OR = 1.5, ± .42, p = .030). Comparing the between group difference indicated that the studies with different outcome types were not statistically significantly different, Q (3) = 6.801, p = .079, indicating that there was not a difference between the student outcome types.

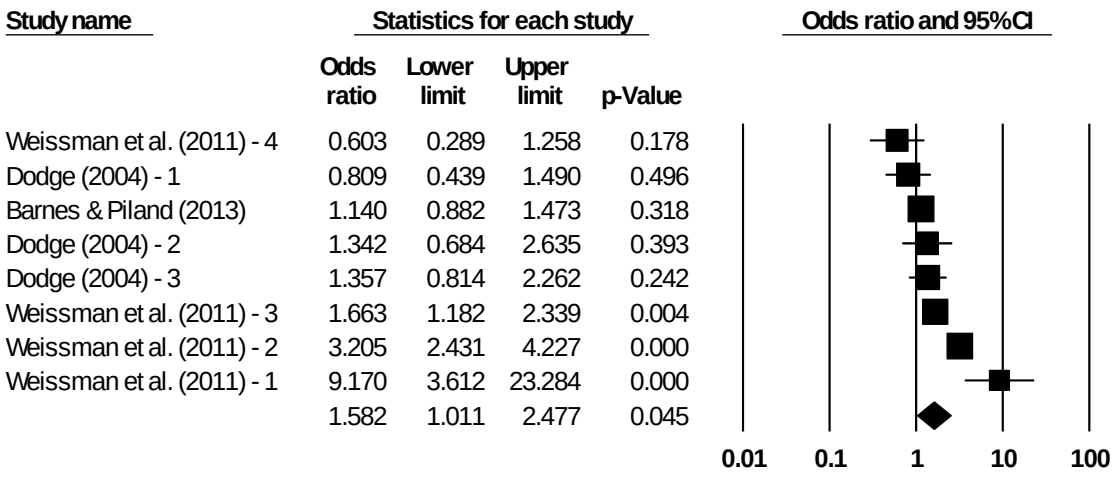

Figure 5. Forest plot of the OR effect sizes for community college course success.

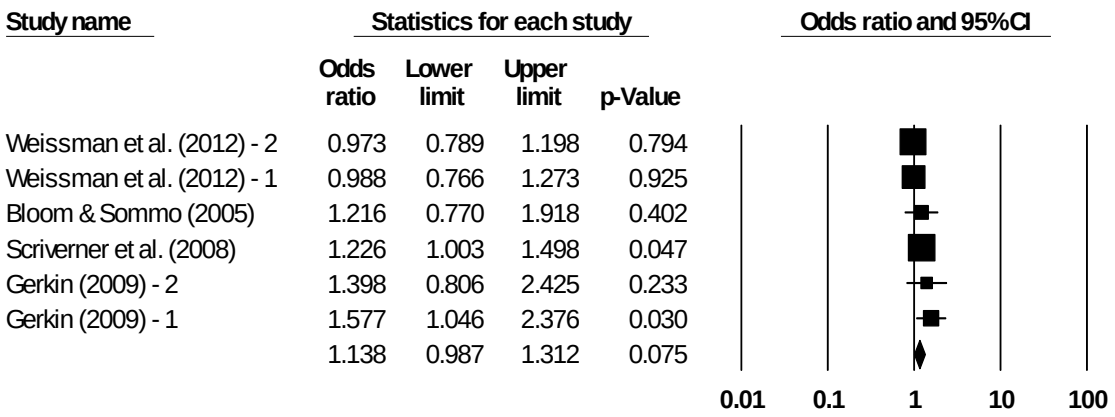

Figure 6. Forest plot of the OR effect sizes for community college Persistence (i.e. retention).

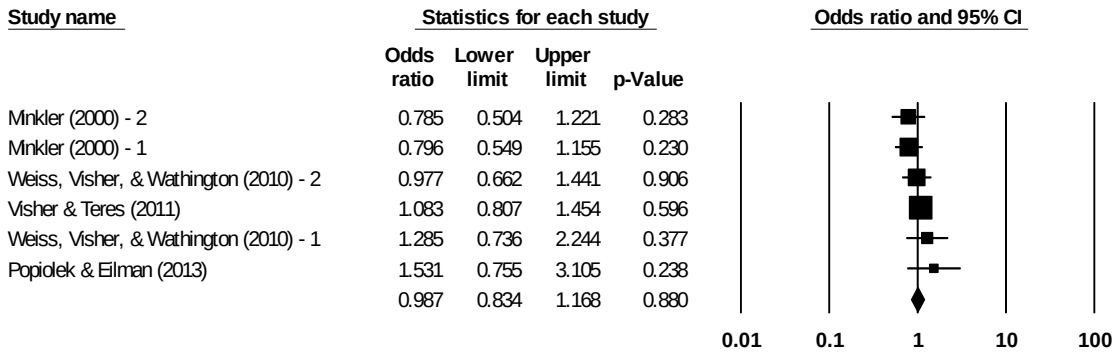

Figure 7. Forest plot of the OR effect sizes for community college GPA.

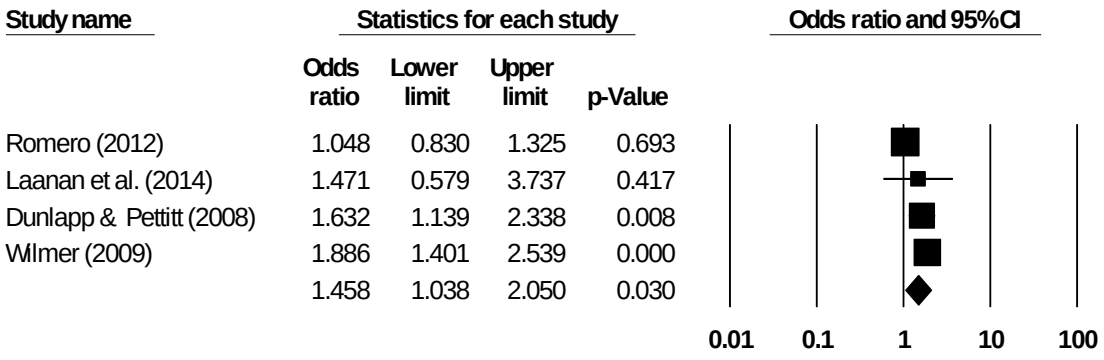

Figure 8. Forest plot of the OR effect sizes for community college Self-Reported Learning Outcome.

Sensitivity analysis for the outcome type comparisons. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the outcome type comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges, indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 24 effect sizes was 1.3.

Publication bias for the outcome type comparisons. Publication bias was assessed for the outcome type comparison analysis with a funnel plot and Orin's Fail-

Safe *N*. The Funnel Plot indicated that there were non-significant unpublished studies because the bottom left quadrant studies were missing (see Figure 4). In addition, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 88. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 130 [5(50) + 10 = 250] was not exceeded, suggesting that publication bias may be present. Calculating the file drawer study tolerance level threshold separately for the two substantial effects (OR >= 1.4), course success and self-reported learning outcome, the file drawer study tolerance level threshold for course success was 50 [5(8) + 10 = 50], which was exceeded by Orwin's Fail-Safe *N* of 75, indicating that publication was not present for the course success odds ratio. Orwin's Fail-Safe *N* of 23 did not exceed Rosenthal's (1979) file drawer study tolerance level threshold of 30 [5(4) + 10 = 30], indicating that publication bias may be present with the self-reported learning outcome odds ratio.

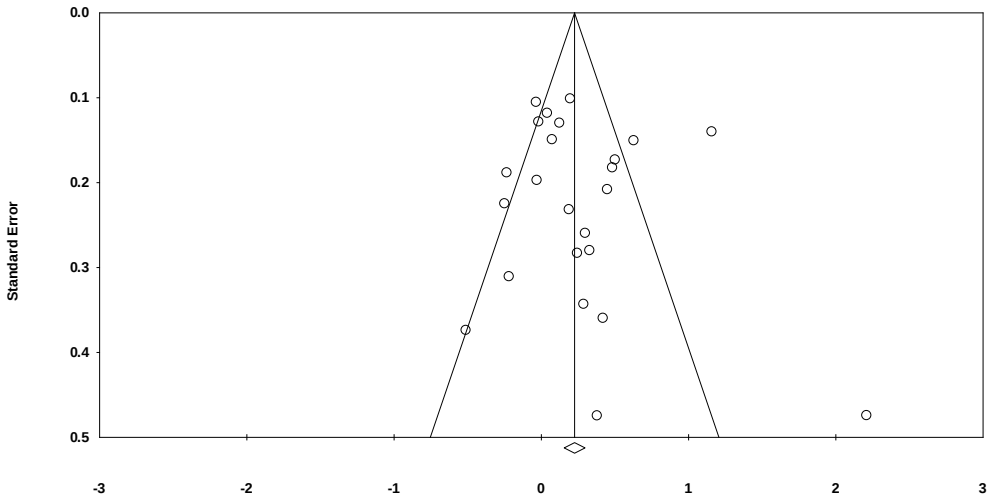

Figure 9. Funnel plot of standard error by log odds ratio for the community college outcome type effect sizes.

Research Question 3

To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)?

Number of linked courses comparisons. Figures 10-11 illustrate the effect sizes by the number of linked courses. I excluded one of the 24 effect sizes from the analysis because it was not possible to determine the number of linked courses for one of the effect sizes. The seventeen effect sizes for LCs with two linked courses ranged from .6 to 9.2 for 11,624 students. LCs with three linked courses had six effect sizes ranging from .9 to 1.6 for 17,839 students. Six of the effect sizes for LCs with two linked courses indicated that LC participation was negatively related to the study outcomes. All but one of the LCs with three linked courses indicated a positive relationship with LC participation.

The random effects model indicated that community college students who participated in an LC with two linked courses were 1.3 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 1.3, ± .27, *p* = .019). Community college students who participated in an LC with three linked courses were 1.2 times more likely to achieve the study outcome than students in the comparison group, which was also statistically significant (*OR* = 1.2, ± .14, *p* = .011). Comparing the between group difference indicated that the studies with different outcome types were not statistically significantly different, *Q* (1) = .758, *p* = .384, indicating that there was not a difference between the number of linked courses.

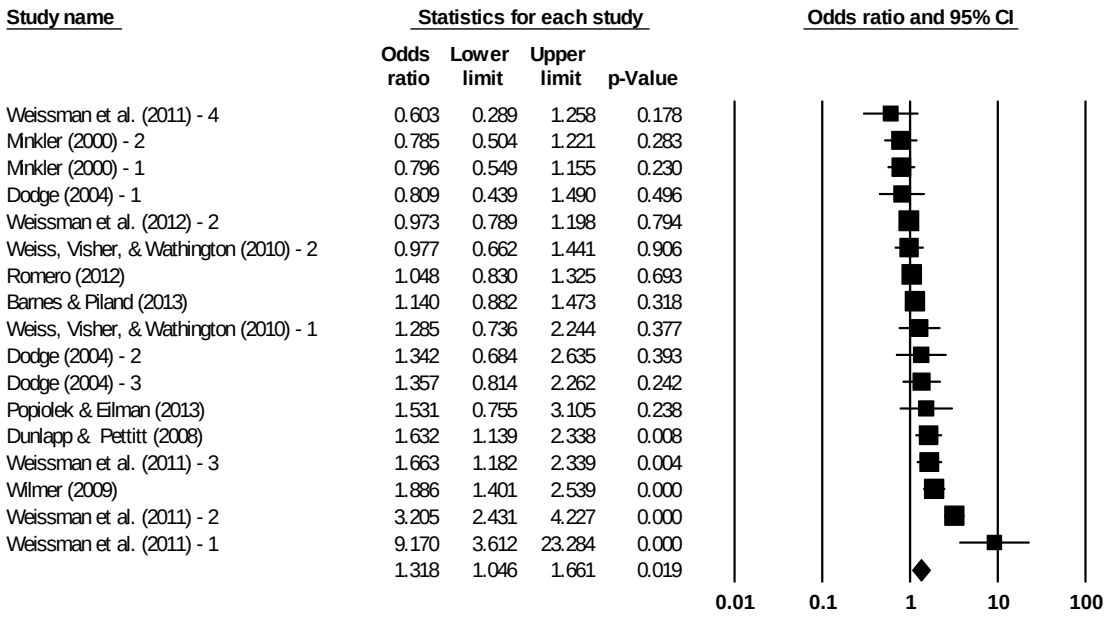

Figure 10. Forest plot of the OR effect sizes for LCs with two linked courses among community colleges only.

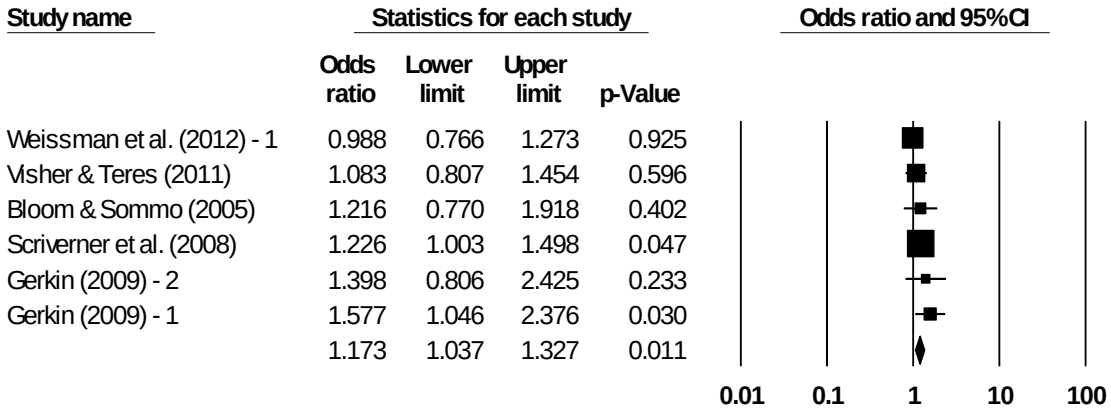

Figure 11. Forest plot of the OR effect sizes for LCs with three linked courses among community colleges only.

Sensitivity analysis for the number of linked courses. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the number of linked courses comparisons. Removing one study at a

time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges. Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 23 effect sizes was 1.3.

Publication bias for the number of linked courses. Publication bias was assessed for the number of linked courses comparison analysis with a funnel plot and Orin's Fail-Safe *N*. The Funnel Plot indicated that there were non-significant unpublished studies because the bottom left quadrant studies were missing (see Figure 12). In addition, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 84. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 125 [5(23) + 10 = 125] was not exceeded, suggesting that publication bias may be present.

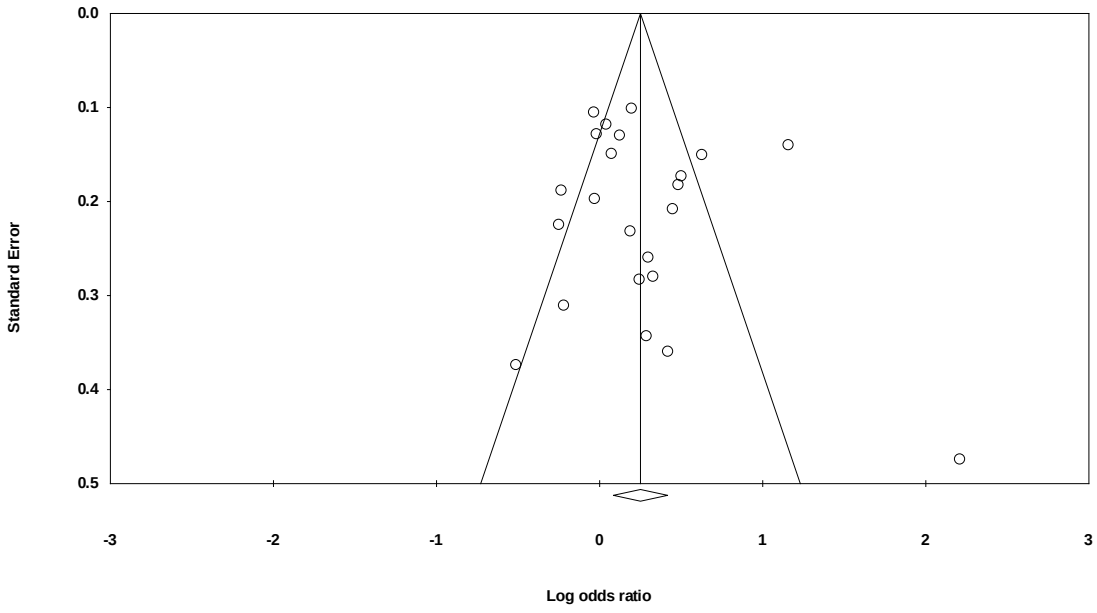

Figure 12. Funnel plot of standard error by log odds ratio for the community college effect sizes for the number of linked courses.

Type of linked courses comparisons. Figures 12-16 illustrate the effect sizes by the type of linked courses. I excluded 2 of the 24 effect sizes from the analysis because it was not possible to determine the type of linked courses. The eight effect sizes for LCs offered in developmental courses only ranged from .6 to 1.9 for 4,339 students. The four effect sizes for LCs offered in transfer courses only ranged from .8 to 1.5 for 5,030 students. The eight effect sizes for LCs offered in developmental and transfer courses ranged from .8 to 1.6 for 18,233 students. The three effect sizes for LCs offered with an academic skills course ranged from 1.0 to 9.2 for 1,861 students. Two of the developmental course effect sizes, two of the transfer course effect size and three of the developmental and transfer level courses indicated that LC participation was negatively related to the study outcomes. Conversely, none of the effect sizes where one of the courses in the LC was an academic skills course was negatively related to the study outcomes.

The random effects model indicated that community college students who participated in developmental course level LC were 1.2 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (OR = 1.2, ± .21, p = .025). Community college students who participated in transfer course level LC were 1.0 times less likely to achieve the study outcome than students in the comparison group, which was not statistically significant (OR = .956, ± .20, p = .712). Community college students who participated in developmental and transfer course level LC were 1.2 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (OR = 1.2, ± .22, p = .031).

Community college students who participated in an LC linked to an academic skills course were 2.9 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 2.9, ± 1.8, *p* = .041). Comparing the between group difference indicated that the studies with different outcome types were not statistically significantly different, *Q* (3) = 6.430, *p* = .092, indicating that there was not a difference between the type of linked courses.

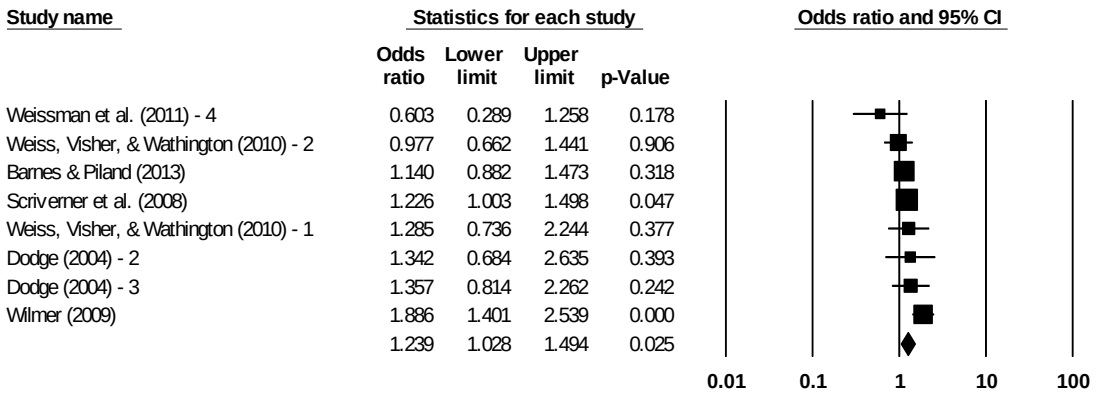

Figure 13. Forest plot of the OR effect sizes for LCs with developmental level courses among community colleges only.

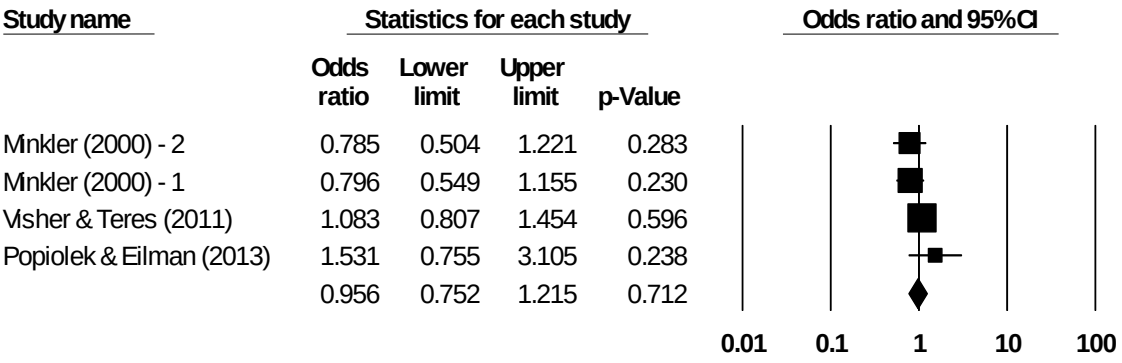

Figure 14. Forest plot of the OR effect sizes for LCs with transfer level courses among community colleges only.

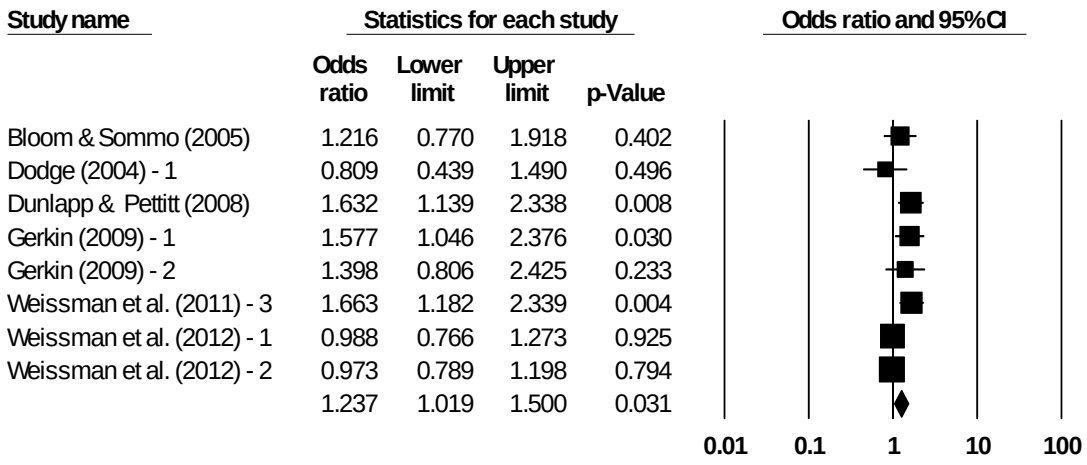

Figure 15. Forest plot of the OR effect sizes for LCs with developmental and transfer level courses among community colleges only.

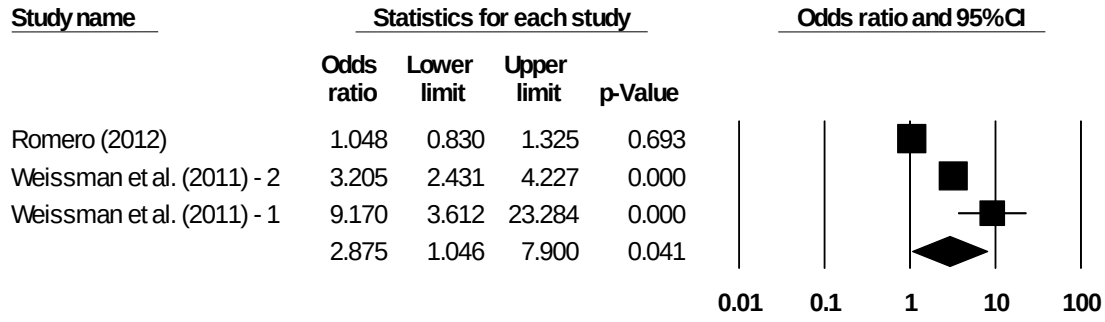

Figure 16. Forest plot of the OR effect sizes for LCs with an academic skills course among community colleges only.

Sensitivity analysis for the type of linked course. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the type of linked course comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges.

Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 22 effect sizes was 1.3.

Publication bias for the type of linked course. Publication bias for the type of linked course comparison analysis was assessed with a funnel plot and with Orin's Fail-Safe *N*. The Funnel Plot is fairly symmetrical indicating that there was not publication bias (see Figure 17). In addition, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 84. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 120 [5(22) + 10 = 120] was not exceeded, suggesting that publication bias may be present. Calculating the file drawer study tolerance level threshold separately for the one substantial effects (OR >= 1.4), course linked with an academic skills course, the file drawer study tolerance level threshold for LCs with an academic skills course was 25 [5(3) + 10 = 25], which was exceeded by Orwin's Fail-Safe *N* of 33, indicating that publication was not present for academic skills course odds ratio.

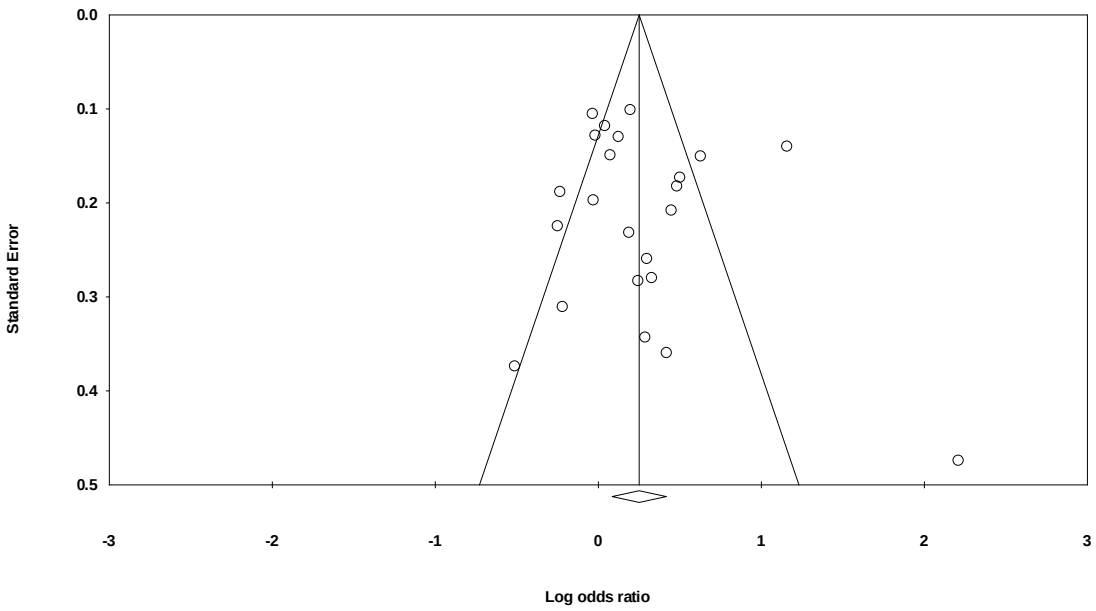

Figure 17. Funnel plot of standard error by log odds ratio for the community college and type of linked courses effect sizes.

Research Question 4

To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (e.g. additional support services and strategies, student characteristics, contextualized curriculum and the size of the college)?

Additional support services and strategies comparisons. Figures 18-19 illustrate the effect sizes for the additional support services and strategies comparisons. I excluded 1 of the 24 effect sizes from the analysis because it was not possible to determine the additional support strategies. The sixteen effect sizes for LCs that provided additional support strategies ranged from .6 to 9.2 for 22,973 students. Seven effect sizes for LCs that did not provide additional support strategies ranged from .8 to 1.4 for 3,057

students. Three of the effect sizes for LCs with additional support strategies and four of the effect sizes that did not include additional support indicated that LC participation was negatively related to the study outcomes and four effect sizes.

The random effects model indicated that community college students who participated in an LC with an additional strategy were 1.4 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (OR = 1.4, ± .28, p = .001). Community college students who participated in an LC program without additional support strategies and those in the comparison group were equally likely to achieve the study outcome (OR = .976, ± .12, p = .720). Comparing the between group difference indicated that LC programs that provided additional support strategies were statistically significantly more likely to have students achieve the study outcome, Q (1) = 8.717, p = .003.

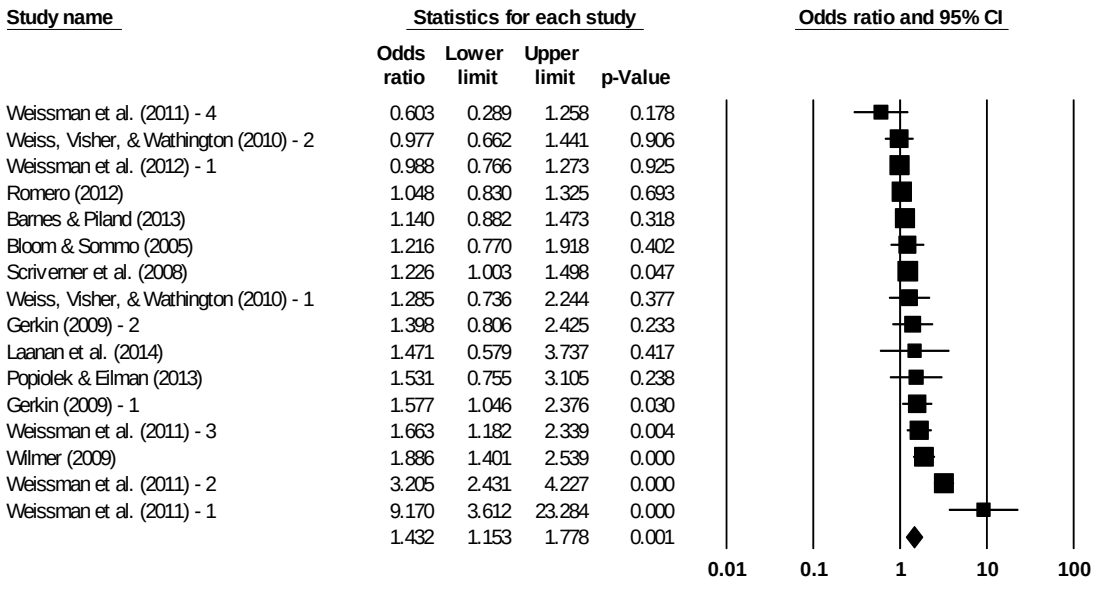

Figure 18. Forest plot of the OR effect sizes for LCs with additional support strategies among community colleges only.

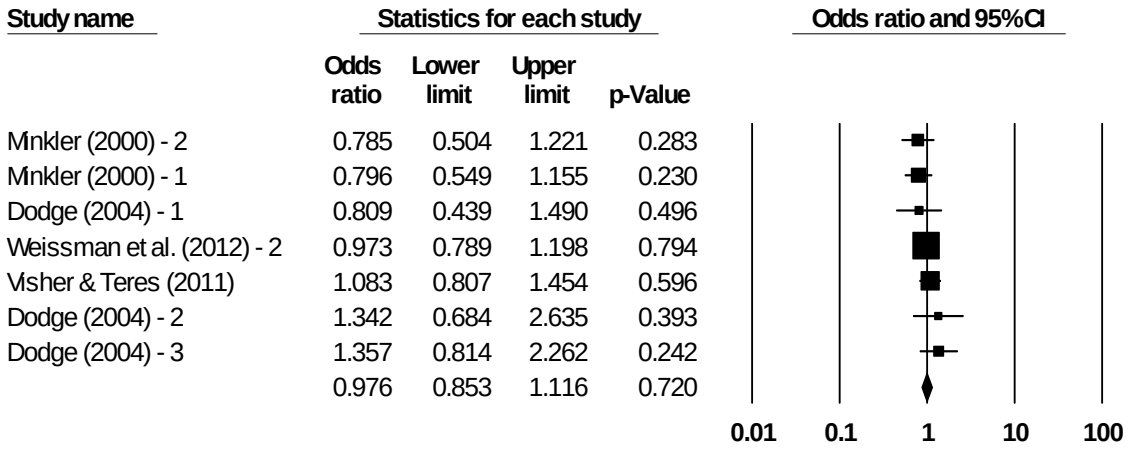

Figure 19. Forest plot of the OR effect sizes for LCs with no additional support strategies among community colleges only.

Sensitivity analysis for additional support services and strategies. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the additional support services and strategies comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges. Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 23 effect sizes was 1.3.

Publication bias for additional support services and strategies. Publication bias for the additional support services and strategies comparison analysis was assessed with a funnel plot and with Orin's Fail-Safe *N*. The Funnel Plot is fairly symmetrical indicating that there is a lower probability of publication bias (see Figure 20). When calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 79. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance

level the threshold of 125 [5(23) + 10 = 125] was not exceeded, suggesting that publication bias may be present. Calculating the file drawer study tolerance level threshold separately for the one substantial effect (OR >= 1.4), LCs with additional support strategies, the file drawer study tolerance level threshold for LCs with an academic skills course was 125 [5(23) + 10 = 125], which was not exceeded by Orwin's Fail-Safe *N* of 87, indicating that publication may be present.

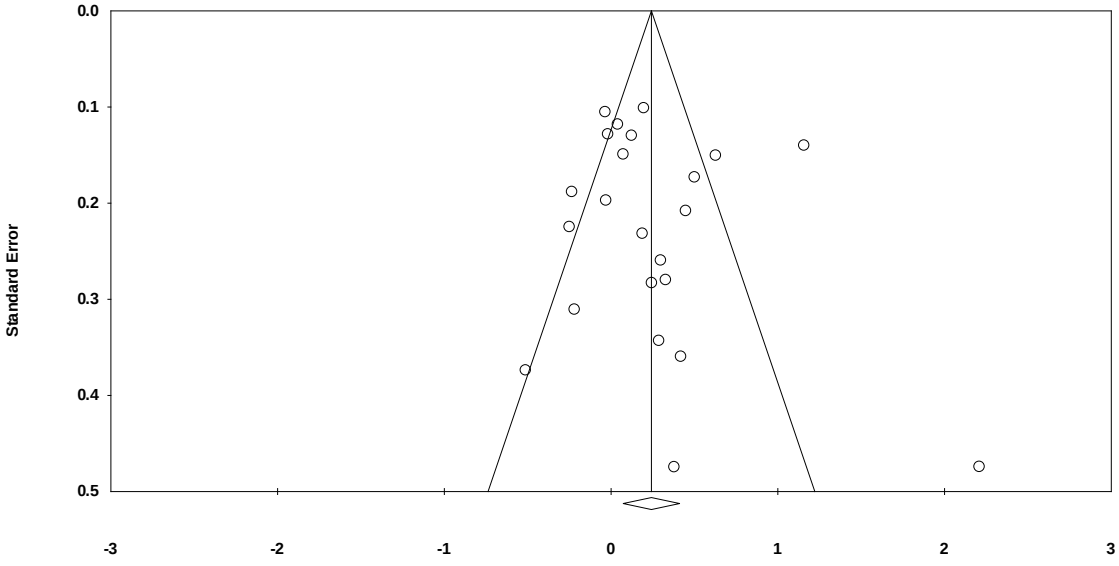

Figure 20. Funnel plot of standard error by log odds ratio for the community college and the additional support strategy effect sizes.

Counseling as an additional strategy comparisons. Figures 21-22 illustrate the effect sizes for the LC programs with counseling as an additional strategy. I excluded 1 of the 24 effect sizes from the analysis because it was not possible to determine whether counseling was an additional support strategy for one of the effect sizes. Nine effect sizes for LCs where counseling was an additional support strategy ranged from 1.0 to 9.2 for 5,807 students. Fourteen effect sizes for LCs where counseling was not an additional

support strategy ranged from .6 to 1.6 for 23,440 students. Only one of the effect sizes where counseling was a support strategy and 6 of the effect sizes where counseling was not an additional support strategy indicated that LC participation was negatively related to the study outcomes.

The random effects model indicated that community college students who received counseling as an additional support strategy were 1.6 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 1.6, ± .46, *p* = .002). Community college students who did not receive counseling as an additional strategy were about equally as likely as those in the comparison group to achieve the study outcome (*OR* = 1.061, ± .12, *p* = .331). Comparing the between group difference indicated that LC programs that provided counseling as an additional support strategy were statistically significantly more likely to have students achieve the study outcome, *Q* (1) = 6.536, *p* = .011.

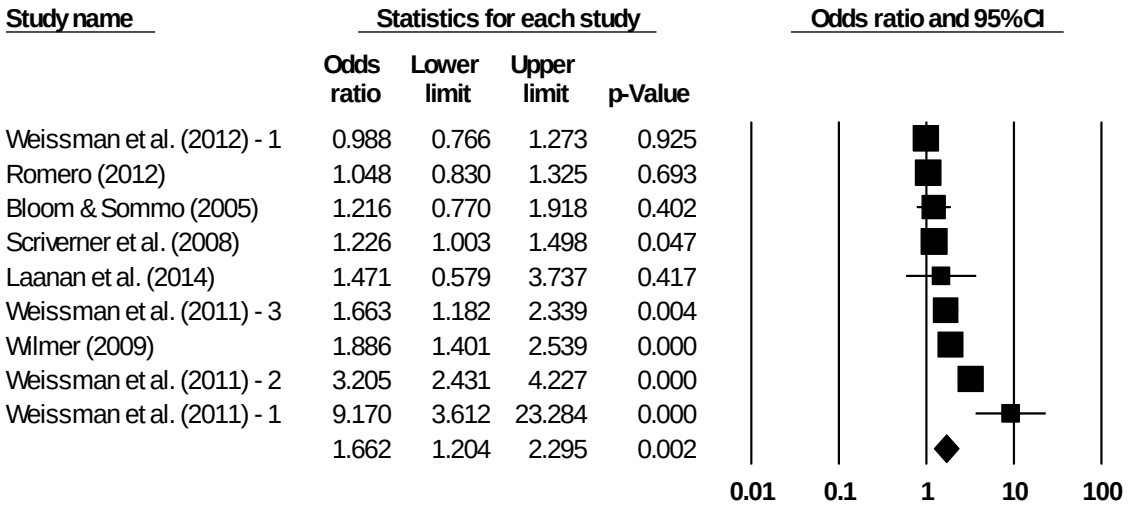

Figure 21. Forest plot of the OR effect sizes for LCs that included counseling as an additional support strategy among community colleges.

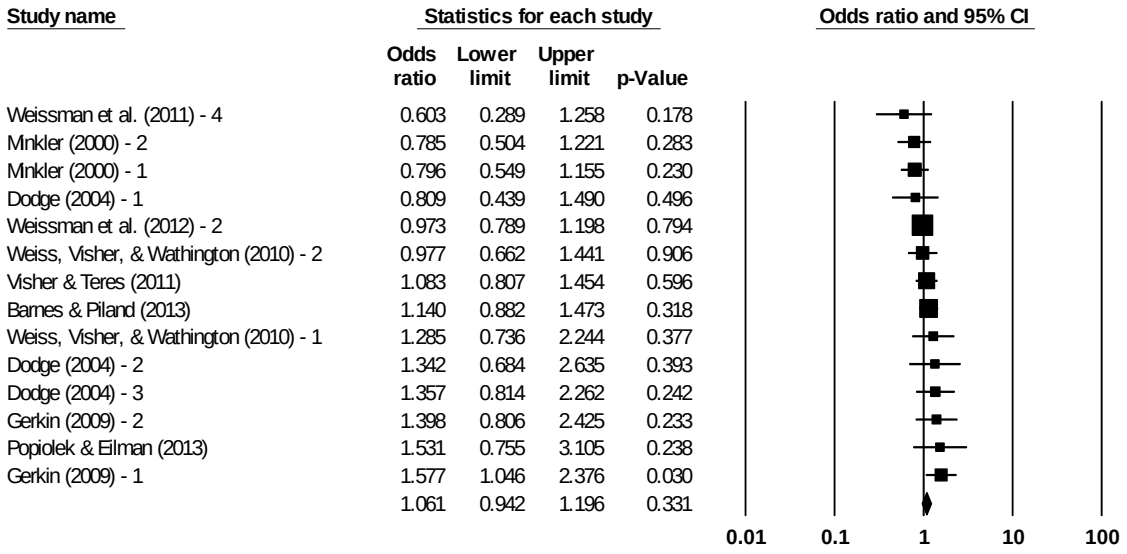

Figure 22. Forest plot of the OR effect sizes for LCs that did not include counseling as an additional support strategy among community colleges.

Sensitivity analysis for the additional strategy was counseling. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the additional strategy was counseling comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges. Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 23 effect sizes was 1.3.

Publication bias for the additional strategy was counseling. Publication bias for the additional strategy was counseling comparison analysis was assessed with a funnel plot and with Orin's Fail-Safe *N*. The Funnel Plot is fairly symmetrical indicating that there is not publication bias (see Figure 23). However, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 79. Using

Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 125 [5(23) + 10 = 125] was not exceeded, suggesting that publication bias may be present. Calculating the file drawer study tolerance level threshold separately for the one substantial effects (OR >= 1.4), additional strategy was counseling, the file drawer study tolerance level threshold for LCs with counseling as an additional strategy was 55 [5(9) + 10 = 55], which was exceeded by Orwin's Fail-Safe *N* of 60, indicating that publication bias was not present for the counseling as an additional strategy odds ratio.

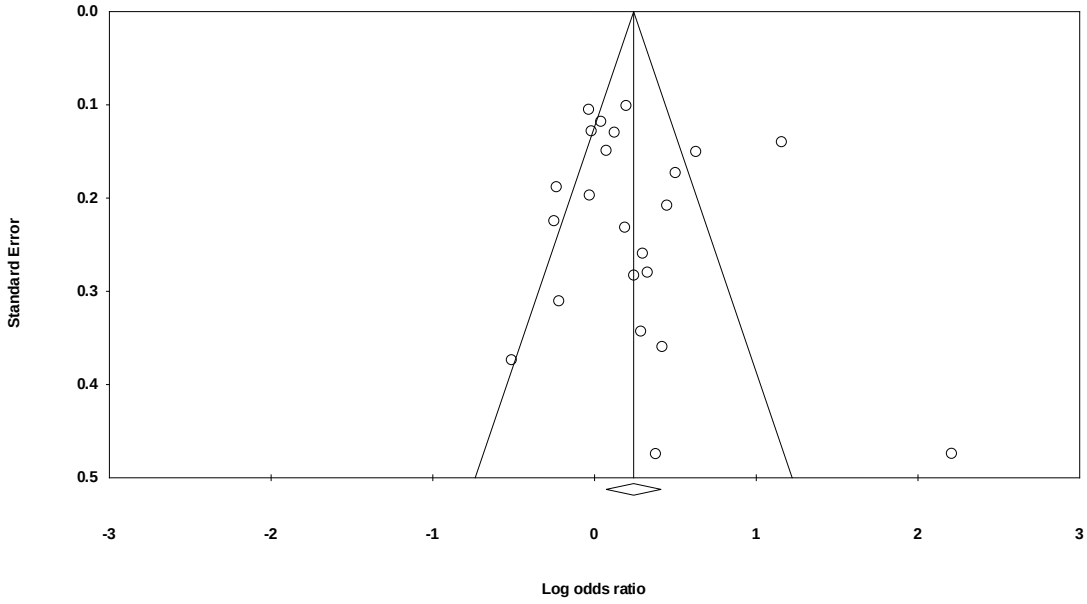

Figure 23. Funnel plot of standard error by log odds ratio for the community college and the additional support strategy was counseling effect sizes.

First-year college student comparisons. Figures 24-25 illustrate the effect sizes by first-year college students. Sixteen effect sizes for LCs with first-year college students ranged from .6 to 9.2 for 23,477 students. Eight effect sizes for LCs without first-year college students ranged from .8 to 1.6 for 6,175 students. Four of the effect sizes for LCs

with first-year students and three without first-year students indicated that LC participation was negatively related to the study outcomes.

The random effects model indicated that first-year community college students who participated in an LC were 1.4 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 1.4, ± .26, *p* = .002). Community college students who were not first-year college students who participated in an LC were about equally as likely as those in the comparison group to achieve the study outcome (*OR* = 1.1, ± .22, *p* = .339). Comparing the between group difference indicated that first-year and non-first-year community college students were not statistically significantly different, *Q* (1) = 2.212, *p* = .137; indicating that there was not a difference between students who were first-year college students and those who were not on the study outcomes.

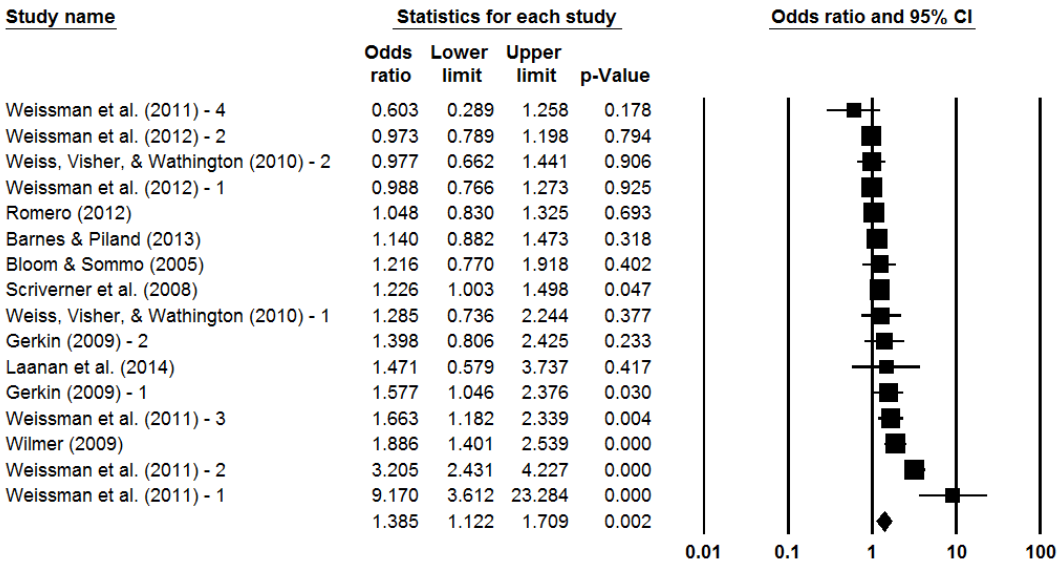

Figure 24. Forest plot of the OR effect sizes for LCs with first-year students among community colleges only.

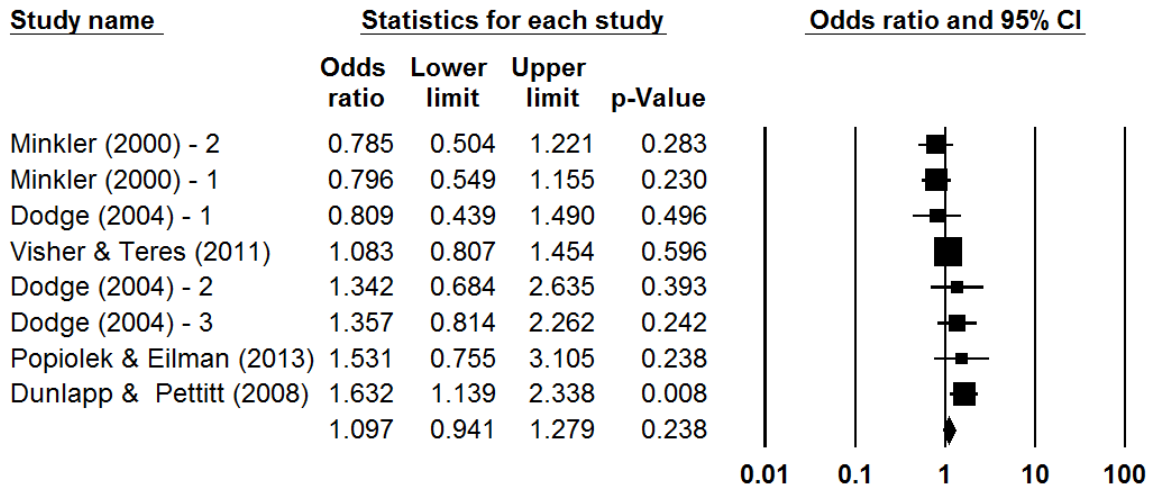

Figure 25. Forest plot of the OR effect sizes for LCs without first-year students among community colleges only.

Sensitivity analysis for first-year college students. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the first-year college student comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges, indicating that removing each study and recalculating the effect size did not dramatically impact the results. The average effect size with all 24 effect sizes was 1.3.

Publication bias for first-year college students. Publication bias was assessed for the first-year college student comparison analysis with a funnel plot and Orin's Fail-Safe *N*. The Funnel Plot indicated that there were non-significant unpublished studies because the bottom left quadrant studies are missing (see Figure 26). However, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 is 88. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance

level the threshold of 130 [5(24) + 10 = 130] was not exceeded, suggesting that publication bias may be present. Calculating the file drawer study tolerance level threshold separately for the one substantial effect (OR >= 1.4), LCs with first-year college students, the file drawer study tolerance level threshold for LCs with first year college students was 90 [5(16) + 10 = 90], which was not exceeded by Orwin's Fail-Safe *N* of 70, indicating that publication may be present for the LCs with first year college students odds ratio.

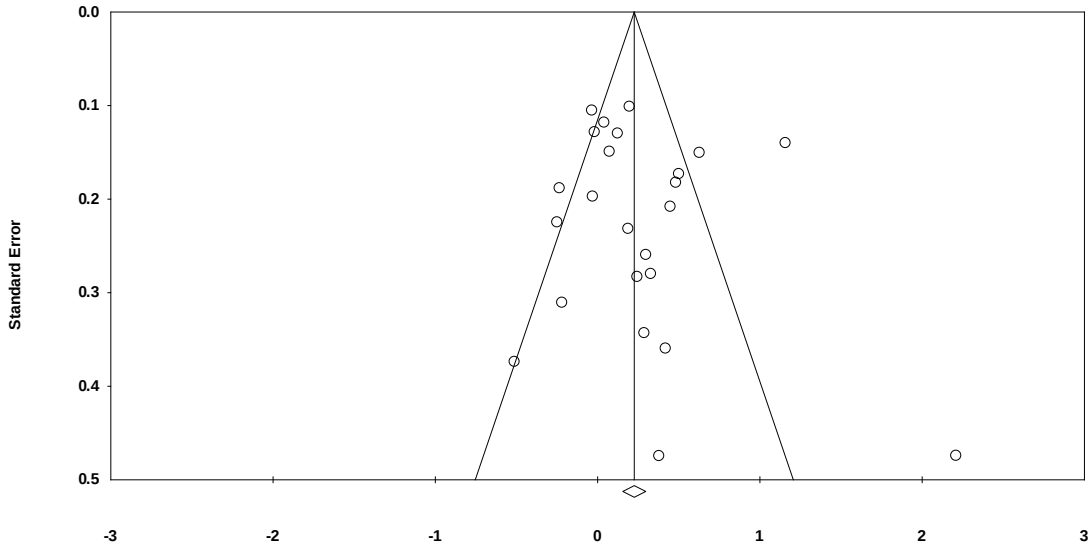

Figure 26. Funnel plot of standard error by log odds ratio for the community college effect sizes for first-year college students.

Size of the college comparisons. Figures 27-30 illustrate the effect sizes by the size of the college. One effect size was calculated for LCs at small colleges (< 4,500) equaling .8 for 1,286 students. Three effect sizes were calculated for LCs at medium colleges (4,500-7,999) ranging from .8 to 1.6 for 3,295 students. Eleven effect sizes were calculated for LCs large colleges (8,000-14,999) ranging from .6 to 9.2 for 5,033

students. Nine effect sizes were calculated for LCs at extra-large colleges (>15,000) ranging from 1.0 to 1.6 for 20,038 students. The small college effect size, one medium college effect size, three large college effect sizes, and two extra-large college effect sizes indicated that LC participation was negatively related to the study outcomes.

The random effects model indicated that LC community college students at a small college were 1.3 times less likely to achieve the study outcome than students in the comparison group, which was not statistically significant (*OR* = .796, ± .25, *p* = .230). Community college students who participated in an LC from a medium college were 1.2 times more likely to achieve the study outcome than students in the comparison group, which was not statistically significant (*OR* = 1.2, ± .49, *p* = .413). Community college students who participated in an LC from a large college were 1.5 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 1.5, ± .44, *p* = .018). Community college students who participated in an LC from an extra-large college were 1.1 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (*OR* = 1.1, ± .11, *p* = .009). Comparing the between group difference indicated that the studies with different outcome types were not statistically significantly different, *Q* (3) = 6.267, *p* = .099, indicating that there was not a difference between the different college sizes.

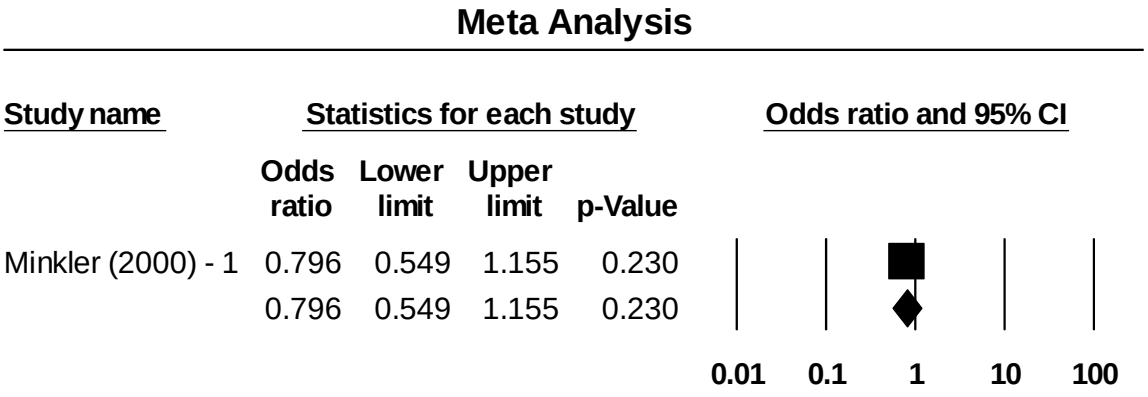

Figure 27. Forest plot of the OR effect sizes for LCs from small community colleges.

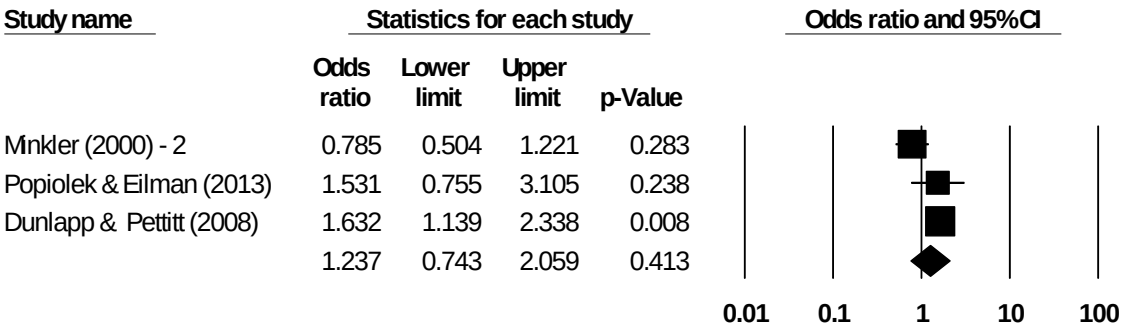

Figure 28. Forest plot of the OR effect sizes for LCs from medium community colleges.

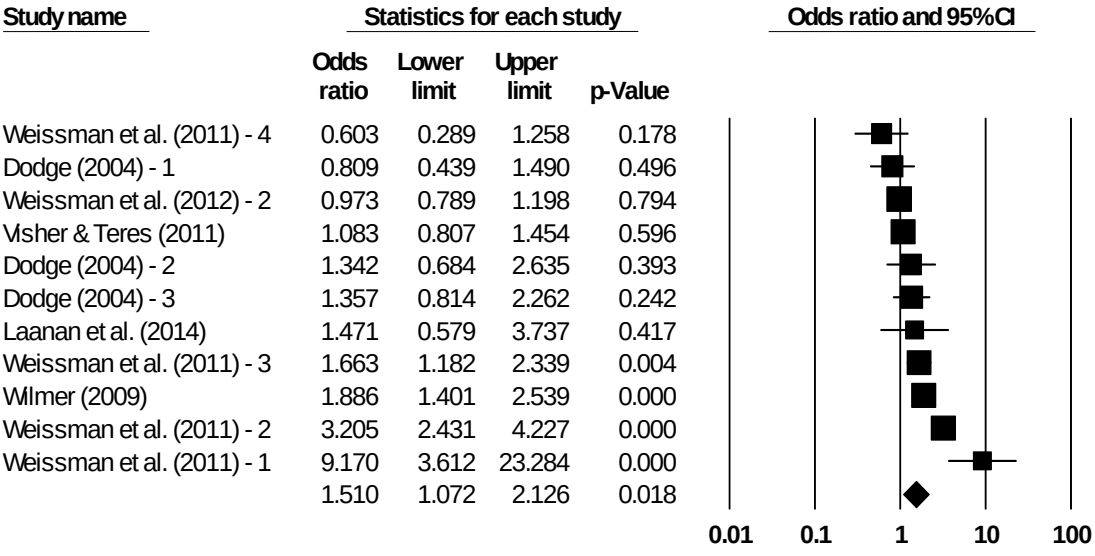

Figure 29. Forest plot of the OR effect sizes for LCs from large community colleges.

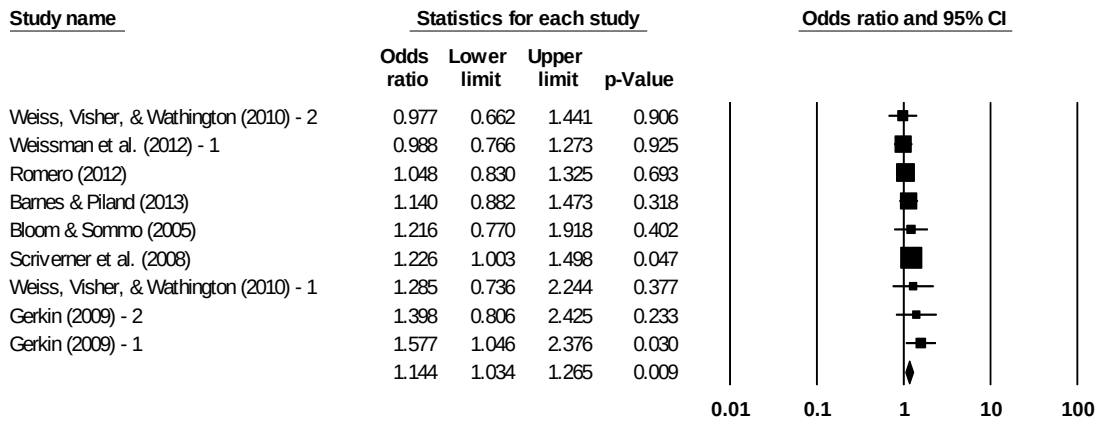

Figure 30. Forest plot of the OR effect sizes for LCs extra-large community colleges.

Sensitivity analysis for the size of the college. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the college size comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges. Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 24 effect sizes was 1.3.

Publication bias for the size of the college. I assessed publication bias for the college size comparison analysis with a funnel plot and Orin's Fail-Safe *N*. The Funnel Plot indicated that there were non-significant unpublished studies because the bottom left quadrant studies were missing (see Figure 31). In addition, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 88. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 130 [5(24) + 10 = 130] was not exceeded, suggesting that publication bias

may be present. Calculating the file drawer study tolerance level threshold separately for the one substantial effect (OR >= 1.4), LCs from large community colleges, the file drawer study tolerance level threshold for LCs from large community colleges was 65 [5(11) + 10 = 65], which was exceeded by Orwin's Fail-Safe *N* of 75, indicating that publication was not present for academic skills course odds ratio.

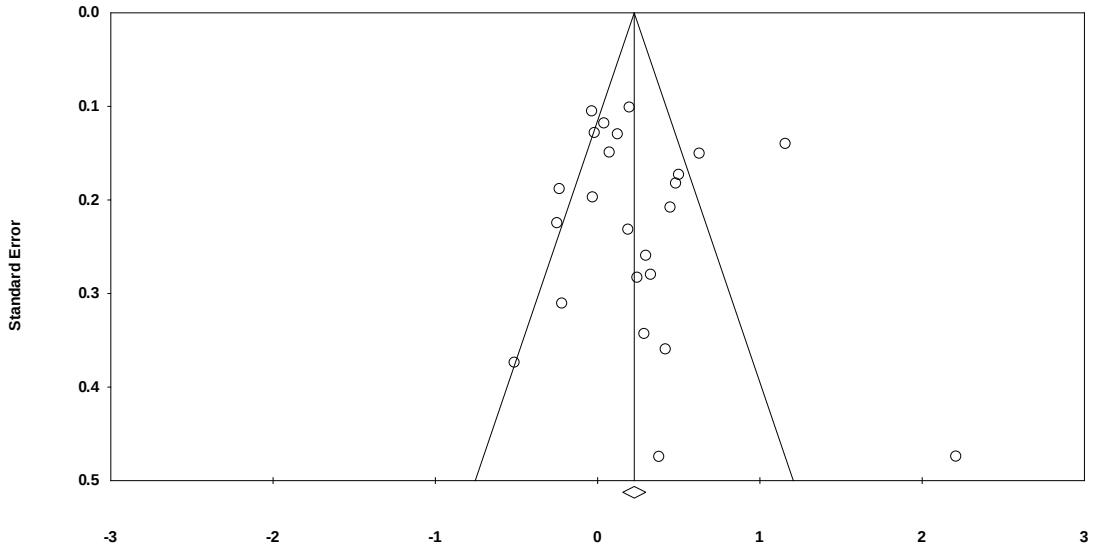

Figure 31. Funnel plot of standard error by log odds ratio for the community college and the size of the college effect sizes.

Contextualized/Integrated curriculum comparisons. Figures 32-34 illustrate the effect sizes by whether the curriculum was integrated. One of the 24 effect sizes was excluded from the analysis because it was not possible to determine whether or not the integration of curriculum occurred for the particular effect size. Eighteen effect sizes for LCs where curriculum integration occurred ranged from .8 to 9.2 for 25,103 students. Three effect sizes for LCs that did not integrate the curriculum ranged from .6 to 3.2 for 1,104 students. Two effect sizes for LCs where curriculum integration occurred in some

linked course but not others ranged from .8 to .8 for 3,256 students. Three of the effect sizes that included integrated curriculum, two of those without integrated curriculum, and both of the effect sizes with mixed integrated curriculum indicated that LC participation was negatively related to the study outcomes.

The random effects model indicated that community college students who participated in linked courses that included integrated curriculum were 1.3 times more likely to achieve the study outcome than students in the comparison group, which was statistically significant (OR = 1.3, $\pm$ .17, p < .001). Community college students who participated in linked courses without integrated curriculum were 1.2 times more likely to achieve the study outcome than students in the comparison group, which was not statistically significant (OR = 1.283, $\pm$ .82, p = .630). Community college students who participated in linked courses that had combinations of integrated curriculum were 1.3 times less likely to achieve the study outcome than students in the comparison group, which was not statistically significant (OR = 1.3, $\pm$ .20, p = .107). Comparing the between group difference indicated that community college LC programs with or without integrated curriculum were statistically significantly different, Q (2) = 9.520, p = .009, indicating that integrated curriculum may help to increase the likelihood that students will achieve a study outcome. Specifically, community college LC students who participated in linked courses that included integrated curriculum were statistically significantly more likely to achieve study outcomes than students in LC programs where the integration of curriculum occurred in some linked courses, but not others, Q (1) = 9.495, p = .002.

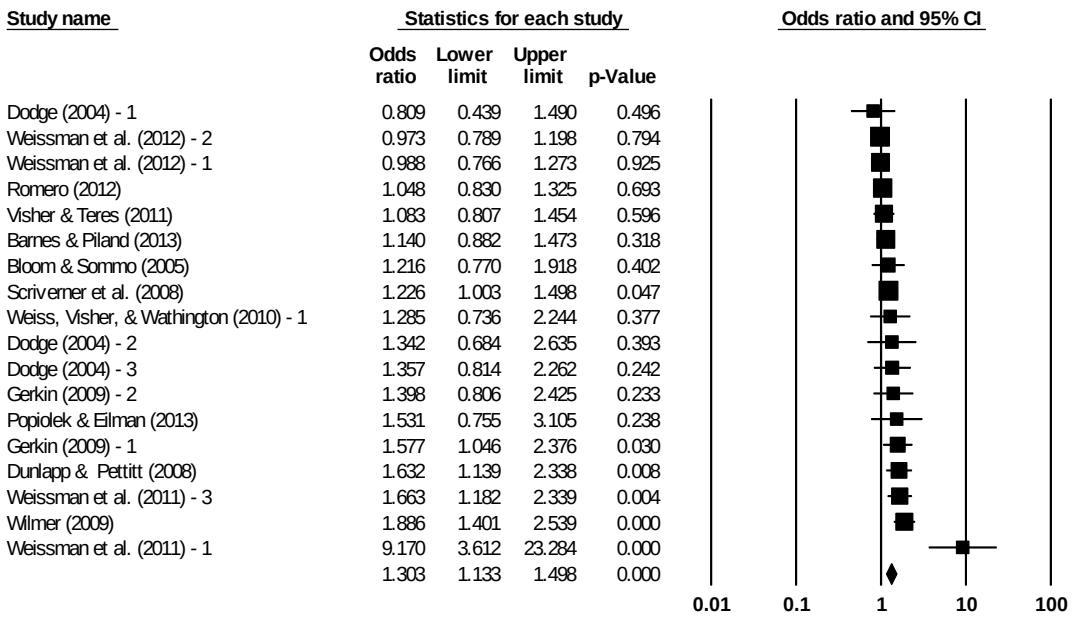

Figure 32. Forest plot of the OR effect sizes for LCs with contextualized/integrated curriculum among community colleges only.

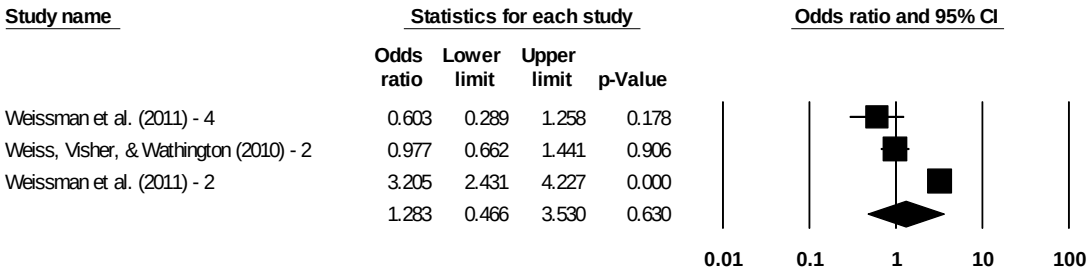

Figure 33. Forest plot of the OR effect sizes for LCs without contextualized/integrated curriculum among community colleges only.

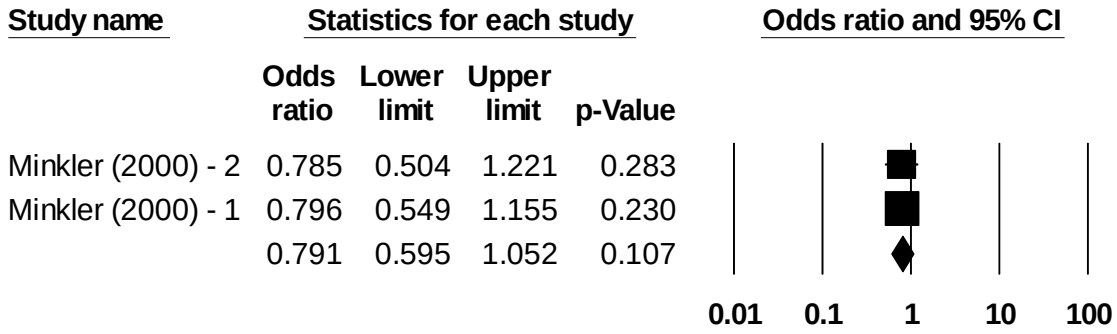

Figure 34. Forest plot of the OR effect sizes for LCs with contextualized/integrated curriculum that was mixed among community colleges only.

Sensitivity analysis for contextualized/integrated curriculum. A sensitivity analysis was performed to determine if one study impacted the average effect size more than any other study included in the contextualized/integrated curriculum comparison analysis. Removing one study at a time resulted in OR ranging from 1.2 to 1.3 for the effect sizes calculated at community colleges. Indicating that removing each study and recalculating the effect size did not dramatically impact the results, the average effect size with all 23 effect sizes was 1.3.

Publication bias for contextualized/integrated curriculum. Publication bias for the contextualized/integrated curriculum comparison analysis was assessed with a funnel plot and with Orin's Fail-Safe *N*. The Funnel Plot was fairly symmetrical indicating that there was not publication bias (see Figure 35). However, when calculating Orin's Fail Safe *N*, the number of missing studies needed to bring the OR less than 1.05 was 84. Using Rosenthal's (1979) formula (*5k + 10*) for the file drawer study tolerance level the threshold of 125 [5(23) + 10 = 125] was not exceeded, suggesting that publication bias may be present.

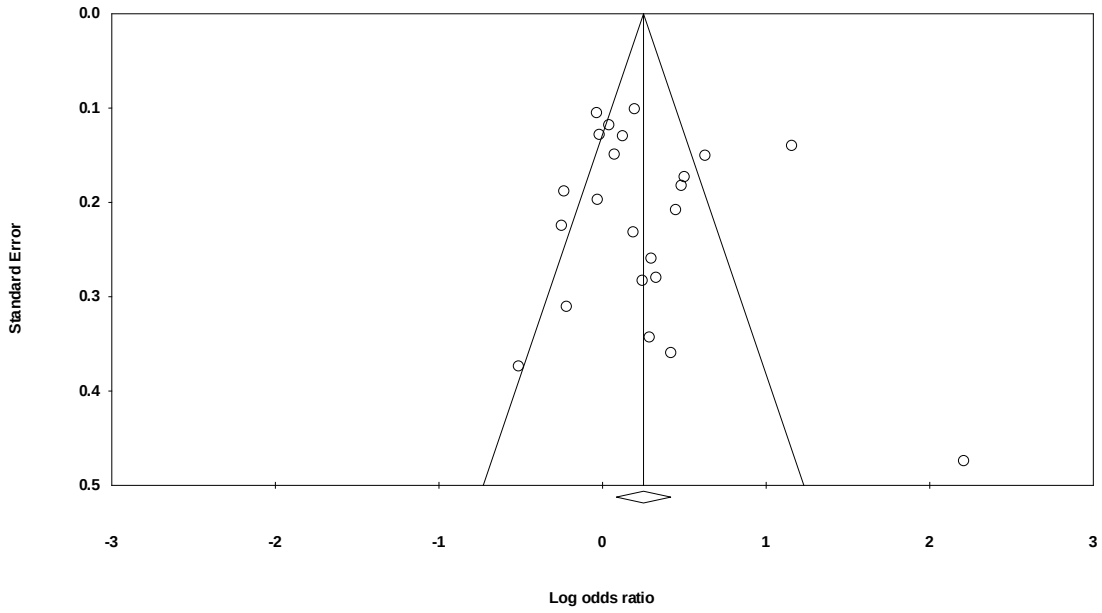

Figure 35. Funnel plot of standard error by log odds ratio for contextualized/integrated curriculum among community colleges only.

Summary and Transition

This chapter illustrated the results from the meta-analysis in response to each research question, procedures for data collection, description of the studies included in

the meta-analysis, a description of how the moderator and effect size data was collected, issues with collecting and compiling the data, a quality assessment of the studies, and a sensitivity and publication bias analysis. The literature search led to the examination of 1,062 references, and the full-text review occurred for 156 studies. Employing the inclusion and exclusion criteria for the full-text review resulted in the selection of 39 studies, generating 50 effect sizes; including 51,819 college students and 29,652 of which were community college students.

In general, the results from the meta-analyses were mixed. First, although there was not a statistically significant difference between LC programs at community and 4-year colleges, students participating in LC programs at a 4-year college were 2 times more likely to achieve the study outcome compared to community college students who were only 1.3 times more likely to achieve the study outcome.

Research Question 2 sought to identify which student outcome was most affected by participation in an LC. LC did not appear to have a statistically significant impact on the type of student outcome for community college students. Specifically, community college students were 1.6 times more likely to complete a course successfully if they participated in an LC, and participating in an LC was negatively related to GPA (see Table 5). In addition, community college students who participated in an LC were also 1.5 times more likely to achieve a self-reported learning outcome. Comparing both of these outcomes to GPA only indicated that community college students participating in an LC were almost statistically significantly more likely to complete their course successfully than an increase in their GPA, Q (1) = 3.734, p = .053 (see Table 5).

However, community college students who participated in an LC were statistically more likely to achieve a self-reported learning outcome than increase their GPA, Q (1) = 4.057, p = .044. These data indicate that community colleges seeking to increase course success and self-reported learning outcomes may want to choose LCs as a strategy to achieve these outcomes.

Table 5

Community College Learning Community Characteristics Statistically Different from Each Other

Learning Community Comparisons	Odds Ratio	P-Value
Course Success	1.6	.053
GPA	.987	
Self-reported learning outcome	1.5	.044
GPA	.987	
Linked with academic skills course	2.9	.038
Transfer courses only	.956	
Access to additional support services	1.4	.003
Did not have access to support services	.976	
Access to counseling	1.6	.011
Did not have access to counseling	1.1	

Research Question 3 identified whether or not two or three linked courses were the most effective at achieving the study outcomes and if the type of linked courses increased the likelihood of achieving the study outcomes. Community college students were statistically more likely to achieve the study outcome if they participated in two or three linked courses and were slightly more likely to achieve the study outcome if they participated in LCs with two linked courses. However, the difference between two and three linked courses was not statistically significant, Q (1) = .758, p = .384, indicating that community college programs consider both when developing LC programs at their colleges.

When examining the relationship between study outcomes and type of LC, community college students were 2.9 times more likely to achieve the study outcome if one of the linked courses that they participated in was an academic skills course (*OR* = 2.9, $\pm$ 1.8, p = .041). Students participating in developmentally linked courses were only 1.2 times more likely to achieve the study outcome, and 1.2 times if the linked courses were transfer and developmental level. Conversely, community college students were 1.0 times less likely to achieve the study outcome if the linked courses were transfer level only. Examining the data further indicated that community college students were statistically significantly more likely to achieve the study outcome if they had participated in a linked course that included an academic skills course when compared to students who participated in transfer only linked courses, Q (1) = 4.316, p = .038 (see Table 5). Academic skills courses may be an important component in increasing the likelihood of community college students achieving the study outcomes.

Research Question 4 examined how each of the following LC program components related to the study outcomes: additional support services, counseling, first-year college students, size of the college, and whether or not the integration of curriculum occurred. First, students participating in LC programs with additional support strategies were 1.4 times statistically significantly more likely to achieve the study outcomes (*OR* = 1.4, ± .28, *p* = .001). Conversely, community college students participating in programs without additional support strategies were less likely to achieve the study outcomes (*OR* = .976, ± .12, *p* = .720). The results here strongly suggest that community colleges need to consider including additional support strategies when developing LC programs, *Q* (1) = 8.717, *p* = .003 (see Table 5). Equally important, counseling was an additional support strategy that was also found to be highly related to achieving the study outcomes (see Table 5). Community college students participating in LC programs with counseling were 1.6 times more likely to achieve the study outcome and statistically significantly more likely to achieve the study outcome when compared to students participating in LC programs without counseling, *Q* (1) = 6.536, *p* = .011.

Community college LC programs focused on first-year college students were statistically significantly more effective than programs that worked with all types of students, *Q* (1) = 2.212, *p* = .137. However, first-year college students were 1.3 times more likely to achieve the study outcome compared to programs with all students where students were 1.1 times more likely to achieve the study outcome.

In relation to the integration of curriculum, the findings indicated that integrating curriculum was not strongly related to the study outcomes. Community college students

were 1.2 times more likely to achieve the study outcome if they participated in a program with integrated curriculum, and 1.9 times more likely to achieve the study outcome if they participated in programs without integrated curriculum. Conversely, community college students were 1.3 times less likely to achieve the outcome in programs that were mixed, In addition, community college LC students who participated in linked courses that integrated curriculum were statistically significantly more likely to achieve study outcomes than students in LC programs where the integration of curriculum occurred in some of the linked courses (i.e. mixed), but not others, Q (1) = 9.495, p = .002. This relationship was not statistically significant when comparing students in programs with no integration to those in programs with mixed integration [Q (1) = .809, p = .368]. A limitation to these findings is that there was a much higher sample of courses that included integrated curriculum, n = 18, than those without integrated curriculum, n = 3, and those with mixed integration of curriculum, n = 2. In addition, at least one study included in the meta-analysis indicated that although the programs sought to integrate the curriculum it was rare that it was consistently integrated across all of the linked courses (Weissman et al., 2011).

Table 6 includes the odds ratios of all of the statistically significant results. Using the 1.4 cut-off to define a substantial effect described in Chapter 3, seven LC characteristics stand out as having a substantial impact on community college student success. Including an academic skills course in the LC had the largest impact on community college student success. Community college students were 2.9 times more likely to achieve the study outcome if they participated in an LC. Students who

participated in an LC were 1.6 more likely to successfully complete their course and 1.6 times more likely to achieve the study outcome if counseling was included in the LC program. Next, community college students who participated in an LC were 1.5 more likely to self-report a learning outcome and 1.5 times more likely to achieve the study outcome if the LC program was at a large community college. Community college students were 1.4 times more likely to achieve the study outcome if additional support services were included in the program or the students were first-year college students. Four out of the seven substantial effect sizes appeared to not have publication bias based on Orwin's Fail-Safe *N*: academic skills linked course, course success, counseling included as a strategy, and LCs at large community colleges.

Table 6

Community College Learning Community Characteristics Statistically Related to the Study Outcomes by Odds Ratio, Number of Effect Sizes (ESs), and Publication Bias

Learning Community Characteristic	Odds Ratio	Number of ESs	Publication Bias Indicated
Academic skills linked course	2.9	3	No
Course success	1.6	8	No
Counseling included	1.6	9	No
Self-reported learning outcomes	1.5	4	Yes
Large CC (8,000-14,999)	1.5	11	No
Additional support services	1.4	16	Yes

(table continues)

Learning Community Characteristic	Odds Ratio	Number of ESs	Publication Bias Indicated
First-year CC students	1.4	17	Yes
Community colleges (CC)	1.3	24	Yes
Two linked courses	1.3	17	Yes
Integrated curriculum	1.3	18	Yes
Three linked courses	1.2	6	Yes
Developmentally linked courses	1.2	8	Yes
Transfer linked courses	1.2	4	Yes
Extra-large CC (>15,000)	1.1	9	Yes

Chapter 5: Discussion

In Chapter 5 includes a brief review the methodology and purpose of the study, a brief summary of the results, an in-depth interpretation of the results, exploration of implications for social change, and recommendations for action and future study. This meta-analysis was conducted to help educators identify the type of LC that will best help students at colleges with diverse cultures attain their goals and to be successful. The four research questions were developed to help facilitate the process of implementing LCs to help to increase the likelihood that students will effectively reach their goals. As an illustration, perhaps a large community college wants to increase the course success rate of first-year students at their college. The results of a meta-analysis will illustrate if an LC is the best strategy to achieve this outcome and the best way to implement the LC to achieve the outcome.

In this study, the effectiveness of LCs were examined by college type and if LCs impacted community college student outcomes differently. Equally important, specific to community colleges only, the number and type of linked courses, support services, counseling, first-year college students, the size of the college, and integration of curriculum were also examined to identify the strategies that will best help community colleges implement LCs.

Interpretation of Results

The following examines the interpretation of results from the meta-analysis findings from this dissertation. In general, the results are consistent with the literature, with some exceptions.

Research Question 1

Are community college students more likely to be successful when they participate in an LC than 4-year college students who participate in an LC?

The results did not indicate that community college students were more likely to be successful when they participated in an LC than 4-year students who participated in an LC although the difference between higher educational segments was not statistically significant. The literature supports the findings that LCs are related to the study outcomes for both community and 4-year colleges (Andrade, 2007; Baker & Pomerantz, 2002; Baker et al., 2004; Barnes & Piland, 2010; Dunlap & Pettitt, 2008; Johnson, 2000; Killacky et al., 2002; Keup, 2005; Marzaono et al., 2001; Price & Lee, 2005; Smith, 2010; Soldner et al., 2009). Even though the difference in the effect for LCs is not statistically significant, it does appear to be substantial. One explanation for this might be the methodological quality of the community college studies compared to the 4-year college studies (Lipsey & Wilson, 1993). Forty-six percent of the community college effect sizes were from studies employing random assignment where students were randomly assigned to the LC treatment group and the comparison group. None of the effect sizes from the 4-year college studies used random assignment. Another possible explanation is that the research has indicated that LCs are more effective at 4-year colleges that are primarily commuter schools (Andrade, 2007). A better comparison group to community colleges might have been commuter 4-year colleges. Another possible explanation is that there may not have been a large enough sample to accurately reflect all of the research on LCs conducted at LCs.

Research Question 2

What student success outcomes do LCs have the largest effect on among community college students?

Examining the results of how LCs impacted student outcomes among community college students indicated that course success and self-reported learning outcomes were more likely to be impacted by LCs. LC community college students were 1.6 times more likely to complete courses successfully and 1.5 times more likely to achieve self-reported learning outcomes than non-LC community college students. The literature supports both LCs being positively related to course success (i.e. academic achievement) and self-reported learning outcomes (Andrade, 2007; Baker et al., 2004; James et al., 2006; Killacky et al., 2002; Marzaono et al., 2001; Minkler, 2002).

Tinto's (1976) model of student departure and model of student persistence (Tinto, 2000) both support the findings that LCs have a positive impact on course success and self-reported learning outcomes (for example, student engagement and motivation). Tinto (1975, 1997b, 2000) argued that students who do not interact with others at the college are less likely to integrate into the social system. In addition, to promote social integration colleges need to implement LCs because the classroom is the center of educational activity for community college students. Astin's (1999/1984) student involvement theory is also supported by the finding that academic involvement is related to student success, LCs increase student involvement as evidenced by the increase in the self-reported learning outcomes and course success.

On the other hand, findings for both GPA and retention were not supported by the literature or the current Tinto (2000) model of student engagement and Astin's (1999/1984) student involvement theory (Andrade, 2007). GPA was negatively related to LC participation, and the odds ratio and dispersion of effect sizes indicated that there is not a relationship between LC participation and GPA (see Figure 7, Chapter 4).

Students participating in an LC were more likely to be retained from term-to-term. Specifically, students participating in an LC were only slightly more likely to be retained from term-to-term (i.e. persistence). This finding suggests that there is not a relationship between retention and LC participation, which is not consistent with the literature (Baker & Pomerantz, 2000; Johnson, 2000; Soldner et al., 1999). However, one study examining persistence and participation in LCs found evidence that LC participation was not related to persistence. The study was conducted at a 4-year college and used random sampling. The evidence from the present study did not support one of the primary aspects of Tinto's (1975, 1997b, 2000) model of student persistence, that participation in activities like LCs will lead to persistence. Some possible explanations for the discrepancy might be the way in which programs implement LCs, whether or not the sample was randomly assigned, and whether or not the integration of curriculum occurred.

Research Question 3

To what extent do the effects of LCs on community college student success differ by the type of LC (e.g., number of linked courses and type of linked courses)?

Examining the relationship between LC participation and study outcome by the number and type of linked courses indicated that there was a slight positive relationship for both. There was not a statistical difference between LCs with two or three linked courses. The literature supported the finding that the number of linked courses did not appear to be related to student outcomes (Andrade, 2007). However, there is some indication in the literature that it is difficult for faculty to integrate the curriculum across linked courses, and it may be easier to integrate curriculum and less costly to implement LC programs with only two linked courses (Weissman et al., 2011).

Community college students participating in LC programs that included an academic skills course as one of the linked courses were 2.9 times more likely to achieve one of the four study outcomes: course success, term-to-term retention, GPA, or self-reported learning outcome. Programs with developmentally linked courses only or a combination of developmental and transfer level linked courses were 1.2 times more likely to achieve the study outcome, which was not substantial. Transfer level courses are college courses where the credit earned can be transferred to 4-year colleges. One of the most challenging aspects, when implementing LCs identified in the literature, is finding a way to implement the most effective LC combinations (Killacky et al., 2002; Minkler, 2002). The research from the meta-analysis strongly suggests that when implementing an LC program the strongest method for increasing the likelihood of student success is to include an academic skills course as one of the linked courses. In addition, LCs also appear to be more effective with developmental courses than when linked courses only consist of transfer level courses.

Research Question 4

To what extent do the effects of LCs on community college student success differ by the characteristics of how the LC was implemented (e.g. additional support services and strategies, student characteristics, contextualized curriculum and the size of the college)?

Students participating in LC programs that provide additional support services or strategies or included counseling were statistically significantly and substantially more likely to achieve the study outcome, more likely to achieve the study outcomes. The literature and theoretical models on persistence and departure strongly supported this finding. Past research has indicated that students participating in more than one strategy were more likely to feel connected to and interact with the institution (Andrade, 2007; Keup, 2005). In his theory of student involvement Astin (1999) argued that the physical and psychology energy that a student dedicates to his or her academic experience defines student involvement. LC programs increase the amount of physical and psychological involvement that students have with the institution when they require or make additional support strategies and services to students more available. The findings here strongly support this aspect of Astin's student involvement theory. Tinto (2000) also argued that the one experience that every student in college shares is the classroom. The findings here strongly support this aspect of Tinto's theory because students are being connected to services through the classroom and may not have accessed the additional support strategies and counseling if they were not available through the classroom.

First-year LC community college students were 1.4 times more likely to achieve the study outcomes than non-LC students. The literature and theoretical perspectives on engagement and departure support this finding. Specifically, first-year college students are less likely to feel isolated when they participate in an LC (Keup, 2005). In addition, research has indicated that LCs are effective with first-year college students and diverse learners (Dodge & Kendall, 2004; Dunlap & Petitt, 2008; Hesse & Mason, 2005; Jehangir, 2009). Tinto (2000) argued that the importance of LCs is to help build supportive peer groups and increase involvement to help first-year College students transition to college and that this can best be achieved in the classroom. In addition, Astin (1999) felt that higher education should be driven by student involvement to help administrators and faculty design effect programs for students to transition and connect to the college.

Students participating in LCs at large (8,000-14,999) community colleges were 1.5 times more likely to achieve the study outcomes and students at extra-large (>15,000) colleges were 1.1 times more likely to achieve the study outcomes. These findings indirectly support the literature. For instance, LCs were not substantially as effective at extra-large institutions. However, the literature suggests that students are less likely to feel engaged at larger commuter colleges and LCs may help to connect students at large schools with other students (Andrade, 2007; Cohen, 2003; Tinto, 1975). In his model of student persistence Tinto (2000) also argued that LCs allow connections with other students. Students have an increased chance of developing connections because the same small group of students in the same class increased the likelihood of friendships

developing than in a course that is not part of an LC, which, based on the literature, could be more important at larger colleges.

Past research on LCs has indicated that gains in persistence were more likely to occur when the faculty had worked together to integrate the curriculum by creating common assignments and course content (Andrade, 2007; Barnes & Piland, 2010; Smith, 2010). In contrast, one study found that having linked courses without integrating the curriculum increased persistence (Baker & Pomerantz, 2000). Community college students who participated in an LC program with integrated curriculum were 1.3 times more likely to achieve the study outcome. However, students who participated in an LC program with integrated curriculum were not statistically significantly more likely to achieve the study outcomes than students who participated in an LC program without integrated curriculum. Similar to the literature these results are mixed. A limitation of these results is that there was a much larger sample of effect sizes identified as coming from programs with integrated curriculum, 18 and three respectively. In addition, at least one study included in the meta-analysis indicated that although the programs sought to integrate the curriculum, it was rare that it was consistently integrated across all of the linked courses (Weissman et al., 2011). These results suggest the possibility that the 18 effect sizes identified with integrated curriculum may also have mixed results in terms of how well-integrated curriculum occurs within each LC program.

Relating Results to LC Theory

LCs were originally developed by Meiklejohn (2001/1932) to improve the undergraduate education of first and second year college students. Meiklejohn reasoned

that students would be more likely to learn if they were part of a community of students and faculty (Guyotte, 2001). This meta-analysis found that first-year community college students who participated in an LC were substantially and statistically significantly more likely to achieve the study outcome then first-year community college students who did not participate in an LC program; this provides support to Meiklejohn's hypothesis that LCs would help first-year college student's transition to college was correct. Moreover, Tinto's (2000) model of student departure theorized that LCs would help first-year college student's transition to college because the strategies focus was in the classroom.

One of the strategies used by Meiklejohn (2001/1932) and the faculty who first implemented LCs was the integration of curriculum. The purpose of integrating the curriculum was to help students generalize information and not focus on only one small aspect of an issue. Community college students were 1.3 times more likely to achieve the study outcome if they participated in an LC program incorporating integrated curriculum then community college students who did not participate in an LC program. The integration of curriculum does not appear to be strongly related to LC participation; however, this may be a result of the inability to identify how well the integration of curriculum occurred in each program. In addition, research has indicated that the effectiveness of LCs is related to how well the curriculum is integrated (Weissman et al., 2011).

Tinto (2000) argued that LCs help to engage students to the college community by helping students build supportive relationships with other students. The meta-analysis indicated that community college students who participated in an LC were 1.5 times more

likely to achieve higher self-reported learning outcomes like increased involvement and motivation. These findings support Tinto's belief that students who participate in LCs are more likely to connect with the college.

Tinto's (2000) theory that LCs increase the likelihood of student learning is mixed. LC students were 1.6 times more likely to complete their courses successfully, but 1.01 times less likely to earn a higher GPA than non-LC students. Accordingly, LC participation did not have an effect on GPA but was positively related to successfully course completion. These results suggest that LC participation may have an impact on student learning; however, grades are not necessarily an indication of learning.

Tinto (2000) also argued that LCs increase the likelihood that students persist, remain in college, and achieve their educational goals. Community college students who participated in an LC were only 1.1 times more likely to persist from term-to-term than community college students who had not participated in an LC. Suggesting that participating in an LC does not help students remain in college. However, the effect of LC participation on term-to-term persistence may be related to how well programs integrate the curriculum.

Limitations

Many institutional research offices conduct research on LCs (Morest & Jenkins, 2007). It was beyond the scope of the researcher to process a sample of these studies. As a result, the peer-reviewed studies, dissertations, and research obtained from web sites may not be a complete representation of all the research conducted on LCs. Moreover,

the sample size may be too small to accurately reflect the relationship between LCs and the study outcomes.

A second limitation is in relation to the information on the effects of integrating curriculum on the effectiveness of LCs. Because such a high number of effect sizes identified the integration of curriculum and the literature suggests that the quality of integrating curriculum is mixed, the results suggest that more information needs to be obtained to improve the accuracy of results in this particular case (Weissman et al., 2011).

A common criticism of a meta-analysis is that the judgment of the researcher shapes the decisions (Bangert-Downs, 1997; Wanous, Sullivan, & Malinak, 1989). In order to help with the reader understanding the decisions made by the researcher, the decisions are outlined in great detail in Chapter 4.

The fourth limitation was that most of the findings with a significant effect appeared to have the file-drawer problem indicating that publication bias may be present. However, four of the seven substantial effect sizes did not appear to have publication bias: academic skills linked course, course success, counseling included as a strategy, and LCs at large community colleges.

Research has indicated that the relationship between persistence (i.e. term-to-term retention) is mixed (Barnes & Piland, 2010; Goldberg & Findelstein, 2002; Johnson, 2000; Potts et al., 2004). A possible explanation for the difference in findings in persistence might be the length of the term-to-term retention that is examined. Namely, the analysis on persistence included six effect sizes. A limitation of this study is that

persistence length was not examined. For example, the effect size reported for persistence could have been from fall to spring or fall to fall.

Implications for Social Change

Community colleges face pressure to improve student performance (Barnes & Piland, 2010; Keup, 2005; Soldner et al, 1999; Tinto, 2006). Due to this, colleges are continuously seeking effective and cost-efficient programs that improve student success (Johnson, 2000; Keup, 2005; Soldner et al., 1999). This meta-analysis was conducted to help community colleges choose whether or not to implement an LC program, and if they do to choose to implement an LC program, the results illustrated here can help to inform the development of an LC program. For example, educators who work at a medium size college may examine the results here and choose not to implement an LC program.

The results indicated that LCs substantially increased the study outcomes for 4-year students, but this was not a statistically significant finding. Based on the research findings presented in this meta-analysis, the following recommendations are warranted for educators at community colleges who are considering implementing an LC program or have implemented an LC program and wish to improve the program.

Implementing LC programs with two linked courses can help reduce the cost of the program and make it easier for instructors to integrate curricula. Students participating in linked courses where the integration of curriculum occurred were 1.3 times more likely to achieve the study outcome; however, evidence suggests that LC programs struggle with integrating the curriculum. In addition, students in LC programs with two linked courses were 1.3 times more likely to achieve the study outcomes.

1. Include an academic skills course as part of the LC (Andrade, 2007; Smith, 2010). Students are 2.9 times more likely to complete one of the study outcomes if one of the linked courses is an academic skills course.
2. Focus the LC linked courses in developmental courses or developmental courses linked with transfer courses (Barnes & Piland, 2010; Mahoney & Schamber, 2011; Smith, 2010). LCs did not appear to be positively related to the study outcomes when the linked courses included transfer only courses.
3. Provide access to a counselor in the LC program (Andrade, 2007; Astin, 1984; Keup, 2005). Students were 1.6 times more likely to achieve one of the study outcomes when they had access to a counselor.
4. Incorporate additional student support and instructional strategies into the program (Andrade, 2007; Keup, 2005; Killacky et. al, 2002; Minkler; 2002; Smith, 2010). Students were 1.4 times more likely to achieve one of the study outcomes when they had access to additional strategies.
5. Implement an LC program if the goal is to increase course success or student engagement (Darabi, 2006; Dunlap & Pettitt, 2008; James et al., 2006). LC students were 1.6 times more likely to complete their course successfully and 1.5 times more likely to score higher on self-reported learning outcomes like engagement and motivation.

Recommendations for Future Studies

There are three recommendations for future studies. First, a better comparison of LCs at community colleges with 4-year colleges might have been a comparison group of

community colleges to 4-year commuter colleges. Comparing community colleges to 4-year colleges that are primarily commuter schools would have been a more methodologically sound comparison. Comparing commuter 4-year schools to community colleges supports Tinto's (1975) idea that students are less likely to engage at commuter colleges, which is similar to community colleges. In addition, LCs have also been found to be more effective at commuter colleges.

Second, Tinto's (1997b) revised model of student departure includes student intentions and external commitments. Future meta-analysis research needs to focus on collecting information on student intentions and external commitments. In order for this to be possible though, researchers examining the effectiveness of LCs need to focus on collecting data on student intentions and the external commitments of students.

Finally, one of the main limitations identified in the study was the high proportion of effect sizes identified as having integrated curriculum and the possibility that the degree to which integrated curriculum across these studies varies widely (Weissman et al., 2011). In order to identify the effectiveness of integrated curriculum future research needs to categorize and track the percent of LC linked courses that provide an integrated curriculum and the degree to which it integration occurs.

Conclusions

The guiding framework for this study was the idea that educators need to strive continuously to discover the most effective strategies identified through research and apply those to how students are educated (Dewey, 1895/1964a). Dewey (1895/1964a), Tinto (2006) and Astin (1999) have argued that the most important challenge that

researchers face is to translate research and theory into practices that are effective, and that can be implemented by educators to help as many students as possible stay in college reach their goals. Accordingly, the research conducted here helps advance the goal of translating research and theory into practice.

The question of whether or not to implement an LC program at a community college is challenging; results of this study are mixed, and LCs are costly (Hotchkiss et al., 2006). They can cost up to $135,000 annually; however, there is also evidence indicating that LCs can generate $350,000 in downstream revenue (Johnson, 2000). In the following narrative I present a possible scenario at a community college to demonstrate the most optimal situation in which to implement an effective LC. In addition, I also highlight some of the questions that each institution exploring whether or not to implement an LC will want to consider.

In this narrative a group of instructional faculty, a counselor, and a professional developmental coordinator, arranges a meeting with an administrator to discuss the possibility of implementing an LC program at their community college. One of the faculty members begins by explaining to the administrator that they have some experience with implementing LCs at another community college. They explain that they have been reading the research literature on the effectiveness of LCs in community colleges. They would like to use this evidence to develop an LC program. The administrator was very excited at this news. She explained to the faculty that she had also been reviewing the literature on the effectiveness of LCs and had planned to start a discussion on creating an LC program in some of the appropriate campus committees.

The group of faculty explains to the administrator that the research indicates that LCs are more likely to increase student engagement and successful course completion when the LC programs include:

- An academic skills course is one of the linked courses
- Counseling
- Additional support services like tutoring
- The community college has from 8,000 to 15,000 students

In addition, they also know that the number of linked courses in the LC does not appear to impact LC students substantially and that the effectiveness of integrating curriculum on engagement, success, GPA, and retention is still unclear.

Administrator: "What do you think will be some of the biggest challenges to implement an effective LC program?"

Instructional Faculty #1: "There are two big challenges that we can foresee right now based on the research. First, implementing an effective LC program can be costly. To implement an effective LC program we need to include counseling, tutoring services, and find a way to integrate the curriculum. I know that the research is unclear on the effectiveness of integrating curriculum, but I have anecdotal experience at doing this, and I believe that it will be an important component to implementing an effective LC program. The costs will include the cost of providing tutoring and counseling services as well as paying instructional Faculty a stipend to spend one semester integrating their curriculum."

Administrator: “Do you have an idea about how much the stipend for each Faculty participating in an LC will cost?

Professional Development Coordinator (PDC): “The research suggests that there was not a strong relationship between the number of linked courses in an LC and student outcomes. As a result, we would like to limit the number of linked courses to two or three. Two if the LC does not include an academic skills course, and three only if the third course is an academic skills course. In this way, we will reduce some of the cost and difficulty in trying to integrate the curriculum of four or more courses. We think that the stipend will be somewhere between $1,000 to $3,000.”

Administrator: “What will the faculty be being paid for?”

PDC: “We believe that the effectiveness of the LC program is in part due to how well faculty integrate curriculum. Due to this, we want to require faculty that want to participate in an LC to spend one semester working with me to integrate their curriculum. I would facilitate the meetings with the faculty participating in the LC in the first and second semesters to ensure that the integration of curriculum and to work through any challenges in the second semester.”

Counselor #1: “Two of the major objectives in our strategic plan are to increase student engagement and course success. We know that the cost of implementing an LC program can be prohibitive; however, the research supports implementing an LC program to increase student engagement and course success. In addition, the research also indicates that LC programs can generate downstream revenue that is three times the amount that it costs to run a program.”

Administrator 1: “It sounds like you have put a lot of time and energy into developing this proposal. How can I help you?”

PDC: “How do we go about starting an LC program and where do we find the money?”

Administrator 1: “First, let me worry about the money. There are a lot of different possibilities. Second, I would strongly suggest that we create a Learning Communities Steering Committee to develop a plan for implementing an LC and that we plan on starting the program next year. This will give me time to find a funding source and time for the committee to develop a training program and recruit participants. In addition, I also think that the plan we develop needs to include targets for student engagement and course success, as well as an annual review of the effectiveness of the program, and how we can improve the program. I also think that we need to develop a scale to measure how well instructors are integrating curriculum. We will need to incorporate the results from this analysis into the research so that we can learn if the integration of curriculum is an effective strategy and worth the cost, time and energy to implement.”

This narrative is the ideal; however, some crucial points were highlighted in the narrative. The LC strategies that had the highest impact the student outcomes were including an academic skills course, tutoring, counseling, and implementing an LC at a college with 8,000 – 15,000 students. Another important consideration is the cost of implementing an LC, and that community colleges need to consider if the cost, the

possible downstream revenue, and the expected outcomes are worth the effort. Finally, the effectiveness of integrating curriculum needs to be investigated further.

In conclusion, learning communities effectively increase the likelihood that students will achieve their outcomes. However, implementing effective LC programs at unique community colleges with diverse learners can be challenging. Accordingly, learning communities are most effective when they include additional support strategies; counseling is available to students, one of the linked courses is an academic skills course, and when the focus is on increasing course success or student engagement.

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Appendix A: Websites Searched for Possible Relevant Studies

Organization	Internet Address
Achieving the Dream	www.achievingthedream.org/
Achieve, Inc.	www.achieve.org
American Association for Community Colleges	www.aacc.nche.edu
American Association of Colleges for Teacher Education	aacte.org/
American Council on Education	www.acenet.edu
American Youth Policy Forum	www.aypf.org
Association for Institutional Research (AIR)	www.airweb.org
Association for Supervision and Curriculum Development	www.ascd.org
Association for the Study of Higher Education (ASHE)	www.ashe.ws/
Association of American Colleges and Universites	www.aacu.org
Bill & Melinda Gates Foundation	www.gatesfoundation.org
Boston College Center for International Higher Education	www.bc.edu/research/cihe.html
Carnegie Foundation for the Advancement of Teaching	www.carnegiefoundation.org/
Center for Research on Developmental Education and Urban Literacy	www.cehd.umn.edu/crdeul/
Council for the Study of Community Colleges	www.cscconline.org/
Discovery and Innovation: Federal Research and Development Activities	www.rand.org/pubs/monograph_reports/MR1194.html
Education Commission of the States	www.ecs.org
Education Policy Institute	www.educationalpolicy.org
EDUCAUSE	www.educause.edu/
Higher Education Research Institute	heri.ucla.edu/
Illinois Community College System	www.iccb.org/
Institute on Education and the Economy	http://www.tc.columbia.edu/centers/iee/
Kellogg Foundation	www.wkkf.org
League for Innovation in the Community Colleges	www.league.org/
Learning Research & Development Center	www.lrdc.pitt.edu/
Lumina Foundation	www.luminafoundation.org/
MDRC (Manpower Demonstration Research Corporation)	www.mdrc.org/
MPR Associates	www.mprinc.com
Charles Stewart Mott Foundation	www.mott.org
National Center for Higher Education Management Systems	www.nchems.org/
National Center for the First-Year Experience and Students in Transition	www.sc.edu/fye/
National Information Center for Higher Education Policymaking and Analysis	www.higheredinfo.org/
National Center for Postsecondary Research	http://www.postsecondaryresearch.org/
National Center for Public Policy and Higher Education	www.highereducation.org/
National Research Council	www.nas.edu/nrc/
National Science Foundation	www.nsf.gov
Office of Community College Research and Leadership	http://occrl.illinois.edu/

(table continues)

Organization	Internet Address
Postsecondary Education Opportunity	www.postsecondary.org
Practical Assessment, Research & Evaluation	edresearch.org/pare/
Rockefeller Foundation	www.rockfound.org
Society for College and University Planning	www.scup.org
Washington Center for Improving the Quality of Undergrad Education	www.evergreen.edu/washcenter/project.asp?pid=73

Appendix B: Coding Template Form for Moderator Variables for Studies Included in Meta-Analysis

Study Coding Number: _____ Effect Size: _____

Title of Study: _____ Authors of Study: _____

Study Characteristics / Moderator Variables

Methodological Quality of the Study

Publication Type: _____

1 = Peer Reviewed

2 = Web Site

3 = Dissertation

Sample Size: _____

1 = N less than 50

2 = N 51 to 100

3 = N more than 100

Sample Type: _____

1 = Random

2 = Non-Random

Outcome Variable Type: _____

1 = Continuous

2 = Dichotomous

Research Questions 1 and 2

Higher Education Segment: _____

1 = Community College

2 = 4-year College

Student Outcome: ___

1 = Course Success

2 = Retention (i.e. Persistence)

3 = GPA

4 = Self-Reported Learning Outcome

Research Questions 3 and 4 (Type and Setting)

College Size: _____

1 = Small (<4,500)

2 = Medium (4,500-7,999)

3 = Large (8,000-14,999)

4 = Extra-Large (>15,000)

Number of Linked Courses: _____

2 = Two

3 = Three

4 = Four

5 = Five

9 = Unknown

Number of Additional Strategies: _____

0 = Learning Community Only

1 = 1 additional strategy

2 = 2 additional strategies, etc.

Type of Linked Courses: _____

1 = Developmental Courses Only

2 = Transfer Courses Only

3 = Developmental and Transfer

4 = Academic Skills w/ any other Course

5 = Unknown

Additional Strategies: _____

1 = Yes

2 = No

3 = Unknown

First Year College Students: _____

1 = Yes

2 = No

3 = Unknown

Additional Strategy was Counseling: _____

1 = Yes

2 = No

3 = Unknown

Contextualized Curriculum: _____

1 = Yes

2 = No

3 = Unknown

Appendix C: Excluded Studies

Category	Excluded Studies	
	#	%
Professional Learning Community (PLC)	454	44.4
Did not study learning communities	133	13.0
Review and Conceptual Articles	89	8.7
Studies with violations of LC definitions	58	5.7
Virtual Learning Community	52	5.1
Living Learning Community	45	4.4
Did not study college students	40	3.9
Case Studies and Qualitative Studies	35	3.4
Multiple Reasons	28	2.7
Service Learning	23	2.2
Did not assess outcomes specified in dissertation	22	2.2
Article/Book Reviews	18	1.8
News Release/Article	7	.7
Insufficient Statistical Data	6	.6
Multiple Colleges	6	.6
Information Requested from Author and Not Provided	5	.5
Reference Not Available	1	.1
Reported Data already reported from prior publication	1	.1
Total	1,023	100

Note. Categories, numbers, and percentages of excluded studies for every abstract reviewed.

Curriculum Vitae

Keith Wurtz (keith.wurtz@waldenu.edu)

Contact Information
11711 Sand Canyon Rd.
Crafton Hills College
Yucaipa, CA 92399
(909) 389-3206

Experience

2012 – Present Dean, Institutional Effectiveness, Research, & Planning	Provides evidence to facilitate evidenced-based decision making	Crafton Hills College
2010 – 2012 Director of Institutional Research	Developed processes that produce reliable data, providing employees easy access to data, and training on how to access, interpret and utilize data	Crafton Hills College
2003 – 2009 Senior Research Analyst	Helped to coordinate office and research projects. Used Logistic Regression and Discriminant Analysis to determine multiple measures for Computerized Placement Tests (math, English, reading, and ESL).	Chaffey Community College
1997 – 2003 Research Analyst	Designed and developed online analytical processing cubes for regular posting of positive attendance data and the relationship between success and use of Success Centers (i.e. Instructional Labs)	Chaffey Community College
1996 – 2005 Adjunct Sociology Faculty	Department of Social and Behavioral Sciences	Chaffey Community College

Education	2005 – Present PhD in Psychology (Evaluation and Research)	Walden University	Minneapolis, MN
	1991 – 1996 Master of Arts Sociology	California State University, Fullerton	Fullerton, CA
	1986 – 1990 Bachelor of Arts Behavioral Science Minor in Criminal Justice	California Polytechnic University, Pomona	Pomona, CA

Publications

Cawthon, S. W., & Wurtz, K. A. (2009). Alternate assessment use with students who are deaf or hard of hearing: an exploratory mixed-methods analysis of portfolio, checklists, and out-of-level test formats. *Journal of Deaf Studies & Deaf Education, 14 (2),* 155–177. doi:http://dx.doi.org.ezp.waldenulibrary.org/10.1093/deafed/enn027

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