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Do New Buildings, Equipment, and Technology Improve Student Outcomes? A Look at One Community College's Experience

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DO NEW BUILDINGS, EQUIPMENT, AND TECHNOLOGY IMPROVE STUDENT OUTCOMES? A LOOK AT ONE COMMUNITY COLLEGE'S EXPERIENCE

by

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ABSTRACT

During the last decade, community colleges have taken a close look at the way they educate and train students, and are using an assortment of student engagement indicators in an effort to assess and document learning outcomes of their students. While these indicators have proven helpful, the extent to which new buildings, equipment, and technology have been integrated into these metrics has been sorely lacking; instead, the assumption has been that more modern facilities, equipment, and technology will improve students' learning and better prepare them for the workforce.

To test this assumption, this study examined the relationship between a new facility and student outcomes at one Southern California community college, specifically addressing the extent to which student perceptions regarding their professional preparation differed between students who completed their programs before and after the new building, as well as the extent to which student perceptions of the new building, equipment, and technology correlated with indicators of student engagement, persistence, preparation for the workplace, licensure exam passage rates, and faculty perceptions of these student outcomes. Using both descriptive and inferential techniques, results revealed that students who completed their programs in the new building perceived the facilities as having a positive influence on their overall learning, preparation for the workplace, and their licensure exam, and felt their program to be of better quality than did students who completed their programs in the old building. Interestingly, the facility had no significant influence on any of the student engagement factors—academic challenge, active and collaborative learning, student effort, and student-faculty interaction—although licensure passage rates of students completing their programs in the new

building were higher than students that completed their programs in the old building. Not surprisingly, faculty program directors perceived the new building, equipment, and technology as having a positive impact on student learning, and their preparation for the workplace.

Taken together, these results suggest that facility characteristics may provide a means in which to capture evidence of student learning, which can be useful for both accreditation and to reassure taxpayers that their fiscal investment is meeting needs of California businesses and industries.

DEDICATION

To Nicholas

Thank you for walking beside me throughout this journey. May you have your own exciting epistemological adventure.

To Eric

Thank you for your being my rock and soul mate.

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CHAPTER ONE

INTRODUCTION

Background to the Study

The California Community College System is the largest higher education system in the nation. It is a vital part of California's postsecondary education system, with nearly 3 million students enrolled every year (California Community College Chancellor's Office [CCCCO], 2002). Comprised of 112 colleges and 72 districts, the California Community College System serves as a gateway to higher education, offering 2-year associate degrees, basic skills remediation, preparation for transfer to a 4-year institution, training for the workforce, and opportunities for personal enrichment and lifelong learning (CCCCO, 2002). Over the last decade the growth in California's population, the increase in jobs requiring postsecondary education, the high unemployment rates, and the need for a better prepared and well-trained workforce has dramatically increased the demand for community college courses and programs. As community colleges throughout the state attempt to address the needs of their community, outdated facilities, obsolete equipment and inadequate technology hamper their efforts. In fact, in 2002, three-quarters of the California community college campus facilities were more than 30 years old (CCCCO, 2002; Copa & Wolff, 2002).

Local general obligation bonds measures have become a way in which community college districts obtain funding for construction, renovation, or replacement of school facilities; acquire school sites; and furnish and equip schools (Carroll, 2006; EdSource, 2000b). Since the passage of Proposition 39 in 2000, which reduced the taxpayer approval rate from two-thirds to 55% "super-majority" to authorize local general

obligation bonds for school construction, more California community college districts have been successful in passing such bonds (Carroll, 2006; EdSource, 2000a, 2000b). For example, in 2001, 13 out of 14 proposed bonds for community college capital outlay projects were passed by California voters. Together, these bonds totaled over $2 billion (CCCCO, 2002).

Although accommodating additional students has been one of the motivations behind community college districts' quest to renovate and build new facilities, there is also a general assumption that modern facilities, equipment, and technology will improve community college students' learning and better prepare students for the workplace (Flemming & Hedrick, 2008; Joch, 2008). However, there are limited data to support this assumption. In particular, the literature regarding community college facilities and outcomes is limited to studies related to buildings designed for recruitment and retention, creating physical spaces that support and enhance learning, and advancing the institution's mission (Calcara, 1999; Copa & Wolff, 2002; Joch, 2008). Many of these studies, unfortunately, lack the empirical analysis to support their recommendations for design, and those that do are limited to elementary and secondary school settings. Findings in these studies indicate a positive correlation between building characteristics and student achievement, behavior, and attitudes (Crampton, 2009; Earthman, 2002; Earthman & Lemasters, 1996; Schneider, 2002; Weinstein, 1979). Building characteristics generally measured include acoustics, aesthetics, building age, indoor air quality, lighting, thermal comfort, and ventilation (Earthman & Lemasters, 1996; Schneider, 2002; Weinstein, 1979).

As California taxpayers continue to make significant investments in new facilities for community colleges, it is critical for community colleges to be able to provide evidence that student learning is enhanced and students are better prepared for the workplace as a result of learning in modern facilities, with state-of-the-art equipment and technology. Evidence of student learning and accountability for community colleges is not limited to taxpayers and local communities. Community colleges are also responsible for meeting accreditation standards. During the last decade, the accreditation standards have shifted from a focus on input measures and tangible aspects of the institution, such as number of students applying to the institution, initial enrollments, modes of instruction, number of books in the library, and number of students that visited the library, to an examination of output measures which include learning outcomes, assessment, and evaluation (Beno, 2004; Wilson, Miles, Baker, & Schoenberger, 2000). California community colleges are now required to assess and document students' learning outcomes for accountability and evidence of continuous improvement (Beno, 2004; Dunsheath, 2010; Friedlander & Serban, 2004).

Given the challenges of measuring student learning, community colleges have begun to utilize student engagement indicators—which refer to a students' level of participation in school activities both inside and outside of the classroom—as a means to assess and evaluate student learning outcomes (Astin, 1985; Kuh, 2009; National Commission on the Future of Higher Education, 2006; Pace, 1979; Walker, Pearson, & Murrell, 2010). For the purpose of this research, engagement was comprised of two components: what the student does—attend class, complete homework, involvement in clubs, and so forth—and what the community college provides for student in the way of

programs, facilities, financial aid policies, parking, and so forth (Astin, 1985; Pace, 1982, 1984). Currently, there are two national surveys that measure student engagement indicators: the College Student Report (National Survey of Student Engagement [NSSE], 2000) for 4-year institutions and the Community College Student Report (Center for Community College Student Engagement, 2010) for 2-year institutions. Both surveys utilize the following five benchmarks to evaluate effective educational practices: active and collaborative learning, level of academic challenge, student-faculty interaction, enriching education experiences, and a supportive learning environment (Kuh, 2004, 2009; McClenney & Marti, 2006; McClenney, Marti, & Adkins, 2006).

These benchmarks, however, do not address the physical characteristics of a college campus, with regard to classrooms, equipment, technology and other building features. As California community colleges continue to be held accountable for student outcomes, it is imperative that all of the resources provided for students—including new buildings—be empirically examined to determine the extent to which these resources improve student outcomes.

Statement of the Problem

During the last decade, California community colleges have been increasingly successful in passing local general obligation bonds to build and improve facilities, and update equipment and technology. Proponents claim that physical improvements and state-of- the-art technology will enhance student learning and better prepare students for the global workplace. However, there is little, if any, empirical evidence to support this claim.

Purpose of the Study

The purpose of this study was to fill the void in the literature with regard to the relationship between buildings, equipment, and technology, and student engagement, student persistence, licensure exams passage rates, and workforce preparation, as perceived by community college students and faculty. The underlying hypothesis of this study was that buildings, equipment, and technology can have an influence on student engagement factors, which in turn influence student outcomes and behaviors. The study was organized around the following research questions:

1. To what extent do student perceptions regarding their professional preparation differ between students who completed their programs before and after the new building?
2. In what ways, if any, do student perceptions of the new building, equipment, and technology correlate with indicators of student engagement, student persistence, student licensure exam passage rates, student preparation for the workplace, and faculty perceptions of these student outcomes?

Justification for the Study

This study has potential implications for policy with regard to new facilities. These implications include bond measures and accreditation. For more than a decade, community college districts have successfully passed facility construction bond measures based on the assumption that new buildings, equipment, and technology positively impact student outcomes. However, in recent years, public concern has grown regarding the cost of these bonds (Lovett, 2013). Evidence from this study suggests that students trained in a new facility, with new equipment and technology, experienced better overall learning

and were better prepared for the workforce. This evidence provides potential support for community college districts that have constructed new facilities, as well as districts that are attempting to garner public support bonds for facility construction and renovation. Community colleges throughout the state are struggling to maintain their accreditation (Rivera, 2013). The area of student learning outcomes is one of the areas of focus for accreditation that has been particularly challenging (Beno, 2004; Friedlander & Serban, 2004). Community colleges must clearly document student learning goals and assess learning of these goals. The study suggests that providing an environment that is conducive to teaching and learning can result in positive student learning outcomes—namely, overall learning and preparation for the workforce. Therefore, when community college administrators are planning and developing new facilities, consideration should be given to creating facilities, with up-to-date equipment and technology, which allow faculty to maximize their teaching and provide opportunities for students to participate in student engagement activities.

Although the results of this study are not technically generalizable in the traditional scientific sense, the findings can assist educators and administrators to better understand the relationship between buildings, equipment, and technology, on the one hand, and student engagement, student persistence, licensure exams passage rates, and workforce preparation, on the other. This study addresses the void in the literature regarding the relationship between facilities and student outcomes.

Limitations of the Study

There are a number of limitations that need acknowledgment. First, the questions for the student surveys are modified questions from two nationally administered student

engagement surveys—the Community College Student Experience Questionnaire (CCSEQ) and the Community College Survey of Student Engagement (CCSSE). Although these questions were reviewed and piloted for accuracy and ease of understanding, the survey instrument used does not have the external reliability or validity as the complete national surveys. Second, the students responding to the survey were not limited to the specific cohorts originally requested. The survey invitation emails were sent to any student who took a class in one of the Allied Health programs. Given the wide range in program completion dates and low response rates, the researcher was unable to conduct before and after comparisons by specific program for each program as originally planned. The lack of student interviews is also a limitation. Interviews with students could have provided additional insight into students' perceptions. A fourth limitation for this study was that no survey responses were received from any Dental Assisting students. Therefore, their perspectives are not reflected in this study.

Another limitation for this study is the possibility of a *Hawthorne effect* (Adair, 1984; Diaper, 1990) with regard to the new facilities, equipment, and technology. That is, given the novelty of the new building, students and faculty may have a tendency to overemphasize the impact of the new building in their responses to the current study compared with students and faculty once they have been in the building a number of years. Lastly, the researcher has personal and professional relationships with some of the study participants. The researcher used caution and objectivity when collecting the data, analyzing data, and reporting the study findings (Glesne, 1999). The use of qualitative and quantitative data analysis allowed for comparisons of findings and thus provided a check for consistencies in the data. The researcher's relationships were also an asset in

that most of the interviewees were trustful of the researcher and therefore more open and honest in sharing their thoughts, their opinions, and information regarding their respective programs.

Organization of the Study

This research study is organized into five chapters. Chapter 1 includes an introduction to the study, the background to the study, the statement of the problem, the purpose of the study, the research questions, the justification for the study, and the limitations of the study. Chapter 2 includes a review of the literature and research regarding building characteristics and student engagement. Chapter 3 provides a discussion of the methodology used in this study. Chapter 4 presents the quantitative and qualitative findings that emerged from this study. Lastly, Chapter 5 provides a discussion of the study's key findings, additional considerations, implications for policy, suggestions for future research and concluding remarks.

The following chapter provides support for the research questions through a review of the literature on critical building characteristics and student engagement indicators that influence student outcomes.

CHAPTER TWO

REVIEW OF THE LITERATURE

The review of the literature is divided into two sections. The first section reviews the research and literature on building characteristics that have been found to affect student outcomes. The list of building characteristics is exhaustive; only key features will be discussed. The second section presents a brief history of the creation and evolution of student engagement, student engagement indicator descriptions, and the current application of student engagement indicators in higher education.

Building Characteristics

State-of-the-art buildings, equipment, and technology are believed to enhance student learning and better prepare students for the workforce (Flemming & Hedrick, 2008; Joch, 2008; Oblinger, 2006). However, there is limited empirical research to support this assumption in higher education. The research studies, in which either a quantitative or qualitative analysis has been conducted, are primarily limited to elementary and secondary school settings. Results from these studies tend to indicate that a positive correlation exists between building characteristics and students' achievement, behaviors, and attitudes (Crampton, 2009; Earthman, 2002; Earthman & Lemasters, 1996; Hines, 1996; Schneider, 2002; Weinstein, 1979). Building characteristics measured include both direct and indirect effects; the direct effects include acoustics, building age, indoor air quality, lighting, and thermal comfort, while the indirect effects include aesthetics, and perceptions of a building (Cash, 1993; Earthman & Lemasters, 1996; Hines, 1996; Lemasters, 1997; Schneider, 2002; Weinstein, 1979).

Direct Effects

Acoustics. The acoustic quality of the classroom is essential to academic performance (Bronzaft, 1981; Bronzaft & McCarthy, 1975; Veltri, Banning, & Davies, 2006). In their study of the effect of train noise in New York, Bronzaft and McCarthy (1975) found that over a 3-year period, the reading scores of second-, fourth-, and sixth-grade students on the noisy side of the school building lagged behind their peers on the quieter side of the building. The reading delay ranged from 3 months to almost 1 year. Similar results were found in a follow-up study by Bronzaft (1981). In this study, students from both noisy and quiet sides of the building were given achievement tests. The students on the noisy side of the building performed below their quiet side peers. However, after implementing noise reduction measures to reduce the noise level in the classroom, Bronzaft found no significant differences between students' achievement test scores on the noisy and quiet side of the building. In another study of first- and second-graders, Evans and Maxwell (1997) found children attending elementary schools where they were chronically exposed to aircraft noise had lower reading skills than children attending elementary schools in quiet neighborhoods. Further, they found that chronic exposure to noise is associated with impairments in speech perceptions which are correlated with reading development. Distracting noises both inside and outside of the classroom were found to interfere with community college student's concentration, in a qualitative case study conducted by Veltri et al. (2006).

Nonauditory effects of noise can also have an adverse impact on learning and health (Cohen, Evans, Krantz, & Stokols, 1980; Lemasters, 1997; Stansfeld & Matheson, 2003). Studies have shown that noise can impede cognitive performance in both children

and adults (Cohen & Weinstein, 1981; Stansfeld & Matheson, 2003). In their review of the literature, Stansfeld and Matheson (2003) determined that the most compelling evidence for the effect of noise on the cardiovascular system comes from studies of blood pressure in work settings. Individuals continuously exposed to noise level of at least 85 dB have higher blood pressure than those not exposed to noise (normal conversation is 60-70 dB). In addition, workers regularly exposed to high levels of noise are more likely to report psychological symptoms, such as headaches, argumentativeness, nausea, and changes in mood and anxiety (Stansfeld & Matheson, 2003).

Building age. The age of school buildings have been linked to student achievement (Berner, 1993; Cash, 1993; Phillips, 1997). Researchers studying building features that influence student achievement have used the age of a building as a proxy to indicate the general condition of a facility. The critical factor is not so much the actual age of the building, but the condition of the components housed within the building; that is, studies use a building's age as a proxy to measure the effects of acoustics, air quality, lighting, thermal comfort, and overall aesthetics (Cash, 1993; Earthman, 2002).

In an investigation of building conditions and student achievement in the District of Columbia Public School System, Berner (1993) found that the condition of a school building was the strongest predictor of student achievement. For example, students in schools with poor building conditions attained lower overall achievement scores; whereas, if a school's building conditions improved from poor to excellent, average Comprehensive Tests of Basic Skills (CTBS) achievement scores were predicted to increase by more than 10 points. Other variables in the study, found to be significant, included the percentage of White students attending a school, the median income, and

school enrollment (Berner, 1993). Supportive findings are also found in a study of upper elementary school students' academic achievement in reading and math and attendance patterns. Phillips (1997) found that students who moved into new facilities had a decrease in their total number of absences from school and attained higher reading and math achievement scores.

Bowers and Burkett (1988) compared the academic achievement, illness occurrences, attendance records, and discipline reports of fourth and sixth grade students housed in two different Tennessee elementary schools. Both schools belonged to the same school district and were similar with respect to student socioeconomic level, principals' and teachers' ages, experience, and certification levels. The schools differed in that one school was new, only 3 years old, and the other school was the oldest school in the district, nearly 50 years old. Differences between the two schools were found to be significant for all variables in the study. Students in the new building had higher reading, listening, language, and mathematic scores compared to the students in the older building. Students in the new building also had higher attendance rates and fewer reported illnesses. Students in the old building had higher reported rates of disciplinary incidents.

It should be noted, that while research indicates that students' achievement improves in new buildings, other research has shown that the building's age may not be the best indicator of a building's quality (Cash, 1993; Earthman & Lemasters, 1996; Schneider, 2002; Sticherz, 2000). Building quality may, in fact, be better determined by building maintenance since the lack of appropriate maintenance can damage an old or new building (Lemasters, 1997; Schneider, 2002). Limited funding can impact school

districts' ability to properly maintain their facilities, old or new, thus affecting the learning environment of their students (Berner, 1993; Schneider, 2002).

Indoor air quality and thermal comfort. Indoor air quality (IAQ) is crucial for student learning (Bates, 1996; Environmental Protection Agency [EPA], 2010; Kennedy, 2001; Mendell & Heath, 2005; Schneider, 2002; Smith, 1990). Mendell and Heath (2005) conducted a thorough review of studies that examined the relationship between indoor environmental quality, namely, indoor pollutants and thermal conditions, and performance or attendance in schools or occupational settings. They concluded that, although there was limited scientific evidence as to a direct relationship in these factors, many of the findings from the reviewed studies suggested that there is evidence that certain conditions related to air pollutants and temperature can have negative impact on the health and performance of students and employees. For example, in a study of fifth graders in 54 elementary schools, researchers found a significant association between students' state standardized reading and math test scores and the level of classroom ventilation. As the quality of IAQ increased, the math and reading scores of students in those classrooms also increased (Shaughnessy, Shaughnessy, Nevalainen, & Moschandreas, 2006).

School buildings, compared to other types of buildings, are more prone to have poor air quality. Factors contributing to these findings are the large number of people in smaller spaces and chronic lack of funding allocated to operation and maintenance of school facilities (Kennedy, 2001; U.S. General Accounting Office, 1995). Characteristics of poor IAQ include mold growth, high humidity/moisture, and dust in the heating, ventilation, and air-conditioning (HVAC) systems (Bates, 1996; Mendell & Heath, 2005).

Symptoms that have been attributed to poor IAQ are collectively referred to as "sick building syndrome" (Schneider, 2002) and include irritated eyes, nose, and throat; nausea; dizziness; upper respiratory infections; headaches; sleepiness; and fatigue (Bates, 1996; EPA, 2010; Mendell & Heath, 2005).

Higher rates of absenteeism can be attributed to IAQ (Diette et al., 2000). High absenteeism for students translates into loss of valuable teaching and learning time; and for employees, a reduction in productivity (Crystal-Peters, Crown, Goetzel, & Schutt, 2000; Marburger, 2001; Mendell & Heath, 2005; Milton, Glencross, & Walters, 2000; Romer, 1993). Marburger (2001) conducted a study with undergraduate students in an economics class to investigate the relationship between student's absenteeism and their performance on exams. Detailed attendance and absences records for students were maintained for one semester. Statistical models were created for three exams administered over the semester. The results indicated a positive and significant relationship between absenteeism and student test performance. Students who were absent more often were more likely to perform poorly on an exam compared to students who had attended class regularly.

Absenteeism in the workplace due to poor IAQ, can also equate to considerable associated costs for employers. Utilizing data from the National Health Interview Survey and the Bureau of Labor Statistics, Crystal-Peters et al. (2000) found that nearly 3.6 million days of work were missed due to allergies and allergy related symptoms. Further, these missed work days cost employers $445.3 million in 1995. The results of a study conducted by Milton et al. (2000) indicated similar findings. Analyzing the sick leave date from 3,720 hourly employee, building characteristics, and IAQ complaints,

they consistently found that employees in areas with lower levels of outdoor air supply and IAQ complaints had increased amounts of sick leave. The estimated cost of sick leave per employee per year was $480.

Coupled with IAQ's effect on student performance is thermal comfort (Chan, 1980; Earthman, 2002; Harner, 1974; Hines, 1996; Lemasters, 1997; Schneider, 2002). For example, Chan's (1980) study of eighth graders in Georgia found that the air-conditioned schools had consistent patterns of higher achievement compared to schools that did not have air conditioning. In fact, air conditioning had the greatest impact on student achievement when compared to the presence of carpeting, fluorescent lighting, and interior pastel coloring (Chan, 1980). Cash's (1993) findings from her study of small, rural high schools in Virginia provide further support for Chan's work. Utilizing mean scale scores from 11th grade students' Test of Academic Proficiency, Cash found that average scale scores increased as the level of air-conditioning increased. Further, classrooms that are excessively warm have been found to foster lethargy and reduce students' class participation (Veltri et al., 2006).

Lighting. Classroom lighting plays a critical role in student performance and should be considered a key component in the overall educational environment (Dunn, Krimsky, Murray, & Quinn, 1985; Philips, 1997). Lighting has been found to have a direct relationship with improved test scores, increased time on task, enhanced students' ability to concentrate, and increased student achievement (Bordwell, 1998; Jago & Tanner, 1999; Lemasters, 1997; Philips, 1997; Schneider, 2002). Veltri et al.'s (2006) study revealed that students tend more to relax and rest than actively participate in class when the lighting is low.

The Heschong Mahone Group (2003) studied the relationship between daylight and student performance through a series of three studies. The first study, *Daylighting in Schools,* was conducted in more than 2,000 classrooms in three school districts and found that students with the most daylight in their classroom had between 7% and 18% higher end-of-the-year test scores than those students in classrooms with the least amount of daylight. Findings also indicated that in one year, students in classrooms with the most daylight progressed 20% faster on math tests and 26% faster on reading tests than students in classrooms with the least amount of daylight. In their second study, *Daylighting in Schools Reanalysis Report,* teacher characteristics were added to their original student performance models. Results supported the findings of the previous study, indicating a 21% improvement in student learning rates for students in classrooms, with the most daylight compared to students in the least. The third study consisted of over 8,000 third- through sixth-grade students in nearly 500 classrooms in 36 schools, in a school district different from the districts previously studied. In this study, in addition to lighting and daylight, other classroom conditions, such as ventilation, windows, view, and indoor air quality, were measured. Although findings in the third study did not indicate a strong distinction in student performance with regard to levels of classroom lighting, students in classrooms with better views and sun control were found to perform above average. Taken together, researchers concluded that lighting quality in classrooms is a key component in student learning (Heschong Mahone Group, 2003).

Classroom lighting, natural or artificial, can have a positive or negative impact on learning. Care must be given to lessen conflicting levels of brightness, reduce glare, and decrease the occurrence of other visual distractions in order to create conducive learning

environments for students (Bordwell, 1998; Chan, 1980; Heschong Mahone Group, 2003).

Indirect Effects

Aesthetics can add to the educational value of a school building by presenting an image of positive support for education (Chan, 1988; Earthman, 2002). The aesthetics in a school facility is an accumulative effect of design in structure, types of materials used, usage of colors, location of parking areas, usage of lighting, pleasant landscaping, and the general maintenance and care for the facilities (Chan, 1988; Hawkins & Stack, 1978). The research suggests that the physical aspects of a building can directly impact student behavior and achievement with regard to lighting, sound, and temperature. But the aesthetics or the way a building looks and feels can directly influence student attitude and indirectly influence teacher attitudes which can also impact students (Berner, 1993; Cash, 1993; Chan, 1988; Earthman, 2002; Gwynne, 1982; Hathaway, 1991).

The American Institute of Architects conducted a study to determine if new educational facilities were meeting the needs of the educational programs they housed. Surveys of site administrators found that facilities considered successful were those designed to fit the needs of the program and create user-friendly and welcoming spaces. Some of the successful schools showed a 20% improvement in student test scores in the first year the students were in their new facility when compared to the prior year in a different facility. In addition to academic improvement of students, teachers were also found to have improved attitudes in the new facilities (Christopher, 1991). In her study of 47 rural high schools in Virginia, Cash (1993) found that student achievement was higher in school buildings that received higher cosmetic ratings. Cosmetic conditions in this

study included interior and exterior paint, graffiti, grounds, and floor maintenance. Berner's (1993) study of the impact of building conditions on student achievement in the District of Columbia Public School System found a positive relationship between the visible conditions of school facilities and student performance on achievement tests. School facilities with excellent physical conditions were associated with higher student performance, whereas facilities with poor building conditions were associated with reduced student performance.

The aesthetics of a school facility also contributes to the perceptions of the facility itself (Chan, 1988; Hawkins & Stack, 1978). The perceptions of school facilities are held by the students, teachers, staff, administrators, the community, and the general taxpaying public. These perceptions can influence attitudes and beliefs about education. Hawkins and Stack (1978) refer to school buildings as "ambassadors for the school system" (p. 10). As such, school facilities are a constant, visible image of the structure and characteristics of their communities. Depending on the appearance and condition of these facilities, the image may be positive or negative (Chan, 1988; Hathaway, 1991; Hawkins & Stack, 1978). Research has shown that an aesthetics environment can influence students' feelings and attitudes, which can significantly contribute to positive student learning (Berner, 1993; Cash, 1993; Chan, 1988; Christopher, 1991). Creating and maintaining an aesthetic educational environment can enhance the learning environment for students, improve the working conditions for teachers, staff, and administrators, and foster a positive relationship with the community.

The research indicates educational facilities directly influence student learning and performance, and indirectly influence the attitudes and behaviors of those who

operate within and outside of the facilities. School facilities also reflect the economic investment across communities. As research continues to identify conditions that foster student academic success, careful attention should be given to the influence the physical learning environment has on student learning and performance.

Student Engagement

During the last 30 years, higher education has looked to student engagement as a construct of institutional accountability, assessment, and improvement (Kuh, 2009; National Commission on the Future of Higher Education, 2006; Walker et al., 2010). Student engagement consists of two key components: the amount of time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success (Kuh, 2009); and the manner in which an institution allocates resources dedicated to creating learning opportunities and services that benefit and encourage student participation (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Walker et al., 2010). Given the difficulty in which to measure actual student learning, student engagement data have become the proxies or process indicators for learning outcomes (Kuh, 2009). Student engagement indicators identify how colleges are impacting student outcomes and areas in which colleges can improve student success (Kuh, 2009).

Theory of Student Involvement

The student engagement construct has its foundations in Alexander Astin's theory of student involvement (1985, 1993) and Robert Pace's quality of effort model (1979, 1982). In his 1985 book, *Achieving Educational Excellence,* Astin questioned the traditional concepts of institutional excellence in higher education—reputation and

resources. Reputation, as the name implies, includes the beliefs or opinions held about an intuition, which may or may not be accurate. Resources consist of physical facilities—laboratories, classrooms, libraries, technology, and equipment; human resources—well-trained faculty members, teaching assistants, counselors, and support personnel; and monetary resources, which include financial aid, endowments, grants, and scholarships. Astin found that neither reputation nor resources were related to an institution's mission, educational opportunities, nor enhanced the overall quality of education. Astin (1985) suggested an alternative approach—talent development, which emphasized the "intellectual and personal development of students as a fundamental institutional purpose" (p. xii). The talent development approach also allowed "any institution to be 'excellent' if it deploys its resources wisely and effectively to facilitate the intellectual and personal development of its students and faculty" (Astin, 1985, p. xiii).

Astin's (1985) idea of talent development led to the creation of the theory of student involvement—"students learn by becoming involved" (p. 133). The theory of student involvement derives from Astin's longitudinal study of college dropouts conducted in 1975, which sought to identify factors in the college environment that significantly affected a student's persistence in college. Astin (1985) found that "virtually every significant effect could be explained in terms of the involvement concept" (p. 144). In addition, Austin found that the level of involvement equally applies to both students and faculty. For students, "involvement refers to the amount of physical and psychological energy that the student devotes to the academic experience" (Austin, 1985, p. 134). Specifically, a student who devotes considerable amount of time to his or her studies is more involved than a student who does not devote time to academic activities.

Similarly, a faculty member's level of involvement can be measured by the amount of time devoted to teaching and teaching related activities.

There are five basic postulates of the involvement theory (Austin, 1985):

1. Involvement requires the investment of physical and psychological energy in various "objects" (tasks, people, activities, etc.). These objects may be highly generalized (the student's college experience) or highly specific (preparing for a final exam).
2. Involvement is a continuous concept—meaning different students will devote differing amounts of energy to different objects.
3. Involvement is comprised of both quantitative and qualitative features; for example, the number of hours a student spends studying can be measured quantitatively while determining if a student reads and understands an assignment or simply stares off into space can be measured qualitatively.
4. The amount of student learning and development is directly proportional to the quality and quantity of student involvement.
5. The effectiveness of any educational policy or practice is directly related to its ability to increase student involvement.

Astin (1985) also suggests three critical considerations when applying the theory of student involvement. First, administrators and faculty members must recognize that every institutional policy and practice (for example, academic calendars; class schedules; course offerings; attendance policies; academic probation; policies on office hours for faculty, student orientations, and advising) can impact how students spend their time and how much effort they devote to their academic goals. In addition, administrative

decisions regarding nonacademic issues, such as the location of a new building; the design of recreational and living facilities; financial aid policies; the relative attractiveness of eating facilities on campus; and parking regulations, can significantly affect how students spend their time and energy. Second, application of the student involvement theory to teaching requires that the teacher utilize techniques that focus more on what students are actually doing and less on content. Lastly, students, staff, faculty members, and administrators must have sufficient feedback. For students, this includes feedback students receive regarding their class work. The concept of feedback, or what Gagne (1985) refers to as "reinforcing event" (p. 314), provides the student with information regarding the correctness of their performances. Thus, feedback is the final stage in the learning process. Feedback for faculty members, counselors, student services personnel, and other higher education practitioners, "can assess their own activities in terms of their success in encouraging students to become more involved in the college experience" (Astin, 1985, p. 157). Feedback administrators receive, regarding students' level of involvement, can assist in making better informed decisions concerning the use of resources.

Student Development Model

Similar ideas, regarding student involvement, are supported by the work of Robert Pace. Pace (1982, 1984) also questioned the assumptions that higher education institutions are solely accountable and responsible for student outcomes. The assumption is that if students do not learn, graduate, and obtain employment then the teacher or institution is at fault. There is no consideration given to the student component. Further, it is assumed that education is a product to be purchased, but "at a later point in time, [the

student] is the product" (Pace, 1984, p. 6). Pace contends both the institution and student are responsible for student outcomes. Colleges are responsible for allocating resources, facilities, programs, policies, and standards that contribute to student development and learning. Students are "also accountable for the amount, scope, and quality of effort they invest in their own learning and development and specifically in using the facilities and opportunities that are available in the college setting" (Pace, 1984, pp. 6-7). Thus, the accountability for student achievement and other related student outcomes must include both what the college offers and how the student utilizes those offerings (Pace, 1982, 1984).

Pace's (1979) model of Student Development provides a means in which to study "students' learning and development and how the student and institution interact in contributing to educational effectiveness" (p. 125). The key concept of this model is quality of effort—"All learning and development requires an investment of time and effort by the student" (Pace, 1979, p. 127). The model is comprised of three basic propositions. The first proposition is the college experience, which includes all of the events that occur to students while in college. The most significant of these events and experiences occur both inside and outside of the classroom—laboratories, libraries, student unions, and athletic venues. The experiences may also include opportunities for interaction with faculty and peers, involvement in clubs and organizations, opportunities for developing self understanding, and improving writing skills. Second, the meaning of these experiences, events, and interactions is influenced by characteristics of the environment and the amount, breadth, and quality of effort students put forth. Lastly,

the combination of environmental influences and student effort contributes to student development and the influence college has on a student.

In addition to these propositions, the model itself has five sets of measures. The first of these considerations is the students' background. This includes demographic information—age, sex, marital status, race/ethnicity, and parents level of education. Second is the student's status in the college—year in college, full- or part-time status, grades, job status, living arrangements, major of study, and academic goals. The third measure is college activities and effort. Pace (1979, 1982) contends that the level of a student's effort is the most important determinant of academic outcomes. The final measures are the student's perceptions of the institutional environment and perceptions related to student's academic progress (Pace, 1979, 1982). Pace (1982) concludes that "the importance of all the elements that influence who goes to college, once the students get there what counts most is not who they are or where they are but what they do" (p. 18).

Pace operationalized these measures, creating the College Student Experiences Questionnaire (CSEQ) in 1979 for 4-year institutions. In 1990, the Community College Student Experiences Questionnaire (CCSEQ, Friedlander, Pace, & Lehman, 1990) was developed to address the needs of 2-year institutions. The survey provides institutions with a mechanism in which to assess the amount, scope, and quality of student effort with regard to the use of resources and opportunities provided by the institution (Ethington & Horn, 2007; Friedlander & MacDougall, 1992; Pace & Kuh, 1998). Both instruments have been determined to be reliable, and valid measures of student involvement and achievement based on data from more than 7,700 students in 30 institutions at the 4-year

level, and more than 6,000 students from 25 community colleges. Brown's review of the CSEQ (as cited in Garrard, 2006) in the Ninth Mental Measurement Yearbook reports Cronbach Alpha reliability scores ranging from 0.79 to 0.90 for quality of effort scales. The quality of effort scales for the CCSEQ had Cronbach Alpha scores ranging from 0.82 to 0.94 (Ethington & Polizzi, 1996).

Student Engagement Indicators

Taken together, the concepts of student involvement and student effort have provided the basis for today's construct of student engagement. Currently, there are two popular measures of student engagement indicators utilized by higher education institutions—the College Student Report administered by the National Survey of Student Engagement (NSSE) and its 2-year institution equivalent, and the Community College Student Report administered by the Community College Survey of Student Engagement (CCSSE). To date, the College Student Report has been given to more than 2.7 million students at nearly 1,500 colleges and universities since 2000 (NSSE, 2013). Similarly, since 2002 the Community College Student Report has been completed by nearly 1.4 million students at more than 800 two-year colleges (A. Bechouia, personal email communication, October 17, 2011).

The purpose of both surveys is threefold: provide institutions with data that can be used to improve student's college experience, document effective educational practices, and promote better understanding of collegiate quality (Center for Community College Student Engagement, 2010; Kuh, 2009; NSSE, 2000, 2002; Pascarella & Terenzini, 2005). Both surveys measure student engagement based on five benchmarks of educational effectiveness. The five national benchmarks for the College Student Report

are: active and collaborative learning; enriched educational experience; level of academic challenge; student interaction with faculty; and supportive campus environment (Kuh, 2004, 2009). The five benchmarks of effective educational practice for the Community College Student Report are: active and collaborative learning; student effort; academic challenge; student-faculty interaction; and support for learners. Active and collaborative learning is a measurement of students' level of participation in class, interaction with other students, and learning outside of the classroom. Student effort measures students' time on task, preparation for class, and use of academic support services, such as tutoring and computer lab. The academic challenge benchmark evaluates the level to which students engage in challenging intellectual and creative activities, including the quality and rigor of this work. Survey questions in this category include the complexity of cognitive tasks presented to students, and the standards faculty use to evaluate student performance. The student-faculty interaction measures the level to which students communicate with faculty about academic performance, career goals, and course assignments and content. The last benchmark, support for learners, measures students' perceptions of their respective colleges and student use of support services, such as academic advising and counseling services (McClenney & Marti, 2006; McClenney et al., 2006).

Both surveys utilize similar student outcome measures. The CCSSE outcome measures are divided into five categories: academic success—which includes grade-point averages (GPAs) and number of completed credit hours; early academics—determined by course completion and GPAs in developmental and gatekeeper courses; persistence—measured by students' enrollment over time, either term to term or year to year;

completion—defined as completion of the students' goal, certificate, degree, or transfer ready; and longevity—determined by the amount of time students spent at the college, including the number of terms enrolled and credit hours completed (McClenney et al., 2006). Studies that utilize data from both the NSSE and CCSSE have validated the use of student engagement as a proxy for persistence and academic achievement. Findings indicate a consistent, positive relationship between the benchmarks and outcome measures. These positive effects of engagement remain even when controlling for multiple variables, such as racial/ethnic backgrounds, enrollment status, family income, financial aid, and precollege achievement (Kuh, Kinzie, Cruce, Shoup, & Gonyea; 2006; McClenney et al., 2006; NSSE, 2000).

Other studies have incorporated aspects of student engagement to assess student outcomes and institutional practices (Chickering & Gamson, 1987; Ethington & Horn, 2007; Kaufman & Creamer, 1991; Kuh et al., 2005; Pascarella & Terenzini, 1991, 2005; Tinto, 1987, 1993, 1997). Kaufman and Creamer (1991) utilized data from Pace's CSEQ to examine if the freshman preenrollment characteristics were mediated by quality of effort. Results from their study found that the students' investment in quality of effort in coursework and use of the library had a much greater impact on intellectual gains than effort invested in nonacademic activities. Also, although female and male students' quality of participation in clubs and organizations were similar, female students tended to invest higher quality effort in relationships with peers. This was further supported by female students' tendency to give more importance to personal development and social goals. In their study of 40 community college students, Ethington and Horn (2007) utilized data from the CCSEQ to test Pace's model of Student Development. Their

findings suggest that the students who put forth greater effort with faculty and coursework were more likely to perceive the institution as positive, which produced higher perceived gains in personal and social development, thus supporting Pace's propositions.

In their synthesis of the thousands of studies devoted to the affects of college on students, Pascarella and Terenzini (2005) concluded that "it appears, individual effort or engagement is the critical determinant of the impact of college" (p. 602). They found that the extent in which a student interacted with faculty and peers had the largest impact on student's academic and personal development. This interaction included both formal classroom and informal nonclassroom settings. Tinto's (1993) theory of student departure incorporates aspects of student involvement. Involvement includes interaction with peers and faculty, both inside and outside of the classroom. According to Tinto (1987, 1993, 1997), students are more likely to drop out of college if they are unable to "integrate" or become involved in the institution academically and socially. Tinto (1993) contends that there is a relationship between student's learning and persistence—students are able to learn more if they stay in college, and the more they learn, the more likely they are to stay in college—but this relationship "arises from the interplay of involvement and the quality of student effort" (p. 71).

Incorporating research on the effects of student engagement factors from an institutional perspective, Kuh et al. (2005) conducted a study to determine institutional characteristics that predict graduation rates. The Documenting Effective Educational Practices (DEEP) project selected 20 baccalaureate institutions based on their higher-than-predicted scores on the NSSE and higher-than-predicted 6-year graduation

rates. Six factors were found to be common to these 20 institutions: "living" mission and "lived" educational philosophy, unshakable focus on student learning, environments adapted for educational enrichment, clearly marked pathways to student success, improvement-oriented ethos, and shared responsibility for educational quality and student success. More specifically, these successful DEEP colleges and universities actually put their institutional mission and educational philosophy into practice, truly "living" the institutional mission as a college community; this includes the continual assessment, evaluation, and improvement of institutional practices. They also dedicate themselves to the holistic development of students by creating experiences to help students acquire self-confidence, study skills, and interact in meaningful ways with faculty. Effective educational practices included first-year transition courses; an emphasis on undergraduate teaching; and a sense of belonging and identity for students, faculty, and staff through physical locations, symbols, and institutional traditions. Collectively, everyone in the DEEP project was committed and accountable for student success. This included counselors, faculty, administrators, residential and food service staff, as well students responsible for themselves and their peers (Kuh et al., 2005; Kuh et al., 2006).

Research has shown that student engagement—student time and effort—are related to the outcomes of a student's community college experience. Colleges play a key role in providing opportunities and devoting resources to enhance student engagement. Further utilization of assessment and evaluation tools to measure and monitor key student engagement indicators will allow community colleges to improve student outcomes and student success.

Conclusion

This literature review provided an overview of two distinctively different areas of research which address student outcomes. The first section reviewed the current literature on specific building characteristics found to affect student learning. However, this research is limited to the elementary and secondary school settings; thus, there is a need to explore the extent to which building characteristics affects students in higher education. The second section presented a brief history and review of the existing literature on student engagement and the development of tools in which to measure student engagement indicators. Student engagement indicators have been used as proxies for measuring student outcomes. These student engagement indicators, however, do not address the physical aspects of a community college campus. This study brings together these two different areas of research and addresses the gaps in each of their respective literatures by exploring whether or not building characteristics affect students in higher education and the possible effect of building characteristics on student engagement.

CHAPTER THREE

RESEARCH METHODOLOGY

This study was conducted to begin to address the empirical void in the literature regarding the relationship between new buildings, equipment, and technology, on the one hand, and collegiate student outcomes, on the other. Specifically, this research study was designed to measure and examine the relationship between new buildings, equipment, and technology and (a) student engagement, (b) licensure exams passage rates, and (c) workforce preparation as perceived by community college students and faculty. This chapter will outline the research methodology utilized in the study in four sections: research design and characteristics of the site, program descriptions, data collection, data analysis, and the delimitations and limitations of the study.

Research Design

This study utilized a mixed method case study design; both quantitative and qualitative data were collected and analyzed to examine the relationship between buildings, equipment and technology, on the one hand, and student outcomes (Creswell, 2003; Creswell & Plano Clark, 2007; Yin, 1993). For the purposes of this study, outcomes included student engagement indicators, student persistence, student licensure exam passage rates, and student preparation for the workplace. The quantitative phase of this study utilized frequency and regression analyses to compare the differences between students who completed their allied health program in old facilities with dated equipment and limited technological resources and students who completed their programs in the new facility equipped with up-to-date equipment and technology. The qualitative component of this study consisted of interviews with faculty from four of the allied health

programs housed in the Allied Health Education and Training Facility. The qualitative interviews provided an understanding (Bogdan & Bilken, 1998) of faculty beliefs and feelings about the new building, equipment, technology, and student outcomes. Moreover, combining both quantitative and qualitative methods allowed for triangulation of the data which provided a more complete and richer view of the phenomena being studied, as well as greater insight about the answers to the study's research questions (Creswell, 2003; Mathison, 1988).

The units of analysis for this study consisted of students and faculty in the Allied Health programs at Omega Community College (OCC). Founded in 1964, OCC is the largest of the colleges in its multi-college district. It is located in an established, suburban neighborhood in a large metropolitan region in southern California. According to OCC's 2009-2010 Report to the Community, OCC's student population is diverse. The largest groups of students with regard to age were those students 18-24, making up 60% of the student population. Ethnicity distribution was 7% African American, 1% American Indian, 15% Asian/Pacific Islander, 5% Filipino, 21% Latino, and 38% White; gender was 53% female and 47% male.

Omega Community College is currently experiencing major renovations and new construction funded by two local general obligations bonds. One such project was the Allied Health Education and Training Facility, which opened in the fall of 2009. This new building provides classrooms and laboratories for certificate and degree programs for five healthcare areas: Dental Assisting, Health Information Technology, Medical Assisting, Physical Therapy Assistant, and Radiologic Technology.

Although OCC's Allied Health Department consists of six programs (Animal Health Technology, Dental Assisting, Health Information Technology, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology), only the programs that moved into the new facility were selected for this study. Each of the five programs, Dental Assisting, Health Information Technology, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology, have cohorts of students that completed their programs before the new building was utilized and cohorts of student that have completed their Allied Health certificates or degrees entirely in the new facility. The faculty program directors for these programs have also taught their respective programs in both facilities. The following provides a brief description of each program.

Dental Assisting. The Dental Assisting program at Omega College is a two-semester certificate program. The program offers theory, skills, and certifications needed to work as a dental assistant and a credentialed dental assistant. The program also includes clinical experience in a dental clinic or private practice. The program offers both a Certificate of Achievement and an Associate's Degree in Dental Assisting. Students that successfully complete the program are also eligible to apply for the Registered Dental Assistant (California certification) and the Certified Dental Assistant (national certification) exams. The program is accredited by the Dental Board of California and the Commission on Dental Assisting.

Health Information Technology. The Health Information Technology program at Omega College is a 2-year degree program which provides training in the areas of storage and retrieval of records, quantitative analysis of medical records, coding and indexing the medical records, legal aspects of medical records, supervision of medical records,

department personnel, calculation of healthcare statistics, performance of healthcare quality improvement studies, implementation of the electronic health record, and an introduction to health care delivery systems. The program also includes direct clinical experience. The program offers an Associate's Degree in Health Information Technology. Students that successfully complete the program are also eligible to apply for the national accreditation examination of the American Health Information Management Association to become a Registered Health Information Technician. The program is accredited by the Commission on Accreditation for Health Informatics and Information Management.

Medical Assisting. The Medical Assisting program is a two-semester certificate program. The program provides specialized training for employment in medical offices, clinics, hospitals, and other organizations requiring entry-level competencies in administrative and clinical medical office procedures. The program also includes direct clinical experience. The program offers both a Certificate of Achievement and an Associate's Degree in Medical Assisting. Students that successfully complete the program are also qualified to apply for the Registered Medical Assistant (national certification) and California Medical Assistant exams. The program content follows the recommendations of the entry-level competencies required by the American Medical Technologists and the California Certifying Board of Medical Assistants, in addition to the recommendations of the Omega College Medical Assisting Advisory Committee.

Physical Therapist Assistant. The Physical Therapist Assistant program at Omega College is a 2-year degree program. The program provides specialized training in effective patient care related to physical therapy. This includes a variety of therapy

treatments including: heat, cold, soft tissue mobilization, electrical stimulation, mechanical traction, hydrotherapy, therapeutic exercise, and gait training. The program also includes direct clinical experience. The program offers a Physical Therapist Assistant Associate in Science degree. Students that successfully complete the degree program are eligible to apply for the National Physical Therapy Assistant Examination and the California Law Examination for Physical Therapy Assistants. The program is accredited by the Commission on Accreditation in Physical Therapy Education of the American Physical Therapy and approved by the Physical Therapy Board of California.

Radiologic Technology. The Radiologic Technology program is a 2-year degree program which provides training in the operation of radiographic equipment, exposing and processing images, exposure and image processing principles, radiographic procedures and protection, positioning patients, ethics, patient care and directed clinical practice. The program offers both a certificate and an Associate of Science degree in Radiologic Technology, which certifies a student as a full diagnostic radiographer. Students that successfully complete the program are also qualified to apply for certification by the national American Registry of Radiologic Technologists (ARRT) and the state of California. It should be noted that unlike the other exams taken for allied health professions, the ARRT is not a licensure exam, but rather a national, professional certification exam. The Radiologic Technology program is accredited by the Joint Review Committee on Education in Radiologic Technology.

The Radiologic Technology program also has a special admissions process. The accreditation body requires admission rates to match industry demand. This requires a limit on class size, thus program enrollment varies every year. Omega College's

Radiologic Technology program has deduced admission by 10% each year for the last 4 years in order to comply with the accreditation requirement.

The new Allied Health Education and Training Facility is a three-story building, located on the periphery of campus at the main entrance to the college. The classrooms and laboratories, outfitted with state-of-the-art materials and equipment, are located on the first and second floors of the building, while faculty offices are located on the third floor. There are two lobby areas, one on the first floor and the other on the second floor. A coffee shop and deli are on the first floor, but their hours of operation are limited—Mondays through Thursdays 7:30 a.m. to 3:00 p.m. (Classes are held in the building Mondays through Fridays, with day and evening sessions.)

In contrast, prior to the construction and use of the new facility, the five Allied Health programs were housed in a one-story building located in the center of OCC's campus. The classroom materials and laboratory equipment were old and outdated. Classrooms and laboratories were clustered together, but the faculty members were dispersed in different buildings throughout the campus. There were no coffee or food facilities in the old building; the campus cafeteria, however, was located within a short walking distance of the classrooms and laboratories.

Data Collection Procedures

Data collection began after receiving Institutional Review Board approval from both the University of San Diego (July, 3, 2012) and Omega Community College District (September 14, 2012). The data collection procedures used in this study are described in the following four sections: participants, instrumentation, licensure exam passage rates, and program completion/student retention.

Participants

Survey participants. The original data design was to limit the survey requests to only the cohorts of students completing their respective programs between the years of fall 2007 and spring 2011. However, Omega Community College District was unable to identify students by specific programs and cohorts. Thus, students who had completed course work in any of the five Allied Health programs were invited to complete the survey by the Omega Community College District. These students had taken courses in their respective programs and may have received a Certificate of Achievement or Associates in Science Degree in Dental Assisting, Health Information Technology, Medical Assisting, Physical Therapist Assistant, or Radiologic Technology. Invitees included both students completing courses and programs in the old and new facilities. Students who agreed to participate in the survey were given the researcher's contact information. Students emailed and called the researcher to express their interest in participating in the survey. These students received an email with a link to the electronic survey. More than 774 students received a survey invitation email from Omega Community College District. However, only 76 students responded to the email invitation and completed a survey. The researcher exhausted all options, within her control, to obtain more survey responses. This included six email invitations that were sent to solicit survey participants—three by the Omega Community College District and three by one of the faculty program directors, who sent a personal email request to her students.

Interview participants. Interviews were conducted with four of the five faculty program directors with programs in the Allied Health Education and Training Facility.

The program directors are faculty members who coordinate their respective program; their responsibilities include program administration and teaching courses within their programs. Their programs included Dental Assisting, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology.

Emails requesting interviews were sent to all five of the faculty program directors (see Appendix A). The Health Information Technology faculty program director, unfortunately, did not respond to multiple interview requests. The program directors are faculty members who coordinate their respective programs, which include administrative components and teaching courses within their programs.

All four of the faculty program directors who agreed to participate are female and had the opportunity to teach in both the old and new buildings. The average number of teaching years in their respective programs at Omega College was seven; the tenure time for each program director ranged from 4 to 33 years.

In addition to the faculty program directors, there is one administrator who oversees all of the Allied Health programs at Omega College. However, in order to protect the confidentiality of the research participants, the administrator was not included in this study.

Instrumentation

Survey. The survey instrument consisted of 21 questions, comprised of rating scales and open-ended questions. Some of the survey questions were modeled after questions utilized in the Community College Student Experience Questionnaire (CCSEQ, Friedlander et al., 1990) and the Community College Survey of Student Engagement (CCSSE, Center for Community College Student Engagement, 2005) both of which are

nationally administered surveys based on community college student engagement/ involvement and student outcomes research. Survey questions addressing the research questions were created specifically for this survey, whereas the survey questions dealing with the four key student engagement indicators—academic challenge (five questions), active and collaborative learning (six questions), student effort (five questions), and student-faculty interaction (seven questions) were derived from the national surveys. There were also six questions regarding students' demographic information, which included gender, age, race/ethnicity, primary language, and first generation college student (see Appendix B).

The initial draft of the survey was presented in a graduate-level survey course, and feedback from the class was incorporated into the final survey. The final electronic version of the survey was also piloted before distribution (Dillman, 2000). The pilot included three nonstudy participant Allied Health students and one Allied Health Program Director who took the survey and provided feedback regarding the survey's accuracy and ease of understanding.

In an effort to simplify the survey questions, the surveys were modified for the different program cohorts; six versions of the survey were created—dental assisting, health information technology, medical assisting, physical therapist assistant, radiologic technology, and general. All of the surveys contained the same demographic and research related questions, the only differences between the six surveys being the questions regarding the licensure exams. Each of the surveys included a question which named the specific licensure exam or exams associated with that program, with the exception of the general survey. The general survey did not ask any questions related to licensure exams.

The need for this survey was determined during the data collection when a number of students responding to the survey request stated that they were not part of any Allied Health programs at Omega College, but had taken classes that were part of these programs. Thus, in an attempt to include all survey participant responses, a general survey was developed.

The surveys were distributed electronically via an internet-based survey software tool—SurveyMonkey.com. This internet-based survey service was utilized for a number of reasons. First, the internet-based survey allowed ease for survey participants to access and use, regardless of their physical location. The electronic survey also had features which blocked multiple survey responses by the same participant and allowed the researcher immediate access to monitor, organize, and analyze response data. Lastly, the internet-based survey provided survey respondents with the option to link to another survey where students could enter their name and email for one of five $50 prepaid VISA gift cards in appreciation of their participation in the study. Participation in the drawing was optional, thus disclosure of a student's identity was optional. If a student chose to disclose their identity, their personal information and survey responses were kept confidential. However, students that chose not to disclose their identity remain anonymous.

Interviews. Interviews with faculty program directors were conducted utilizing an interview guide (see Appendix C). The interview guide ensured the same questions are asked of each participant (Patton, 2002) but allowed the participants to "share the content of the interview" (Bogdan & Biklen, 1998, p. 94). The interview guide was comprised of five exploratory questions. The interview questions were based on the

research questions. However, during the interviews, probing and follow up questions were asked for clarification and to gain clearer insight from the participants (Hatch, 2002).

Field notes were also taken to document participants' nonverbal reactions in addition to their spoken words. The interviews were conducted at a time and location convenient and comfortable for the participants.

The interviews ranged in length from 25 to 45 minutes. Three of the interviews were held on Omega College's campus, and one interview was conducted in the researcher's home. Each of the faculty program directors signed an Interview Participant Consent form (see Appendix D) and received a $20 gift card to Target, in appreciation of their participation in the study.

Each of the interviews was digitally recorded and professionally transcribed for data analysis. Transcriptions of the interviews were shared with the participants to ensure the accuracy of their transcribed responses (Appendix E). One faculty program director submitted clarification modifications and provided additional information that she thought she had mentioned during the interview. Participants were also asked if they would be available for follow-up interviews during the data analysis phase should clarification of their responses be needed. No additional follow-up interviews were needed.

Licensure exams. Students completing Omega College's Allied Health programs are eligible to sit for state and national exams. These exams include: the California Registered Dental Assistant exam, the California Medical Assistant, the Certified Medical Administrative Assistant, the National Clinical Medical Assistant Certification

and the National Registered Medical Assistant exams, the National Physical Therapy Assistant Examination, the California Law Examination for Physical Therapy Assistants, and the National American Registry of Radiologic Technologists. The data regarding the passage rates was obtained from the faculty program directors, Omega College's Annual Accreditation Reports, the Dental Board of California website (http://www.dbc.ca.gov/applicants/rda/exam_rda.shtml), and the Joint Review Committee on Education in Radiologic Technology website (https://portal.jrcertaccreditation.org/summary/programannualreportlist.aspx).

Data Analysis

This study utilized a mixed method research design; both quantitative and qualitative data were collected and analyzed to address the research questions. The processes used to analyze both the quantitative and qualitative data are outlined in the following sections.

Survey Analysis

The 76 survey responses were mostly complete; minimal cleaning of the data was required. Questions 12 (Have you taken or do you plan to take the following licensure exams? and 13 (If you have taken the licensure exams, did you pass?) were not asked on the general survey, therefore they were coded as N/A or not applicable and not included in the analysis.

The demographic questions provided a description of the student participants both in the aggregate and by specific program. Descriptive statistics included frequencies, means, and standard deviations. Descriptive comparisons were also made between students completing their respective programs before and after the new facility.

Frequencies also provided insight into students' perceptions regarding the quality of their respective programs, the influence of the facility on their overall learning, their preparation for the licensure exam, and preparation for the workplace.

Composite factors were created for each of the four key student engagement indicators—academic challenge (comprised of five question responses), active and collaborative learning (comprised of six question responses), student effort (comprised of five question responses), and student-faculty interaction (comprised of seven question responses). Factors were also created for facilities, which included responses from 16 questions, and instructor, which was comprised of three questions.

Regression analyses were conducted to determine which factors, if any, impacted students' perceptions regarding their professional preparation based on their program completion before and after the new building. Ten regression models were created to gain insight into the demographic variables that impacted students' perceptions and student engagement factors. The first six regression models utilized student perceptions as the dependent variable. Students responded to questions related to their perceptions regarding the quality of the program, their overall learning, their preparation for the licensure exam, their preparation for the workplace, the facilities, and the program instructors. The following model was used for these dependent variables:

$$SP = \beta_0 + \beta_1 BA + \beta 2AGE + \beta_3 ENGL + \beta_4 FIRSTGEN + \beta_5 GENDER + \beta_b HISP + \beta^7 ASIANPI + \beta_8 OTHER \quad (1)$$

where

SP = student perception (see Table 1 for detailed explanation of each variable)
β_i = standardized regression coefficients (i = 0...9) associated with the independent variables described in Table 2.

Table 1

Explanation of Student Perception Dependent Variables

Variable	Question	Coding
Quality of the Program (PROGRATE)	How would you rate the overall quality of the allied health program?	Responses were coded on a numeric scale as follows: "excellent" = 4, "good" = 3, "fair" = 2, and "poor" = 1
Overall Learning (OL)	How did the allied health facilities at influence your overall learning?	Responses were coded on a numeric scale as follows: "positive influence" = 3, "neutral influence" = 2, "negative influence" = 1
Preparation for Licensure Exam (PREPEXAM)	How did the allied health facilities influence your preparation for the licensure exam(s)?	Responses were coded on a numeric scale as follows: "positive influence" = 3, "neutral influence" = 2, "negative influence" = 1
Preparation for the Workplace (PREPWORK)	How did the allied health facilities influence your preparation for the workplace?	Responses were coded on a numeric scale as follows: "positive influence" = 3, "neutral influence" = 2, "negative influence" = 1
Facilities (FL)	Rate how important the following characteristics of the allied health facilities were in preparing you to become a (allied health professional)	Responses were coded on a numeric scale as follows: "very important" = 4, "somewhat important" = 3, "neutral" = 2, "not important" = 1
Program Instructors (INSTR)	Rate how important the following instructional components were in preparing you to become a (allied health professional)	Responses were coded on a numeric scale as follows: "very important" = 4, "somewhat important" = 3, "neutral" = 2, "not important" = 1

Table 2

Explanation of Independent Variables

Variable	Description and coding
Before and After the new building (BA)	Before/After was coded as a dichotomous variable. "Before" was the reference category. Before = 0; A = 1
Age (AGE)	Number of years was coded on a numeric scale
English Primary Language (ENGL)	English Primary Language was coded as a dichotomous variable. "Yes" was the reference category. Yes = 0; No = 1
First Generation College Student (FIRSTGEN)	First Generation College Student was coded as a dichotomous variable. "Yes" was the reference category. Yes = 0; No = 1
Gender (GENDER)	Gender was coded as a dichotomous variable. "Male" was the reference category. Female = 0; Male = 1
Asian or Pacific Islander Race/Ethnicity (ASIANPI) Hispanic Race Ethnicity (HISP) African American and American Indian Race/Ethnicity (OTHER)	Race/ethnicity was coded as a dichotomous variable. "White" was the reference category. There were four categories of race/ethnicity, one for "white," one for "Asian/Pacific Islander," one for "Hispanic," and one for "African American/American Indian"

The remaining four regression models utilized the student engagement composite factors as the dependent variables. This included questions related to academic challenge, active and collaborative learning, student effort, and student-faculty interaction. The following model was used for these dependent variables:

$$SEF = \beta_0 + \beta_1 BA + \beta 2AGE + \beta_3 ENGL + \beta_4 FIRSTGEN + \beta_5 GENDER + \beta_b HISP + \beta^7 ASIANPI + \beta_8 OTHER \quad (2)$$

where

SEF = student engagement factor (see Table 3 for detailed explanation of each variable)
β_i = standardized regression coefficients (i = 0...9) associated with the independent variables described in Table 2.

Table 3

Explanation of Student Engagement Factor Dependent Variables

Variable	Question	Coding
Academic Challenge (AC) Active and Collaborative Learning (ACL) Student Effort (SE) Student-Faculty Interaction (SFI)	Indicate the response that most closely states how often you did each of the following, while in the allied health professional program	Responses were code on a numeric scale as follows: "very often" = 4, "often" = 3, "occasionally" = 2, "never" = 1

Given that the survey invitation emails were not limited to the specific Allied Health program cohorts originally requested, it was not possible to conduct a before and after comparison by specific program for each program. Instead, three groups of students were created and analyzed. The first group consisted of all of the students who responded to the survey, regardless of their respective Allied Health program. The second group was comprised of Medical Assisting students, since the Medical Assisting program was the only program in which an adequate number of students responded that allowed for a before and after comparison. The last group consisted of the Non-Medical Assisting students. The 10 regression models, listed above, were run for each of the three groups.

All statistical analysis was conducted utilizing IBM Statistical Package for Social Sciences (SPSS) 21.0, a statistical analysis software program that provides a user-friendly method in which to organize and analysis quantitative data.

Interview Analysis

The interview transcripts were reviewed, along with the field notes, utilizing thematic analysis, a process that involves coding and separating the coded data into data groups (Glesne, 1999; Roberts, 2004). A list of themes and subthemes were generated based on their relevance to the research question (Goetz & LeCompte, 1984). Codes were then created to align with the themes and subthemes. The interview responses were also color coded according to each of the faculty program directors. For each color code (i.e., for each faculty program director), the relevant data were organized, first, by interview questions, and, then, by codes and subcodes. The color coding allowed the researcher to easily identify the different faculty program directors' responses.

Delimitations and Limitations of the Research Methodology

This study examined the relationship between buildings, equipment, and technology and student outcomes as perceived by community college students and faculty. Comparisons were made between students who had completed their programs of study in the old facilities and students who completed their programs in the new facility. The faculty program directors had experience teaching in both the old and new facilities and thus could provide additional insight for comparisons between the old and new facilities and student outcomes. There are a number of limitations that need acknowledgment. First, the questions for the student surveys are modified questions from two nationally administered student engagement surveys—the Community College Student Experience Questionnaire (CCSEQ) and the Community College Survey of Student Engagement (CCSSE). Although these questions were reviewed and piloted for accuracy and ease of understanding, the survey instrument used does not have the

external reliability or validity as the complete national surveys. Second, the students responding to the survey were not limited to the specific cohorts originally requested. The survey invitation emails were sent to any student who took a class in one of the Allied Health programs. The original survey solicitation request included cohorts of students completing their respective programs between fall 2007 and spring 2011. This request would have allowed for a comparison of an equal number of cohorts completing their respective programs before and after the new facility. Given the wide range in program completion dates and low response rates, the researcher was unable to conduct before and after comparisons by specific program for each program as originally planned. The lack of student interviews is also a limitation. Interviews with students could have provided additional insight into students' perceptions. A fourth limitation for this study was that no survey responses were received from any Dental Assisting students. Therefore, their perspectives are not reflected in this study. It is unclear to the researcher as to the reason for the lack of responses from this group.

Another limitation for this study is the possibility of a Hawthorne effect (Adair, 1984; Diaper, 1990) with regard to the new facilities, equipment, and technology. That is, given the novelty of the new building, students and faculty may have a tendency to overemphasize the impact of the new building in their responses to the current study compared with students and faculty once they have been in the building a number of years. Lastly, the researcher has personal and professional relationships with some of the study participants. The researcher used caution and objectivity when collecting the data, analyzing data, and reporting the study findings (Glesne, 1999). The use of qualitative and quantitative data analysis allowed for comparisons of findings and thus provided a

check for consistencies in the data. The researcher's relationships were also an asset in that most of the interviewees were trustful of the researcher and therefore more open and honest in sharing their thoughts, their opinions, and information regarding their respective programs.

CHAPTER FOUR

FINDINGS

The purpose of this study was to address the void in the literature regarding the relationship between buildings, equipment and technology and student outcomes—specifically, student engagement, student persistence, licensure exams passage rates, and workforce preparation. This chapter presents the findings of this mixed-method study in four sections. The first section provides the demographics characteristics of the survey participants. The second section presents the quantitative findings from the student surveys and the licensure passage rates. The third section describes the qualitative findings derived from the interviews with the faculty program directors. The last section provides a summary of the findings.

The findings address the following research questions:

1. To what extent do student perceptions regarding their professional preparation differ between students who completed their programs before and after the new building?
2. In what ways, if any, do the new building, equipment, and technology correlate with indicators of student engagement, student persistence, student licensure exam passage rates, student preparation for the workplace, and faculty perceptions of these student outcomes?

Survey Participant Demographic Characteristics

Survey participants included 76 students who completed coursework in at least one of the Allied Health programs—Health Information Technology, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology. As noted earlier, no responses

were received from students in the Dental Assisting programs. The majority of the survey respondents were medical assisting, female, white, and not first generation college students; English was their primary language.

The physical therapist assistant program had the least number of survey respondents. The radiologic technology program survey participants were all female. The overall average age of the respondents was 34, but the average age by program was slighter lower for the medical assisting and radiologic technology students, and slightly higher for the health information technology and physical therapist assistants. There were more students who completed their programs before the new building that responded to the survey. The following tables provide addition demographic information for the survey participants. Table 4 presents the aggregate demographic characteristics of the survey participants, whereas Table 5 presents the demographic characteristics by Allied Health Program.

Quantitative Findings

The quantitative findings are comprised of students' survey responses and licensure exam passage rates. Survey responses were obtained from students who completed coursework in the Allied Health programs—Health Information Technology, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology. As noted earlier, no responses were received from students in the Dental Assisting programs. The following two sections describe (a) the findings from the surveys and (b) licensure exam passage rates for each of the Allied Health programs.

Table 4

Demographic Characteristics Frequencies of Aggregate Survey Participant

Demographic	Number	Percentage of total
Gender		
Female	64	84
Male	12	16
Race/Ethnicity		
American Indian	2	3
Asian	6	8
Black	4	5
Hispanic	13	17
Pacific Islander	10	13
White	41	54
Program Completion		
Before	30	51.3
After	37	48.7
First Generation College Student		
Yes	26	34
No	50	66
English Primary Language		
Yes	64	84
No	12	16
Age		
< 24	19	25
25-35	19	25
36-45	25	33
> 46	13	17

Table 5

Demographic Characteristics Frequencies of Survey Participants by Allied Health Program

Program	Gender	Median age	Race/ ethnicity	First generation	English primary language	Program completion
Health Information Technology	9 Females 2 Males	41 38	1 (9%) Am. Ind. 10 (19%) White	3 Yes 8 No	11 Yes 0 No	Before = 7 After = 4
Medical Assisting	41 Females 1 Male	28 33	6 (14%) Asian 2 (5%) Black 8 (19%) Hispanic 7 (17%) Pacific Is. 19 (45%) White	15 Yes 27 No	33 Yes 9 No	Before = 14 After = 28
Physical Therapist Assistant	4 Females 3 Males	39 41	1 (14%) Black 1 (14%) Hispanic 5 (72%) White	3 Yes 4 No	7 Yes 0 No	Before = 5 After = 2
Radiologic Technology	8 Females 0 Males	26 31	2 (25%) Hispanic 6 (75%) White	2 Yes 6 No	7 Yes 1 No	Before = 6 After = 2
No specific program	2 Females 6 Males	37 34	1 (12.5%) Am. Ind. 3 (37.5%) Asian 1 (12.5%) Black 2 (25% Hispanic 1 (12.5%) White	3 Yes 5 No	6 Yes 2 No	Before = 7 After = 1

Surveys

Survey findings provided insight into the students' perceptions regarding buildings, equipment, technology, and professional preparation. Students responded to questions related to the quality of their respective programs, the influence of the facility on their overall learning, their preparation for the licensure exam, their preparation for the workplace, the importance of facility characteristics, importance of instructional components, and students' engagement behaviors. The following section describes the statistical findings derived from frequency and multiple regression analyses.

Frequency analyses. Doing frequency analyses provided the opportunity to compare the mean responses of students. Table 6 presents the results of the frequency analyses related to the overall quality of the program and professional preparation survey questions. The response scale for the overall quality question ranged from 1 to 4, with 1 representing the poor value and 4 representing the excellent value; the response range for the three professional preparation questions ranged from 1 to 3, with 1 representing the negative value and 3 representing the positive value. In all four of these questions, independent sample *t*-tests indicated that there were statistically significant differences between the perceptions of students completing their programs in the old facility and students completing their programs in the new facility. In short, students who completed their programs in the new building perceived their programs to be of better quality and felt the new facility had a positive influence on their overall learning, their preparation for the licensure exam, and the workplace.

Composite factors were created to analyze students' perceptions regarding the importance of facility characteristics and instructional components in their professional preparation. The frequency findings for these composite factors are presented in Table 7. The response scale ranges from1 to 4 for the composite factor questions, with 1 representing the not important value and 4 representing the very important value. Students completing their programs in the new building felt that the facility characteristics were more important in their professional preparation than students completing their programs in the old building. An independent samples *t*-test revealed that this finding was also statistically significant. Students completing their programs in the old building felt that instructional components were more important in their

Table 6

Professional Preparation Frequencies

Survey question		Before	After	*t*	*df*
Overall quality of the Allied Health Program	*n*	39	37	-1.99*	74
	Mean	3.44	3.70		
	SD	0.60	0.57		
Influence of facilities on overall learning	*n*	39	37	-2.62*	74
	Mean	2.49	2.78		
	SD	0.56	0.42		
Influence of facilities on preparation for the licensure exam(s)	*n*	28	27	-2.19*	53
	Mean	2.50	2.82		
	SD	0.58	0.48		
Influence of facilities on preparation for the workplace	*n*	37	36	-3.03*	71
	Mean	2.41	2.81		
	SD	0.64	0.47		

*$p < 0.05$.

Table 7

Frequencies of Facility Characteristics Factor and Instructional Component Factor

Factor		Before	After	*t*	*df*
Facility characteristics	*n*	39	37	-2.03*	74
	Mean	2.47	2.79		
	SD	0.60	0.75		
Instructional component	*n*	39	37	1.03	74
	Mean	3.83	3.74		
	SD	0.32	0.42		

*$p < 0.05$.

professional preparation than students completing their programs in the new building. An independent samples *t*-test did not, however, indicate this finding to be statistically significant.

Further review of students' perceptions of facility characteristics revealed that some specific characteristics were perceived to be more important than others. The facility characteristics perceived, by both before and after students, as most important in their professional preparation included: the temperature inside the building, classrooms and labs; the lighting inside of the building; and the furniture in the classrooms and labs. Students completing their programs in the old building indicated that location of food or snacks on campus was important, whereas students completing their programs in the new building indicated that the availability of food or snacks *in the building* was important. This finding is revealing, in that the old building was located in the center of campus, close to the cafeteria; and the new building is on the periphery of campus, a considerable walking distance from the cafeteria.

The least important facility characteristics for students completing their programs in the old building were the aesthetics or look of the building and the availability of food or snacks in the building. Students completing their programs in the new building indicated that the physical layout of the building was the least important facility characteristic for students' professional preparation.

In addition to the composite factors for facility characteristics and instructional components, student engagement composite factors were created to analyze potential differences in student engagement behaviors during their professional preparation. The frequency findings regarding the student engagement composite factors are presented in

Table 8. The response scale range for these indicators was 1 to 4, with 1 representing the never value and 4 representing the very often value. In three of the four student engagement indicators, the means of the students completing their programs in the new facility were higher than the students completing their programs in the old facility. These findings indicate students completing their programs in the new building participated in more positive engagement behaviors—active and collaborative learning, student effort, and student-faculty interaction—compared to students completing their programs in the old building. Whereas, students completing their programs in the old building participated in slightly more positive academic challenge engagement behaviors compared to their new building counterparts. Independent samples *t*-tests revealed that none of these findings were found to be statistically significant.

Table 8

Frequencies of Student Engagement Factors

Factor		Before	After	*t*	*df*
Academic challenge	*n*	39	37	0.45	74
	Mean	3.48	3.44		
	SD	0.31	0.44		
Active and collaborative learning	*n*	39	35	-0.26	72
	Mean	2.99	3.03		
	SD	0.52	0.70		
Student effort	*n*	39	37	-0.49	74
	Mean	2.55	2.59		
	SD	0.31	0.41		
Student-faculty interaction	*n*	38	37	-0.03	73
	Mean	2.84	2.85		
	SD	0.51	0.58		

Regression analyses. Regression analyses were also conducted to determine which factors, if any, impacted students' perceptions regarding their professional preparation based on their program completion before and after the new building. The following section presents 10 regression models which provided further insight into the demographic characteristics and students' perceptions regarding the new building, equipment, technology, and professional preparation.

The first four tables present the results of Regression Models 1-4, which demonstrate how the demographic characteristics impacted students' perceptions regarding their professional preparation. The dependent variable for Regression Model 1 is students' perceptions regarding the overall quality of the program (Table 9). Holding all other variables constant, only Hispanic ($p = .10$) and Asian/Pacific Islander ($p = .05$) students were found to perceive their respective programs as high quality programs. This model explained 18.7% of the variance in students' perceptions regarding the overall quality of their program.

The dependent variable for Regression Model 2 is students' perceptions regarding the impact of the program facilities on their overall learning (Table 10). Results from this model reveal that in addition to Hispanic ($p = .05$) and Asian/Pacific Islander ($p = .05$) students, students who completed their program in the new facilities ($p = .05$) perceived the facilities as having a positive impact on their overall learning. However, students that are not first generation college ($p = .05$) students perceived the facilities as having a negative impact on their overall learning. This model explained 31.9% of the variance in students' perceptions regarding the impact of the program facilities on their overall learning.

Table 9

Regression Model 1—Students' Perceptions Regarding Overall Quality of the Program

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	3.50	0.25		13.89	.00
Hispanic	0.34	0.19	0.22	1.79	.08*
Asian/Pacific Islander	0.49	0.19	0.34	2.54	.01***

Note. $R^2 = 0.19$.
*$p \leq 0.10$. ***$p \leq 0.01$.

Table 10

Regression Model 2—Students' Perceptions Regarding Overall Learning

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	3.45	0.20		17.64	.00
Not First Generation College Student	-0.31	0.11	-0.29	-2.71	.01***
Hispanic	0.35	0.15	0.26	2.30	.02**
Asian/Pacific Islander	0.32	0.15	0.26	2.12	.04**
After New Building	0.26	0.11	0.259	2.41	.02**

Note. $R^2 = 0.32$.
**$p \leq 0.05$. ***$p \leq 0.01$.

Regression Model 3's dependent variable is students' perceptions regarding the impact of the program facilities on their preparation for the licensure exam (Table 11). In this model, male ($p = .05$) students and Asian/Pacific Islander ($p = .05$) students perceived the facilities positively impacting their preparation for the licensure exam. This model explained 25.7% of the variance in students' perceptions regarding the impact of the program facilities on their preparation for the licensure exam.

The last of the professional preparation models, Regression Model 4, explains students' perceptions regarding the impact of the program facilities on their preparation for the workplace (Table 12). This model revealed that Hispanic ($p = .10$), Asian/Pacific Islander ($p = .05$), and African American/American Indian ($p = .05$) students perceived the facilities positively impacting their preparation for the workplace. Additionally, students completing their programs in the new facility ($p = .05$) indicated that the facilities positively impacted their preparation for the workplace. Regression Model 4 explained 29.1% of the variance in students' perceptions regarding the impact of the program facilities on their preparation for the workplace.

Two out of the four professional preparation regression models indicated a statically significant difference between perceptions of students completing their programs in the old and new buildings. Models 2 and 4 found that students who completed their programs in the new building perceived the new facilities as having a positive impact on their overall learning and preparation for the workplace. These findings are consistent with the findings from the frequency analyses.

Table 11

Regression Model 3—Students' Perceptions Regarding Preparation for Licensure Exam

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	3.26	0.27		12.30	.00
Males	0.56	0.27	0.30	2.09	.04**
Asian/Pacific Islander	0.48	0.21	0.35	2.28	.03**

Note. $R^2 = 0.26$.
**$p \leq 0.05$.

Table 12

Regression Model 4—Students' Perceptions Regarding Preparation for the Workplace

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	3.29	0.24		13.91	.00
Hispanic	0.31	0.18	0.20	1.68	.09*
Asian/Pacific Islander	0.39	0.18	0.27	2.11	.04**
African American/ American Indian	-0.49	0.25	-0.23	-1.98	.05**
After New Building	0.33	0.13	0.28	2.52	.01***

Note. $R^2 = 0.29$.
*$p \leq 0.10$. **$p \leq 0.05$. ***$p \leq 0.01$.

Regression Models 5 and 6 were run to explain student perceptions regarding facility characteristics and program instruction. Regression Model 5 (Table 13) indicates that non-White (Hispanic $p = .10$, Asian/Pacific Islander $p = .05$, African American/ American Indian $p = .05$) students perceived the building characteristics as positively impacting their professional preparation. This model explained 32.9% of the variance in students' perceptions regarding the impact of the facility characteristics on their professional preparation. Regression Model 6, which explains student perceptions regarding program instruction, was first run with all student survey responses included in the model. This model revealed that when holding all variables constant, none of the demographic characteristics were significant. Given this finding and the number of responses received from each Allied Health programs, two separate models were run—one with only non-Medical Assisting students ($n = 33$) and the other with only Medical Assisting students ($n = 41$)—to determine if possible differences existed between students in different programs. There were no significant findings for either of these models. These findings are consistent with the frequency analyses findings.

Regression Models 7-10 were run to determine if any demographic characteristics impacted student engagement behaviors (Tables 14-16). The academic challenge factor is the dependent variable for Regression Model 7. Holding all other variables constant, Hispanic ($p = .05$) and Asian/Pacific Islander ($p = .10$) students were found to engage in academically challenging activities. However, male ($p = .05$) students were found to not engage in academically challenging activities. This model explained 24% of the variance in students' engagement in academically challenging activities. The dependent variable for Regression Model 8 is active and collaborative learning. Results from this model

Table 13

Regression Model 5—Students' Perceptions Regarding Facility Characteristics

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	2.02	0.26		7.70	.00
Hispanic	0.40	0.20	0.22	1.97	.05**
Asian/Pacific Islander	0.81	0.21	0.48	3.93	.00***
African American/ American Indian	0.48	0.28	0.19	1.74	.09*

Note. $R^2 = 0.33$.
*$p \leq 0.10$. **$p \leq 0.05$. ***$p \leq 0.01$.

Table 14

Regression Model 7—Student Engagement Behavior—Academic Challenge

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	3.33	0.15		21.82	.00
Males	-0.25	0.12	-0.25	-2.11	.04**
Hispanic	0.46	0.12	0.46	3.93	.00***
Asian or Pacific Islander	0.23	0.12	0.25	1.89	.06*

Note. $R^2 = 0.24$.
*$p \leq 0.10$. **$p \leq 0.05$. ***$p \leq 0.01$.

Table 15

Regression Model 8—Student Engagement Behavior—Active and Collaborative Learning

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	2.88	0.25		11.52	.00
Hispanic	0.73	0.20	0.44	3.68	.00***
Asian or Pacific Islander	0.51	0.20	0.34	2.63	.01***

Note. $R^2 = 0.22$.
***$p \leq 0.01$.

Table 16

Regression Model 9—Student Engagement Behavior—Student Effort

	Unstandardized coefficients		Standardized coefficients		
Coefficient	*B*	Std. error	*B*	*t*	Sig.
(Constant)	2.43	0.15		16.04	.00
Males	-0.24	0.12	-0.24	-2.04	.04**
English Not Primary Language	-0.20	0.12	-0.21	-1.67	.09*
Hispanic	0.36	0.12	0.37	3.09	.00***

Note. $R^2 = 0.20$.
*$p \leq 0.10$. **$p \leq 0.05$. ***$p \leq 0.01$.

reveal that Hispanic ($p = .05$) and Asian/Pacific Islander ($p = .05$) students participant in active and collaborative learning activities. This model explained 22.3% of the variance in students' engagement in active and collaborative learning behaviors. Regression Model 9's dependent variable is student effort. In this model, only Hispanic ($p = .05$) students engaged in student effort activities, whereas male ($p = .05$) students and students whose primary language is not English ($p = .10$) did not participate in student effort activities. This model explained 19.8% of the variance in students' engagement in student effort activities. The last student engagement model, Regression Model 10, explains students behaviors related to student-faculty interaction. This model showed that when holding all variables constant, none of the demographic characteristics were significant. Based on this finding and the number of responses received from each Allied Health programs, two additional models were run—one with only non-Medical Assisting students ($n = 33$) and the other with only Medical Assisting students ($n = 41$). There were no significant findings for either of these models.

Survey findings indicated there are perceptional differences between students' who completed their programs in the old buildings (before) and students who completed their programs in the new building (after). Students completing their programs in the new building perceived the facilities as having a positive influence on their overall learning and preparation for the workplace. These findings are similar to the frequency analysis findings. Further, non-White students were found to perceive the facilities as having a positive influence on their overall learning and preparation for the workplace; yet students who were not first generation college students did not perceive the facilities as having a positive influence on their overall learning. Non-White students also perceived the

facility characteristics as having a positive influence on their professional preparation. Hispanic and Asian/Pacific Islander students tended to participate in positive engagement behaviors; however, male students and students who were not first generation college students did not engage in student effort behaviors.

There were no significant findings regarding the influence of instructional components on students' professional preparation or student-faculty interaction engagement behaviors.

Licensure Exams

The allied health programs' licensure exam passage rates for the two semester programs are listed in Table 17; Table 18 lists the passage rates for the 2-year programs. The percentage rates are based on the data obtained from the faculty program directors, Omega College's Annual Accreditation Reports, the Dental Board of California, and the Joint Review Committee on Education in Radiologic Technology. The licensure exam results represent the passage rates for: the California Registered Dental Assistant exam; the National Healthcareer Association's Certified Medical Administrative Assistant and Clinical Medical Assistant Certification (for the 2010-2011 medical assisting cohort) and the American Medical Technologists' Registered Medical Assistant exam (for medical assisting students prior to 2011); the National Physical Therapy Assistant Examination and the California Law Examination for Physical Therapy Assistants; and the National American Registry of Radiologic Technologists.

Based on the licensure passage rates data, it appears that students completing their programs in the new building had higher passage rates compared to the students who completed their programs in the old building. However, given the lack of raw data,

Table 17

Licensure Exam Passage Rates for the Two Semester Allied Health Programs

	Exam passage rate (%)			
Name of program	2007-2008	2008-2009	2009-2010	2010-2011
Dental Assisting	86	95	100	*
Medical Assisting	100	100	100	100

*Data not available.

Table 18

Licensure Exam Passage Rates for the 2-Year Allied Health Programs

	Exam passage rate (%)	
Name of program	2007-2009	2009-2011
Physical Therapy Assistant	81	100
Radiology Technology	100	100

statistical analysis could not be conducted. Therefore, these findings could have occurred by chance and not be the related to students completing their programs in the new building.

Qualitative Findings

The qualitative findings were derived from the interviews with four faculty program directors—Dental Assisting, Medical Assisting, Physical Therapist Assistant, and Radiologic Technology. The interviews provided insight into faculty perceptions regarding the new building, equipment, technology, and student outcomes.

Four themes emerged from the interview. These themes consisted of curriculum, faculty, new building, and student outcomes. Subthemes also surfaced and are noted

within the respective theme. The following section describes what the interviewees said about each of these themes. The first two sections provide background and insight into the program directors' feelings about their respective programs with regard to curriculum and faculty, whereas the last two sections present their perspectives on the impact of the facilities on teaching and student outcomes.

Background

The first theme during the interviews was the program curriculum. All of the interviewees talked about the rigor and professionalism of their respective programs. The discussion regarding rigor included the additional hours required beyond the accrediting agency-mandated minimum for a program; the extensive amount of material covered in a program; the hands-on training on state-of-the-art equipment and technology; the evaluation of students' mastery of skills; and the philosophy of teaching more than the technical skills. With respect to this last point, one of the interviewees said, "[We are] trying to develop them as a good healthcare provider" (Marie, October 17, 2012). Professionalism and patient care were key subthemes when comparing Omega's programs to proprietary programs.

The second theme was faculty. This discussion applied to both the faculty program directors and the part-time faculty that taught in their programs. The faculty in each of the allied health programs had a commitment to student learning and growth. The interviewees expressed the importance of having faculty members that are current in their respective fields, not only from a subject matter knowledge perceptive, but also in terms of contributions to the quality of the programs.

New Building

The new building, which also included dialogue regarding technology and equipment, was the third theme that emerged from the interviews. Although the interviewees were told the research study was exploring the relationship between facilities and student outcomes in allied health programs prior to their respective interviews, three of the four faculty program directors mentioned something about the new Allied Health Education and Training Facility without a prompting question. The discussion about the new building centered on how teaching methods and student learning were enhanced due to classrooms, the size of the laboratories, and state-of-the-art equipment and technology. For example, when one of the program directors was specifically asked about the new building's influence on faculty teaching, she felt that the new building did "not really influence the *way* we teach because we taught this way for years. It has influenced us on the equipment that we have to work with" (Pat, October 15, 2012, emphasis added). Thus, for her and the other program directors, the new building, equipment and technology enhanced the methods they had always used to teach and promote student learning.

Although not directly stated by the other program directors, Pat's perspective was reflected in other program directors' comments. For example, all of the program directors discussed the impact of the classroom and laboratory size on their ability to teach and student learning. The new building's larger classrooms and laboratories provide more space for teaching, equipment, and practice stations. Additional equipment and practice stations allow faculty easier access for interaction with students and students to have more practice time on the equipment.

The quote matrix in Table 19 provides examples of the program directors' statements regarding how the size of the new classrooms and laboratories has influenced their teaching and student learning. Three of the four program directors also compare the new classrooms and laboratories to the old facilities.

The program directors also discussed how the new building's state-of-the-art equipment and technology has influenced their teaching and student learning. For example, Pat (October 15, 2012) stated:

> [The building has] influenced us on the equipment that we have to work with. We have the state of the art equipment as you saw in our program here. The students get a lot of hands on, meaning that they manipulate every style, every delivery system of dental material. Every single one. We give them that knowledge, we give them that skill.

Similarly, Erica (October 23, 2012) said

> What we used to have was horrible, it was terribly outdated. We had two rooms, neither of which worked correctly and was very limited as far as working in a laboratory. But [now] we do have a lot of other things that other programs do not have. We have a lot of portable equipment, portable x-ray and portable fluoroscopy. We bought the equipment with Prop S and N funds so that is a direct benefit to patients in this region that we do have these facilities here because our students learn here.

And another program director stated

> Now we have computers [for students to use]. We are implementing and forcing them [students] to use computers . . . because there is a computerized test instead of a paper test for their board exam, so just being comfortable with a computer has become really important. (Marie, October 17, 2012)

The program directors made a clear distinction between equipment and technology. Equipment was in reference to tools and machinery specific to the program (i.e., mannequins, ultrasound machines, etc.); whereas technology included computers for students and teaching tool (i.e., document cameras, pan-zoom-tilt cameras, etc.). The

Table 19

Impact of Classroom and Laboratory Size on Teaching Methods and Student Learning

Program Director	Statement
Erica	Room matters in radiology. We need room to move patients round and simulate that. [Students] can work in smaller groups, and any time you have a smaller group and you have access to the equipment, will give you a better educational outcome directly tied to a patient care outcome. That is one of the unique situations that we hold.
Marie	And our space is probably about twice the size it was. For years, we were in this very tight space where we were bumping into each other, trying to move around. It was very hard because of the volume, and we could not really see what was going on because we were so tightly packed together. I could not necessarily see across the room. Now I can stand in the middle [of the] room and turn around and watch pretty much everything that is going on and have a clear vision of everybody working, so I think that has helped me from a teaching standpoint.
Nicole	It is definitely an upgrade from the facilities we had before. It gives the student a better working environment. We have more space, we have better equipment. It is a functional lab and the lecture space is large enough to accommodate more students. I have definitely seen improvement in students focusing when they have a better environment to work in. . . . There is less distraction because there is more space for them to spread out. Before we had a small space, so only a certain number of students could be working on something, and the other ones were sitting and waiting. Now they can all be working instead of sitting and having downtime.
Pat	[Students] get a chance to be an operator, and assistant, and a patient during a whole lab time, where before it was maybe half an hour. But now they get a whole lab time and our labs are 3 hours long, so they get the whole lab time on learning. And I get to go from one station to another, or one treatment room to another, and I give them correction or praises or whatever I need to do at that moment for each one of them. It has been a great education for not only us but for the students.

quote matrix in Table 20 presents additional statements made by the program directors regarding specific ways in which the new technology has impacted their teaching and student learning.

Table 20

Impact of the New Technology on Teaching Methods and Student Learning

Program Director	Statement
Erica	[We have a] picture archiving and communication system that is [similar to what] hospitals use. Our students can sit at their own computer, pull up their images, manipulate them, learn how to pull them up for a physician to view.
Marie	[W]e now have the document cameras. They are so much better than overhead projection. Several times I've brought in articles/ pictures that I've been able to put up for viewing during spontaneous teachable moments, whereas the overhead projectors required planning, since the overheads have to be made ahead of time. The fact that additionally you can easily project pictures in the textbook is helpful—you can point to specific items being discussed; also, if someone has forgotten their text, they have the benefit of having critical items projected.
Pat	We have smart classrooms, and one of the most wonderful teaching tools that we have is this camera. . . . And it is this pan, tilt, zoom camera, and it is wonderful because we can zoom in on just the mannequin's mouth, or if we have a patient in here we can zoom in on the patient's mouth, and there is a monitor at each one of the stations that the student can look directly at the monitor, and they are seeing right into what we are demoing and no more, "I can't see." They [students] were all 15 crowded around trying to see what I was doing in my demo. [Now] they get to stay at their station. It is wonderful.

Student Outcomes

The fourth theme was student outcomes, which included preparation for the workplace, retention rates, and licensure passage rates. Each of the faculty program directors commented on the enhanced preparation students received in their respective

programs due to the new building, equipment, and technology. For example, one program director said, "We have more equipment. The equipment is up to date, so the students are actually able to practice on equipment they would use in a real doctor's office" (Nicole, September 24, 2012). Another program director said:

> [W]e are able to keep up with the dental industry with all of the equipment, so the student is very well prepared to go out into the dental office in order to function as the extra set of hands that the dentist needs to work in the patient's mouth. (Pat, October 15, 2012)

Finally, when remarking on student preparation for the workplace compared to other allied health programs offered by proprietary institutions, one of the program directors stated, "[W]e have facilities that outshine by far our local competitor" (Erica, October 23, 2012).

The retention or completion rates of students were mentioned by three faculty program directors. Each of these directors' programs had different retention trends. The Dental Assisting program had a positive retention trend: 100% of the first year's cohort of students in the new building and a 97% completion with the second year's cohort. This rate contrasts with past cohort retention rate of 50% or less in the old building. The Medical Assisting program experienced a mixed trend when comparing the retention rates of student cohorts completing in the old and new buildings. The cohorts completing their programs in the old building had a decrease in retention: 93% in the 2007-2008 cohort and 68% in the following cohort (2008-2009). However, students completing their programs in the new building had the reverse trend: 60% in the first cohort (2009-2010) and 72% in the second year's cohort (2010-2011). Lastly, the Physical Therapist Assistant program experienced a slightly negative retention trend when the retention rates

of student cohorts completing in the old and new buildings were compared. The Physical Therapist Assistant cohort completing their program in the old building (2007-2009) had a 68% retention rate, and the first cohort to complete in the new building (2009-2011) had a retention rate of 65%.

Students' licensure passage rates were mentioned by four of the program directors. Each indicated that their licensure passage rates have been above state and/or national averages and have not been influenced by the new building, equipment, or technology. All of the program directors echoed similar sentiments regarding students' licensure passage rates. For example, one faculty program director stated, "We have always had high passage rates; this has not changed since we moved into the new building" (Nicole, September 24, 2012). Another said, "Our students for the last 5 years have a 100% pass rate on the first time attempt" (Erica, October 23, 2012). And Marie (December 20, 2012) stated in a follow-up email correspondence,

> We have always enjoyed high board pass rates—always above state and national levels. I'd like to believe that the new facilities have improved our outcomes. The reality is that our board pass rates are probably more highly related to [other factors].

Qualitative findings from the program directors' interviews revealed key themes—curriculum, faculty, new building, and student outcomes. Statements regarding program curriculum and faculty provided background and positive insight regarding the program directors' feelings about their respective programs. All of the program directors felt their respective programs were rigorous and professional—programs which prepared students to be "good healthcare providers." The program directors were in agreement regarding the impact the new facilities had on students' preparation for the workplace.

The program directors felt that the new building, equipment, and technology not only enhanced the methods which faculty members used to teach but improved student learning, resulting in better preparation for the workplace.

Program director sentiments regarding influence of the new building on student retention was mixed. For example, the dental assisting program experienced phenomenonal retention rates with its first two cohorts in the new building; whereas, the Physical Therapist Assistant program experienced a slight decrease in completion rates for its first cohort in the new building.

Lastly, with regard to the impact of the new building on student licensure passage rates, the program directors were in agreement. All of the programs reported experiencing higher than state and national licensure passage rates and felt that the new building, equipment, and technology did not have an impact on student licensure passage rates.

Summary

The findings from this study begin to fill the void in the literature regarding the relationship between buildings, equipment and technology, and student outcomes. This chapter presented the findings of this mixed-method study. The chapter began with a presentation of the demographic characteristics of the survey participants. The results of the analysis were provided to address both of the research questions. The quantitative findings were derived from student surveys and the licensure passage rates data. Analysis of interviews with the faculty program directors resulted in the qualitative findings.

Survey results indicated students who completed their programs in the new building (after) perceived the facilities as having a positive influence on their overall

learning, preparation for the workplace, preparation for the licensure exam, and felt their program to be of better quality, compared to students that completed their programs in old building (before). However, there were no significant findings regarding the influence of the facility on instructional components or any of the student engagement factors—academic challenge, active and collaborative learning, student effort, and student-faculty interaction.

The licensure passage rates data appear to indicate that students completing their programs in the new building had higher passage rates compared to the students who completed their programs in the old building.

All of the faculty program directors perceived the new building, equipment, and technology as having a positive impact on student learning and students' preparation for the workplace. However, the program directors did not feel the new facility had any impact on students' licensure passage rates. Perceptions regarding the impact of the new facility on student retention were mixed. One program experienced increased student retention, whereas other programs experienced a decrease in student retention. Further discussion of these findings, and their implications for policy and future research, are presented in Chapter 5.

CHAPTER FIVE

DISCUSSION AND CONCLUSIONS

California community colleges are uniquely positioned to meet industry demand for a well-trained workforce. In an effort to fully address these needs, California community colleges have had to replace outdated facilities, obsolete equipment, and inadequate technology. Legislative changes, in recent years, have made is easier for community college districts to pass local general obligation bond measures to fund construction, renovation, or replacement of school facilities (Carroll, 2006; EdSource, 2000a, 2000b). During the last decade, community colleges and schools districts have received $7 billion for numerous construction projects (Lovett, 2013).

Coupled with the task of training the workforce to meet the needs of industry, community colleges are also required to assess student learning and provide evidence of these student learning outcomes. One set of measures community colleges are utilizing to assess and evaluate student learning outcomes are student engagement indicators (Kuh, 2009; National Commission on the Future of Higher Education, 2006; Walker et al., 2010). Student engagement refers to a student's level of participation in activities, both inside and outside of the classroom (Astin, 1985; Kuh, 2009; Pace, 1979). Thus, a student actively participating in engagement activities and behaviors tends to have positive learning outcomes (Kuh, 2009; Pace, 1984; Tinto, 1993). The current national student engagement indicator benchmarks include: academic challenge, active and collaborative learning, student effort, student-faculty interaction, and support for learners. These benchmarks, however, do not address the physical characteristics of a college campus, with regard to classrooms, equipment, technology, and other building features.

California taxpayers have made significant investments in new facilities, equipment, and technology; it would be helpful if community colleges were able to provide evidence that students are learning and becoming better prepared for the workforce as a result of learning in modern facilities, with the state-of the-art equipment and technology (Flemming & Hedrick, 2008; Joch, 2008). Currently, there has been little empirical evidence to support this statement. The literature concerning community colleges facilities and outcomes is limited to studies related to buildings designed for recruitment and retention, creating physical spaces that support and enhance learning, and advancing the institution's mission (Calcara, 1999; Copa & Wolff, 2002; Joch, 2008). Though related research findings indicate a positive correlation between building characteristics and student achievement, behavior, and attitudes; these studies are limited to elementary and secondary school settings.

The purpose of this study was to fill the empirical void in the literature regarding the relationship between buildings, equipment and technology, and student engagement, student persistence, licensure exams passage rates, and workforce preparation at the community college level. Two research questions provided guidance for this study. The first question examined students' perceptions regarding their professional preparation. The second question sought to understand relationships between the new building, equipment, and technology and student learning outcomes—student engagement indicators, student persistence, student licensure exam passage rates, and student preparation for the workplace—based on student performance data, student perceptions, and faculty perceptions.

In addition, this study explored perceptions regarding professional preparation held by allied health students who completed their programs in the old facilities and allied health students who completed their programs in the new building. The faculty program directors' perceptions were also included in this study. Each of the faculty program directors had the opportunity to teach in both the old and new buildings. The students and faculty program directors were from one of the following allied health programs: Dental Assisting, Health Information Technology, Medical Assisting, Physical Therapy Assistant, and Radiologic Technology.

This study utilized a mixed method case study design, whereby both quantitative and qualitative data were collected and analyzed to better understand the relationship between buildings, equipment and technology, and student outcomes (Creswell, 2003; Creswell & Clark, 2007; Yin, 1993). The quantitative phase of the study included an electronically distributed survey—comprised of rating scales and open-ended questions—and professional licensure passage rates. Descriptive statistics, independent sample *t*-tests, and multiple regression methods were used to analyze the 76 survey responses. The qualitative component of this study consisted of individual interviews with faculty program directors. These transcribed interviews were reviewed utilizing thematic analysis.

This chapter begins with a discussion of the study's key findings and how these findings relate to the literature regarding the affects of building characteristics on student outcomes and student engagement. The following segment provides possible policy implications based on this study's findings. The final section provides suggestions for future research and concluding remarks.

Discussion of the Study's Key Findings

Whereas Chapter 4 provided the details of the findings from this study, this section succinctly summarizes the key findings. Presented first are the significant findings which pertain to students' perceptions regarding the impact of facilities on their professional preparation. Second, the links between student perceptions of the new building, student outcomes, and faculty perceptions of these student outcomes are discussed.

The first research question examined student perceptions regarding their professional preparation. Comparisons were made between students who completed their programs before the new building and students who completed their programs in the new building. Specifically, this question asked: To what extent do student perceptions regarding their professional preparation differ between students who complete their programs before and after the new building?

The quantitative findings indicate that there are perceptional differences between students who completed their programs in the old buildings (before) and students who completed their programs in the new building (after). Survey findings showed students completing their programs in the new building perceived the facilities as having a positive influence on their overall learning. Frequency analysis found that students who completed their programs in the new building perceived their programs to be of better quality and felt the new facility had a positive influence on their overall learning. Other studies have found a positive correlation between building characteristics and students' achievement, behaviors, and attitudes (Crampton, 2009; Earthman, 2002; Earthman & Lemasters, 1996; Hines, 1996; Schneider, 2002; Weinstein, 1979). More specifically,

studies utilizing the age of school buildings, as a proxy to indicate the condition of a facility, found a positive link to student achievement (Berner, 1993; Cash, 1993; Phillips, 1997).

The second research question examined correlations between student perceptions of the new building and student outcomes, and faculty perceptions of these student outcomes. Specifically, this research question asked: In what ways, if any, do student perceptions of the new building, equipment, and technology correlate with indicators of student engagement, student persistence, student licensure exam passage rates, student preparation for the workplace, and faculty perceptions of these student outcomes.

Survey findings showed there were no significant findings regarding the influence of the new facility and instructional components or any of the student engagement factors—academic challenge, active and collaborative learning, student effort, and student-faculty interaction. The licensure passage rates data seem to indicate that students completing their programs in the new building had higher passage rates compared to the students that completed their programs in the old building. However, without the means to conduct statistical analysis, these passage rates could have occurred by chance and not be the related to students completing their programs in the new building. Further, quantitative results showed there is a correlation between the new building, equipment, and technology and student preparation for the workplace. Survey findings indicated students completing their programs in the new building perceived the facilities as having a positive influence on their preparation for the workplace. Frequency analysis found that students who completed their programs in the new building felt the

new facility had a positive influence on their preparation for the licensure exam and the workplace.

The faculty perceptions component of the second research question was addressed through interviews with the faculty program directors. The qualitative findings from these interviews revealed key themes—curriculum, faculty, new building and student outcomes. Statements regarding program curriculum and program faculty provided background and positive insight regarding the program directors' feelings about their respective programs. All of the program directors felt their respective programs were rigorous and professional—programs which prepared students to be "good healthcare providers." The program directors were in agreement regarding the positive impact the new facilities had on students' preparation for the workplace. The program directors also felt that the new building, equipment, and technology not only enhanced the methods which faculty members used to teach but improved student learning, resulting in better preparation for the workplace.

Findings regarding the influence of the facility on student retention were mixed. Some programs, like Dental Assisting, experienced extraordinary retention rates; whereas other programs, like Physical Therapist Assistant, had flat or poor retention rates. These results may be due to the specific needs and requirements of each program. For example, the Dental Assisting program requires a vast array of equipment, ranging from dental chairs to mannequins to intricate dental instruments; whereas, the Physical Therapist Assistant program does not require a large amount of equipment. Therefore, it may be that the building, equipment, and technology in new building had a more dramatic impact

on the Dental Assisting students than the Physical Therapist Assistant students due to their level of equipment use and the significant upgrade in equipment.

Finally, the program directors did not believe that the new building, equipment, and technology had an impact on student licensure passage rates; however, the data indicates that students completing their programs in the new building had higher passage rates compared to the students that completed their programs in the old building. There are three possible reasons why the program directors held this perception. First, all of the programs traditionally experienced passage rates well above state and national levels; therefore, maintenance of this high standard was not perceived to be influence by the new building, equipment, or technology. Another reason the program directors believe the new facilities did not influence the professional licensure passage rates may be due to other factors affecting students. For example, one program director mentioned that the licensure exam was electronic; this created a challenge for one of her students with limited computer skills. Another program director alluded to the fact that a particular set of students received passing course grades when they should not have and, as such, may not have been adequately prepared to take the licensure exam. Lastly, another potential reason the program directors believe the new facilities did not influence the professional licensure passage rates may be due to curriculum changes that may have occurred during this time period.

As a final comment, it should be noted that even though the faculty did not specifically discuss student engagement or student engagement indicators, the themes revealed in the program director interviews can be linked to student indicators. For example, active and collaborative learning is a measurement of students' level of

participation in class and interaction with other students. Program directors felt that the new classrooms, laboratories, equipment, and technology provided opportunities for active and collaborative learning to take place. Additionally, student effort is a measure of students' time on task; again, the faculty believed that the new facilities allowed students to have more hands-on practice time (McClenney & Marti, 2006; McClenney et al., 2006).

Implications for Policy

The findings from this study provide some implications for policy with regard to new facilities. These implications include bond measures and accreditation. For more than a decade, community college districts have successfully passed facility construction bond measures based on the assumption that new buildings, equipment, and technology positively impact student outcomes. However, in recent years, public concern has grown regarding the cost of these bonds (Lovett, 2013). Evidence from this study suggests that students trained in a new facility, with new equipment and technology, experienced better overall learning and were better prepared for the workforce. This evidence provides potential support for community college districts that have constructed new facilities, as well as districts that are attempting to garner public support bonds for facility construction and renovation.

Community colleges throughout the state are struggling to maintain their accreditation (Rivera, 2013). The area of student learning outcomes is one of the areas of focus for accreditation that has been particularly challenging. (Beno, 2004; Friedlander & Serban, 2004). Community colleges must clearly document student learning goals and assess learning of these goals. The literature indicates that institutions that have

implemented student engagement activities have been successful in assessing student learning (Chickering & Gamson, 1987; Ethington & Horn, 2007; Kaufman & Creamer, 1991; Kuh et al., 2005; Pascarella & Terenzini, 1991, 2005; Tinto, 1987, 1993, 1997). The study suggests that providing an environment that is conducive to teaching and learning can result in positive student learning outcomes—namely, overall learning and preparation for the workforce. Therefore, when community college administrators are planning and developing new facilities, consideration should be given to creating facilities, with up-to-date equipment and technology, which allow faculty to maximize their teaching and provide opportunities for students to participate in student engagement activities.

Suggestions for Future Research

Although the results of this study are not technically generalizable in the traditional scientific sense, the findings can assist educators and administrators to better understand the relationship between buildings, equipment and technology, on the one hand, and student engagement, student persistence, licensure exams passage rates, and workforce preparation, on the other. This study addresses the void in the literature regarding the relationship between facilities and student outcomes. This section provides four suggestions for future research.

One suggestion for future research is to replicate this study with students in Allied Health programs at a different community college. There are a number of community colleges throughout the state of California, like Omega College, that have recently built new facilities for their Allied Health programs. The ability to compare and contrast student and faculty perceptions from another institution with new facilities, equipment,

and technology could prove to be very insightful. It would be interesting to see if student and faculty perceptions were similar to those held by Omega College students and faculty or if they differed, and in what ways.

Another suggestion for future research is to conduct a similar study with a different type of career and technical education (CTE) program. Other CTE programs have unique classrooms and laboratories and provide students with the opportunity to take professional licensure exams. Examples of such programs include: automotive technology, cosmetology, and culinary arts. Many of these programs have been beneficiaries of bond supported new or renovated facilities. Being able to compare and contrast student and faculty perceptions from different disciplines in another institution with new facilities, equipment, and technology could prove to be insightful. It would be interesting to see if student and faculty from other CTE areas held similar or different perceptions as those held by Omega College students and faculty.

Another recommendation is to conduct a similar study with academic non-CTE programs. Although these programs do not have unique classrooms, laboratories, or external licensure exams, perceptions of students and faculty could provide further insight into the relationship between facilities and student outcomes. Student transfer rates could be an added student outcome. This type of study could provide an additional perspective to the literature regarding the relationship between community college facilities and student outcomes.

The last recommendation would be to conduct a similar study with a focus on specific facility characteristics and student outcomes. This type of study could provide insight into what specific characteristics, if any, impact student outcomes. Conducting

this type of study would contribute to the limited empirical research regarding the relationship between facilities and student outcomes at the community college level.

Conclusion

The purpose of this study was to examine the relationship between buildings, equipment and technology, and student engagement, student persistence, licensure exams passage rates, and workforce preparation. Findings from this study support the assumption that physical improvements and state-of-the-art equipment and technology enhance student learning and better prepare students for the workplace. Specifically, students completing their programs in the new building felt that the building, equipment, and technology positively influenced their overall learning and preparation for the workplace, when compared to students who had completed their programs in the old building. Faculty also felt the new building, equipment, and technology improved their teaching methods and better prepared students for the workplace.

California community colleges are challenged to provide evidence of student learning, either for accreditation requirements or to reassure the taxpayers that their fiscal investment is meeting needs of California businesses and industries. Findings from this study suggest that facility characteristics may provide a means in which to capture evidence of student learning outcomes.

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APPENDIX A

Email to Recruit Faculty Program Directors for Interviews

Email to Recruit Faculty Program Directors for Interviews

Email Subject Line: Allied Health Faculty Program Directors - Special Request

Dear [Ms. Last Name]:

My name is Danene Brown and I am a doctoral student in the School of Leadership and Education Sciences at the University of San Diego. I am conducting my dissertation on the relationship between facilities and technology and student outcomes in Allied Health Programs. I hope you would be willing to share your experiences of teaching and working with students before and after the new Allied Health Education and Training Facility.

Interviews are expected to last no longer than 60 minutes and will be conducted at a time and place convenient for you. Participation is voluntary and your responses will be kept strictly confidential.

To participate, simply respond to this email and let me know two or three dates and times that would work best for an interview; I will then do my best to make one of those times work with my schedule.

Your participation will significantly contribute to my research on a facilities and their impact on student outcomes; a topic that is currently lacking in the community college literature. Thank you in advance for your assistance. I look forward to talking with you

Kind regards,

Danene Brown
Researcher, Ph.D. Candidate
danene-09@sandiego.edu
Personal cell: 619-252-2818

APPENDIX B

Omega College Allied Health Programs Student Survey

Omega College Allied Health Programs Student Survey

Email Introduction

Email Subject Line: Former Allied Health Students - Special Request

Hello former Omega College Allied Health students,

I hope this email finds you well.

A doctoral student at University of San Diego is conducting a research project on Omega College's Allied Health Programs. She is studying the relationship between facilities, equipment and technology at Omega College and its impact on student outcomes. Your participation will help community college educators learn how to improve student outcomes, especially those in Allied Health programs. Please take a moment to complete the following survey.

Thank you in advance for your participation. In appreciation of your time and participation, you will have the opportunity to enter your name into a drawing for one of five prepaid $50 VISA gift cards.

Please click on the link below to begin the survey.

Thank you,

XXXXX XXXXX
Assistant Professor
Program Director, XXXXX Program
Omega College

Omega College Allied Health Program Survey

Informed Consent

Greetings former Omega College Allied Health students! My name is Danene Brown. I am a student in the School of Leadership and Education Science at the University of San Diego. This email is an invitation for you to participate in a research project I am conducting for my doctoral dissertation. The purpose of this study is to examine the relationship between facilities, equipment and technology and student outcomes at Omega College.

The project will involve a brief survey that will ask you questions about your experiences in the Allied Health program at Omega College. The survey should take you about 30

minutes to complete. At the end of the survey you will be given a chance to enter your name in a drawing for one of five $50 prepaid VISA gift cards in appreciation for your participation in this phase of the study.

Participation is entirely voluntary and you can refuse to answer any question and/or opt out at any time. Your survey responses will be confidential; even I, as the researcher, will not know the identity of the survey respondents. All survey data will be stored in a password-protected file for a minimum of five years before being destroyed. Any contact information provided at the end of the survey by participants who wish to enter their names into the gift card drawing will also be kept confidential. Neither the Allied Health programs nor the university will know of your decision to participate in this study. This study involves no more risk than the risks you encounter in daily life.

There are no other verbal or written agreements related to this study beyond those expressed in this consent form. If you have any questions regarding this research, please contact Danene Brown at 619-252-2818/danene-09@sandiego.edu or Dr. Fred Galloway, my dissertation chairperson, at the University of San Diego at 619-260-7435/ galloway@sandiego.edu.

Your participation is very important and greatly appreciated. As a survey participant, you will benefit in knowing that you helped community college educators learn how to improve student outcomes, especially those in Allied Health programs. By clicking the box below, you indicate your willingness to participate in this study. I thank you for your participation!

☐ I have read and understand this form, and consent to the research it describes to me. (If your response is no, please exit the survey.)

Background Information

1. What Allied Health program did you participate in at Omega College? Dental Assisting; Health Information Technology; Medical Assisting; Physical Therapist Assistant; Radiologic Technology

2. What is your age? [Drop down menu]
   Under 18; 19-21; 22-24; 25-29; 30-34; 35- 39; 40-44; 45-49; 50-54; 55-59; 60-64; 65+

3. What is your gender? Female/Male [Drop down menu]

4. What is your marital status while in the program? Single; Married; Domestic Partner; Divorced; Separated; Widowed [Drop down menu]

5. Is English your primary language? Yes/No [Drop down menu]

6. What racial or ethnic group do you most closely identify with? American Indian or Alaskan American; Asian Indian; Cambodian; Chinese; Japanese; Korean; Laotian; Vietnamese; Asian Other; Black or African American, Non-Hispanic; Central American; Mexican, Mexican-American or Chicano; South American; Hispanic Other; Filipino; Guamanian; Hawaiian; Samoan; Pacific Islander Other; White, Non-Hispanic; [Drop down menu]

7. Are you the first person in your family to go to college? Yes/No [Drop down menu]

8. Indicate which of the following were your reasons or goals for attending Omega College's Allied Health program. (Please respond to each item) [Drop down menu for each]

	Primary goal	Secondary goal	Not a goal
a. Obtain a certificate			
b. Obtain an associate degree			
c. Opportunity to take state/national licensure exam			
d. Transfer to a 4-year college or university			
e. Obtain or update job-related skills			
f. Self-improvement/personal enjoyment			
g. Change careers			

9. Did you achieve your primary goal? Yes/No [Drop down menu]

10. Did you achieve your secondary goal? Yes/No [Drop down menu]

11. Did you complete the program? Yes/No [Drop down menu]

12. What year did you complete or leave your program? 20_ _ [Drop down menu]

13. During the time you were in the program, about how many hours a week did you usually spend studying or preparing for your classes?
None, 5 or fewer hours a week; 6-10 hours a week; 11-15 hours a week; 16-20 hours a week; more than 20 hours a week [Drop down menu]

14. During the time you were in the program, about how many hours a week did you usually spend on campus, not counting time spent in classes, but doing academic activities (for example, meeting with faculty, meeting with classmates to study, studying in the library, etc.)?

None, 5 or fewer hours a week; 6-10 hours a week; 11-15 hours a week; 16-20 hours a week; more than 20 hours a week [Drop down menu]

15. Have you taken a state or national licensure exam related to your Allied Health program? Yes - passed, Yes - failed, No - have not taken exam [Drop down menu]

16. Which exam did you take or do you plan to take? Select all that apply. A) California Registered Dental Assistant exam; B) Registered Health Information Technician exam; C) California Medical Assistant exam D) National Registered Medical Assistant exam; E) National Physical Therapy Assistant exam; F) the California Law Examination for Physical Therapist Assistants; G) National American Registry of Radiologic [Drop down menu]

17. If you have taken a state or national licensure exam, how many times have you taken it? 1 time; 2 times; 3 times; 4 or more times [Drop down menu]

18. During the time you were in the program, were you employed? Yes, full time, Yes, part time, No [Drop down menu]

19. Are you currently working in an Allied Health position/occupation? Yes/No [Drop down menu]

20. Did the Allied Health program you participated in at Omega College, help you obtain employment? Yes, No, but it helped me to advance in my field, No [Drop down menu]

21. How would you rate the overall quality of the Allied Health program at Omega College? Excellent/Good/Fair/Poor [Drop down menu]

22. Would you recommend Omega College's Allied Health program to a friend? Yes/Maybe/No [Drop down menu]

In the following three questions Allied Health facilities refers to classrooms, labs, faculty offices, building characteristics, and items located within the building, such as furniture, equipment, technology, lighting, and temperature.

23. How did the Allied Health facilities at Omega College influence your overall learning in becoming a XXXX? Positive Influence - Contributed to my overall learning/Neutral - No influence on my overall learning/Negative Influence - Detracted from my overall learning [Drop down menu for selections, also use logic to specific occupation]

24. How did the Allied Health facilities at Omega College influence your preparation for the licensure exam(s) in becoming a XXXX? Positive Influence - Better prepared/Neutral - No influence/Negative Influence - Less prepared [Drop down menu for selections, also use logic to specific occupation]

25. How did the Allied Health facilities at Omega College influence your preparation for the workplace in becoming a XXXX? Positive Influence - Better prepared/Neutral - No influence/Negative Influence - Less prepared [Drop down menu for selections, also use logic to specific occupation]

26. For the following questions, please rate how important the following characteristics of the Allied Health facilities were in preparing you to become a XXXX? [Use logic to specific occupation]

Facilities	Very Important	Somewhat Important	Neutral	Not Important
a. Location of the Allied Health building on campus				
b. Availability of parking				
c. Aesthetics or look of the Allied Health building				
d. Acoustics inside the Allied Health classrooms and labs				
e. Physical layout of the Allied Health building				
f. Physical layout of the Allied Health classrooms and labs				
g. Furniture in the Allied Health building				
h. Furniture in the Allied Health classrooms and labs				
i. Lighting inside of the Allied Health building				
j. Lighting outside of the Allied Health building				
k. Temperature in the Allied Health building				
l. Temperature inside the Allied Health classrooms and labs				
m. Availability of food/snacks in the Allied Health building				
n. Location of food/snacks in the Allied Health building				
o. Availability of food/snacks on campus				
p. Location of food/snacks on campus				

27. For the following questions, please rate ***the importance of the following instructional components were in preparing you to*** become a XXXX? [Use logic to specific occupation]

Instruction	Very Important	Somewhat Important	Neutral	Not Important
a. Instructor's ability to teach program skills				
b. Instructor's use of computer technology				
c. Instructor's use of lab equipment				
d. Opportunities to use equipment to develop skills				
e. Opportunities to use equipment in "real world" applications				
f. Opportunities to interact with instructor(s)				
g. Opportunities to interact with classmates				

28. For the following questions, please indicate the response ***that most closely states how often you did each of the following***, during your Allied Health program at Omega College?

	Very Often	Often	Occasionally	Never
a. Participation in class discussions or asked questions				
b. Went to class without completing readings or assignments				
c. Worked on a paper or project that required integrating ideas or information from various sources				
d. Applied principles and concepts learned in class to understand other problems or situations				
e. Summarized major points and information from our class notes, assignments or readings				
f. Made a class presentation				
g. Practiced to improve your skill in using a piece of lab equipment				
h. Showed someone else how to use a piece of equipment				
i. Worked with other students on projects during class				
j. Worked with classmates outside of class to prepare class assignment, project, or presentation				
k. Met other students at some campus location (library, cafeteria, etc.) for a discussion				
l. Asked an instructor for information related to a course you were taking (grades, make-up work, assignments, etc.)				

m. Discussed your academic program or course selection with an instructor				
n. Worked harder as a result of feedback from an instructor				
o. Used email to communicate with an instructor				
p. Discussed your career plans and ambitions with an instructor or counselor				
q. Received prompt feedback (written or oral) from instructor(s) on your performance				
r. Discussed your personal problems or difficulties with an instructor				

Please write any additional comments you would like to make in the space provided below.

_____

Thank you for taking the time to complete this survey. Your participation will significantly contribute to the current research on the relationship between community college facilities, equipment and technology and its impact on student outcomes. In appreciation of your time, you are invited to have your name entered into a drawing for one of five $50 prepaid VISA gift cards.

In order to keep your current survey responses anonymous, you will automatically be taken to another link when you click "Done" below, before you will be asked to provide any contact information. In this new link, you will be given the opportunity to provide your name and contact information.

Thank you!

APPENDIX C

Faculty Program Director Interview Guide—Specify Allied Health Program

Faculty Program Director Interview Guide—Specify Allied Health Program

☐ Review and have interviewee sign the "Interview Participant Consent Form - Program Directors."

☐ Provide a copy to interviewee. ☐ Ask for pseudonym.

☐ Check recording device. Begin interview. ☐ Give gift card.

_____, thank you for taking the time to meet with me today. As I have shared with you earlier, my research is exploring the relationship between facilities and student outcomes in Allied Health programs. And even though I have experience working in community colleges, I do not have any experience or background in Allied Health programs. Before we begin do you have any questions?

Probes	Questions
Can you give me a specific example of that? Do you personally feel that way?	1. How long did you teach in the (Specify Allied Health Program) program at Omega College?
Can you tell me more? Can you *expand* on your answer?	2. Can you tell me what it's like to teach in the (Specify Allied Health Program) program at Omega College?
Can you *explain* your answer?	3. How do you think Omega College's (Specify Allied Health Program) program compares to other (Specify Allied Health Program) programs?

Can you give me a specific example of that? Do you personally feel that way? Can you tell me more? Can you *expand* on your answer? Can you *explain* your answer?	4. What do you think are the most important features or characteristics of Omega College's (Specify Allied Health Program) program? 5. Is there anything else you'd like to say about the (Specify Allied Health Program) program that wasn't covered in these questions? 6. If needed: What do you think about the new Allied Health Education and Training Facility (its equipment and/or technology)?

Notes:

APPENDIX D

Interview Participant Consent Form—Faculty Program Directors

Interview Participant Consent Form—Faculty Program Directors

Do new buildings, equipment, and technology improve student outcomes?
A look at one community college's experience

Danene Brown is a doctoral student in Leadership Studies at the School of Leadership and Education Sciences at the University of San Diego. You are invited to participate in a research project she is conducting to explore the relationship between facilities and technology and student outcomes in Allied Health programs.

The project will involve one interview that asks questions about your experience in teaching and working with students in the Allied Health Education and Training Facility. The interview will last approximately 45 to 60 minutes and will take place at a time and location convenient for you. In case any further explanation is required regarding any of your statements, you will be asked to respond to any follow-up questions via email. You will be sent a copy of the transcribed interview so that you may verify that the transcript conveys your reflections of your experiences regarding this study.

The information you provide will be analyzed and studied in a manner that protects your identity. For instance, a pseudo name will be used and that your real name will not appear on any of the study materials. All information you provide will remain confidential and locked in the researcher's home office for a minimum of five years before being destroyed.

Participation is entirely voluntary and you can refuse to answer any question and/or quit at any time. Should you choose to quit, no one will be upset with you and your information will be destroyed right away. Neither the Allied Health programs nor the university will know of your decision to either continue or terminate your participation in this study.

While it is not expected that the topic of this interview will evoke strong emotions, sometimes when people asked to think about their feelings or experiences, they feel sad or anxious. If you would like to talk to someone about your feelings at any time, you can call toll-free, 24 hours a day: San Diego Mental Health Hotline at 1-800-479-3339. Remember, you can stop the interview at any time if you feel tired or for any other reason.

If you have any questions regarding this research, please contact Danene Brown at 619-252-2818/danene-09@sandiego.edu or Dr. Fred Galloway, my dissertation chairperson, at the University of San Diego at 619-260-7435/galloway@sandiego.edu.

I have read and understand this form, and consent to the research it describes to me. I have received a copy of this consent form for my records.

Signature of Participant	Date
Name of Participant (Printed)	Email Address of Participant
Signature of Principal Investigator	Date

APPENDIX E

Transcription Follow-Up Email With Faculty Program Directors

Transcription Follow-Up Email With Faculty Program Directors

Email Subject Line: Transcription Follow-Up

Hi _____,

Thank you again for taking the time to talk with me. Please find attached the transcription of our conversation on _____, _____ XX, 2012. Please let me know if any corrections need to be made.

Many thanks,

Danene Brown
Researcher, Ph.D. Candidate
danene-09@sandiego.edu
Personal cell: 619-252-2818