Does Course Design Impact Student Engagement and/or Student Outcomes at Community Colleges? An Empirical Test of a Web-Based, Student-Centered Learning Design Strategy.

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Abstract

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College of Education

Community college enrollments have been on the rise since the 1960s. Because of these ever increasing enrollments, community colleges have come to play an important role in students' pursuing post-secondary education. Some individuals question this expansion of community colleges because these institutions typically have lower retention rates than 4-year universities. Others argue that the demographics of community colleges and the diverse needs of their students are behind these the lower retention rates. While it is important to discuss the low success rates at community colleges, it is more important to move forward to discuss how community college instructors address the lower success rates. Some suggest that instruction needs to be changed in order to tackle the specific needs of its diverse population.

This mixed method study explores the impacts of a specific course design, referred to here as the Web-SCL (Student Centered Learning) model, on diverse learners at a community college in the Pacific Northwest. This specific course design couples web-based support tools with other student activities to create the Web-SCL model. It is the author's belief that this approach to course design has the potential to address the unique needs of the community college student.

This study used two methodologies, quantitative and qualitative, in multiple phases to explore the Web-SCL model and to test whether this specific course design had an impact on student engagement and/or student outcomes. The first quantitative data phase compared GPAs from students in classes using the Web-SCL model to students who took classes from instructors using a traditional approach of lecturing. The second quantitative phase came from a student survey administered to the treatment group and to the control group. For this study, the unit of analysis was the student. However, instructors' perspectives play a crucial role in the delivery of course material and in the creation of the course design. As a result, the qualitative section focused on the instructors' perspective. The first qualitative phase came from instructors observing the Web-SCL model during a class observation. Following the class observation, each instructor was interviewed using a series of questions designed to bring forth their views on class design. This quantitative data allowed us to see if the model addressed the needs of our student population while the qualitative data gave us the instructors' perspective on whether this was a viable course design. Merging all data sources was crucial in attempting to get a better understanding of the Web-SCL model and the extent to which course design may have had an impact on student engagement and/or student outcomes.

Merging the data revealed three general themes: Class structure, Technology, and Learning. Students were able to distinguish the different characteristics in the two types of classes (Web-SCL and traditional) and instructors viewed the Web-SCL model as a positive impact on student outcomes. Students also believed that technology could help their learning and that instructors would advise future instructors to incorporate technology into their class. And finally, instructors used group activities to gauge learning, yet there was no quantifiable

evidence to prove that the Web-SCL model had an immediate impact on grades received in a course.

Table of Contents

Table of Contents (cont.)

Table of Contents (cont.)

List of Tables

List of Figures

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Dedication

To my wife, Danielle: Without your help, I would have never had a chance to complete my research. I will always be grateful for all the sacrifices you made over the years to support me throughout my educational endeavors.

Chapter I: Introduction

Statement of the Problem:

Over the years, instructors have come to recognize that students bring into their classroom various levels of ability. Many instructors believe that the one-size-fits-all model might not be the way to deal with the diversity of students in the classroom (Guinier, 1997; Ibara, 2001). Teachers can no longer ignore the academic diversity within the classroom and they will need to tailor their classrooms in order to maximize the learning experience of these diverse students (Guinier, 1997; Tomlinson et. al., 2003).

To deal with the diverse needs, there has been a growing movement away from traditional instruction--simply lecturing and presenting material to students as passive participants (Schwartz and Jenkins, 2007). Some characterize this type of traditional instruction as "surface level learning" (Biggs, 1999). Simkins (1999) argued that the traditional format was not doing enough to develop the cognitive skills such as reproducing, understanding, and solving problems. Some have even suggested that instruction needs to be changed in order to tackle the specific needs of its diverse student population (Braxton et al., 2000; Ibara, 2001). In many ways, the traditional model makes the assumption that lecture material is transferable to ALL students working at the same pace and covering the same material. While this structure may be productive for some students, this may not be the preferred instructional method for students with diverse needs (Ibara, 2001).

While there are various levels of diversity in postsecondary education, community colleges possess one of the highest levels of diversity among the postsecondary options. These institutions have a much larger percentage of non-traditional, low-income, and minority students than 4-year colleges and universities (U.S. Department of Education, 2008). According to a

study by Horn and Nevill (2006), community college students had a higher mean age, higher percentage female, higher percentage of low income students, and a higher percentage of minorities (Black and Hispanic). Community colleges also have a high percentage of first-generation students (Tinto and Engle, 2008) and in general, enroll a much wider variety of students than 4-year institutions (Bailey and Alfonso, 2005).

Research has also demonstrated that community college students possess lower degree attainment than 4-year university students (Pascarella et al., 2003; Tinto and Engle, 2008). Some individuals have even questioned the expansion of community colleges because these institutions typically have lower retention rates than 4-year universities (Long and Kurlanender, 2009). Others argue that the demographics of community colleges and the diverse needs of their students' (Townsend, 2007) along with working excessive hours,[1] enrolling part-time (Fry, 2004), and having dependents themselves (Fry, 2004) are behind these lower success rates. While it is crucial to discuss the lower success rates at community colleges, it is more important to discuss what community college instructors are doing to address the lower success rates.

This dissertation explores how a specific course design, Web-SCL model, may engage diverse learners which in turn, could improve student learning outcomes. The sample population for this study focuses on courses with this specific course design taught at a community college in a large metropolitan area in the Pacific Northwest. This class design couples web-based support tools with another type of student-centered learning activity (Web-SCL model). It is the author's belief that coupling these activities has the potential to address the unique needs of the community college student inside and outside the classroom. This research also examines the argument that students of today, especially non-traditional students, need much more than the traditional model of lecturing and presenting course material to students.

[1] Excessive hours would be working at least 30 hours a week.

Research Questions:

While the debate continues as to what causes the lower attainment rates at community colleges, educators at community colleges need to look forward and figure out what can be done to improve student outcomes. That is the central theme of this study: What can be done? The one-size-fits-all model of traditional lecturing might not be suitable for non-traditional students. The diverse student body may need something different to help them reach their educational objectives. If students need something different, then how should instructors respond to their needs? This study explores different types of course designs, analyzing whether there is a difference between two types of classes: Traditional model vs. Web-SCL model.

This dissertation attempts to answer one overarching question: Does course design impact student engagement and student outcomes at community colleges? This question includes several sub-questions.

- Can students distinguish classroom design features between the two types of classes? Are there any differences in the level of engagement between the Web-SCL class design and the traditional class design?
- Is there any relationship between the class design and student outcomes, such as GPA?
- While observing my Web-SCL experimental design, do observers see more, less, or the same level of student engagement than in the traditional method?
- Do instructors see advantages or disadvantages of using my Web-SCL experimental design? How does this course design relate to their classroom?

This mixed-methods study used two methodologies, quantitative and qualitative, to explore the Web-SCL model and whether it had an impact on student outcomes. The quantitative section was split up into two parts: 1. Student Survey. 2. Statistical Analysis of GPAs. In the first quantitative phase, a student survey was administered to the treatment and control groups to determine the engagement levels between the two types of classes. The second

quantitative data source included GPAs from two types of classes, one using the Web-SCL model (treatment group) and the other using the traditional approach (control group). The two subsets of students were compared to each other to see if there was a statistical difference in GPAs.

For this study, the unit of analysis was the student. However, instructors' perspectives play a crucial role in the delivery of course material and in the creation of the course design. As a result, the qualitative section focused on the instructors' perspective. The qualitative sources came from two sources: 1. Observations 2. Instructor interviews. The first qualitative phase came from instructors observing the Web-SCL model during a class observation. Following the class observation, each instructor was interviewed using a series of questions designed to bring forth their views on class design. The purpose of the observation was for instructors to view the particular course design and whether the instructors noticed a change in student engagement. The interviews served as a follow-up to the observation allowing a researcher to measure the impact of this particular model on the instructors.

The quantitative data attempted to get information about student engagement from the student's perspective while the qualitative data helped us better understand the context that our instructors face. Merging both sources was crucial in attempting to better understand the effectiveness of this pedagogical approach rather than looking at the methodologies separately.

Overview of Dissertation:

This dissertation includes four chapters: the literature review, the methodology, the results, and the discussion. Chapter 2, which is the literature review, begins by reviewing the characteristics of the non-traditional student and the community college student attempting to establish a link between the two groups and their specific needs. After establishing a link between the two groups, the discussion moves to reviewing the persistence literature in order to build a conceptual model as to why a community college student may or may not persist towards course completion and eventual degree attainment. Some researchers have argued that persistent rates at community colleges are simply too low (Tinto and Engle, 2008; Calcagno et al., 2008). This research will then examine the student-centered learning literature to develop a rationale for why a specific pedagogical approach (Web-SCL model) may be a better method to support community college students, which in turn could increase persistence. The final section of the literature review explores the theories around technology integration and academic achievement at the college level.

Chapter 3 lays out the methodology and the data used for this research, while Chapter 4 presents the findings in relation to the research questions. Chapter 5 summarizes the findings and poses following-up questions.

The purpose of this project is to explore a promising instructional reform that may help improve persistence, attainment, transfer rates and engagement at community colleges. The ultimate goal is to be able to scale this instructional reform to other classes. This paper reviews literature in education, economics, sociology, public policy and other fields to better understand the characteristics of the community college student and the obstacles they face. This will give

some context to the obstacles facing community college instructors and what instructors may be able to do in order to change persistence, attainment and transfer rates.

Chapter II: Literature Review

Who is the non-traditional student?

Many scholars maintain that community colleges possess a very high percentage of non-traditional students (U.S. Department of Education, 2008). Research has shown that non-traditional students have lower persistence and attainment rates than their four-year university counterparts (Long and Kurlanender, 2009; U.S. Department of Education, 2008). Some argue that non-traditional students have very specific needs in order to obtain their educational goals (Braxton et al., 2000). If this research holds true, who is the non-traditional student? And if community colleges have a high percentage of these types of students, how can community college instructors help them to obtain their educational goals?

As part of the Web-SCL Model[2] that my research is proposing, it is critical to discuss the characteristics of the community college student along with the characteristics of the non-traditional student. As will become clear, there are many overlapping themes between the descriptions of community college student and those describing the non-traditional student. Understanding those overlaps will help devise a plan for supporting their educational objectives.

To provide a formal definition of the community college student is no easy task. There are various groups, races, cultures, and individuals that make up the community college population. However, most community colleges have a larger percentage of non-traditional students than 4-year universities (U.S. Department of Education, 2008). Much like the definition of a community college student, the definition of a non-traditional student is no easy task either (Bean and Metzner, 1985).

[2] Web-SCL Model: Coupling student-centered learning and web-based materials for the purpose of supporting and potentially improving student outcomes.

U.S. Department of Education (2002) offers their perspective on the non-traditional student as someone who possesses one of the following characteristics:

- Delays enrollment (does not enter postsecondary education in the same calendar year that he or she finished high school);
- Attends part-time for at least part of the academic year;
- Works full time (35 hours or more per week) while enrolled;
- Is considered financially independent for purposes of determining eligibility for financial aid;
- Has dependents other than a spouse (usually children, but sometimes others);
- Does not have a high school diploma (completed high school with a GED or other high school completion certificate or did not finish high school).

Many of these characteristics are interrelated and the more of these issues that a student faces the more likely it will decrease the chances of success in higher education (U.S. Department of Education, 2002). Research has also demonstrated that community college students possess many of these non-traditional characteristics (U.S. Department of Education, 2002). While non-traditional students attend 4-year universities, the largest portion of the non-traditional students attend the community colleges (U.S. Department of Education, 2008). Comparing community college students to 4-year university students will allow us to establish a setting at the community college. Understanding this setting will only help instructors and researchers to understand the obstacles that community colleges and administrators face. This will give context to instructors as to the specific needs of the community college student and what can be done to help them succeed.

The Community College Student:

Over the last 10 years, roughly 30 to 35% of total postsecondary education enrollments have come from community colleges (U.S. Department of Education, 2008; Juszkiewicz, 2015). These institutions have a larger percentage of non-traditional, low-income, and minority students

than 4-year colleges and universities (U.S. Department of Education, 2008). According to a study by Horn and Nevill (2006), community college students had a higher mean age, higher percentage female, higher percentage of low income students, and a higher percentage of minorities (Black and Hispanic).[3] Community colleges also have a high percentage of first-generation students (Tinto and Engle, 2008) and in general, enroll a much wider variety of students than 4-year institutions (Bailey and Alfonso, 2005).

Some 61% of community college students are considered independent from their parents compared with 35% of students enrolled in public or private not-for-profit 4-year institutions (Horn and Nevill, 2006). This fact would help to explain the difference in work hours per week between community college students and 4-year university students. Nearly 79% of community college students work on average 32 hours per week while only 41% of university students work those same hours (Horn and Nevill, 2006). According to Zumeta and Frankle (2007), community college students' success was often jeopardized by working excessive hours to support their needs. This would also help to explain why half those enrolled at community colleges are part-time students, which is generally twice the average of their counterparts (U.S. Department of Education, 2008).

Not only do community colleges enroll a diverse group of students, but students enroll for a variety of reasons. According to a survey by U.S. Department of Education (2008), over one-third of students reported that they enrolled for the purpose of transferring to a 4-year institution. Students also enroll at community colleges for non-credit courses, training courses, and personal interest courses (Horn and Nevill, 2006). A survey in Horn and Nevill (2006) showed that the number one reason for attending a community college were for personal interest

[3] These racial and ethnic identifiers are not themselves indicators of potential success or failure, but can be so if they are correlated with other factors such as poverty, lack of home support or family's level of education.

and obtaining job skills followed by completing an associate's degree and then for transferring to a 4-year institution. Geographic convenience may also play a role. Community colleges are usually within commuting distance while the nearest university may be a lot farther away (Townsend, 2007; Zumeta and Frankle, 2007). And finally, community college tuition is roughly half of a 4-year institution (U.S. Department of Education, 2008) and the tuition is increasing at a faster rate in the 4-year universities. According to a U.S. Department of Education study (2008, pg. 7-8), "Between 1976-77 and 2006-07, average tuition and fees at community colleges increased by 105 percent… over this period, average tuition and fees at public 4-year institutions increased by 165 percent."

Some students may also have no other choice but to attend community colleges. Because of weak academic records, students may not have the option of attending a 4-year university (Townsend, 2007) and may have to attend community college due to their open access policy. Tinto and Engle (2008) echoed that same point by saying that first-generation and low-income students who attend community colleges are less prepared than their peers. Many community college students have low proficiencies in math and reading (U.S. Department of Education, 2008), much lower than students at 4-year universities.

So, who is the community college student? While community colleges are not unique in hosting the non-traditional student, they do enroll a higher percentage of non-traditional students (U.S. Department of Education, 2008). The combination of factors described above, typical for the community college students as a whole and for non-traditional students, can have an impact on persistence, attainment, and transfer rates.

Persistence[4]*, Attainment and Transfer Rates at Community Colleges*:

One could define persistence as a student's continual enrollment from quarter to quarter. Over a three-year period and even those "most committed"[5] students transferring, U.S. Department of Education (2008) noted that community colleges had a drop-out rate of 39% compared to the drop-out rate of roughly 17% for state universities and private universities. Seventy-six percent returned after the first year of a 4-year university while 59% returned after the first year of community college for low-income, first generation students (Tinto and Engle, 2008).

One way to think about educational attainment is the highest level of education one achieves, such as a bachelor's degree. Community college students typically have lower degree attainment of bachelor's degrees than 4-year university students (Tinto and Engle, 2008). In fact, enrolling in a community college reduces the probability of degree attainment by 15% to 20% (Pascarella and Terenzini, 2005). Long and Kurlanender's study (2009) suggested that community college students are less likely to complete a bachelor's degree in nine years and these students would have been better off if they had attended a 4-year university. U.S. Department of Education (2008) also found that even the "most committed" community college students have the lowest completion rates among the range of institutions of higher education (state and private universities).

These attainment numbers are even lower for the first-generation and low-income student. Tinto and Engle (2008) showed that first-generation and low-income students were seven times more likely to earn a bachelor's degree if they had gone to a 4-year university. For low-income and first generation students, only 5% of community college students will attain a

[4] Persistence and retention will be used interchangeably. Some authors may elect to use the term retention rather than persistence, but in any event, it will be used as re-enrolling from quarter to quarter.
[5] "Most committed" defined as students who intended to transfer to a 4-year college

bachelor's degree while 34% of those same types of students at a 4-year institution will attain that level (Tinto and Engle, 2008). They also stated that non-traditional students were 2/3 less likely to graduate with a bachelor's degree.

Transfer can be defined as the movement from a community college to a 4-year university for the purpose of obtaining a degree. Roughly 70% of students who enrolled at a community college do not transfer (Tinto and Engle, 2008; Ishitani, 2008). Some researchers have the national transfer rate at a lower range of 20% to 25% once the methodology includes those students who intend to transfer (Bryant, 2001; Grubb, 1991). Hurst and Bradburn (2001) emphasized that if a community college focused on academic programs rather than vocational programs the transfer rates would be much higher. Some research, albeit a very short list of studies, shows non-negative results. For example, Rouse (1995) found that a near location of community college increased college attendance, but found a non-negative impact on degree attainment.

While there seems to be much more evidence pointing to lower persistence rates, transfer rates and attainment rates at community college, there are a few researchers that point to quantitative measurement errors in the research. Townsend (2007) argued that unobservable and observable characteristics contribute to the lower degree attainment. She goes on to say that the quantitative measure used in many of these studies do not reflect the true differences between community colleges and universities. For example, Long and Kurlanender (2009) used race, age and parental-income as the independent variables. However, Townsend pointed out that they needed to consider working students, single-parents, and English as a second language for a more accurate measurement of attainment. Wassmer et al., (2004, p. 652) stated, "…data limitations and controversy over how best to measure transfer rates make it difficult to define

precisely the extent or causes of the decline." Wassmer went on to say, "The calculation of a transfer rate would seem to be relatively straightforward: the number of students who transfer to a 4-year institution divided by the number of potential transfer students." The "potential" transfer student in the denominator is obviously problematic because persistence can be interrupted for a number of reasons. Some students may elect to stop and come back at another time due to work obligations. Others may have another educational objective, such as graduate school prerequisite or personal satisfaction. All these decisions will impact the persistence, attainment, and transfer rates.

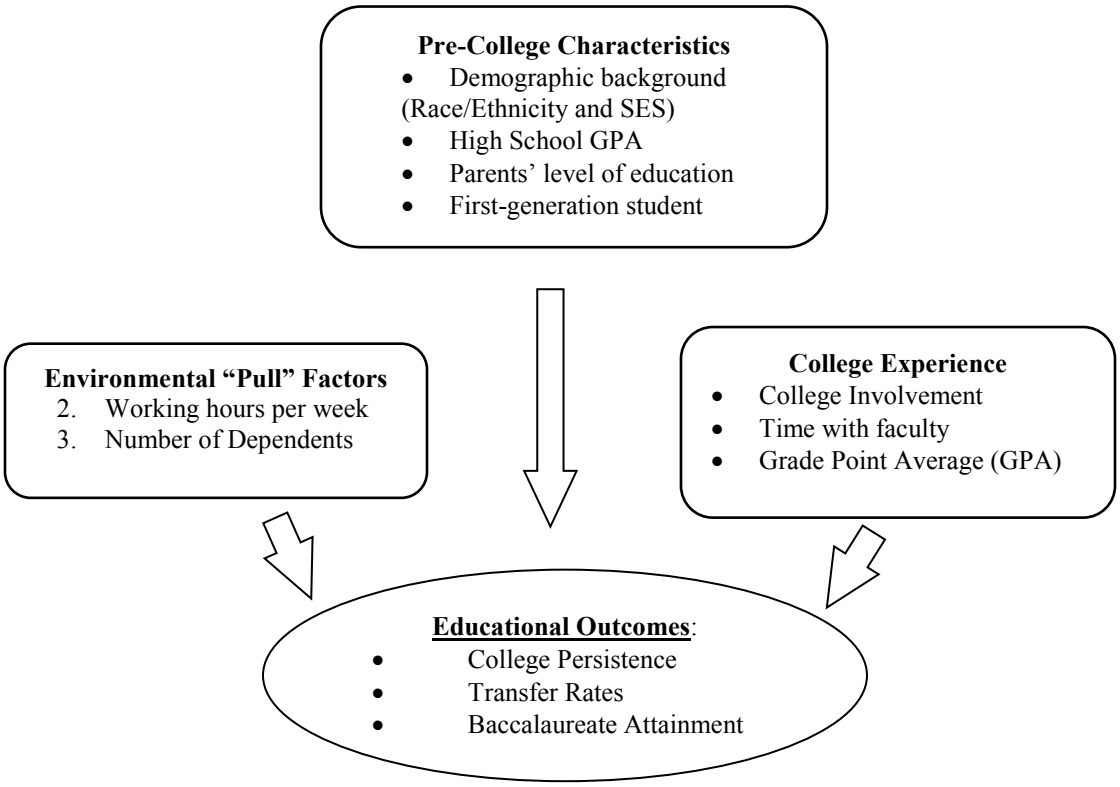
Persistence Model of the Community College Student:

There have been a number of theories as to whether a student "persists" to graduate (Tinto, 1975; Bean, 1980; Tinto, 1993; Nora and Cabrera, 1993; Wang, 2009; Crisp and Nora, 2010). However for this discussion, this research combines portion of three persistence models into one conceptual model: Tinto's (1993) Model of Student Integration, Wang's (2009) Attainment and Persistence among Community College Transfers and Crisp and Nora's (2010)[6] Persistence Model for Hispanics enrolled in Developmental Math. Combing portions of the three persistence models will put into context the obstacles that community college students face and to better understand whether they may or may not "persist" to graduate. This conceptual model consists of three sections: Pre-College Characteristics, College Experience, and Environmental "Pull" Factors. Each of the three sections includes the impact of that variable on community college students. This discussion eventually leads to what community college instructors can do to address the unique needs of community college students. Figure 1 merges

[6]While not every Hispanic community college student attribute overlaps with the community college population, many Hispanic students and community college students still fall under the category of "non-traditional" student.

the three persistent models describing which variables could impact educational outcomes for community college students.

Figure 1: Model of Persistence among Community College Students



Pre-College Characteristics

Tinto's (1993) Model of Student Integration focuses on these Pre-College Characteristics and that success of the educational outcomes is based on the relationship between these characteristics and the institution. High school GPA, demographic background (Race/Ethnicity and SES), and parents' level of education are viewed as important predictors of educational outcomes (Khan and Nauta, 2001). Khan and Nauta (2001) emphasized that Tinto's Pre-College

variables, "... help determine how the student will interact with, and subsequently become integrated into, the institution's social and academic systems."

Research has shown that these Pre-college characteristics have had an impact on educational outcomes of community college students (Wang, 2009). Socioeconomic status (SES) is significantly associated with degree attainment (Wang, 2009) and transfer rates (Grubb 1991; Wassmer et al., 2004). Much of the research has also confirmed that community colleges enroll a higher percentage of low-income students and higher percentage of minority students than 4-year universities (U.S. Department of Education, 2008; Horn and Nevill, 2006). These institutions also have a higher percentage of first-generation students (Tinto and Engle, 2008) and in general, enroll a much wider variety of students than 4-year institutions (Bailey and Alfonso, 2005). Lower levels of parental education will impact outcomes as well, especially among first-generation students. Without the proper guidance, these students may have difficulty navigating the college and academic environment (Crisp and Nora, 2010; Berger, 2000; Wassmer et al., 2004).

High school coursework and grades impact persistence among traditional college students (Tinto, 1993). In fact, one of the strongest predictors of achieving a bachelor's degree is the academic intensity of high school curriculum, in which the student should have taken either calculus, pre-calculus, or trigonometry (Adelman, 2006). As a result, it should not come as a surprise that pre-college academic preparation will impact student outcomes for community college students (Adelman, 1999; Wassmer et al., 2004; Grubb, 1991; Hurst and Bradbrun, 2001; Wang, 2009; Nora, 2001). Marcotte et al., (2005, p. 158) stated, "..community colleges provide educational opportunities to students who are typically economically disadvantaged and whose academic preparation is typically not as strong." Because of weak academic records,

some students may have no other choice but to attend community colleges with their open access policy (Marcotte et al., 2005; Townsend, 2007). Crisp and Nora (2010, p. 176), also noted, "Contributing to the issues of low transfer and high student attrition rates for Latino students is another disturbing figure—the number of Hispanics who enter higher education academically unprepared or underprepared to engage in college level coursework." Numerous students come to community colleges generally unprepared for the rigors of the academic life. Couple all this with students who come from households with lower levels of education and it is not a surprise that Tinto and Engle (2008) stated, "A large number of low-income, first-generation students begin and end their studies at public two-year… institutions."

Environmental "Pull" Factors

The Environmental "Pull" Factors (Crisp and Nora, 2010) discussed in Crisp and Nora's (2010) Model can be described as those factors "pulling away" students from pursuing and persisting through higher education. One of the biggest "Pull" factors would be the need for students to work off campus (Crisp and Nora, 2010). Nearly 79% of community college students work on average 32 hours per week while only 41% of university students work those same hours (Horn and Nevill, 2006). According to Zumeta and Frankle (2007), community college students' success was often jeopardized by working excessive hours to support their needs.

If community college students work a substantial number of hours, these students will have limited capacity to complete college assignments. This would also help to explain why half of the community college enrollments are part-time students, which is generally twice the average of their 4-year university counterparts (U.S. Department of Education, 2008, table 187). Generally speaking, full-time enrollment is relatively low for certain demographics at

community colleges (Fry, 2004). For example, Fry (2004) showed only 40% of Latino students enroll full-time, which is a lower percentage than for average community college students. Tinto and Engle (2008, p. 3) went on to say, "Due largely to a lack of resources, low-income, first-generation students are more likely to live and work off campus and to take classes part-time while working full-time, which limits the amount of time they spend on campus." Many of these students have multiple obligations outside school, which will limit the amount of time that can be spent on campus.

Other "Pull" factors include family obligations and dependents of their own. Research has shown that many community college students have multiple family obligations (Fry, 2004; Crisp and Nora, 2010). Family responsibilities, such as financial dependents and single parents, will impact completion of a degree and both characteristics would be considered risk factors (U.S. Department of Education, 1995a).

College Experience Factors:

While Pre-college characteristics play an important role in persistence, some researchers argue that college experiences may play just as an important role in persistence as Pre-College characteristics (Wang, 2009; Nora and Cabrera, 1993; Tinto 1993). The college experience can vary depending on interactions with faculty, college involvement, and working with peers on homework, but these experiences are significant predictors of persistence (Crisp and Nora, 2010, Tinto, 1993; Wang, 2009; Austin, 1993; Bean, 1990). Participation in clubs is also lower at the community college level than at 4-year universities (Cohen and Brawer, 2002). As Tinto and Engle (2008, p.3) put it, "Research has shown that low-income and first-generation students are less likely to be engaged in the academic and social experiences that foster success in college,

such as studying in groups, interacting with faculty and other students, participating in extracurricular activities, and using support services."

One of the most influential factors that can impact a students' decision to persist in college is the student's academic performance (Wang, 2009). If there's an increase in a student's GPA, they are more likely to remain in college (Wang, 2009). Wang (2009) stated, "The very fact that community college GPA is the single best predictor of baccalaureate attainment and persistence brings attention to the defining role of the academic experience at community colleges in shaping community college transfers' long-term educational outcomes. From the perspectives of policy makers and school leaders, improving student learning and academic performance might represent the most effective approach to promoting desirable student outcomes." Because current GPA is such a strong predictor of the performance, it will be used as a predictor in the Hierarchical Linear Modeling in a later chapter.

Even though many of these student attributes are simply out of the control of the community college, the institution has an obligation to find better ways to meet the educational objectives of their student population. Simply put, community college students have very different needs than the traditional student. They will have limited amount of time on campus due to family and work obligations (Chang, 2005; Hagedorn et al., 2000). The classroom may be the only time that some of these community college students have with their peers and their instructor. Working with other students in groups after class, studying with other students for exams, joining clubs, and other social groups, may not even be an option for some of these students. With all the challenges, is there anything that an instructor can do in his/her classroom to specifically address the needs of the community college student?

Student-Centered Learning Model:

There has been a growing body of research that traditional instruction of lecturing and presenting material may not be the method of choice for effective instruction (Schwartz and Jenkins, 2007; Terenzini et al., 2001; Slavin, 1989). Some believe that the traditional instructional model focuses too much lecturing and presenting material to students, which in turn would make students passive learners (Biggs, 1999). Simkins (1999) argued that the traditional format is not doing enough to develop such cognitive skills as reproducing, understanding, and solving problems. Simkins (1999) also argued that instructors should use better active learning methods, which will allow students to take more responsibility for their own learning. Lecturing makes the assumption that the lecture material is transferable to ALL students with the delivery of the material given at the same pace covering the same material. While this structure may be successful for some students, this may not be the preferred instructional method for the student with diverse needs (Ibara, 2001). Student-centered instruction may be the instruction of choice when dealing with non-traditional students at community colleges.

Unlike the traditional model where the instruction is teacher driven, student-centered learning focuses on the student to be active participants in developing their own learning (Armbruster et al., 2009). One of the key assumptions is that learning is an active and interactive process (Confer, 2000). Active learning is thought to be a more effective way of instruction due to the increase in the metacognitive development (Armbruster et al., 2009; Bransford, et al., 2000), which helps engage more parts of the brain, creates new pathways, and "embeds" the material in their cognitive structure. A feature that is characteristic of a student-centered learning classroom is the frequent opportunities that students have with other students (Confer, 2000). This class structure encourages interaction between students giving them the possibility

of developing friendships outside the classroom (Braxton et al., 2008). This is crucial for students who have very limited time on campus and may need support from others to succeed in their own development. This class design emphasizes the importance of interacting with their peers in much the same sense as Tinto's (1993) social integration of persistence.

One other promising technique is to include real world applications and examples in the class discussions (Grubb, 2010; Massachusetts, 2006). Some argue that students need to have real world applications and that these real world activities can help students learn (Massachusetts, 2006; Bransford et al., 2000). These activities could help students to build a stronger connection to the class and help increase class participation as well. These real world activities could come in many forms. To name a few, the class could use articles from the internet, YouTube videos, or anything to connect the concepts from class to the real world.

A variety of individual and group projects can help students to acquire new skills (Schwartz and Jenkins, 2007; Massachusetts 2006). Schwartz and Jenkins (2007, p. 7) said, "The most effective developmental teaching strategies in the literature are characterized by dynamic student-and-student and teacher-and-student interactions as well as by efforts that aim to awaken students' innate desire to acquire knowledge." While no single set of instructional practices will impact every single student, students may be responsive to student-centered activities such as individual and group activities, which can lead to better teacher-student interactions and student-student interactions.

Web-based Support Materials:

Kanuka and Anderson (1999) argued that computer based learning is a form of constructivism where students actively build their knowledge. This type of learning can be an

integral component of engaging students outside the classroom. If students need constant interaction with the course material and sometimes a little more time with the material, development of web-based instructional tools may give them the direction and support they require.

A popular trend in instruction is the partial replacement of class instruction with computer based learning (Epper and Baker, 2009; Twigg, 2005). Hodara (2011) noted, "…that some community colleges have experienced improved pass rates and persistence for developmental math students after the introduction of computer-based instruction and course redesign." One study focused on MyMathLab™ (Speckler, 2008), which was developed by Pearson Education, to deliver the support materials to students. These support materials included homework, step-by-step examples, animations, and videos. According to the study by Speckler (2008) over 90% of the students at Louisiana State University responded that MyMathLab™ helped them learn mathematics better and most of the feedback in the report reflected a positive feeling towards the software program. Pearson has a similar software program for economics, MyEconLab™, in which 90% of the students surveyed felt that the questions helped them prepare for the exams and roughly 84% would recommend the software to a friend (Speckler, 2005).

Even though there are many more examples of software based learning, there is some literature on web-enhanced instruction. Most of the results tend to demonstrate a high satisfaction rate from the students. High school instructors found that their web-enhanced interactive tool increased students' interest (Wang and Reeves, 2006). Wang also said, "Both the survey and the interview results provided evidence that students displayed greater interest in the fossilization unit featuring the interactive tool than ten others units related to earth science." In a

histology class, instructors created and used computer graphics to help support the learning of their students (Deniz and Cakir, 2006). Deniz and Cakir (2006) said, "Students adopted the position that histology software should be supported with traditional instruction." Van Gundy et al., (2006) found that math anxiety was reduced significantly through the use of web-enhanced instruction. In another study comparing the traditional model and the web-enhanced model, Conrad (1997) found that web-based support material helped to increase satisfaction rates, but did not find any statistical significance with student learning outcomes such as pass rates and GPA.

As described above, using software or designing their own web-based material, students seemed to have high satisfaction rates with the material being used in class. Computer based instruction has, on the whole, done better than traditional instruction and when testing the treatment and the control group, the computer based instruction scored higher on standardized exams than students in the traditional model (Rezaei and Katz, 2002). These tools can be used for individual review and/or can be used to study with others (Klein et al., 2005). As Clark and Mayer (2011) noted, "Computers represent one of the most flexible media options, as they support media elements of text, graphics (still and animated) and audio… computers offer multi-lateral communication channels that span time and space."

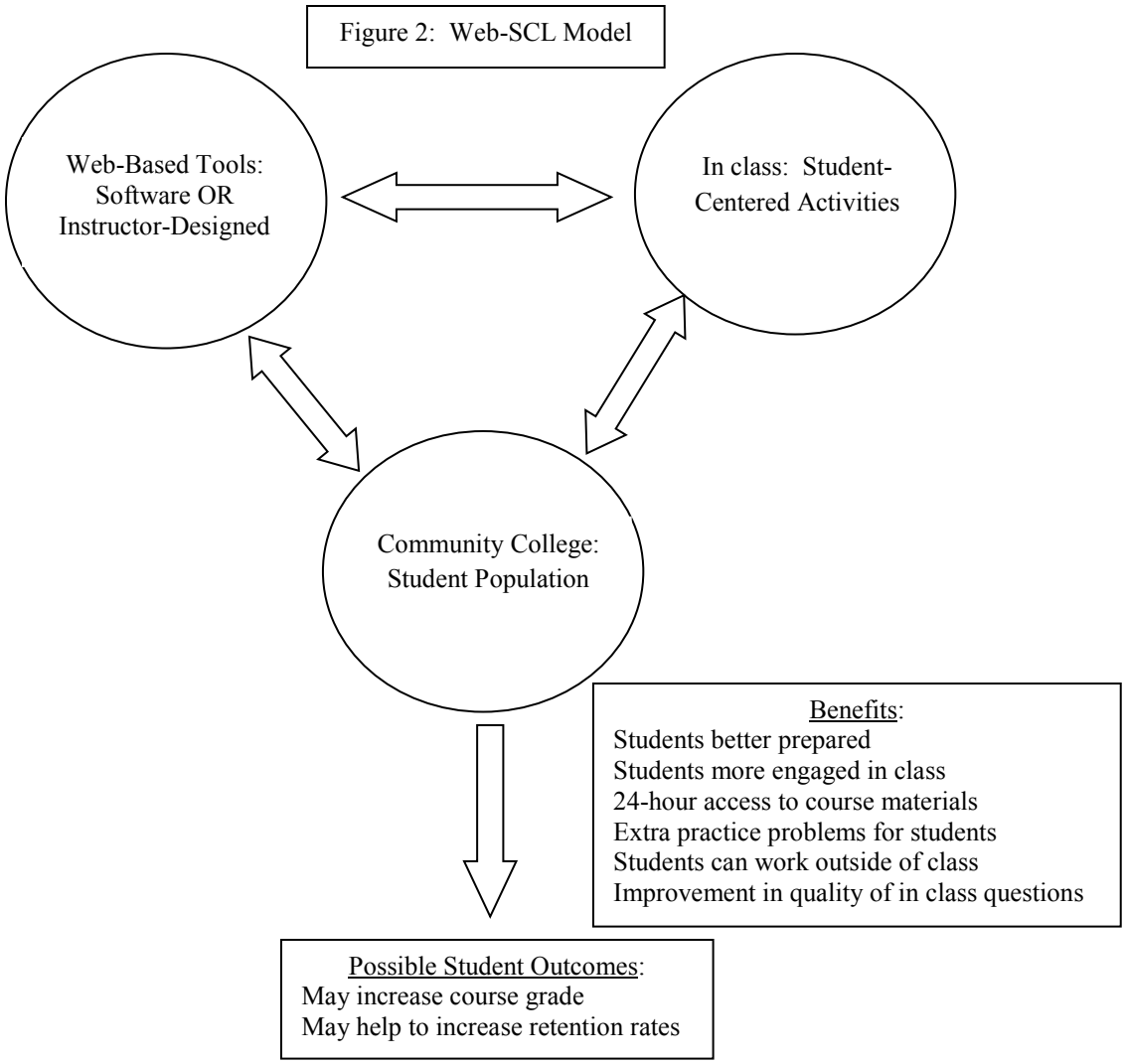
The Web-SCL Model:

The traditional model of lecturing and presenting materials to students may not be enough to address the unique needs of the community college students. Student-centered learning activities may be a better approach to addressing the unique needs of the non-traditional student. These types of learning structures may be better suited for higher levels of student-

student interaction and student-teacher interaction. Many researchers consider computer-based learning under the student-centered umbrella as well (Hsieh and Cho, 2011), simply another way to actively engage the student. While this may be true, this framework separates student-centered learning activities from web-based learning. The student-centered learning activities will be the mechanism that promotes learning in class while the web-based materials and supports will be the mechanism that drives learning outside the classroom. Much of the research on student-centered learning has only focused on one unique student-centered learning activity for the treatment group. At no point has the research coupled multiple student-centered learning activities.

Figure 2 (Web-SCL model)[7] helps explain the conceptual picture of how web-based instructional tools and student-centered activities may help to increase student outcomes.

[7] A more specific Web-SCL model will be discussed in Chapter III: Methodology and it will detail an example of what it could look like in practice.



The model couples the use of student-centered activities and the use of web-based instructional tools to help support and engage community college students. Using student-centered learning activities or using technology is not unique. Coupling student-centered learning activities and technology to address the unique needs of the community college student inside and outside of the classroom is unique.

Computer learning programs, like Cengage, are useful and have high satisfaction rates, but part of the problem is that it is an additional cost to increasing tuition and increasing book costs. As it stands, low-income and first-generation students tend to receive less financial

support (Tinto and Engle, 2008). Although some research has shown an improvement in learning outcomes after using the computer learning programs, this research focuses on course material specifically designed by an instructor to find an inexpensive substitute for the students.

If students need better support materials, the instructor will need to have a Learning Management System (LMS) or a web-site to distribute the course material. The instructor designed web-based solutions will need to be flexible enough to provide for these use contexts: individual review, study with others, and review in class. A key component of having these solutions is that these materials need to be fully integrated into the classroom, not just a static tool. An instructor cannot just post the solutions online and expect students to review the material. Wang and Reeves (2006) echoed the same feeling by saying that putting content online does not provide effective solutions for teaching and learning and the Web material must be fully integrated and couple with the theories and the instructional strategies for the expectations of higher learning outcomes to be reached. Simkins (1999) stated, "Instructional technology indicates that what matters most is not he medium by which information is delivered but how that medium is used to deliver the information." This is why the integration of the material into the classroom is so critical. There needs to be some sort of review in class, thus avoiding the static assignment where students do not even bother looking at the solutions. In many cases, electronic documents will then be uploaded to a destination of choice where students can view course material. These electronic documents will contain not only solutions to the assigned problem, but useful content information from articles, past problems, helpful hints, commentary and videos to better support the learning experience. These developed web-based tools could be critical for the student who has limited time at school and needs more direction outside the classroom.

Much like the web-based tools, the in-class student-centered activities must be fully integrated into the class. An instructor can select from numerous student-centered activities such as use of clickers, just in time teaching, case studies, or cooperative learning. For example, students could be assigned to a specific group where they would all work on a solution to the assigned problem. At the end of class, one group member would present to the class their findings. After the presentations, the instructor would upload general solutions to those specific problems along with article and videos. This example follows along the lines of cooperative learning, but this could just as easily be another student-centered activity. All of these in-class activities will be attempting to get the individual student to become more involved in the learning process. If non-traditional students have only the time in class for peer interaction, then instructors need to design assignments that give them the ability to interact with other students and at the same time, give them direction for individual review.

Part of the Web-SCL model goal is to strengthen the bonds between the students and give them a more student-centered instruction experience rather than the traditional model. As a result, they might feel stronger connections with their class and ultimately their school (Bean, 1990). This could potentially help persistence rates from quarter to quarter, which could then lead to higher transfer rates and ultimately attainment rates. Another important aspect of this project is to give students the proper support materials, so they have the opportunity to work on tasks or assignments individually or with other students. It is this coupling mechanism of using the web-based support materials along with student-learning activities that can potentially break the low success rates at community colleges.

Chapter III: Methodology

Methods and Research Questions:

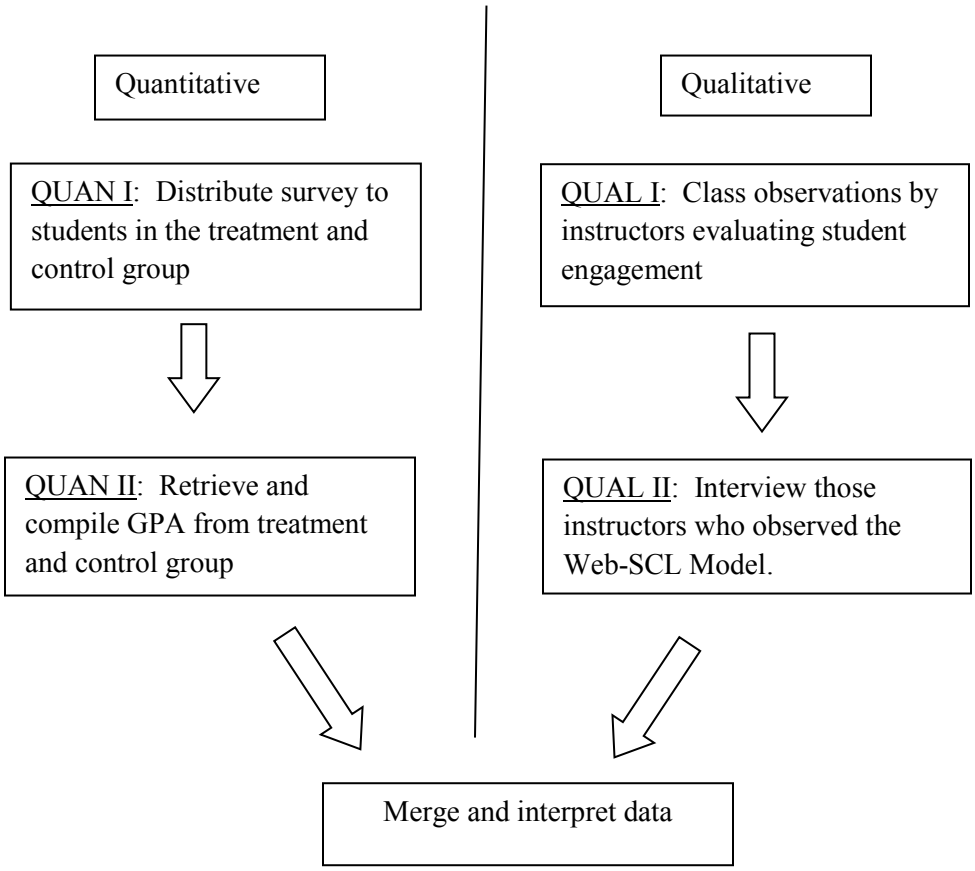
This dissertation used several methods to illuminate different aspects of how students and instructors interact with the Web-SCL class design. The quantitative section focused on the student's perspective and was broken up into two sections. Each quantitative section attempted to evaluate differences between the control group (those students who took a traditional class) and the treatment group (those students who took a Web-SCL class). In the first quantitative section, a survey was distributed to the treatment and control group, attempting to measure differences in student engagement. The second quantitative section consisted of collecting GPAs from those same students who took the survey and then statistically compare the GPAs between the two groups. The qualitative data was also split up into two sections. The first qualitative section consisted of instructors observing my Web-SCL experimental design during one of my lectures to assess a potential relationship between the class structure and student engagement. In the second qualitative phase, those same instructors, who participated in the observation, were interviewed using various questions pertaining to the Web-SCL model and student engagement. The finally section merged the data from the quantitative and qualitative sources to get a better understanding of the Web-SCL model and its potential impact on the level of engagement and student outcomes.[8]

This type of research, using quantitative and qualitative methods, can be best characterized as a "mixed method" approach (Creswell and Clark, 2007). The specific design in this research is the triangulation mixed method design and is one of the more common mixed method approaches (Creswell and Clark, 2007). In order to best understand the research

[8] Each section will detail the sampling, criteria, and data collection along with a description of the treatment and control groups.

problem, one must "obtain different but complementary data" on the same topic (Morse and Richards, 2007). Creswell and Clark (2007, p. 62) argued, "The intent in using this design is to bring together the differing strengths and non-overlapping weaknesses of quantitative methods with those of the qualitative methods." The overall goal is to use the two complementary data pieces and merge them into one interpretation.

Figure 3: Mixed Method Design



This research attempts to answer the following questions:

1. QUAN I: Can students distinguish classroom design features between the two types of classes? Are there any differences in the level of engagement between the Web-SCL class design and the traditional class design?

2. QUAN II: Is there any relationship between class design and student outcomes, such as GPA for these courses?

3. QUAL I: While observing my Web-SCL experimental design, do observers see more, less, or the same level of student engagement than the traditional method?

4. QUAL II: Do instructors see advantages or disadvantages of using my Web-SCL experimental design? How does this course design relate to their classroom?

The unit of analysis for this study is the student, but the qualitative and quantitative sections address different questions as noted above. The quantitative section focuses on the perspective of the student while in the qualitative section allows instructors to evaluate the impact on the classroom structure and whether it had an impact on student engagement. Using these two types of data will hopefully shed some light on whether the Web-SCL design has an impact on student outcomes and engagement.

Definitions of Online, Hybrid, Face-to-Face, Web-Enhanced Classes:

Before getting into the research design, there needs to be a brief discussion about the some of the definitions used in this paper. Online courses will have ALL the course materials delivered through the internet (Tallen-Runnels et al., 2006). Tallen-Runnels et al. (2006) defined hybrid classes as a blend between online and traditional courses. In other words, a hybrid courses will be considered with roughly 50% face-to-face and 50% online. A face-to-face course will be considered 100% "in class instruction."

None of these definitions would properly fit the class description in this research. Some could argue that the Web-SCL classes in this paper could be considered a hybrid structure.

However, with a hybrid class, some of the class time is supplemented with online work. Instead of five days of class, a hybrid class could have three days of lecture and two days of online work. This is not the case for the Web-SCL classes in this research because these classes met on a daily basis and these classes added support material to enhance the learning experience for the students. For this research, these classes will then be defined as "Web-enhanced" courses, where the courses will be face-to-face, but possess the use of the Web to enhance or deliver materials to the students. This whole project is an enhancement of the traditional model, which will be attempting to make students more active participants in their education.

Community College in the Pacific Northwest:

This research focuses on classes taught at a community college in the Pacific Northwest. My affiliation with the school dates back to September 2007 when I was hired to teach Economics. This institution is a 2-year, state funded college, fully accredited by the Northwest Commission on Colleges and Universities. This community college serves approximately 15,000 students a year, many of whom are low-income, culturally diverse, and non-native English speakers. Fifty-four percent of students are eligible for financial aid. Students, whose first language is not English, comprise of 43.6% of the student population and approximately 35 languages are spoken on this campus. Half (50.5%) of the students at this school are the first in their families to attend college and over 16% of students are immigrants or refugees. The campus represents a diverse student population representing nearly 100 different cultures and 25 different countries.

As one can see, this community college has very similar characteristics with the typical community college. It has a high population of first-generation students along with many

students working full-time. With its student population, this community college would be an ideal place to test the Web-SCL course design to assess the potential of its impact on student engagement and outcomes.

My Web-SCL experimental course design:

With active-learning in mind and that community colleges have a student population of non-traditional students, I have designed all my Economics classes to incorporate active learning approaches along with having support material online (Web-SCL model). At this point, it also makes sense to discuss my experimental design strategy because my class was one of the Web-SCL classes included in the quantitative section and the class that instructors observed in the qualitative section.[9]

While every Web-SCL class will be slightly different in course design, it is important to go over the basic elements of my Web-SCL experimental course design. I would like to give the reader (and other instructors) the opportunity to "reproduce" my approach in their own fields. These are the elements from my Economics classes that I have incorporated over the years: Power Point/Text lectures, Group work and presentations, Homework presentations, Quiz/Quiz reviews and Old exam reviews.

1. Power Point/Text Lectures: At the time of this study, my Economics classes still possess some elements of a traditional course. I still use Power Point slides to get general concepts to the students for every chapter of the textbook. However, if the assumption for this Web-SCL class design treats the student population as unique, students may need more support than just lecturing. As a result, the Power Point slides are uploaded 3-4 days before the actual lecture. I also upload text lectures for each chapter as well. These

[9] Rationale and justification for using my class in my research will be discussed in subsequent sections.

text lectures cover the actual lecture and the problems in class. These online tools allow students to look at the course material ahead of time before the lecture. It also gives students a general benchmark for the material rather than students' feverishly writing down notes as fast as possible. Some may argue, "You have already given the students the lecture notes, so why should students go to lecture." In an attempt to avoid this situation, attendance is taken at random. It has been the hope that this tool allows students to be more prepared for lectures with more focused questions during lecture. These instructional tools are uploaded to a website which possesses a password, so that no copyright laws are infringed.

2. Group work and presentations: Students are randomly assigned to a group of 4-5 students where they work on a solution to their assigned problem. This random assignment strategy is important to avoid students becoming isolated, especially if they are underperforming in class (Bransford et al., 2000). Typically, the class is broken up into five groups with each group having a Group Leader who facilitates the discussion. These individuals are responsible for making sure that every group member understands their assigned problem and this Group Leader will present their findings the following day. While they discuss the problems, I go to each group making sure they stay on task and answer any miscellaneous questions. The following day, Group Leaders present their findings to the class. Each Group Leader uses the dry erase board to go over their assigned problem and is prompted by me about which concepts to cover. The five Group Leaders normally take about 10-15 minutes to write their answer on the dry erase board. While the Group Leaders writes on the dry erase board, I go around the class answering questions and asking students if they need help on certain concepts. After 10-15 minutes,

the Group Leaders are supposed to "teach the class" while I remain in the background only to be used as a facilitator or intercede if a student struggles with the material. This strategy is important so that student can become the "Experts" in that specific concept (Bransford et al., 2000).

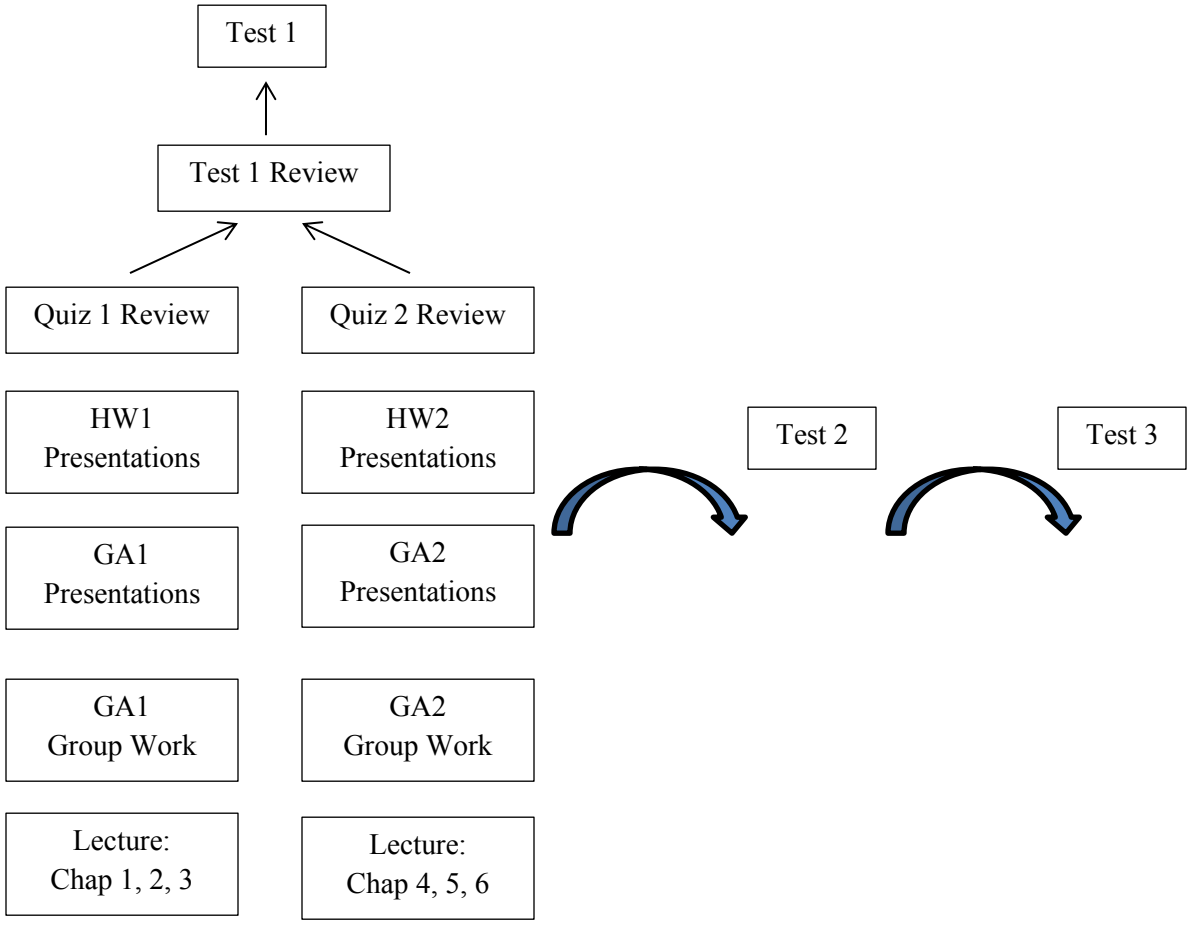
3. Homework presentations: After the group presentations, students are randomly selected from the class for homework presentations. This activity uses, more or less, the same set up as the presentation portion of the group activity. As a result, these students understand the flow of the activity. Just like those in the group presentations, the five homework presenters take about 10-15 minutes to write their answer on the dry erase board. While they write on the dry erase board, I go around the class answering questions and asking students if they need help on certain concepts. After 10-15 minutes, the homework presenters are supposed to "teach the class" while I remain in the background only to be used as a facilitator or intercede if a student struggles with the material. Just like the group work, I upload the solutions to a secure online platform that requires a password.
4. Quiz/Quiz reviews: At the conclusion of the homework presentations, I upload a quiz to our Learning Management System (LMS). These quizzes are 20 multiple-choices questions that reflect the concepts we discussed in the lecture, group work, and homework problems. That night right after the due date, I would upload the quiz solutions to be discussed in class the following morning. When the students arrive the following morning, students are randomly assigned to a group of 4-5 students where they discuss the problems they missed on the quiz. For consistency, I try breaking up the class into five groups, much like the way I set up the groups in the group work and homework. While they discuss the problems for about 20 to 25 minutes, I walk around the room

asking and answering questions. I also try keeping the students on task if I find a student wondering off on a tangent, especially those who did not score well on the quiz. After the discussion, I go up to the board and discuss the common concepts covered in each group. I also go over some the obstacles that students faced in each quiz.

5. Old exam review problems: These review problems are designed with the intent of giving students more examples and to demonstrate how I design my exams. Before each of the three exams, I spend two days of test reviewing. For the first exam, I include a 20-minute talk on how I create an exam and show them basic test strategy. This is also a perfect opportunity to discuss some of the past errors from students and how my current students could improve from their mistakes. This activity heavily relies on a "Question and Answer" strategy and students are aware that their responses will count towards their participation score. On a normal test review, half the class can be expected to be call upon.

A sample calendar has been constructed to detail all these specific activities over a 10-week teaching quarter (See Appendix G for example calendar of the Web-SCL experimental design). While the sample calendar may be helpful for distributing the activities throughout the quarter, Figure 4 gives a visual example of the activities in relation to the assessments (quizzes and tests). Each test has a series of corresponding lectures and activities, which is iterated three times over a 10-week teaching cycle.

Figure 4: Visual Example of Web-SCL Experimental Design



If the traditional model is simply about presenting and lecturing to students, this Web-SCL experimental design is clearly different. Lecture material is online well before the actual lecture and students have 24-hour access to the course material. Solutions to the group activity, homework, and old exams are uploaded to a web-site after each class review. These documents are fully integrated into the classroom where the students have multiple opportunities to review the material in class. Having 24-hour access also allows them to have the support materials outside the classroom for review. And because each activity has students randomly assigned,

this approach gives the students multiple opportunities to meet and to discuss concepts with other students, strengthening the bonds between them.

This Web-SCL experimental design could be critical for the student who has limited time at school and who needs more direction outside the classroom. If the non-traditional student has only limited time in class for peer interaction, then instructors must design activities that give them the ability to interact with other students in class. Braxton et al. (2000) emphasized this point by saying, "To the extent that faculty can structure classroom activities in ways that require students to become more involved in the learning process and with their peers, such as using cooperative learning and problem-based learning, they can improve student engagement."

Using my class in my own research:

As mentioned earlier in this section, my Economics class was one of the ten Web-SCL classes included in the quantitative section and the class that instructors observed in the qualitative section. Selecting my class as part of the study was a difficult choice, but reasonable for the following reasons. Initially, in my research proposal, I decided to implement my Web-SCL experimental design into another Math class, which was not my own. In fall 2013, I unsuccessfully attempted to incorporate all the nuances of my particular Web-SCL experimental design into this other class. The whole process went way beyond my time expectations and would have taken multiple quarters to incorporate all the nuances of my course design into another class. There was also an attempt to search for a class at my school that had the same course design as my own. While there were some similar characteristics from one class to the next (use of student centered learning activities and use of technology), no other classes had the

same characteristics as my own, especially the frequent use of the student-centered activities and the integration of technology into the classrooms.

Bransford et al. (2000) argued that their project focused on bridging the gap between the educational research and practices in the classroom. Bransford et al. (2000, p. 248) also argued, "To a limited extent, research directly influences classroom practice when teachers and researchers collaborate in design experiments, or when interested teachers incorporate ideas from research into their classroom practice. This appears as the only line directly linking research and practice." Bransford et al. (2000, p. 249) went on to say, "This reflects the fact that practitioners typically have few opportunities to shape the research agenda and contribute to an emerging knowledge base of learning and teaching." After taking in account Bransford's research and after a lengthy discussion with my original Chair, Marge Plecki, it was decided to use my class as one of the ten Web-SCL classes in the quantitative section and the class that instructors observed in the qualitative section. I wanted to investigate some of my own classroom practices in order to contribute to the course design research and in many ways, have the influence go in the other direction from the classroom to the research as Branford described.

Quantitative Phase I: Student Survey Development

Sampling, criteria, and data collection for the student survey:

A student survey was conducted in Spring 2013 (See Appendix A for student consent and survey) to determine any possible differences in the level of engagement between the two different types of class structures (Traditional class structure versus Web-SCL class structure). While sampling all classes would have added to the reliability of this study, it would have been impractical to survey students in every class at this community college. In an attempt to reduce the number of classes and focus on students transferring to a 4-year university, this part of the research focused on courses from Academic Programs.[10] This type of sampling would be considered "purposeful" sampling, where the researcher would be sampling based on a specific criteria to give context to the research questions (Patton, 2002).

For the specific criteria in this study, an instructor had to answer two questions:

- Do you use technology during your lectures or distribute course material over the internet (your own website, Power Point notes online, and so forth)?
- Do you have structured group activities during class time (collaborative, cooperative, or otherwise)?

If the respondents said "yes" to both questions OR said "no" to both questions, I approached them about their potential participation in this research project. A total of 10 classrooms were selected based on their class structure. Five classes were selected for their traditional classroom characteristics while the other five classes were selected for their Web-SCL classroom characteristics. For consistency, classrooms were matched.[11]

[10] Academic Programs at this community college focused on students transferring to a 4-year university and those working toward an Associate's degree.

[11] Initially, a pre and post student surveys were considered, but students could have been exposed to the Web-SCL in other classes. If so, it would be difficult to measure the change in student's responses, so the "correlated group design" had to be rejected. Instead, a "matching group design" was used.

Table 1: Matching the Classes for Student Survey

	Web-SCL classes	**Traditional Classes**
Match 1	Advanced Math	Advanced Math
Match 2	Developmental Math	Developmental Math
Match 3	Social Science	Social Science
Match 4	Applied Math	Applied Math
Match 5	Life Science	Life Science

For example, once an advanced math class had been selected, which included technology and group activities, I searched for an advanced math class without technology or group activities. I also made sure that classes were selected from relatively the same time period. For example, if I selected an advanced math class at 10am, I would search for one at 9am or 11am to ensure that the student populations were relatively similar. At no point did this sample contain a morning and an evening class. There were more classes that integrated technology and group activities, but in some cases, the classes could not be properly matched with a corresponding course. A potential problem was that using this matching strategy would limit the discipline selections because some disciplines did not have multiple sections being offered.

Once the classes were selected, the ten instructors were sent a human subject's informed consent form (Appendix B). The instructors were informed that any "individual" results would be kept anonymous and results would be de-identified before I received the data for analysis. Instructor participation was purely voluntary and they could opt out at any point. After the faculty agreed to be part of the survey, these ten instructors determined the time for the student survey to be distributed to their class.

Students were informed of their potential participation through a 5-minute presentation done by a representative from the Office of Planning and Research (OPR) (See Appendix C). A representative from Office of Planning and Research (OPR) emphasized that their participation

could help improve future classes at their school and that portions of their responses could be used for research purposes. The student participation, like the instructor participation, was purely voluntary. OPR distributed and then collected all the surveys from the ten classes in Spring 2013.

As discussed in earlier, I wanted to include my class in this student survey as one of the Web-SCL classes. As a result, I had to remove myself from the distribution, collection and the transcription of the student surveys. To remove some of the potential bias, OPR distributed, collected, and transcribed the student surveys. Before my analysis, they removed all the student and instructor identifiers from the data set to ensure confidentiality. During Spring 2013, I made no reference to my students that this survey was, in fact, my research. OPR representatives were the only ones who had access to the student surveys.

Developing the Student Survey:

This student survey was designed to explore the student's perspective on three issues: Course design, level of engagement, and course preferences (See Appendix A). Part A of the student survey focused on course design with questions focusing on specific characteristics of either the Web-SCL class structure or traditional class structure. Part B focused on the level of engagement measured by Community College Survey of Student Engagement (CCSSE).[12] Part C and part D focused on students' reactions and preferences for specific course design elements.

Part A of the survey was used to determine how students perceived class structure. An important part of this survey was for students to be able to distinguish some key differences between the two types of classes. The questions focused on lecture time, percentage of class

[12] This survey is distributed to community colleges every four years. The intent of this survey is to help institutions identify good educational practices and areas they can improve. A section in CCSSE specifically focuses on level of engagement. It is questions in this section that will be used to compare the treatment and control group.

time devoted to group activities, and whether the instructor used some form of technology either in class or on a website. In theory, students enrolled in the Web-SCL model should perceive a lower percentage of lecture time relative to their traditional class counterparts. The Web-SCL class should also show awareness of two predominant design features: Use of group activities and use of technology either during lecture or through a Learning Management System (LMS). This part of the survey was attempting to answer the following question: Can students distinguish classroom design features between the two types of classes?

In Part B of the student survey, questions were taken directly from the CCSSE and incorporated into this student survey. The purpose of this section was to compare the level of engagement of the treatment and the control groups at this community college. Instead of asking all the questions from CCSSE, this study focused on the questions that best characterized the differences between the Web-SCL model and the traditional model. The CCSSE survey had numerous questions relating to engagement. In theory, the treatment group should have higher scores than the control group at this community college. For example, students should feel more comfortable asking questions in class since the Web-SCL focuses on the student-centered learning activities. There should also be a difference in the amount of time spent on projects during class and outside of class. And finally, the Web-SCL model should have significant differences in using the internet and communicating with the instructor online. This part of the survey attempted to determine whether there was a statistical difference between the two types of courses in the level of engagement as determined by CCSSE?

Part C and Part D of the student survey had overlapping questions, but the questions focused on different aspects. Part C focused on what types of activities best supported students' learning in their current class. For part D, it focused on what types of activities best support

students' learning at this school. The difference between part C and part D was subtle, but very important. One focused on the activities IN CLASS and the other focused on the activities AT THE SCHOOL. The assumption was that the treatment group should have higher satisfaction rates than the control group with the questions pertaining to the Web-SCL model. For example, satisfaction with the internet use should increase in the treatment group because of the web focus and reading the recommended book should decrease because of the larger and more varied support materials in the treatment group. Part D acknowledged that some students may have already been exposed to the Web-SCL model in other classes at this community college. If true, these students would have developed an opinion on class design before entering either class and there should not be any difference between the treatment and control groups. These two parts of the survey attempted to answer the follow question: What types of activities best support learning in these classes and at this school?

Method of Analysis for the Student Survey:

This student survey was administered by OPR and followed a "purposeful" sampling (Patton, 2002). In essence, those students enrolled in the classes taught by the participating instructors took the student survey. There were ten classes selected in this student survey with roughly 25 students in each class. Approximately, 250 students had the potential to be exposed to the survey.

After the Office of Planning and Research (OPR) de-identified all student and instructor characteristics, all the survey responses were broken up into two groups: Web-SCL class structure and Traditional class structure. Breaking up the two groups allowed the responses to be analyzed by the inferential statistic Chi-square. This can then be used to test the associated

hypotheses from the cross-tabulations (Chambliss and Schutt, 2015). While this test will not be able to tell the strength of the relationship between the two categories, Chi-square will be able to tell whether there is a difference in the way the two groups answered the questions. A p-value of 0.05 was used in this study to determine statistical significance. This means that there is only a 5 percent chance that the statistical significance resulted from a random sampling error (Chambliss and Schutt, 2015). P-values between 0.05 and 0.10 would be considered weak statistical significance (Lane, n.d.).

Quantitative, Phase II: HLM Development

Sampling, criteria, and data collection for the HLM:

The overarching theme for this section was to see if there was a statistical difference in GPA between the two types of courses. This section used the same sampling pool as Quantitative, Phase I – Student Survey. Basically, if students were surveyed in the student survey, their information would be used for Hierarchical Linear Model (HLM) analysis. The two groups possessed the following characteristics:

- Web-SCL class structure: The first group consisted of classrooms using technology during lecture AND using group activities during class time.
- Traditional class structure: The other group did not use technology AND did not use group activities during lecture.

Like the student survey, a total of 10 classrooms were selected based on their class structure in Spring 2013. Five classes were selected for their traditional classroom characteristics while the other five classes were selected for their Web-SCL classroom

characteristics. With each classroom approximately 25 students, the estimated potential sample pool should be around 250 students.

Office of Planning and Research (OPR) at this community college provided data on each individual student (socioeconomic status, grade for each class, age, gender, and prior accumulative GPA) and then provided data on the type of classroom (average GPA for each class and the type of class such as whether the class was technology based and/or student activity based). After removing all personal identifiers, OPR supplied the data for HLM analysis. SPSS version 19 was used to format the student and class data. HLM version 7 was used for the HLM analysis.

The data set consisted of a sample of students that occurred in one point of time and would be considered a cross-section data set (Wooldridge, 2009). All variables, with the exception of the outcome variable, were standardized and un-centered. This data source attempted to determine whether there was a statistically significant difference between the traditional model and the Web-SCL model. A p-value of 0.05 was used in this study to determine statistical significance (Chambliss and Schutt, 2015) and p-values between 0.05 and 0.10 were used to determine weak statistical significance (Lane, n.d.).

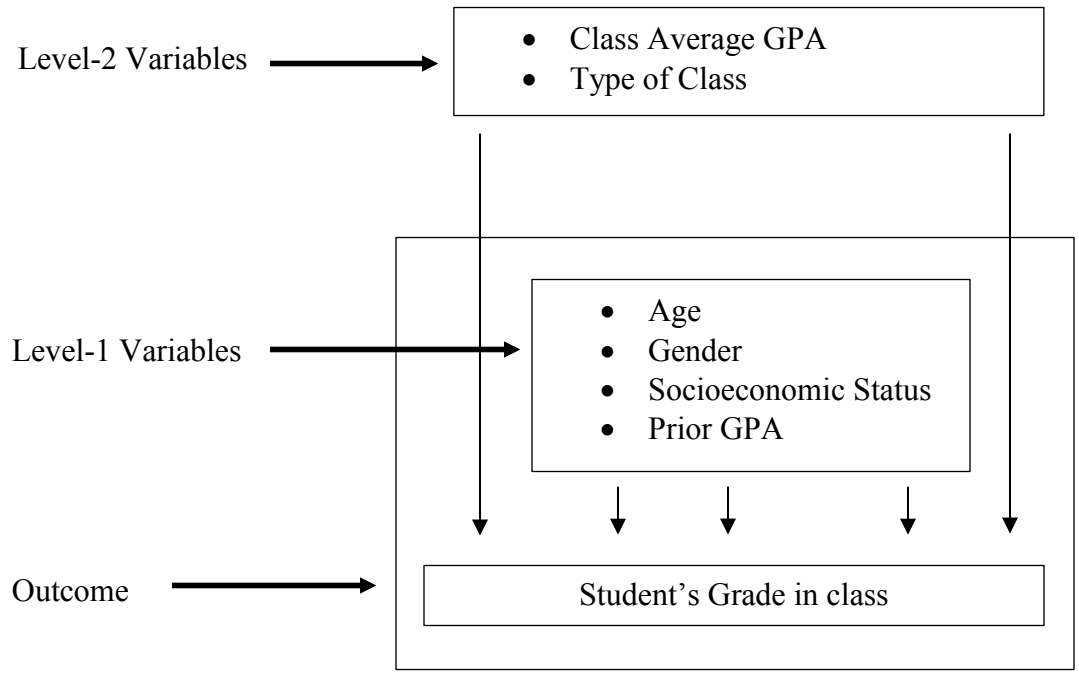
Developing the HLM:

When selecting a model, it is important to look at the data structure and then determine the appropriate model because of the naturally occurring differences between the types of data (O'Connell and McCoach, 2008). In this situation, Office of Planning and Research (OPR) provided data on each individual student and then provided data on the type of classroom. This

means that the data could be characterized at two levels: At the student level and at the class level.

Using a traditional linear model would not be very useful because individuals in the same group could be regarded as more similar than individuals in different groups (Raudenbush and Bryk, 2002). According to Raudenbush and Bryk (2002, p. xx), "…students in different classes can be independent, but students in the same class share values on many more variables." To account for the shared variance in hierarchically structured data, Woltman et al. (2002) recommended Hierarchical Linear Modeling (HLM). This modeling would allow the data to be analyzed at two levels: At the student-level and at the class-class level. As a result, the conceptual model looks like the following:

Figure 5: Conceptual Model of HLM



Method of Analysis for the HLM:

The Web-SCL model proposes that students should perform better in classrooms that possess technology and student centered activities. If true, the grade received in the Web-SCL classes should be higher than those classes without technology and group activities. This analysis tested whether or not the Web-SCL class had an immediate impact on student grades. As a result, the null and the alternative hypotheses are the following:

> H_o = Students attain similar decimal grades in the traditional classes and Web-SCL classes.
>
> H_1 = Students attain different decimal grades in the traditional classes and Web-SCL classes.

The outcome variable was grade received in the treatment and control group. Selecting grade received as the outcome variable was based on research done by Adelman (1999) and Pascarella and Terenzini (2005), in which their research showed that grades were the best predictors of persistence. For this study, the outcome variable of grade received had a number of controlling variables coming from two levels.

From level-1, the student variables included prior cumulative GPA, socioeconomic status, gender, and age. Prior cumulative GPA has been one of the best predictors of student success (Adelman, 1999; Pascarella and Terenzini, 2005) and was used as a predictor for the grade received in each class type. Socioeconomic status was also used as a level-1 student variable. Research has shown that socioeconomic status can impact student success (Sirin, 2005). This analysis included gender as a variable, although it would be very surprising if the class type had an impact on gender.

From level-2, the class variables included class average GPA and whether the class had technology and student-centered activities (Web-SCL model). Class average GPA was used to

see if instructors had different grading styles, which encompassed giving a high average grade or giving a low average grade. This inclusion was also necessary to isolate the teacher impact versus the technology/student-centered activity (Web-SCL) impact. The second level-2 variable was the technology/student-centered activity variable (Web-SCL). This variable was at the heart of this research and tested whether a technology and student-centered activities (Web-SCL) had an impact on student performance. In theory, the HLM model looks like the following:

Level 1 Model:

$$\text{Grade Received}_{ij} = \beta_{0j} + \beta_{0j}\,(\text{Student variable 1})_{ij} + \beta_{0j}\,(\text{Student variable x})_{ij} + u_{oj}$$

Level 2 Model:

$$\beta_{0j} = \gamma_{00} + \gamma_{00}\,(\text{Class Average GPA})_{ij} + \gamma_{00}(\text{Web-SCL})_{ij} + u_{oj}$$

At level-1, a number of different student variables were tested for significance. At level-2, there were only two level-2 variables, class average GPA and whether the class possessed technology/student-centered activities (Web-SCL). In this analysis, the coefficient (Web-SCL) determined the size of the impact and the two-tailed test was used to test the significance of that variable. This HLM analysis attempts to answer the following question: Do the Web-SCL classes have an immediate impact on grade received?

Qualitative, Phase I: Class Observation Development

Sampling, criteria, and data collection:

Students' perspectives are crucial for this particular model; however, instructors' perspectives are just as crucial. In many ways, this inquiry is from what Creswell and Clark (2007, p. 22) termed as "from the bottom up: from individual perspectives to broad patterns and, ultimately, to theory." It is possible that instructors feel that these activities do not support

learning or that instructors do not have enough support to provide the Web-SCL model. Then again, instructors could have positive feedback about my Web-SCL experimental design. Regardless of whether the feedback is positive or negative, their perspective needs to be captured, which could then lead to broader theories. This could also further the understanding and the interpretation of the quantitative results. And finally, the overarching purpose of the Class Observation is for instructors to observe my Web-SCL experimental design in action and for them to determine the level of engagement relative to the traditional class along with observing technology use in the classroom.

Randomly selecting instructors from the faculty population is not practical. If this research is to focus on the impact of a class design on student outcomes, it makes sense to focus on those instructors who use of technology or use student-centered activities in their classroom or at the very least, are interested in using technology or use student-centered activities in the classroom at some point in the future. As a result, instructors were selected upon four criteria: 1. Their willingness to be involved in the study or; 2. Their adoption and use of technology in their class or; 3. Use of student-centered learning activities in their class or; 4. Interested in class designs in order to improve student outcomes. This type of sampling would be considered "purposeful" sampling, where the researcher would be sampling based on a specific criteria to give context to the research questions (Patton, 2002). Unlike the student survey which focused on academic transfer classes, this section broadened the sample faculty population to include professional technical instructors due to their adoption of technology and student-centered activities in the classroom.[13] A few professional technical instructors agreed to participate in the observation and the interview. Each instructor was approached about the potential participation

[13] At this community college, Professional Technical Instructors included instructors whose students did not necessarily transfer to a 4-year degree, but sought skills to secure jobs in today's skill-focused economy (i.e.- Automotive, Nursing, Culinary Arts and so forth).

in the research project through an email. Eventually, ten instructors agreed to participate in observing my Web-SCL experimental design during my 50-minute class.

For those instructors who were interested in observing my Web-SCL experimental design, each instructor was sent a human subject's informed consent forms (Appendix D). The instructors were informed that any "individual" results will be kept anonymous and results would be de-identified before I received the data for analysis. Instructor participation was purely voluntary and they could opt out at any point. After the faculty agreed to observe my class, they determined the time for the observation. They were also notified that if they observed my class that they would eventually be asked to participate in a follow-up interview (See Appendix D).

After completing the observation form, instructors were informed to send their observation to Office Planning and Research (OPR). Once again, OPR was primarily used to remove some of the potential bias in the observations. Some instructors may be apprehensive of giving a negative review of the Web-SCL to me and their viewpoint may be influenced. As a result, OPR was used as a medium between the observer and me. Instructor identifiers were removed from the data set before analysis to ensure confidentiality. OPR were the only individuals to have access to the observations. The observations were then transcribed, all identifiers removed and the data sets sent to me for analysis.

Developing the Class Observation:

A few days before the observation, each evaluator was given the observation form (See Appendix E). This appendix not only provided the observation questions, but also elaborated in detail, my Web-SCL experimental design and its potential impact on student outcomes. This

appendix also gave the observer a glimpse at what they "should" be viewing during their observation.

On the day of the observation, these observers evaluated my class during a group activity presentation. This presentation day was broken up into five sections during a 50-minute class period. Each section was presented by one student deemed as the Group Leader. These Group Leaders had already completed and reviewed their assigned problems. Their purpose as the Group Leader was to demonstrate their expertise of their assigned problem to the class and to me, essentially becoming the "Expert." It was my hope that the Group Leader demonstrated a higher level of learning, but at the same time, it needed to be verified by an observer (Tessier, 2004). In this particular exercise, I was only to be used as a facilitator and to make minor adjustments in the student's presentations in the event of an incorrect statement. Another goal of this Group Leader approach was to give ownership of the class to the students and in effect, increase the engagement, increase the number of questions being asked in class, and increase learning.

The observation form was broken up into two sections. In many ways, breaking up the observation into two sections mimicked the Web-SCL model: Section 1 was about the activities in the classroom and Section 2 was about the Web-based tools offered online.

Section 1: Classroom Observation

- Description of the class activity
- Description of the level of engagement
- Description of the learning
- Use of technology in class
- Effectiveness of class activity

Section 2: Website Observation

- Evaluating website and support materials

The class observation gave instructors the opportunity to view a portion of my Web-SCL model and to give feedback as to what worked and what did not. This class observation portion was about evaluating the level of student engagement in the classroom. The observers should have seen an increase in student engagement in comparison to the traditional class. They should also have observed students taking control of the class activity, essentially leading the class discussion. When the Group Leader presented his/her findings, the discussion should have been an even split between me and the student. Theoretically, because the all the students discussed the problems the day before, students should be more inclined to ask questions. In fact, those questions should be more specific than general definitions or clarifying terms. And finally, the observers should have viewed students becoming the "Expert."

After the class observation, I went over with the observer the types of support materials given to the students (10-15 minutes). These observers then determined whether these support materials helped increase learning. Were these support materials different from what was offered from the traditional model? And most importantly, was this interaction between student-centered learning activity and Web-based tools able to increase student learning and student engagement?

Method of Analysis for the Class Observation:

After OPR removed all specific identifiers, the text transcripts were initially analyzed using the open coding technique (Strauss, 1987; Strauss and Corbin, 1997). Using the open coding technique, each line was analyzed several times before summarizing the meaning of the text. A matrix was developed to better visualize the potential connections and patterns among the large amounts of text. This analytical technique was imperative in developing categories and

sub-categories. After several revisions, axial coding was used to determine the relationships among the open codes. Category construction (Merriam, 1998) was then used to develop the naming of the categories and sub-categories.

In the observation form (Appendix E), the observers were reminded to think about my Web-SCL class design in relation to the traditional lecture, where a majority of the course material was delivered through the lecturer. This reminder was a crucial step in the identification of potential differences between the traditional teaching model and the Web-SCL model, in which this research was attempting to answer the following question: Are there any differences between the two types of course designs?

Qualitative, Phase II: Interview Development

Sampling, criteria, and data collection for the Interview:

Semi-structured interviews were used for the second portion of the qualitative section (See Appendix F). As discussed in the class observation section, students' perspectives are crucial for this particular model; however, instructors' perspectives are just as crucial. This is especially important because instructors are ultimately responsible for delivering the course material. In many ways, this section builds off of the class observation section. The last section focuses on the instructor observing my Web-SCL class design and its potential impacts on engagement along with the use of technology in the classroom. This section also focuses on the instructor's perspective, but has a different objective. The purpose of this section is for the instructors to relate their classroom to my Web-SCL experimental design. Do they see any advantages or disadvantages of using this particular model? And, how does this course design relate to their classroom?

The same faculty population for the class observations was used for this section. Instructors were notified prior to the class observation that if they participated in the observations, they would be asked to participate in a 30 to 60 minute interview (See Appendix D). Fortunately, none of the faculty dropped out from the observations to the interviews and the same ten instructors were used in this section.

Prior to the interview, each instructor received numerous pieces of information. They were re-sent a human subject's informed consent forms (Appendix D) as well as their class observation. Giving them the informed consent was simply a reminder that any "individual" results will be kept anonymous and results would be de-identified before I received the data for analysis. Their participation was purely voluntary and they had the option to opt out at any point. Also, giving them their own class observation was a reminder of what they observed in preparation for their up-and-coming interview. After the faculty agreed to be part of the interview, they determined a time in conjunction with the Office of Planning and Research (OPR) for the interview. As recommended by Morse and Richards (2007), the interviews were conducted in a private office at OPR to minimize interruptions.

Once again, OPR was primarily used to remove some of the potential bias in the interviews. Some instructors may be apprehensive of giving a negative review of my Web-SCL class structure and their viewpoint may ultimately be influenced. Thus, to mitigate some of the potential bias, OPR conducted the interviews and was used as a medium between the interviewee and myself. Instructor identifiers were removed from the data set before analysis to ensure confidentiality. OPR were the only individuals to have access to the interviews. The interviews were then transcribed to Word documents, in which all identifiers were removed before the data sets were sent to me for analysis.

Developing the Interview:

As discussed earlier, the main purpose of this interview method was a matter of reflection in how the selected instructors thought about my Web-SCL model in relation to their views about course design. Their course design could be similar or different. A survey to each of the instructors was considered, but an interview seemed like a more logical choice since I wanted the instructor's story as to why an instructor would design their own class one way or another. Either way, this section attempted to give context and fill in the gaps from the other sections.

This qualitative interview design was not as structured as the last section. Unlike the observation questions, where I could generally speculate what the instructor might observe, the interview questions were designed in a much different way. I wanted their story and how they viewed technology and group activities. As with setting up semi-structured interviews, the researcher knows about enough about the topic, but cannot anticipate the answers of the interviewee (Morse and Richards, 2007). This seemed to be the case, but I still wanted to have some general themes around the questions.

I wanted to know how other instructors specifically designed their course. Did they just lecture or did they use class time for group activities? Did they use technology while lecturing or possess a website? How did they view technology? Was technology this abstract term or did they have their own construct of technology? In many of the cases, the group activities were going to take up lecture time. Was it worth the tradeoff in lecture time? I also wanted to know what suggestions they would recommend for incoming, new instructors. Did course design matter? These were some of the questions that were discussed in the interview section.

Method of Analysis for the Interviews:

The method of analysis for the interviews was identical to the method of analysis for the class observations. After OPR removed all specific identifiers, the text transcripts were initially analyzed using the open coding technique (Strauss, 1987; Strauss and Corbin, 1997). Using the open coding technique, each line was analyzed several times before summarizing the meaning of the text. The open coding method helped to break down the textual semi-structured interviews into manageable pieces of data. A matrix was developed to better visualize the potential connections and patterns among the large amounts of text. This analytical technique was imperative in developing categories and sub-categories. After several revisions, axial coding was used to determine the relationships among the open codes. Axial coding was used in order to relate codes to each other in to build categories. All of this analysis was influenced by Strauss and Corbin guidelines for grounded theory, in which theory can be derived from data (Strauss and Corbin, 1998). Category construction (Merriam, 1998) was then used to develop the naming of the categories and sub-categories.

This type of analysis was based on bringing out the instructor's perspective in relation to the course design and the many questions surrounding that perspective. The semi-structured interview also attempted to get context and to get meaning of why instructors design their course a certain way.

Chapter IV: Results

Quantitative Phase I: Student Survey Results

This chapter summarizes quantitative and qualitative results from this study. The first section details student survey results (Appendix A contains the student consent and survey questions). 196 students took the survey and 22 students were left out due to incomplete results, which left the final sample to 174 completed surveys. For some questions, there were less than 174 students because some of the students chose not to answer all questions. The student survey was structured using a Likert scale (5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree, and 1 = Strongly disagree). As discussed in the survey development section, the survey collected information about these three questions:

> Part A: Can students distinguish between the two types of classes (Web-SCL class structure and Traditional class structure)?
>
> Part B: Is there a statistical difference between the two types of courses in the level of engagement as determined by CCSSE?
>
> Part C&D: What types of activities best support learning in these selected classes and at this school?

Part A results: Can students distinguish between the two types of classes (Web-SCL class structure and Traditional class structure)?

Part A of the survey was broken up into several questions. Each question focused on a specific characteristic of either the Web-SCL model or the traditional class structure.

Table 2: Chi-square results - Instructor lectures to the class at least 90% of the time.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Totals
	Count	40	21	6	2	1	70
	Traditional classes	57.1%	30.0%	8.6%	2.9%	1.4%	100.0%
	Count	65	31	6	2	0	104
	Web-SCL classes	62.5%	29.8%	5.8%	1.9%	0.0%	100.0%
Total	Total Count	105	52	12	4	1	174
	Total Percentage	60.3%	29.9%	6.9%	2.3%	0.6%	100.0%

In theory, the Web-SCL classes should have a lower percentage of class time devoted to lecture. At a quick glance, 57.1% of students in the traditional classes strongly agreed that their instructor lectured at least 90% of the time while 62.5% of students in the Web-SCL classes strongly agreed that their instructor lectured at least 90% of the time. Using Chi-square, there seemed to be no significant difference between the time devoted to lecture, χ^2 (4, N = 174) = 2.32, p = 0.677. If there was a significant difference, the two-tailed Chi-square test should have had a p-value value of less than 0.05 instead of 0.677. Students did not perceive a difference in lecture time between the two types of classes. This finding will be discussed in the next chapter.

Table 3: Chi-square results - Instructor lectures, but also spends at least 1/3 of lecture time on group activities and/or individual assignments.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Totals
	Count	8	23	12	16	11	70
	Traditional classes	11.4%	32.9%	17.1%	22.9%	15.7%	100.0%
	Count	28	30	25	16	4	103
	Web-SCL classes	27.2%	29.1%	24.3%	15.5%	3.9%	100.0%
Total	Count	36	53	37	32	15	173
	Total Percentage	20.8%	30.6%	21.4%	18.5%	8.7%	100.0%

In theory, there should be a significant difference between the two class structures in terms of class activities devoted to group activities and/or individual assignments during lecture. At a quick glance, 11.4 % of students in the traditional classes strongly agreed that their instructor spent 1/3 of lecture time on group activities and/or individual assignments during lecture while 27.2% of students in the Web-SCL classes strongly agreed that their instructor spent 1/3 of lecture time on group activities and/or individual assignments during lecture. Using Chi-square, there seemed to be statistical significance between students' perceptions of the time devoted towards group activities and/or individual assignments during lecture, χ^2 (4, N = 173) = 14.01, $p < 0.01$. This two-tailed Chi-square test had a p-value of 0.007, which was far below the 0.05 p-value threshold of statistical significance. From the perspective of the student, there seemed to be statistical significance difference between the two types of classes using group activities and/or individual assignments during lecture. This result will be discussed in the next chapter.

Table 4: Chi-square results - Instructor usually uses technology during lecture.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Totals
	Count	3	7	23	13	22	68
	Traditional classes	4.4%	10.3%	33.8%	19.1%	32.4%	100.0%
	Count	52	21	13	13	4	103
	Web-SCL classes	50.5%	20.4%	12.6%	12.6%	3.9%	100.0%
Total	Count	55	28	36	26	26	171
	Total Percentage	32.2%	16.4%	21.1%	15.2%	15.2%	100.0%

In theory, there should be a significant difference between the two class structures in terms of using technology during lecture. At a quick glance, 4.4% of students in the traditional classes strongly agreed that their instructor used technology during lecture while 50.5% of

students in the Web-SCL classes strongly agreed that their instructor used technology during lecture. Using Chi-square, there was a statistically significant difference between the use of technology during lecture, χ^2 (4, N = 171) = 61.30, $p < 0.01$. This two-tailed Chi-square test had a p-value of 0.000, which is far below the 0.05 p-value threshold of statistical significance. From the students' perspective, there seemed to be a statistical significance between the two types of classes in terms of the use of technology during lecture with low Chi-square of 0.000. This finding will be discussed in the next chapter.

Table 5: Chi-square results - Instructor uses a class website, CANVAS, Google Apps, or another Learning Management System (LMS) to deliver course material.

		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Totals
	Count	3	7	10	17	31	68
	Traditional classes	4.4%	10.3%	14.7%	25.0%	45.6%	100.0%
	Count	61	28	8	3	4	104
	Web-SCL classes	58.7%	26.9%	7.7%	2.9%	3.8%	100.0%
Total	Count	64	35	18	20	35	172
	Total Percentage	37.2%	20.3%	10.5%	11.6%	20.3%	100.0%

In theory, there should be a significant difference between the two class structures in terms of the use of a class website. At a quick glance, 4.4% of students in the traditional classes strongly agreed that their instructor used a website or Learning Management System (LMS) to deliver course material while 58.7% of students in the Web-SCL classes strongly agreed that their instructor used a website or LMS to deliver course material. Using Chi-square, there seemed to be a statistically significant difference between the two types of courses with the use of a website to deliver course materials, χ^2 (4, N = 172) = 95.53, $p < 0.01$. This two-tailed Chi-square test had a p-value of 0.000, which was far below the 0.05 p-value threshold of statistical

significance. From the students' perspective, there seemed to be a statistically significance difference between the two types of classes in terms of using a website or using a LMS. This finding will be discussed in the next chapter.

Part B results:

Table 6: Chi-square results – Is there a statistical difference between the two courses in the level of engagement as determined by CCSSE?

		Very Often	Often	Sometimes	Never
a. Asked question in class or contributed to class discussions	**Web-SCL** Traditional	**31 (29.8%)** 19 (27.5%)	**14 (13.5%)** 12 (17.4%)	**45 (43.3%)** 24 (34.8%)	**14 (13.5%)** 14 (20.3%)
b. Made a class presentation	**Web-SCL** Traditional	**12 (11.5%)** 7 (10.3%)	**12 (11.5%)** 3 (4.4%)	**25 (24.0%)** 11 (16.2%)	**55 (52.9%)** 47 (69.2%)
c. Worked with other students on projects during class	**Web-SCL*** Traditional	**15 (14.4%)** 7 (10.4%)	**27 (26.0%)** 10 (14.9%)	**33 (31.7%)** 19 (28.4%)	**29 (17.9%)** 31 (46.3%)
d. Worked with classmates outside of class to prepare class assignments	**Web-SCL** Traditional	**10 (9.6%)** 9 (13.0%)	**24 (23.1%)** 11 (15.9%)	**30 (28.8%)** 22 (31.9%)	**40 (38.5%)** 27 (39.1%)
e. Tutored or taught other students	**Web-SCL*** Traditional	**10 (9.6%)** 5 (7.2%)	**14 (13.5%)** 8 (11.6%)	**32 (30.8%)** 21 (30.4%)	**48 (46.2%)** 35 (50.7%)
f. Used the internet or instant messaging to work on an assignment	**Web-SCL***** Traditional	**37 (35.6%)** 7 (10.3%)	**21 (20.2%)** 14 (20.6%)	**31 (29.8%)** 18 (26.5%)	**15 (14.4%)** 29 (42.6%)
g. Used email to communicate with an instructor	**Web-SCL***** Traditional	**23 (22.1%)** 4 (5.8%)	**26 (25.0%)** 11 (15.9%)	**40 (38.5%)** 21 (30.4%)	**15 (14.4%)** 33 (47.8%)
h. Discussed ideas from your readings or classes with others outside of class (students, family, co-workers, etc.)	**Web-SCL** Traditional	**21 (20.2%)** 11 (15.7%)	**24 (23.1%)** 19 (27.1%)	**39 (37.5%)** 28 (40.0%)	**20 (19.2%)** 12 (17.1%)

*significant at p <0.10; **significant at p<0.05; ***significant at p<0.01

As discussed in the Student Survey Development section, the CCSSE has numerous questions in its survey and instead of asking all the questions from CCSSE, these questions best characterized the differences between the two types of class structures. For this section, the non-results will be discussed first and then move to the results that had weak significance. For the last section, the significant results will be discussed.

As far as the non-results, there was not a statistical difference between the two classes as to whether a student asked a question in class or contributed to class discussions (Question a.). There also was not a statistically significant difference as to whether a student made a presentation in class (Question b.). The two more surprising non-results came from questions relating to outside the classroom (Question d. and h.). The Web-SCL class structure had no impact on outside activities such as working with classmates outside of classes (Question d.) and discussing ideas with others outside of class (Question h.). These findings will be discussed in more detail in the next chapter.

There was weak significance for students working together on projects during the class (Question c.), χ^2 (3, N = 171) = 0.56, p = 0.076. The Web-SCL classes showed weak significance for tutoring students as well (Question e.), χ^2 (3, N = 173) = 0.56, p = 0.905. In hindsight, there might have been some confusion between group work and projects during class in Question c. However, it was decided to stick with the original wording from CCSSE instead of changing the wording to better reflect "Group activities." This issue will be discussed in the next chapter.

Questions f. and g. had strong statistical significance with both asymmetric two-tailed Chi-square tests below p-values of less than 0.001. Students who were in the Web-SCL classes clearly identified their class for the use of internet (Question f.), χ^2 (3, N = 172) = 23.24, p < 0.01

and communicating with their instructor via email (Question g.), χ^2 (3, N = 173) = 26.11, p < 0.01.

Part C Results:

Table 7: Chi-square results – What activities best support learning in this class?

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	N/A
a. Instructor lectures to the students at least 90% of the time helps my learning.	**Web-SCL** Traditional	**39 (37.5%)** 20 (28.6%)	**39 (37.5%)** 27 (38.6%)	**18 (17.3%)** 17 (24.3%)	**5 (4.8%)** 1 (1.4%)	**1 (1.0%)** 4 (5.7%)	**2 (1.9%)** 1 (1.4%)
b. Teaching and learning from other students during class hour helps my learning.	**Web-SCL*** Traditional	**20 (19.4%)** 15 (21.4%)	**44 (42.7%)** 19 (27.1%)	**26 (25.2%)** 16 (22.9%)	**9 (8.7%)** 10 (14.3%)	**2 (1.9%)** 3 (4.3%)	**2 (1.9%)** 7 (10.0%)
c. Students presenting assigned problems during class hour helps my learning.	**Web-SCL** Traditional	**18 (17.6%)** 8 (11.4%)	**40 (39.2%)** 18 (25.7%)	**20 (19.6%)** 18 (25.7%)	**12 (11.8%)** 9 (12.9%)	**5 (4.9%)** 4 (5.7%)	**7 (6.9%)** 13 (18.6%)
d. Using support materials (handouts or electronic documents) provided by the instructor helps my learning.	**Web-SCL** Traditional	**45 (43.7%)** 22 (31.9%)	**44 (42.7%)** 33 (47.8%)	**9 (8.7%)** 8 (11.6%)	**3 (2.9%)** 0 (0.0%)	**0 (0.0%)** 1 (1.4%)	**2 (1.9%)** 5 (7.2%)
e. Reading the recommended book helps my learning	**Web-SCL** Traditional	**35 (34.0%)** 33 (47.1%)	**40 (38.8%)** 22 (31.4%)	**22 (21.4%)** 9 (12.9%)	**4 (3.9%)** 4 (5.7%)	**1 (1.0%)** 1 (1.4%)	**1 (1.0%)** 1 (1.4%)
f. The group activities and/or individual projects during class hour helps my learning	**Web-SCL** Traditional	**31 (30.4%)** 14 (20.0%)	**33 (32.4%)** 26 (37.1%)	**17 (16.7%)** 16 (22.9%)	**7 (6.9%)** 3 (4.3%)	**3 (2.9%)** 1 (1.4%)	**11 (10.8%)** 10 (14.3%)
g. Using the homework solutions and old exams designed by the instructor helps my learning	**Web-SCL** Traditional	**52 (50.5%)** 27 (38.6%)	**31 (30.1%)** 28 (40.0%)	**13 (12.6%)** 9 (12.9%)	**5 (4.9%)** 1 (1.4%)	**1 (1.0%)** 0 (0.0%)	**1 (1.0%)** 5 (7.1%)
h. The use of the internet by the instructor helps my learning	**Web-SCL***** Traditional	**40 (38.8%)** 8 (11.4%)	**26 (25.5%)** 9 (12.9%)	**26 (25.5%)** 27 (38.6%)	**6 (5.8%)** 4 (5.7%)	**0 (2.9%)** 3 (4.3%)	**5 (4.9%)** 19 (27.1%)
i. Class structure has no bearing on my learning (more or less lecturing, more or less use of internet, more or less use of group activities)	**Web-SCL**** Traditional	**11 (10.7%)** 6 (8.6%)	**20 (19.4%)** 12 (17.1%)	**34 (33.0%)** 24 (34.3%)	**17 (16.5%)** 10 (14.3%)	**15 (14.6%)** 13 (18.6%)	**6 (5.8%)** 5 (7.1%)

*significant at p < 0.10; **significant at p < 0.05; ***significant at p < 0.01.

The results for Part C of the student survey were broken down in two tables: Table 7 and Table 8. Table 7 attempts to answer the following question: Do students respond differently between the two classes when asked about the activities that help them learn? Table 8 asks the same question, but it was based on a different sample population. It focused on students who had an opinion on the class activities and did not check the "N/A" box.[14] This distinction was important because Table 7 looks at whether all the students answered differently while Table 8 was a conditional response on those students who had an opinion on the activities in the classroom. Table 8 will allow for direct comparison between the types of activities and the types of classes unlike Table 7 where it will be based on whether the students answered differently.

In Table 7, there was no statistical difference between the two classes for whether lecturing helped learning (Question a.) and whether support materials helped their learning (Question d.). There was also no difference in the way students responded to whether reading the book helped their learning (Question e.) and whether group activities helped their learning (Question f.). There were two questions that had p-values Chi-square results slightly above the weak significance (p-value < 0.10): 1. Whether students presenting problems helped their learning (Question c.), χ^2 (5, N = 172) = 8.99, p = 0.109 and; 2. Whether the homework solutions helped their learning (Question g.), χ^2 (5, N = 173) = 9.16, p = 0.103.

One question had a weak statistical difference (Question b.) while two other questions had a statistically significant difference (Question h. and i.). Although the significance was considered weak, students answered differently about learning from other students (Question b.), χ^2 (5, N = 173) = 10.12, p = 0.07. The students also answered differently about class structure having an impact on learning (Question i.), χ^2 (5, N = 173) = 0.984, p = 0.964 and the use of

[14] "N/A" box was included in the student survey because a traditional class might not have possessed a certain class characteristic.

internet helping their learning (Question h.), χ^2 (5, N = 173) = 36.20, $p < 0.001$. These three results will be discussed in the next chapter.

Probably the most surprising result came from the number of students in the traditional classes not checking the "N/A" box. For example, Question f. focused on group activities and individual projects during class, yet only 10 (14.3%) of the students in the traditional class checked off the "N/A" box. Students in the traditional class should have checked the "N/A" box more often. The difference between the Web-SCL class and traditional class checking the "N/A" box was very negligible (10.8% versus 14.3%) for Question f. The biggest "N/A" differential came from Question h., which focused on internet use. Students in the traditional class clearly understood Question h. and there was big difference in the "N/A" box being checked (27.1% for the traditional class vs. 4.9% for the Web-SCL class).

Table 8: Chi-square results: What activities best support learning in this class (omitting "N/A" box)?

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. Instructor lectures to the students at least 90% of the time helps my learning.	**Web-SCL** Traditional	**39 (38.2%)** 20 (29.0%)	**39 (38.2%)** 27 (39.1%)	**18 (17.6%)** 17 (24.6%)	**5 (4.9%)** 1 (1.4%)	**1 (1.0%)** 4 (5.8%)
b. Teaching and learning from other students during class hour helps my learning.	**Web-SCL** Traditional	**20 (19.8%)** 15 (23.8%)	**44 (43.6%)** 19 (30.2%)	**26 (25.7%)** 16 (25.4%)	**9 (8.9%)** 10 (15.9%)	**2 (2.0%)** 3 (4.8%)
c. Students presenting assigned problems during class hour helps my learning.	**Web-SCL** Traditional	**18 (18.9%)** 8 (14.0%)	**40 (42.1%)** 18 (31.6%)	**20 (21.1%)** 18 (31.6%)	**12 (12.6%)** 9 (15.8%)	**5 (5.3%)** 4 (7.0%)
d. Using support materials (handouts or electronic documents) provided by the instructor helps my learning.	**Web-SCL** Traditional	**45 (44.6%)** 22 (34.4%)	**44 (43.6%)** 33 (51.6%)	**9 (8.9%)** 8 (12.5%)	**3 (3.0%)** 0 (0.0%)	**0 (0.0%)** 1 (1.6%)
e. Reading the recommended book helps my learning	**Web-SCL** Traditional	**35 (34.3%)** 33 (47.8%)	**40 (39.2%)** 22 (31.9%)	**22 (21.6%)** 9 (13.0%)	**4 (3.9%)** 4 (5.8%)	**1 (1.0%)** 1 (1.4%)
f. The group activities and/or individual projects during class hour helps my learning	**Web-SCL** Traditional	**31 (34.1%)** 14 (23.3%)	**33 (36.3%)** 26 (43.3%)	**17 (18.7%)** 16 (26.7%)	**7 (7.7%)** 3 (5.0%)	**3 (3.3%)** 1 (1.7%)
g. Using the homework solutions and old exams designed by the instructor helps my learning	**Web-SCL** Traditional	**52 (51.0%)** 27 (41.5%)	**31 (30.4%)** 28 (43.1%)	**13 (12.7%)** 9 (13.8%)	**5 (4.9%)** 1 (1.5%)	**1 (1.0%)** 0 (0.0%)
h. The use of the internet by the instructor helps my learning	**Web-SCL***** Traditional	**40 (40.8%)** 8 (15.7%)	**26 (26.5%)** 9 (17.6%)	**26 (26.5%)** 27 (52.9%)	**6 (6.1%)** 4 (7.8%)	**0 (2.9%)** 3 (5.9%)
i. Class structure has no bearing on my learning (more or less lecturing, more or less use of internet, more or less use of group activities)	**Web-SCL*** Traditional	**11 (11.3%)** 6 (9.2%)	**20 (20.6%)** 12 (18.5%)	**34 (35.1%)** 24 (36.9%)	**17 (17.5%)** 10 (15.4%)	**15 (15.5%)** 13 (20.0%)

*significant at $p < 0.10$; **significant at $p < 0.05$; ***significant at $p < 0.01$.

As far as the non-results in Table 8, there were a number of non-significant results between the two classes in terms of which activities helped their learning. Students seemed equally satisfied with the lecture between the two classes (Question a.). Few students, less than 2% for either group, checked the "N/A" box for question a. Students also felt equally satisfied with the handouts from the instructor (Question d.), whether it came in the form of a handout or retrieved from the internet. Students from both classes had similar feeling about reading the recommended book (Question e.). Question g. was very similar to Question d., so it was no surprise that there was not a difference in learning from the homework or old exams.

Students felt differently in the Web-SCL class with the use of the internet by the instructor (Question h.), χ^2 (4, N = 149) = 20.19, $p < 0.001$. This confirms the same results from Table 7. Whether it was a conditional response or not, students answered differently when asked whether the use of the internet helped their learning. Even though there was a weak significant difference with a p-value of 0.07, students in the Web-SCL answered differently than their counterparts when it came to class structure having no bearing on their learning (Question i.), χ^2 (4, N = 162) = 0.865, $p = 0.07$. All of these results will be discussed in the next chapter.

Part D results:

Table 9: Chi-square results – Examining Pre-existing Student Perspectives.

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. Instructor lectures to the students at least 90% of the time helps my learning.	**Web-SCL**	**36 (36.0%)**	**36 (36.0%)**	**18 (18.0%)**	**7 (7.0%)**	**3 (3.0%)**
	Traditional	22 (31.9%)	23 (33.3%)	18 (26.1%)	3 (4.3%)	3 (4.3%)
b. Teaching and learning from other students during class hour helps my learning.	**Web-SCL**	**28 (28.0%)**	**41 (41.0%)**	**20 (20.0%)**	**8 (8.0%)**	**3 (3.0%)**
	Traditional	16 (22.9%)	26 (37.1%)	23 (32.9%)	1 (1.4%)	4 (5.7%)
c. Students presenting assigned problems during class hour helps my learning.	**Web-SCL**	**21 (21.2%)**	**41 (41.4%)**	**28 (28.3%)**	**7 (7.1%)**	**2 (2.0%)**
	Traditional	12 (17.4%)	28 (40.6%)	20 (29.0%)	8 (11.6%)	1 (1.4%)
d. Using support materials (handouts or electronic documents) provided by the instructor helps my learning.	**Web-SCL**	**42 (42.0%)**	**39 (39.0%)**	**16 (16.0%)**	**3 (3.0%)**	**0 (0.0%)**
	Traditional	32 (46.4%)	27 (39.1%)	9 (13.0%)	1 (1.4%)	0 (0.0%)
e. Reading the recommended book helps my learning	**Web-SCL**	**34 (33.7%)**	**37 (36.6%)**	**28 (27.7%)**	**1 (1.0%)**	**1 (1.0%)**
	Traditional	28 (40.0%)	31 (44.3%)	9 (12.9%)	2 (2.9%)	0 (0.0%)
f. The group activities and/or individual projects during class hour helps my learning	**Web-SCL**	**30 (30.3%)**	**45 (45.5%)**	**18 (18.2%)**	**3 (3.0%)**	**3 (3.0%)**
	Traditional	16 (22.9%)	37 (52.9%)	13 (18.6%)	4 (5.7%)	0 (0.0%)
g. Using the homework solutions and old exams designed by the instructor helps my learning	**Web-SCL**	**50 (50.0%)**	**35 (35.0%)**	**13 (13.0%)**	**1 (1.0%)**	**1 (1.0%)**
	Traditional	32 (46.4%)	29 (42.0%)	6 (8.7%)	1 (1.4%)	1 (1.4%)
h. The use of the internet by the instructor helps my learning	**Web-SCL**	**39 (39.0%)**	**33 (33.0%)**	**22 (22.0%)**	**5 (5.0%)**	**1 (1.0%)**
	Traditional	18 (26.1%)	27 (39.1%)	17 (24.6%)	5 (7.2%)	2 (2.9%)

Students come into classrooms with various degrees of experiences when dealing with class structures. The purpose of Part D was to capture that difference. When students from both classes answered these questions from a school perspective, there was no statistical difference between the two classes in any of the questions. This makes sense in that students in both

classes should want these activities in a classroom. If anything, this gives more credibility to the technology question (use of internet) in Part C of the student survey and how it might help learning. All these items will be discussed in the next chapter.

Summary of the Student Survey Results:

In Part A of the student survey, there was not a difference in responses in lecture time between the two types of courses. However, students in the Web-SCL classes could identify the class structure in terms of class time devoted to group activities and/or individual assignments. Students in the Web-SCL classes could also identify the use of technology in their classes and they could identify instructors who use a website to distribute course material to the students. Part A was particularly important because students in the Web-SCL classes needed to identify the differences between the two types of courses, so that inferences could be made about learning.

For Part B, there was a weak significance for "worked with other students on projects during class" and "tutored or taught other students." There was a statistically significant difference between the two classes for "Used the internet or instant messaging to work on an assignment" and "Used email to communicate with an instructor."

As for Part C, there were three questions worth mentioning. Although there was a weak statistical significance, students responded differently when asked "Teaching and learning from other students during class hour helps my learning." On the other hand, students answered differently when asked, "The use of the internet by the instructor helps my learning." An interesting question that was found to be significant was the question about class structure. Students responded differently when asked, "Class structure has no bearing on my learning."

There were no statistically significant differences when students were asked about what course characteristics impacted their learning at this school (Part D). This result was expected since students in both types of classes should want the same activities to help their learning. Part D plays an important role in determining pre-existing student conditions as to whether they viewed the Web-SCL model in other classes. All of these findings will be discussed in the next chapter.

Quantitative Phase II: HLM Results

For this HLM analysis, the Office of Planning and Research provided student level data (Level-1) and class level data (Level-2). Pulling of student records was based on whether they took the student survey. If they filled-out the student survey, their records were retrieved by the Office of Planning and Research. The student level data (Level-1 data) included grade received for each class, academically disadvantaged, socioeconomic status, gender, age, and prior cumulative GPA. The class level data (Level-2 data) came from two sources: 1. Whether the class used technology AND student-centered activities during lecture (Web-SCL class); 2. Average GPA of the class. The outcome variable was grade received in each class. Initially, 186 student records were pulled, but due to incomplete records or students under the age of 18, 164 students had complete records. As discussed in the HLM development section, this section attempts to answer the following question: Do the Web-SCL classes have an immediate impact on grade received?

Level-1 Results: Which Level-1 variables were significant?

Mixed Model format:

$$GR\_REC_{ij} = \gamma_{00} + \gamma_{10} *(\text{Level-1 variable 1})_{ij} + \gamma_{10} *(\text{Level-1 variable x})_{ij} + u_{oj} + r_{ij}$$

There were several Level-1 variables tested for significance and its impact on the outcome variable of grade received (GR_REC). Gender, academically disadvantaged, and economically disadvantaged at Level-1 were not statistically significant. These variables did not need much modification to be added to the model above, due to their dichotomous structure (dummy variables), such as Male = 0 and Female = 1. Two other Level-1 variables, age and

race, were tested for significance, but needed some modifications before being added to the model.

Age was converted to a dummy variable breaking up the group into younger and older students. The younger group consisted of individuals less than 25 years of age and the older group over 25 years of age. Because younger generation are thought to be more technology savvy, age was tested for statistical significance, but it did not have an impact on the grade received.

Race was also added to the model and checked for statistical significance. There were multiple categories for race in this data set (Asian Pacific Islander, Latino, African-American, Native American, International, White and Multi-race). In order to use race as one of the control variables in this model, it had to be recoded and one of the races had to serve as the reference group (Chen et al., 2003; Harris et al., 2008). While there is no "wrong" way in selecting the reference group, a study should select the reference group with the highest number of observations (Hardy, 1993). In this case, it made most sense to use the White students as the reference group because of the high count in this study. The null and alternative hypotheses look like the following:

$$H_o: B_{\text{asian pacific islander}} = B_{\text{other}} = B_{\text{african-american}}$$

$$H_1: B_{\text{asian pacific islander}} \neq B_{\text{other}} \neq B_{\text{african-american}}$$

After conducting an F-test, there was no reason to reject the null hypothesis and conclude that any of these dummy variables had any statistical significance in determining the outcome variable of grade received, $F(4, 150) = 1.61$, $p = 0.173$. In

order for this study to reject the null hypothesis, the p-value had to be less than 0.05. All these non-significant results will be discussed in the next chapter.

There was one statistically significant Level-1 variable. Prior GPA had a statistical significance in determining the grade received in each class ($b = 0.574$; $p < 0.001$). In some sense, this was expected since other researchers (Adelman, 1999; Adelman, 2006) claimed that prior GPA was one of the most influential variables that can impact current grade. This variable was used in subsequent models while testing the two other Level-2 variables.

Level-2 Results: Which Level-2 variables were significant?

Mixed Model format: Overall HLM

$$GR\_REC_{ij} = \gamma_{00} + \gamma_{01} * Web\text{-}SCL_{ij} + \gamma_{02} * CLASS.AV\_GPA_{ij} + \gamma_{10} * PRIOR\_GPA_{ij} + u_{oj} + r_{ij}$$

There were two Level-2 variables added to the model for significance testing: Web-SCL class structure (Web-SCL) and the class average GPA. (CLASS.AV_GPA). Both Level-2 variables were tested separately and then together. Since prior GPA proved to be statically significant at Level-1, it was used as a controlling variable in these subsequent models.

Mixed Model format: HLM for Class Average GPA at Level-2

$$GR\_REC_{ij} = \gamma_{00} + \gamma_{01} * CLASS.AV\_GPA_{ij} + \gamma_{10} * PRIOR\_GPA_{ij} + u_{oj} + r_{ij}$$

If class average GPA was used as the only Level-2 variable and prior GPA (PRIOR_GPA) was used as the only Level-1 variable, the mixed model would look like the model above. Both of these variables were used to determine the significance and its impact on grade received.

Table 10: Summary of Class Average GPA variable at Level-2

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	-1.651013	1.355579	-1.218	8	0.258
CLASS.AV_GPA, γ_{01}	0.953599	0.416494	2.290	8	0.051
For PRIOR_GPA slope, β_1					
INTRCPT2, γ_{10}	0.543411	0.119484	4.548	152	<0.001

As expected, the prior GPA proved to be statistically significant and a variable that determined grade received (b = 0.54, p <0.001). For this model, class average GPA was considered weak significance with a p-value slightly above the 0.05 threshold (b = 0.95; p = 0.051). The coefficient of class average GPA could be interpreted in the following manner. The difficulty or easiness of the course determined the grade received in the class. This could also be interpreted as the instructor being easier or harder, which then determined the grade received in this course.

Mixed Model format: HLM for Web-SCL at Level-2

$$GR\_REC_{ij} = \gamma_{00} + \gamma_{01}*\text{Web-SCL}_{ij} + \gamma_{10}*PRIOR\_GPA_{ij} + u_{oj} + r_{ij}$$

The next step tested whether the Web-SCL model had an impact on grade received. If the class was constructed with a Web-SCL design at Level-2 and prior GPA was used at Level-1, the mixed model would look like the model above. Once again, prior GPA was used in the model as it proved to be significant in prior sections. Both of these variables were used to determine the significance and its impact on the grade received outcome.

Table 11: Summary of Web-SCL variable at Level-2

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	1.303506	0.405375	3.216	8	0.012
Web-SCL, γ_{01}	0.043670	0.265864	0.164	8	0.874
For PRIOR_GPA slope, β_1					
INTRCPT2, γ_{10}	0.572143	0.119843	4.774	152	<0.001

As expected in previous models, the prior GPA proved to be statistically significant for the grade received for each class (b = 0.57; p <0.001). Web-SCL variable was slightly out of the weak significance category (b = 0.04; p = 0.87). Even if the p-value was significant, the coefficient of 0.04 was relatively small. This means that the technology and group activities in the Web-SCL classes had very little impact on the outcome variable, grade received. If the average GPA for this data set is 3.00, it would mean that a student would increase his/her GPA from 3.00 to a 3.04. However, this was not true because of the p-value was not significant.

Mixed Model format: Overall HLM model

$$GR\_REC_{ij} = \gamma_{00} + \gamma_{01} * Web\text{-}SCL_{ij} + \gamma_{02} * CLASS.AV\_GPA_{ij} + \gamma_{10} * PRIOR\_GPA_{ij} + u_{oj} + r_{ij}$$

The last model was putting in the Web-SCL variable and the class average GPA variable into the model at Level-2. As a result, the mixed model would look like the model above. Once again, prior GPA was used in the model as it proved to be significant in prior sections. All of these variables were used to determine the significance and its impact on the outcome variable, grade received.

Table 12: Summary of Web-SCL variable and Class Average GPA variable at Level-2

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard error	*t*-ratio	Approx. *d.f.*	*p*-value
For INTRCPT1, β_0					
INTRCPT2, γ_{00}	-1.813208	1.515017	-1.197	7	0.270
Web-SCL, γ_{01}	0.002535	0.220115	0.012	7	0.991
CLASS.AV_GPA, γ_{02}	0.997732	0.466256	2.140	7	0.070
For PRIOR_GPA slope, β_1					
INTRCPT2, γ_{10}	0.547572	0.119840	4.569	152	<0.001

Prior GPA variable proved to be statistically significant (b = 0.547; p < 0.001). Class average GPA also showed to have an impact on the outcome variable, grade received, although it had a weak significance (b = 0.997; p = 0.07). Interestingly, the Web-SCL variable demonstrated statistical significance, (b = 0.002; p = 0.99). Although the coefficient of 0.002 was still positive, it had very little impact on the outcome variable, grade received. All these results will be discussed in the next chapter.

Summary of the HLM Results:

For the Level-1 variables, gender, academically disadvantaged, economically disadvantaged, age, and race were tested for significance and all were not significant. Only the prior GPA variable proved to be statistically significant at Level-1. Class average GPA variable and the Web-SCL variable had significance at Level-2, but it was model dependent. All of these results will be discussed in full detail in the discussion.

Qualitative Phase I: Class Observation Results

The main objective of this section was for instructors to view my Web-SCL experimental design and note any impacts my class had on student engagement and student learning. Another objective was for the observer to examine first-hand the use of technology during my lecture and to evaluate the use of my website. This observation occurred during my Economics lecture in Spring 2013. This class had 29 students.

As described in the Class Observation development section, the observational form was broken up into two sections (See Appendix E). Section 1 was about the activities in the classroom and Section 2 was about the Web-based tools offered online.

Section 1: Classroom Observation

- Description of the class activity
- Description of the level of engagement
- Description of the learning
- Use of technology in class
- Effectiveness of class activity

Section 2: Website Observation

- Evaluating website and support materials

This study used a "purposeful" sampling, which yielded ten instructors who participated in the class observations. One week before the observation, they were given the observation form (See Appendix E). The observational form gave them the questions to be answered and a general outline of what they should be viewing in the observation. The pool of instructors came from a number of different disciplines: English, Chemistry, Professional Technical, Math and Biology. In terms of gender, there were six females and four males. At the time of the study, six instructors were tenured while the remaining instructors were part-time instructors. Of the ten instructors, nine instructors submitted their observational comments to the Office of Planning

and Research (OPR). After receiving the observational forms, OPR removed all identifiers and formatted the data in a way that removed any possible instructor identification.

Using open coding technique to summarize the meaning of the text data and using axial coding to determine the relationships between the groups, five categories emerged from the observational data: 1. Student Involvement in the Learning Process. 2. The Impact of the Web-SCL on Engagement and Learning. 3. Becoming an "Expert." 4. Use of the Website. 5. Effectiveness of the Class Activity. Each category had a number of subcategories. These categories included some comments from the observational data to support or not support some of the theories put forth in earlier sections.

Category 1: Students Involvement in the Learning Process

Sub-category 1: Different class structure, Instructor used as a secondary resource, and One-on-one interaction.

As described in the Methods chapter, the student-centered learning activity should share the responsibility of the activity into two equal parts between me and the student, meaning 50% of the time students will lead the class while the remaining time will be led by me. In theory, the students were more engaged in their learning which could then lead to an increase in the understanding of the material and enable them to perform better on the exams (Tessier, 2004; Carini et al., 2006). Of the eight observations submitted from this particular question,[15] three observers noted that students were in charge of the classroom over 50% of the time. Three other observers had the students leading the classroom between 40% and 50% of the time. The percentage of leading the classroom between me and the student varied from one class to the next, but every observation noted some form of sharing the responsibility of the activity. Below

[15] Of the nine observation submissions, there were a couple of questions that instructors chose not to respond to.

are two comments describing the sharing of the activity, one above 50% and the other between 40% and 50%:

> "The students were leading the class for probably on the order of 80% of the time."

> "The students were speaking/leading about 45% of the time, with the instructor clarifying, questioning, and further explaining the rest of the time."

Different class structure:

One of the sub-categories that emerged from the observational data was the issue of different class structure. Was my Web-SCL experimental design different from the traditional class where the instructor simply lectures to the student? Was the group activity exercise similar to the way it was explained in the Appendix E? While many of the observers did not directly quote that the class structure was different, their explanation demonstrated that the class structure was, in fact, different.

> "The class session observed consisted of a series of presentations of homework problems by the students from various groups."

> "During the first ten minutes students write their presentations on the board. The instructor calls for questions and there are none. Students present their answers and the instructor assess and each directly from the student's presentations."

Instructor used as a secondary resource:

A big part of this type of model was to give ownership to the student, where the instructor really becomes a facilitator or even as a secondary source of information. With students taking ownership of the classroom, they may feel more empowered, which could then lead to higher engagement (Bransford et al., 2000).

> "Occasionally during presentations and typically after the presentation instructor would add points for clarification or answer questions beyond the scope of what the students were able to, but most of the class was devoted to student presentations of the topics involved."

> "The students were speaking/leading about 45% of the time, with (The instructor) clarifying, questioning, and further explaining the rest of the time."

One-on-one interaction:

And finally, the last sub-category explained what could happen with a small portion of downtime during lecture. Before the student presentations, each student wrote his or her explanation on the dry erase board. This took approximately 10-15 minutes of class time. This was an opportunity for me to do other items such as one-on-one questions, taking care of class logistics, and getting to know the students. As a result, did the observers notice the one-on-one interaction?

> "For the first 5 minutes or so of class, the instructor walked around the students as they finalized their homework and (the instructor) checked in about their understanding of the concepts."
>
> "During that time, the instructor took attendance, answered questions, and prepped the next group of students to be ready to put their solutions up."

Category 2: The Impact of the Web-SCL on Engagement and Learning

Sub-category 2: Level of Engagement and Learning, Detecting Learning, and Conditional Engagement.

Level of Engagement and Learning:

As described in previous sections, one of the purposes of this Web-SCL class structure was to increase engagement. The in-class activities were specifically designed to get the individual student to become more involved in the learning process. At worst, the in-class activities should have been on par with other classes. At best, the in-class activity should have increased student engagement.

Of the six observers who responded, four commented that the engagement was above the average class at this community college and better than the traditional model, where students are

just listening and sometimes participating. The other two instructors said it was about the same level of student engagement as the average class at this community college. One of the observers said the following:

> "Using as a benchmark the traditional lecture model where students listen and sometimes participate, students in this model were far more active."

> "The engagement level was particularly high, particularly in comparison to the traditional instruction methods used at this school."

Level of learning:

A general purpose of this section was to determine whether learning was occurring. If students are more engaged, was it possible to detect learning as well? For this particular class design and if student lead the class 50% of the time, did other students learn from the students leading the class?

The results of this particular question were mixed. Four out of eights observers said "Yes"-- that students were learning from other students. Three observers said "No"-- that students were not learning from other students, while the other observers had neutral comments. These two comments mimicked the diversity among the comments:

> "First, outside of class or just before class, they were forced to talk to each other about the problems and work out solutions. Then they had to present the solution—this often involved consultations, etc. Students were communicating with each other and the instructor about the concepts being discussed. It was really clear that learning was taking place because students were producing the content; it wasn't just coming from the instructor or a book."

> "I feel that the students are not learning that much from other students. Students are given the solutions to the problems, so they can look at the solution on their own before class. If a student does not explain something very well, instead of (the instructor) asking follow up questions of the student giving the presentation or from anyone in the class, (the instructor) explains the answer and talks some more about the topic with maybe another example. I think it would be good at that point to explain a different related example, but have someone in the class answer it- either by asking for a volunteer or calling someone by name. That would get more students participating in the class."

Detecting Learning:

Interestingly, several of the observers mentioned the difficulty of assessing learning. Even the observers who said the students were more engagement had difficulty in assessing the learning.

> "Yes, students did learn from other students, I think. Assessing the learning was hard for me to do, since I basically just saw students paying attention to other students. That was definitely happening. Did it result in learning? Harder to say."

> "For those students who were attentive, they appeared to be learning from other students, but there was no way for me to determine this through observation."

Conditional Engagement:

Many observers pointed out the conditional engagement. Student presenters were definitely engaged, but the students who were not presenting did not seem any more attentive than in the traditional course.

> "For the students presenting, obviously there was 100% engagement. Students on a given team had to be prepared to respond to questions, so they seemed likewise engaged. For the students who were not presenting or were not involved in the presentation, it is difficult to ascertain their level of engagement."

> "The students who presented to the class were definitely more engaged than in a traditional course. For those students who were not presenting, they didn't seem any more attentive than in a traditional course."

Category 3: Becoming an "Expert"

Sub-category 3: Given solutions before presentations

If students were truly prepared, then the observers should have noticed a difference in the quality of their questions. Did students move beyond the rudimentary questions to a more specific, advanced set of questions? If so, did the observers notice some students becoming "Experts"? Bransford et al. (2000, p. 16) defined "Experts" in the following way:

> A pronounced difference between experts and novices is that the experts command of concepts shape their understanding of new information: it allows them to see patterns, relationships, or discrepancies that are not apparent to novices.

Three of five submissions noticed students moving beyond the rudimentary questions while one had no assessment and felt the Web-SCL class was "on par" with the average class at this community college. One of the observers said the following:

> "In a traditional lecture classroom there are usually only a few students who speak up to ask questions. One assumes that the students not speaking are absorbing the content of the lesson. In this situation, all students were challenged to present information and solve problems. Using this model, students are more actively engaged and their learning is more clearly observed."

As to whether students were becoming "Experts", many of the observers (six out of seven) pointed out that some of the students were becoming "Experts", but not all the students. They felt that most of the presenters were becoming experts, while they were not so sure about the other students.

> "Because the students were practicing using the terminology and concepts, it was clear they were growing more familiar with the ideas and becoming experts."

> "Only the presenters appeared to be experts and occasionally a member of the group who was called on was an expert."

Student answers and solutions:

An interesting side note came from the solutions given to students. As noted, students were given the solutions after they discussed the material in groups. This brought up an interesting point in that students needed to come up with their answers first and then given the solutions.

> "No. I think reading and going over someone else's written solution to a problem does not ensure the student understands the material well enough to solve a similar problem on their own."

> "To become an expert, a student needs to be given a problem they have not seen before and know how to solve it. That is not being done here."

Category 4: Use of the Website

Sub-category 4: Benefits of course material online and Evaluating the Website

A theme that emerged from the data was the issue of active website use; in other words, did I actively use the website during class? Or, did I simply tell the students to just find the course material online without any direction? Technology does not guarantee learning and in fact, may negatively impact learning if not used properly (Bransford et al., 2000). In order for it to be successful, an instructor needs to demonstrate the abilities of technology in class on a daily basis and into the curriculum to have any sort of impact on student outcomes (White and Frederiksen, 1998; Noeth and Volkov, 2004).

> "In this lesson, the problems were posted on a website which was also projected in the classroom for reference, either to state the problem or to locate information in reference to it."

> "The website is nicely laid out so the material is easy to find and use. In class, the overhead projector was used to display the questions students were to answer."

Benefits of course material online:

Online resources are only effective if the user uses them (Noeth and Volkov, 2004). Were the observers about to point out the benefits of having online material during lecture? Did I give enough guidance so that the students would be able to repeat the task when they left class?

> "(The instructor) also showed them online (using the projector) where they could find old tests so they could use them to study."

> "(The instructor) used technology to pull up additional resources for students to support the students' presentations, which I thought went well and was very helpful to students"

> "Because it was all available in one place, students could connect previous lessons to current lessons."

Evaluating the Website:

All of the observers discussed the various course materials that I offered online for the students. Three of the observers said the following:

> "I think almost all lecture notes and assignments were available on the website. Students could refer to and review the website notes as well as their own notes."

> "The instructor offers a thorough review of the course, but also links to all of his lectures and resources. Most traditional classroom environments don't offer this depth of content to students online, as the content, i.e. lecture, is provided within the classroom."

> "The website is fantastic. This would have made my college experience so much easier. Students can easily find everything from the course's grading policy to the homework key and comments to old tests to study with. This likely makes it easier for both students and instructor when a student is absent, because they can access much of what they missed online."

Category 5: Effectiveness of the Class Activity:

Five out of five observers noted the effectiveness of the class activity. All of them seemed to like the structure of the class activity and the way the website effectively transmitted information to the students. All of the observers agreed that I did not have any obvious problems implementing the Web-SCL experimental course design. One of the observers said the following:

> "The instructor uses the web to transmit information to students – and it is obvious students are using the website for their work."

Summary of the Class Observation Results:

Although the percentage varied from one observation to the next, observers did notice a shared responsibility of the class activity between me and the student. They also noticed a different type of course design in comparison to the traditional class where the instructor is the primary source of information. Generally, observers noticed a higher amount of engagement, but

were unsure if students were actually learning. This will be discussed in more detail in the next section.

The students who were presenting were very engaged while some observers mentioned that the participation for the rest of the students was on par in comparison to the traditional classes. An interesting note came in the form of providing solutions to the students. As one of the observers mentioned, "Students need to be given a problem they have not seen before." This issue will also be discussed in the next chapter.

Observers were more or less pleased with the access to online material that I provided and understood the benefits of having an online presence so students can have constant access to online support materials.

Qualitative, Phase II: Interview Results

The main objective of these semi-structured interviews was to capture the instructor's perspective on how technology and group activities can impact their own class design. If technology and group activities have influenced their course design, then how do these instructors structure activities in their own class? These were some of the objectives for this section.

Using open coding method (Strauss, 1987; Strauss and Corbin, 1997) and category construction (Merriam, 1998), four categories emerged from the observational data: 1. Class Structure. 2. Benefits and Challenges of using Technology. 3. Were Group Activities worth the tradeoff for lecture? 4. Impact of Web-SCL course design. Each category had a number of subcategories. All the categories included comments from the interview transcripts to support or counter some of the theories put forth.

Category 1: Class Structure

Sub-category 1: Differential class structure, Justifying group work, and Advice to new instructor about class structure.

As expected there was lots of diversity in terms of how instructors designed their class. Some instructors only lectured. Others instructors used a combination of lecturing with some form of student-centered activity. There were also a couple of instructors who lectured very little while utilizing technology in the classroom. Overall, it was a diverse group with various reasons for setting up their course.

> "…most of my classes are largely lecture, that's traditionally how I've done it."
>
> "…if I had to pick a percentage I would say 50/50 (50% lecture/50% student activities), but some days it's all student activities..."
>
> "I try to make them (my classes) as non-lecture as possible and I teach with a lot of technology."

Differential class structure:

While some instructors noted that they did not change class structure with the level of class, several instructors noted that they do change their class structure depending on class type, advanced or developmental.

> "...(For the) higher level classes, I will spend most of my time lecturing. For the developmental one, I spend more time having them work in groups to practice ideas."
>
> " I do change the class structure... But, mostly the main difference is that there are problems in the lecture packet that we would work together (in class)."
>
> "…but I'm doing it (lecturing) really quickly for the 200 level classes as opposed to the 100 level class where I do far more explaining and give much more help (in class)…"

Only one of the instructors used the group activities for advanced classes and not the developmental classes. While the other instructors justified the group work at the lower levels, this instructor did not give a reason for giving group work only to the advanced classes.

"I haven't used this in developmental at all. I think it will be harder for me to do that. So far I only used it in my (advanced) classes."

Justifying group work:

The justification for using group work during lecture was rather interesting. As described earlier, the Web-SCL model is one in which gives the opportunity for students to meet other students, for an instructor to assess learning and to give students an alternative from continuous lecturing. For the most part, this section mimicked the previous description in what the instructors were going to say. There were several reasons as to why they used group activities, but it was mainly used to figure out the progress of the student.

"I see a lot better learning when I see them doing the activities."

"… so that (group activities) helps them break up the lecture into smaller units… so that's gonna help them practice the material, and I can find out where they come from and how they are thinking…"

"…it's better if they're actually doing a lot of the work themselves in-class every day, and I more quickly see where they're at…"

A couple of instructors used group activities as a way to break up their lecture knowing that students have a short attention span and to keep up the level of engagement in their classrooms. According to Allen and Tanner (2005), they mentioned that instructors use this type of activity as a way to give students a break from continuous lecturing.

"… I want to keep the students engaged because (they will) just zone out if I'm talking forever..."

"I did this (group activities) because if I talked too long, they students will tune out… (and) they can practice with one another and engage in discussion."

"When I stand and talk to them, their attention doesn't last long, even when I'm having them take notes…"

Advice to new instructor about class structure

For the most part, the instructors focused on one of two themes: 1. Having more group work. 2. Being able to utilize technology in the classroom. This was very interesting because the instructors, more or less, reiterated the descriptive features of the Web-SCL model.

"Of course, I certainly try to incorporate technology to some degree.

"Well, certainly a good portion of class during the week should be devoted to activities that forces the student to process the content in some way to help them retain the information and understand it in a deeper level."

"Well, I would steer them away from 100% lecture for sure. I think they should mix it up and get the students more active as possible every class period. Also, if they haven't moved toward technology, I would encourage them to have a course website and to put as much of the material online, to use Canvas once they get certified and start using it."

"I would tell them to try to get the students to talk about the material or try to present the material as much as possible-- the more that an instructor can get a student to do that, the better the student will learn the material, although that the teacher isn't the font of knowledge that some people like to be, it is a completely different kind of teaching, but the teacher is organizing the students learning just telling them what they should learn."

"I continually give feedback to new instructors about balancing out their class. If they're traditional lecture, I encourage them to start prepping more group work, more student engagement, where students can step back and apply what they've learned in lecture, either in small group or class to develop the community, and it gives them a chance to apply their learning and engage in it, and I'm constantly giving feedback and implementing balance lecture with group activities."

"I think it's a good thing to include some group work; the first day or the first week the student should get in their mind that class would be different with a different format, because you don't wanna do it half way through the quarter and try to do something weird, then it would seem too strange for students "

"It would be don't lecture the whole time, I know that every teacher has a different style, but I think some are pretty incredible lecturers but I feel like if they're doing that 100% of the time they are gonna be missing out on what the students are learning."

"Yeah, I would say that's it, I would recommend having access to the material outside of class, if you have totally face-to-face, you still need a online presents where your student is ill and misses two or three days you can say" okay your not missing everything that's going on inside of class, you can find that online."

Category 2: Benefits and Challenges of using Technology

Sub-category 2: Student benefits/challenges, Instructor benefits/challenges, Technology giving structure to lecture.

Many of the comments about student benefits mimicked the benefits described in Figure 2: Web-SCL model. Almost all of the instructors noted the advantages of having 24-hour access to course material and the ability for students to access lectures and old exams online. Overall, there were not too many surprises. If there was a different perspective for student benefits, it would be that technology provides an alternative to the instructor.

> "Sometimes they have discussions in the discussion area. That's wonderful for me because it has them talking to each other, instead of waiting for me to reply."

> "…having them see that in the classroom (using technology) and navigating through it. It helps them more and when they to their home environment."

Student obstacles:

Some of the student obstacles were fairly predictable as well. Some instructors commented that some students had difficulty with computer access, internet access or printer access confirming previous researchers (Jeffrey et al., 2011; Ballard, 2004). As expected, some students had trouble accessing the material. An interesting point was that some instructors had cautionary examples of technology and that technology needed to be used on a regular basis in class in order to be effective for students.

> "They can't follow me quickly if I'm just using it once or twice... it (problems with technology) goes away when I use it more often"

> "... it kind of depends how prepared you are to use it. If you want to incorporate these tools and you use it thoughtfully, then I think there (are lots of) benefits…"

Instructor Benefits:

Once again, most of the instructor benefits were fairly predictable. One instructor mentioned that they did not have to pass out handouts in class. Another said that the

technology helped with assessing what is going on with the class and some of the features in their Learning Management System (LMS) helped alleviate their teaching load with many of the students helping themselves in online discussions. Many of the instructors focused on two items: 1. The ability to pull up course material very quickly and cover more material in lecture. 2. They did not have to draw graphs and concepts on the board. One instructor argued that instructors were lazy for not drawing out the graphs on the board, but overall, the instructors viewed technology as adding efficiency to their classroom either directly or indirectly.

> "…there are definitely times when you don't want them to compute them by hand... and we can bring up graphs that I don't have to draw on the board"

> "…if you're organized, and if you have a website that is up to speed, and you can pull it up quickly, you're not spending time writing on the board and losing class time."

> "...technology was put in so we don't have to graph graphs, or not have to put our overheard grind up on the white board so we can draw our graphs"

> "I can pull those (work sheets and review problems) pretty quickly."

Instructor Challenges:

Many of the instructors talked about the problems associated with using technology. Some talked about the time lost in set-up and problems with the functionality of technology. One instructor discussed the absence of technology in his/her classroom. The functionality of technology is very important and one of the main reasons for faculty resistance incorporating technology into the classroom (Hicks, 2011).

> "I have to figure out in the classroom I'm in – what works; I lose some time for setup."

> "The problems could be technological: if you have problems getting it up on the screen, that could waste time, or if you're having problems connecting, and you don't have any control on what days you have technological problems."

> "I've been asking for the computer with the big overhead projector and the big screen for years, and I would have made other modifications and adaptations to my course if I had access to technology."

> "Well, one of the problems you have is functionality, like is your network up and running, is everything okay in that regard…"

Some also discussed problems associated with professional development and training.

> "…and the instructors taking the time or having the time to attend the training in order to use the technology that's there…"

As one instructor pointed out, students want more than just lecture. Interestingly, there was another instructor who, while emphasizing the importance of technology in a classroom, had a cautionary tale about having technology in a classroom.

> "So, there are definitely problems to both, one problem is that I overly rely on the course material. Like, oh year this course has old exams there and the students will review them and I forget that. I have this rule as an instructor to actively encourage (them)…"

Technology giving structure to lecture:

Many of the instructors commented on the technology giving structure to his/her lecture. One instructor said that it gives structure, but one should be cautious about the impact. Another instructor did not necessarily agree with technology giving class structure, but rather technology making the class more efficient in the delivery in course content.

> "It can… it can be also slightly distracting, but depending on the lecture it can give structure. If you got something up there, displayed, you know what you're gonna cover, the students know what you're gonna cover."

> "I do believe they (technology) give structure to my course, because of the calendar feature I am able to think about the course in a visual way, like when the exam review, when it's the exam, how far apart are the quizzes…"

> "I'm able to structure them more carefully; I can update them quickly, and it will persist overtime, and I stored it online, so if I lose it on one computer, it's still out there."

> "In fact, a number of people who teach online think that it really improves their in-class work, because the way you have to structure your ideas in technology can sometimes make it more clear."

> "I could say that they could have had that (class structure) anyway, just probably give them more efficient structure because they aren't writing on the board."

> "I do believe it gives an instructor structure during lecture – you can clearly lay out what you wanna integrate it and the technology, and when you wanna pull the technology up to give a

chance to look at problems and do problems, and it makes it a lot easier because it's right there. I think it makes it a lot more streamlined for students.

Category 3: Were the Group Activities worth the tradeoff for lecture?

Sub-category 3: No sub-categories for Category 3.

Most of the instructors fluctuated between group activities being worth the tradeoff and it "depends." A few instructors commented that the group activities were too time consuming and that instructors were under too much pressure to cover a certain amount of material to be experimenting with group activities.

"… you need to complete a certain amount of work… But group activities can be very time consuming, especially with the quarter system and a 50 min (class time). To me, that is a disincentive to do as much group work to benefit the students."

"So, I haven't adopted the model because I haven't had the time to put something like that together."

It seemed that these instructors were positive yet had some hesitation about saying the group activities were better. Those instructors who more or less said it "depends" had this to say about group activities.

"For a lower level class, say a developmental class, I can explain something and do an example or two, but the students benefit from trying on their own to go through the examples and make sure they are applying the parts correctly. Small group work supplementing the lecture is a great way to do that; it also potentially gives them a chance to explore and take some wrong turns and work together and correct each other, which is gonna give them more insight than they will get, that just being told the answer directly."

"Well, I think all group activities would have some problems… Well, let me answer it this way, yes I think group activities are generally better than lecture, if the instructors are actively engaged and present in the room. Lecture is fast though; it has an important role to play in the course; there are some parts of the course that are better presented."

Those instructors who had more positive comments had this to say.

"I definitely think group activities are better because it makes the students produce something, as opposed to being so passive. They are more actively involved."

"I think it's important to have something besides lecturing. Lecturing is one way to convey information, but some students work better by reading the information so they need that

opportunity to discuss things out and to work in groups to solve problems and thing they can't do it all by themselves."

"I definitely think it's worth the trade-off. First, I think if I was lecturing I wouldn't understand what students know and don't know… When they are doing activities I'm like "oh, I know immediately what I taught if it makes sense or not" and I'm able to assist it and change it immediately to make sure they understand it…"

Category 4: Impact of Web-SCL course design

Sub-category 4: Student Engagement/Student Outcomes and Impact of Web-SCL course design on the Observers/Interviewees

Almost all of the interviewees acknowledged that this particular course design could help engagement and student outcomes. One instructor said that he/she could not assess whether the engagement would increase or decrease. The rest of the instructors had very positive comments about the Web-SCL class structure and its potential impact on student engagement and student outcomes.

"I think it can, one of the nice things of the SCL model is that the students really do have access to the assignments they are working on, all the time. I should expect there should be far fewer questions about "what are we doing today?", and "what's the homework?" they can always go and look it up very easily . They don't have to wait for feedback from the instructor for something like that, when they're confused.

"Overall, for success, I would guess it should increase achievement, either because they are paying more attention in class, or because they got access to the stuff later on."

"I think when the students are more engaged and talking to each other and show they're learning something, the more likely they will stay in the class, and they are practicing talking about the material or solving that problem about the materials, and so you're seeing learning."

"I think it's a much better mode. I really like the idea that it's not a teacher based thing -- a teacher is not the source of the information. The information comes from books or on the websites, so the students have their own relationships that the information isn't always funneled through the instructor."

"…the atmosphere is more like," lets figure it out," which is a lot higher student engagement than just worrying about if you're right or you're wrong, which also ties to student outcomes and objectives -- they're higher engagement, they're investing in what they're learning,

they're making more connection on why they are learning and it matters for their larger goals"

"I believe that it gives positive outcomes to the brain, getting used to do more work outside of class to prepare themselves for discussions. I think it brings more students in more prepared; if more instructors do that, it will become the standard -- and model that, it will help students transfer."

"Yes, I think it can be very enriching and engage students more than your typical lecture class, and what I noticed in his model -- when I did my observation -- it puts more accountability on the students, because much of the students and the learning is knowledge gain is obtained outside of class, and they have to come to class and impart what they learned to their peers, so in that sense, yes it enhances their learning, and that's researched based, because research will say a student learns better if they teach someone else how to do something"

Impact of Web-SCL course design on the Observers/Interviewees

Many of the instructors talked about how they were incorporating some of the ideas into their classroom. A majority of the instructors had many positive comments how this research impacted their own class design.

"…I've made more of a concerted effort to get my assignments and projects online; even in the classes where I'm not pulling up the computer very much in class, the students now have better access to all the documents in class that don't have to wait for me to hand them out in class, they can get them right away."

"I don't think this would be good for multiple, I think this is a good component for a course, but for an everyday thing, I think it would be a bad thing."

"Starting in graduate school, I was taught about the relationship between the teacher, the student and the subject matter, and this was all about how to get the student to interact with the subject matter, that is the role of the teacher, and this follows through on that, and I really like having all the technology around, it makes it easier for the students."

"I observe many new faculty in the classroom, and I encourage them to adopt aspects of this model"

"(This class)… is more problem solving base. His has much more critical thinking moments to it."

"It kind of reminded me what I learned when I was obtaining my Master's degree, the teaching where it was like "yes having them teach something makes them learn better." As well, providing a new prospective on something you might not have when your teaching directly. So, I think doing that, I'm doing that, I having them teach something has been really helpful doing that. Yeah, so I think it got me directly thinking about or consciously thinking about something I just go automatically do these

class things without examine the why and it forces be to doing the examining of why, which has shifted some activity a little bit."

Summary of Interview Results:

For Category 1: Class Structure, there seemed to be a lot of variation as to how instructors designed their class. Some instructors used differential course design depending on whether the class was developmental or advanced. The main justification for group work was to assess learning. Interestingly, all of the instructors mentioned the descriptive features of the Web-SCL model when giving advice to new instructors.

For the most part, results were fairly predictable in Category 2: Benefits and Challenges of using Technology. Almost all of the instructors noted the benefit of 24 hour access for course material and the ability for students to access lectures and old exams. Some instructors commented on students having trouble accessing the course material. There was one interesting point about technology giving structure to their lecture.

As for Category 3: Are Group Activities worth the tradeoff for lecture?, most of instructors thought the group activities were worth the tradeoff for lecturing while most thought the course design would help engagement and student outcomes.

Overall, it seemed that instructors were fairly satisfied with the course design and what the Web-SCL model had to offer in Category 4. Some of the instructors planned to incorporate some of the ideas in their classroom. Many of these details will be further discussed in the next chapter.

Chapter V: Analysis of the Quantitative and Qualitative Data

This chapter reviews both the quantitative and qualitative data that were collected in this study. After discussing each phase separately, this research proceeds to a general discussion of what all the data meant. Connections between the findings and the relevant literature will be noted throughout.

Quantitative, Phase I: Student Survey Analysis

Part A: Did students distinguish between Web-SCL and traditional lecture classes?

In many respects, Part A of the student survey was very significant to this study because students needed to identify key differences between the Web-SCL classes and the traditional classes. These differences would then allow this study to look for differences in student engagement and student outcomes. While it was surprising to see no difference devoted to lecture time as opposed to student activity, it was not all that surprising to see students clearly identify the three other class characteristics: Use of group activities, use of technology, and use of a website or Learning Management System (LMS) to deliver course material.

From the perspective of the student, there was no difference in responses between the two types of class structure in terms of class time devoted to lecture. In theory, students in the Web-SCL classes should have noticed a reduction in lecture time in comparison to students in the traditional classes. Initially, this was slightly worrisome because if the instructor was lecturing 90% of the time, the instructor would not have enough time for the group activities and/or individual projects. Students could have been unsure about what "lecturing" actually meant. Maybe they thought "lecturing" included everything that was going on in the classroom, regardless of whether the instructor was actually lecturing. Although this question did not go as planned, students made significant distinctions between the two types of classes in the next series of questions.

Students responded differently in terms of class activities devoted to group work. There was also a difference in the responses when asked about using technology during lecture. And finally, students responded differently when asked about how course material was delivered to the student. All of these characteristics were part of the Web-SCL model and students identified those differences in their responses.

These last three questions were crucial to the remaining sections of the student survey. In order for this study to make a hypothesis about the impact of class structure on student engagement and outcomes, students need to identify the class structure differences first. While the students still thought that Web-SCL instructors lectured 90% of the time, students responded differently for the use of group work by the instructor and the use of technology by the instructor. As long as the students recognized the differences about group work and technology in the classrooms, it made sense to continue to see whether those differences had an impact on the level of engagement and learning.

Part B: Was there a statistical difference between the two courses in the level of engagement as determined by Community College Survey of Student Engagement (CCSSE)?

At this community college, CCSSE has been used to measure engagement. It also has been used as a comparative tool to measure the level of engagement against other community colleges across the country. This survey is distributed every four years and the intent of this survey is to help institutions identify good educational practices and areas they can improve.

Part B of the student survey focused on questions that might differentiate responses between the two types of classes. It was originally postulated that the Web-SCL model would increase the number of student posed questions during class (Question a.) and would further

stimulate conversations outside the classroom (Question h.). This was not the case and the responses across the two types of classes were not statistically significant.

There were some questions that were difficult to assess because of the wording in the CCSSE questionnaire. For example, Question c. stated, "How often have you worked with other students on projects during class." It was tempting to change this question because "projects" could have multiple meanings. Do projects include group work and/or individual assigned problems? Although Question c. was statistically weak, it did make me pause and think about the wording of the question and whether I should have changed the question before surveying the students. Another issue was in Question e. It stated, "How often have you tutored or taught other students?" If students are working in groups, did students consider themselves tutoring or teaching others? These were some of the issues that I had thought about before sending out the survey, but decided to stick with the original wording for consistency and to examine the questions more carefully.

There were a number of results that came within expectations. Some of the Web-SCL classes selected for the survey had class presentations (Question b.) as part of their class structure, but not all of them. Instead of class presentations, some classes used individual projects during class time while in other classes they worked in groups to solve problems. As a result, it was not too much of a surprise to see a non-statistical difference when students were asked, "How often have you made a class presentation?" Question f. focused on students using the internet for assignments while Question g. focused on students using email as a way to communicate with an instructor. In either case, students clearly responded to these two questions in ways indicating that they perceived differences: Web-SCL instructors used the internet for assignments and students used email to communicate with the instructor.

Part C discussion: From the students' perspective, which activities best supported learning in their respective class?

In Part B, the survey questions were attempting to measure if there were differences in the level of engagement between the two types of classes. With Part C (Table 7), the student survey sought to ascertain which activities had an impact on student learning. This analysis was broken down into two sections: Results within expectations and surprising results.

In response to Question a., students did not respond differently as to whether lecturing helped their learning. This was to be expected since there was not a significant difference in the Part A results of the student survey, where they could not differentiate between the lecturing characteristics. In response to Question c., students did not respond differently to class presentations helping their learning. While class presentations were a part of my Web-SCL experimental design, it was not a part of all the Web-SCL classes. If there was not a statistical difference in the class presentations in Part B of the student survey, it would have been a surprise if the students thought class presentations helped their learning in Part C.

A surprising result was observed in responses from the students in the traditional classes. Far more students in the traditional classes answered all the questions instead of opting out by checking off the "N/A" box. I originally thought that far more students in the traditional classes would opt out of the questions by checking off the "N/A" box. For example, in response to Question f. in Part C of the student survey, 14.3% of the students in the traditional classes opted out of this question when asked whether the group activities and/or individual projects during class hour helped their learning. This number (14.3%) should have been higher and students in the Web-SCL had very similar numbers (10.8%). Far more students in the traditional classes answered all the questions, which suggested a number of possibilities: Students did not see a

difference between the responses, students did not understand the question or the questions were written in an unclear way.

Another surprising result came from the students in the Web-SCL classes. Those students said that class structure had no bearing on their learning. This was very interesting and could mean the following: Students in the Web-SCL did not recognize the difference in class structure while the students in the traditional class could notice the difference in class structure.

Part D: Examining Pre-existing Student Perspectives

The purpose of Part D was to capture any pre-existing student perspectives before they took their respective classes. In theory, there should not be a difference between the two classes in terms of what students wanted from the activities that could have helped them learn.

As expected, there were not any statistically significant differences between the two classes. If anything, it emphasized the single positive result in Part C (Table 7) of the student survey. Students believed that the use of the internet by the instructor and its ability helped their learning. Another positive note was that students in both classes agreed or strongly agreed that each of these activities helped their learning. If "strongly agree" and "agree" for both students were aggregated, the table would look like the following:

Table 13: Aggregating the results in Part D of the student survey.

		Strongly agree or agree
a. Instructor lectures to the students at least 90% of the time helps my learning.	**Web-SCL** Non Web-SCL	**72 (72.0%)** 45 (65.2%)
b. Teaching and learning from other students during class hour helps my learning.	**Web-SCL** Non Web-SCL	**69 (69.0%)** 42 (60.0%)
c. Students presenting assigned problems during class hour helps my learning.	**Web-SCL** Non Web-SCL	**62 (62.6%)** 40 (58.0%)
d. Using support materials (handouts or electronic documents) provided by the instructor helps my learning.	**Web-SCL** Non Web-SCL	**81 (81.0%)** 59 (85.5%)
e. Reading the recommended book helps my learning	**Web-SCL** Non Web-SCL	**71 (70.3%)** 59 (84.3%)
f. The group activities and/or individual projects during class hour helps my learning	**Web-SCL** Non Web-SCL	**75 (75.8%)** 53 (75.8%)
g. Using the homework solutions and old exams designed by the instructor helps my learning	**Web-SCL** Non Web-SCL	**85 (85.0%)** 61 (88.4%)
h. The use of the internet by the instructor helps my learning	**Web-SCL** Non Web-SCL	**72 (72.0%)** 45 (65.2%)

Looking at Part D of the student survey, all students believed these activities helped their learning. Yet, the results in Part C suggested that only the "the use of the internet by the instructor helps my learning" really produced an observable statistical difference between the two classes. Students did not observe any difference in the other activities (group projects or individual projects) offered by the instructors in the Web-SCL course design. As far as the

student survey results, it was the technology part that the students really appreciated while the student-centered learning, such as the group activity work, seemed to have no observable impact.

Quantitative, Phase II: Hierarchical Linear Modeling (HLM) Analysis

The purpose of this HLM model was to answer the following question: Did the Web-SCL classes have an immediate impact on grade received? In order to do this, this research used HLM analysis using Level-l and Level-2 variables to determine an immediate impact on a specific outcome. The outcome variable for this study was grade received in two types of classes (Traditional classes versus Web-SCL classes) testing multiple Level-1 variables and two Level-2 variables.

There were several Level-1 variables tested for significance: gender, academically disadvantaged, economically disadvantaged, age, race and prior GPA. With the exception of the prior GPA variable, no Level-1 variable was statistically significant. The class average GPA Level-2 variable had an impact on the outcome variable while the Web-SCL Level-2 variable had an impact on grade received as well, although the magnitude was minimal. These are the general results, but we will now look at specifics at each level and then go over the overall model. The breakdown of this section will be as follows: As expected results and surprising results.

As expected, gender and age did not have an impact on the outcome variable, grade received. It would have been very surprising if gender at Level-1 was statistically significant. Whether male or female, class design should not have had an impact on grade received. It also made sense that the age of the student, whether older or younger, should have no impact on grade received in a class.

The two more surprising results from the Level-1 variables came from the economically disadvantaged variable and academically disadvantaged variable. In order to be considered academically disadvantaged in this data set, the student must have been enrolled in basic or

developmental classes in their first quarter. In theory, academically disadvantaged students may need a little more time with the course material. If so, a website or a Learning Management System (LMS) could have supported their learning and increased their performance. This was not the case and there was no relationship between the Level-1 variable, academically disadvantaged and the outcome variable, grade received. The number of academically disadvantaged students in this sample pool was sufficient (69 out of 175), so there should not be a concern for having a small sample pool.

In terms of the economically disadvantaged students, 52 out of 175 students were considered economically disadvantaged. This Level-1 variable indicated whether the student received need-based financial aid. The economically disadvantaged variable was not significant, but it was difficult to determine that this variable was even a good indicator in the first place. To be considered economically disadvantaged in this data set, one must apply for financial aid. As we know, filling out financial aid papers can be daunting for first-generation students and economically disadvantaged students (Dynarsk and Scott-Clayton, 2006; Bettinger et al., 2012). Some students may choose to work a full-time job instead of applying for loans (DesJardins, S.I. et al., 2006). If this variable included working hours, the economically disadvantage variable would have much more predictive power.

The race variable in this model had its shares of issues, too. While all the race variables were not significant, some of the sample populations were too small to determine a general trend. For example, there were 38 Asian Pacific Islander, 25 African American, 50 White, and 37 International students. There was one Native American, 10 Latinos and 5 students who selected "other." These later student populations were too small to be drawing any conclusions about the impact of race on the outcome variable, grade received.

As expected, the prior GPA Level-1 variable was statistically significant in relation to the outcome variable grade received. This result simply mimicked other results reported in literature (Adelman, 1999: Adelman, 2006). This variable was used in building the overall model at the Level-2 stage.

There were two level-2 variables added to the model for significance testing: Web-SCL class variable and the class average GPA variable. Both Level-2 variables were tested separately and then together. When testing separately and using prior GPA as the Level-1 variable, class average GPA had a weak significance with a p-value of 0.051 and the Web-SCL variable had no significance. However, when combining class average GPA variable and Web-SCL variable it was slightly different.

After combining the variables, the prior GPA variable proved once again to be a powerful variable. Class average GPA fell into the weak significance, but had a large magnitude impact on the overall grades. The Web-SCL class variable coefficient was significant, but had only a minor impact (0.002) on the outcome variable, grade received. This demonstrated that the Web-SCL classes had no impact on grade received while the instructor had a very large determination in the overall grade of a class.

Qualitative, Phase I: Class Observation Analysis

The purpose of the class observation was two-fold: Were observers able to detect any differences in the level in engagement in my own Web-SCL experimental design relative to a traditional class? Also, how did the observers view the use of technology during my lecture and was it an effective way to deliver course material to the students? After instructors observed my class, they sent their comments to the Office of Research and Planning (OPR). The text data was analyzed using opening codes and axial coding to create categories and sub-categories. These categories and sub-categories will be discussed in the following manner: Results within expectations and surprising results.

As the results suggested, this class activity of students presenting the problems to the class was perceived as a shared responsibility between me and the student. It was also clear that students who actually did the presentations were engaged with the class activity, but it also seemed that there needed to be more participation from other students in the class. In some ways, observing one class session of the class activity had its share of limitations. Observers viewed the student presentation, which was the last part of the activity and at no point did the observers see the students working together in groups the day before. I tried as much as possible to inform those observing my class that this was one portion of a larger activity (See Appendix E), but that was obviously missed because not one observer mentioned that this activity was one of many activities that occurred in the classroom. This issue will be fully discussed in the limitations section.

Observers also mentioned that I was there as a facilitator of the course material, not someone who was lecturing the whole time. In a sense, this class observation was very

successful in proving Bransford et al. (2000) research in that students should see the instructor from a different perspective, someone who was a facilitator.

An intriguing point revolved around the engagement of students. Generally, observers felt that students were a bit more engaged in my Web-SCL experimental design. Yet, could learning be measured? Class observations may not be the best analytical tool to answer whether students were learning. This is something that will be discussed more thoroughly in the Merging the Data – Discussion.

Another interesting point came from the practice of giving solutions to the students. In some ways, this mimicked the use of technology in the classroom. While technology needs to be integrated in the classroom, so should the solutions. Simply giving them the solutions without any sort of review or guidance will not promote active student learning. This activity is really about giving them just enough guidance, so they can work with the material on their own.

Almost all the evaluators expressed their satisfaction with the online presence and many understood the benefits of having an online presence. They felt the exercise was effective and their observations were congruent with the research, which stated that student-centered learning was a better model than the traditional one (Knight and Wood, 2005; Armbruster et al., 2009).

Qualitative, Phase II: Interview Analysis

As noted in the Interview Results section, one of the main interview objectives was to capture the instructor's perspective and how the Web-SCL class design related to their own class design. In many ways, this research was trying to get the story out of instructor in terms of why an instructor would set up their class in a specific manner. The structure of this discussion followed the four categories in the Interview Results section.

As expected, there was a lot of variation in terms of the class structure. Some instructors lectured while many of the other instructors embedded some form of student-centered learning activity in their lectures. If there were any surprises in the Category 1: Class Structure, it would be that some instructors used a differential class structure between their developmental classes and their advanced classes. Those instructors who used differential class structure stated that the developmental classes needed "more practice" and set up their developmental classes with more group work while in their advanced courses, they used a more traditional type lecture.

Instructors felt that using group activities helped them figure out "where their students were at" or in other words, assessed their learning. A couple of instructors mentioned that they used group activities to break up the lecture instead of lecturing the whole time. It seemed that some instructors indirectly understood that students have an attention span of roughly 15 minutes (Bonwell and Eison, 1991).

Of all the sub-categories in Category 1: Class Structure, advice to new instructors was incredibly interesting. With the exception of one instructor (that instructor did not answer the last question), all of them mentioned in one form or another, the importance of the Web-SCL class structure. They either mentioned the importance of using group activities or using technology. This was particularly important because in some other places, the instructors said

that the group activities might not be worth it. Yet, the general consensus was that students needed something else besides lecturing.

In general, responses to the Category 2 questions, "Benefits and Challenges of using Technology," fell within expectations. From the instructor's point of view, students were perceived to benefit from 24 hours access allowing students to access course material online at any time. Even though students still had access issues, most of the interviewees understood the importance of having an online presence. Some of the interviewees said that instructors will not have to waste time drawing out diagrams when they can easily be accessed online. They also discussed network system failures, but this could be easily avoided with a strong IT department. According to Hicks (2011), schools must have a strong IT department in place to support the use of technology in classrooms.

From the instructor's point of view, technology can also provide additional structure to a classroom. While I could have worded the question a little better, it was an instructor who pointed out the main objective of using technology in relation to structure, "It's not really about structure more than it is about efficiency. In that, technology can simply cover a lot more material than a standard traditional class."

For Category 3: Are the Group Activities worth the tradeoff of lecture time? Most of the instructors felt that the group activities were worth the tradeoff. While some said it "depends," much of the issues revolved around the time committed to switching from traditional lecturing to group activities. Some instructors were simply hesitant about making the switch because they believed it might take up too much time and it might not be that effective.

For Category 4: Impact on student engagement and student outcomes, instructors were very positive about the impact of my Web-SCL experimental design on engagement and student

outcomes. Many of instructors were already uploading course material online. Some thought it was a good component to add to a course and many felt that it helped students to interact with the course material. This course design also helped students teach each other where the instructor became the facilitator instead of leading the class.

Merging the Data - Discussion

This section of the paper begins to put everything together and discusses some of the main themes throughout this research, especially the areas that have complementary themes across sections. The Quantitative section was from the student's perspective while the Qualitative section was from the instructor's perspective. When merging the quantitative sections and qualitative sections together, three themes emerged from this research: Class structure, Technology, and Learning.

In Part A of the student survey (Did students distinguish between the Web-SCL model and traditional lecture classes?), students clearly identified the differences between the two types of class structures. The Web-SCL classes possessed a student-centered learning activity and some form of technology use. This, more or less, matched the class structure that the instructors said they were offering to the students. The same could be said for the instructors from the traditional course structure. These instructors did not offer a student-centered activity or technology in their classroom. From this perspective, the student survey did a good job of demonstrating the differences between the class structures.

From the instructor's point of view, they clearly identified my Web-SCL experimental design as a different kind of class structure. Observers noticed the shared responsibility of the course material between me and the student. All observers noticed the use of technology in the

classroom. Another interesting result, in terms of class structure, came from the interview. There, the instructors mentioned the importance of less lecturing and more activities. The focus was that students needed more than just lecturing.

From the student's perspective, emailing an instructor and instructors using the internet for assignments helped and supported student learning. Students clearly appreciated the technology aspect of the Web-SCL model while the results for the group activities were not as conclusive from the student's point of view. However, in the student survey Part D: Examining Pre-existing Student Perspectives, it shed some light in terms of the needs of the students. A majority of students thought that the following activities helped their learning: teaching and learning from other students, students presenting assigned problems during lecture, use of support materials, group activities and use of internet. All of these characteristics point to a Web-SCL course design. However, in Part C of the student survey, it did not confirm the differences as to whether these activities helped learning. If anything, it could be the case that instructors were giving student-centered learning activities, but maybe not the right ones.

In terms of the instructor's perspective, the technology piece of the Web-SCL model really stood out. This was apparent when instructors were asked to give advice to new instructors. There was not one instructor that said instructors should be lecturing more. In fact, all of the instructors pointed in some aspect to the Web-SCL course design, whether it was more group work or more use of technology. This was also the case when observers were asked about technology aspect in the class observation. Observers appreciated the web use in my class and the importance of it supporting student learning objectives.

Student learning was another theme throughout this research. However, many of the results seemed to conflict with one another. The Hierarchical Linear Modeling (HLM) results

did not indicate any increase in student learning, such as the grade received. In part C and part D of the student survey, there were several questions regarding learning from the activities and most of those questions outside the use of technology did not show any positive results for student learning. This may be a case of perception of learning rather than quantifiable actual learning. Then again, it could be an issue with using HLM as the analytical tool. This will be discussed in the limitations section.

How instructors viewed and measured learning was an issue in several parts of the results. In the class observation, some instructors could not assess the learning during the class observation. Yet, in the interview section, instructors commented in several places that they used the group activities to gauge student learning. This could be another case of instructors perceiving learning, but without any direct evidence of an increase in quantifiable learning.

Looking at the results from the different methods together gave us a fuller perspective than we would have had from analyzing each method separately. While in all cases, the results were not crystal clear, it was apparent that this Web-SCL model offered advantages in several areas. If anything, it clearly pointed that these instructors preferred their course design with some form of student-centered learning activity and some form of technology. Students also want more than just lecturing and it is our duty to find the right mix of activities to help them fulfill their educational objectives.

Recommendations:

A number of recommendations emerged from this research. Instructor perceptions and needs of technology need to be continually monitored. There also needs to be more research on which types of student-centered activities have the most impact. And finally, instructors need to

have access to instructional designers to tackle the ever growing changes in technology and the needs of their student population at community colleges.

Community colleges need to conduct surveys and interviews of their instructors in order to capture their perceptions and needs of technology, at the very least on an annual basis. Some instructors will try and use new technology in their classes while others will design their course from what they have learned in the past. Other instructors will continue to design traditional courses unless given the incentive to test other course designs with the integration of technology. Either way, policy makers need to capture those perspectives, positive or negative. One instructor in the interview said the following about some of the obstacles that instructors face:

> "I've been asking for the computer with the big overhead projector and the big screen for years, and I would have made other modifications and adaptations to my course if I had access to technology."

While this comment seemed to be in the minority, it still needs to be heard and monitored because these are the types of comments that can stifle the incorporation of technology in the classroom. If policy makers are pushing technology, they need to provide the technological infrastructure to support instructor objectives. This could be done with an annual survey and randomly interviewing some of the faculty at this community college.

From the student survey results, students clearly wanted more than just lecturing. However, the Web-SCL course design did not seem to have any quantifiable increase in the outcome variable, grade received. For this study, a class was considered to be a Web-SCL design if it possessed a student-centered activity and active use of technology. At no point did this research get into which student-centered activities were most effective. Community colleges should obviously allow flexibility with course designs to deal with the diversity needs of their student population, but at the same time, evaluate which student-centered activities have the most impact.

Community colleges want instructors to be content masters and instructional designers at the same time. This is why it is so important that community colleges have trained instructional designers to assist instructors. If an instructor has to cover a certain amount of material and then they are asked to make it accessible online, some instructors may not have time to do this or more importantly not know how to do this. In the interview, two instructors said the following:

> "… you need to complete a certain amount of work… But group activities can be very time consuming, especially with the quarter system and a 50 min (class time). To me, that is a disincentive to do as much group work to benefit the students."

> "So, I haven't adopted the model because I haven't had the time to put something like that together."

Just like the students in our classes, instructors need to receive support and guidance, so that instructors are able to get the most out of technology. This is why it is so important to have personnel with those skills to act as a medium between the technology and the instructors. Just like the students in our classes, we cannot just give our instructors the keys to technology and expect them to understand the intricacies and nuances immediately. The same could be said for using student-centered activities and figuring out which activity works best for an instructor. If students have all these diverse needs at community college, instructors need to be better prepared to deal with these evolving changes in course design.

Bias and Limitations:

With any research, there is the potential for bias. I removed myself from administering and collecting the student surveys, collecting the observations, and conducting the interviews. In all of these cases, Office of Planning and Research (OPR) at this community college acted as a medium. However, even if I removed myself from these duties, instructors knew that I was

analyzing the data and I still worked with most of them on a professional level. This could have had an impact on their responses.

Another bias is whether the instructors are telling the truth. Some instructors may feel that group activities and technology are part of the future. Yet, they may feel embarrassed to admit that they know little about the different types of technology used in the classroom or the different types of student-centered learning activities. This points to the importance of using open coding in analyzing the data. The open coding technique used in the observation and interviews were used to screen for content rather than a specific response of "yes" or "no" responses. This is what makes the open coding process so powerful. Nevertheless, this does bring up the issue of certain biases within this research.

By far the biggest limitation of this study was that in some cases, I was researching my classes while being the researcher. While OPR was used as a medium to mitigate some of the bias, this did not change the fact that my classes were included in the student survey and HLM analysis. My class was also used as the class that instructors observed. However, there were certain issues that simply could not be avoided. Picking my class as part of the study was a difficult choice, but reasonable for the following reasons. Initially in my research proposal, I decided I would implement the Web-SCL experimental design into another Math class. Unfortunately, I was unable to successfully implement my course design into another Math class. There was also an attempt to a search for a class that had similar characteristics as my own, but it could not be found. No other class in the Math, Science, and Business had this type of student-centered learning activity in their classes, where students attempted to become the "Expert." After a lengthy discussion with my original Chair, Marge Plecki, it was decided to use my class in this research.

Another limitation was that this study was not able to use either randomized assignment or a longitudinal design in the Hierarchical Linear Modeling (HLM). This study examined the immediate impact of a specific class on students' GPA for one period of time.

Looking at the interview results, it was clear that course design varied from one class to the next. Instructors had a whole host of reasons why they set up their class the way that they do. This fact might make it difficult to come up with generalizations about certain class structures.

And finally, observers were only viewing a small portion of my Web-SCL class, which was during the student presentations. At no point did the observers see all the other student-centered learning activities in the other days. While it would have been ideal for the observers to view all the student-centered learning activities in my class, it was not possible from a practical point of view. Thus, it was decided to select a characteristic in my Web-SCL experimental design that was not common in the Business Transfer Program.

Future Research:

While some of the instructors in the interview said that my Web-SCL experimental design had an impact on their own class, it would be an interesting research project to follow-up with these instructors to see which ideas were incorporated into their classroom. For example, when giving advice to new instructors, did these instructors mention the Web-SCL model? Not one instructor said they should be lecturing more, but, how did they change? And, would they be able to change the views of incoming instructors?

Another future research project could be the use of data analytics. At this community college, every class has been accompanied with the use of Learning Management Systems (LMS) and in our case, Instructure's Canvas System. Looking at the needs of students in Part D

of the student survey, students wanted more than just lecturing. And since going back to the traditional approach seems unlikely for many of these instructors, there needs to be a mechanism for targeting students and getting them the help that they need. It would then make to most sense to have a set of activities at the beginning of the quarter to generate analytics that could project their eventual grade in the class. In fact, after submitting my dissertation, I will launch a research pilot sometime in 2016 where I will design activities to project future grades. In many ways, this would mirror Adelman's work (2006). If prior GPA can accurately predict the eventual grade in the classroom, is it possible to have assignments at the beginning of the course to predict the eventual grade? If so, and if the results from those initial assignments suggest possible future problems, students would be able to get the help they need immediately without the instructor having to look at grades from previous courses and potential ethical issues of student records (FERPA laws).

The Hierarchical Linear Modeling (HLM) analysis for this study focused on all student and needs, but there might be some merit to studying certain student populations. Does this Web-SCL model help support the top 20% of the student population? What about the bottom 20% of the population? Then again, would this knowledge help the average student (in other words, the middle 50% of the student population)? This would be a good project to pursue in figuring out which activities help which types of students.

And lastly, instructors need to be surveyed on multiple levels. While I only asked about a single student-centered learning activity, instructors could be using multiple activities. And while I focused on early adopters of technology, a researcher could focus on all the instructors: What are their needs and what can the policy makers do to help them? Capturing all the

instructor's needs can ultimately better supply the students with the appropriate material they need.

Concluding Remarks:

While I do feel that this project was a success, there is more work to be done and from my perspective, this is only the beginning. I feel that this approach to course design helps not only the student, but the instructor as well. Although I'm not entirely convinced about the use of group activities, I'm more than convinced about the technology aspect from the instructor and student perspectives. While I do believe that course design is a crucial aspect of learning, it may be that targeted data analytics may be the most efficient at improving student outcomes. The best students will always perform regardless of the course design. The same rationale could be offered about the bottom 20%. So, after lifting the boat for everyone (Web-SCL course design), why not focus tutoring and mentoring on those for whom that would offer the biggest return? If we do, we may be able to increase persistence and move closer to the goal of increasing graduation rates and transfer rates at community colleges.

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Appendix A: Student Consent and Survey

This survey will assess which activities best support your learning here at this community college. Your participation in this study is completely voluntary and you may refuse to participate at any time. Any information collected from this survey shall be fully protected. Your participation in this study will not affect your grade in this class and will not be shared with your instructor. This survey will only be used for research purposes. Before data analysis is to take place, all data will be de-identified to protect individual responses. The survey should take about 10 minutes. All participants must be 18 years of age and if not, please opt-out of this survey by checking the appropriate box. We appreciate your feedback and we are confident your feedback will help improve courses at South.

___ I am over 18 and I would like to participate in this survey.

___ I am NOT over 18 and will NOT be able to participate in this survey.

___ I am over 18, but I do NOT want participate in this survey.

Name or Student ID#: _____

PART A:

In your experiences IN THIS CLASS, which descriptors below best describe the class structure?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
a. Instructor lectures to the class at least 90% of the time	☐	☐	☐	☐	☐
b. Instructor lectures, but also spends at least 1/3 of lecture time on group activities and/or individual assignments	☐	☐	☐	☐	☐
c. Instructor usually uses technology during lecture.	☐	☐	☐	☐	☐
d. Instructor uses a class website, CANVAS, Google Apps, or another Learning Management System to deliver course material	☐	☐	☐	☐	☐

PART B:

In your experiences IN THIS CLASS, about how often have you done each of the following?

	Very Often	Often	Sometimes	Never
a. Asked question in class or contributed to class discussions	☐	☐	☐	☐
b. Made a class presentation	☐	☐	☐	☐
c. Worked with other students on projects during class	☐	☐	☐	☐
d. Worked with classmates outside of class to prepare class assignments	☐	☐	☐	☐
e. Tutored or taught other students	☐	☐	☐	☐
f. Used the internet or instant messaging to work on an assignment	☐	☐	☐	☐
g. Used email to communicate with an instructor	☐	☐	☐	☐
h. Discussed ideas from your readings or classes with others outside of class (students, family, co-workers, etc.)	☐	☐	☐	☐

PART C:

In your experiences IN THIS CLASS, which activities BEST SUPPORT your learning?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Not applicable
a. Instructor lectures to the students at least 90% of the time helps my learning.	☐	☐	☐	☐	☐	☐
b. Teaching and learning from other students during class hour helps my learning.	☐	☐	☐	☐	☐	☐
c. Students presenting assigned problems during class hour helps my learning.	☐	☐	☐	☐	☐	☐
d. Using support materials (handouts or electronic documents) provided by the instructor helps my learning.	☐	☐	☐	☐	☐	☐
e. Reading the recommended book helps my learning	☐	☐	☐	☐	☐	☐
f. The group activities and/or individual projects during class hour helps my learning	☐	☐	☐	☐	☐	☐
g. Using the homework solutions and old exams designed by the instructor helps my learning	☐	☐	☐	☐	☐	☐
h. The use of the internet by the instructor helps my learning	☐	☐	☐	☐	☐	☐
i. Class structure has no bearing on my learning (more or less lecturing, more or less use of internet, more or less use of group activities)	☐	☐	☐	☐	☐	☐

PART D:

In your experiences AT THIS SCHOOL, which activities BEST SUPPORT your learning?

This question is about your experiences at THIS SCHOOL!

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Not applicable
a. The instructor who lectures to the students at least 90% of the time helps my learning.	☐	☐	☐	☐	☐	☐
b. Teaching and learning from other students during class hour helps my learning.	☐	☐	☐	☐	☐	☐
c. Students presenting assigned problems during class hour helps my learning.	☐	☐	☐	☐	☐	☐
d. Using support materials (handouts or electronic documents) provided by instructors helps my learning.	☐	☐	☐	☐	☐	☐
e. Reading the recommended book helps my learning	☐	☐	☐	☐	☐	☐
f. Group activities and/or individual projects during class hour helps my learning	☐	☐	☐	☐	☐	☐
g. Using the homework solutions and old exams designed by instructors helps my learning	☐	☐	☐	☐	☐	☐
h. The use of the internet by the instructor helps my learning	☐	☐	☐	☐	☐	☐

- What grade do you expect in this class?

    a. 4.0 to 3.5
    b. 3.49 to 3.0
    c. 2.99 to 2.5
    d. 2.49 to 2.0
    e. 1.99 or lower

- Suggestions for learning activities? Are there other activities that support your learning? What suggestions would you give to instructors at this community college? (Write in comments below)

Appendix B

Informed consent forms for the instructors whose students will be surveyed

University of Washington Consent Form

Does Course Design Impact Student Engagement and/or Student Outcomes at Community Colleges? An Empirical Test of a Web-Based, Student-Centered Learning Design Strategy.

Researcher: Larry Angel, doctoral student

University of Washington

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larry.angel@seattlecolleges.edu

Faculty Advisor: Marge Plecki, Ph.D.

University of Washington College of Education

206-221-3430

mplecki@uw.edu

I am asking for you to be a participant in my research study at the University of Washington. The purpose of this form is to give you all the information you need to assist you in whether you want to be part of this study. I will be giving you information about the purpose of this research, procedures, potential risks, and benefits.

PURPOSE OF THE STUDY

This mixed method study will explore how a specific course design, Web-SCL model, may effectively engage diverse learners which in turn, could improve student learning outcomes. This specific course design will couple web-based support tools with another type of student-centered learning activity (Web-SCL model). It is the author's belief that coupling these activities has the potential to address the unique needs of the community college student.

PROCEDURES

If you choose to be part of this study, I will be seeking your participation in a number of ways. I would like to survey students in your class. This survey will be administered through the Office of Planning and Research at this community college. Once a time has been agreed upon to administer the in-class survey, a representative from Office of Planning and Research will visit your class. The representative will then read a survey script describing the purpose of the survey. After reading the survey script, the representative will pass out the survey, which should take about 10 minutes. This student survey will be completely voluntary and any identifiers will be removed before analysis.

The survey will contain questions about class structure. For example, "How often do you (the student) make a class presentation?" "Does the use of the internet by the instructor supports my learning?", "Does lecturing at least 90% of the time best support your learning?" Of course, there are many other questions, but I'm trying to figure out if there's a difference between different types of class structures.

RISKS

Some instructors may feel that revealing their class structure may expose them to professional risk. For this reason, all identifiers will be removed and coded by the Office of Planning and Research before any analysis will occur. The information generated from the student survey will not be shared with your current or previous employer, nor will the written report identify you or your course in any way. All information from this study will be confidential and your participation is purely voluntary.

BENEFITS

The ultimate goal of this study is to investigate whether face-to-face "enhancement" impacts student learning outcomes and student engagement at community colleges. The results of this study may encourage further development of face-to-face "enhancement" at this community college. So while it may not impact you directly, it is simply investigating the possibilities of different class structures.

Statement:

This study has been explained to me. If I have any questions later about the research, I can ask the researcher.

____ I give my permission for the researcher to survey my class.

____ I DO NOT give my permission for the researcher to survey my class.

Signature of subject Print name Date

Copies to: Larry Angel, Researcher

Subject

Appendix C: Survey Script

(An affiliate from the Office of Planning and Research at this community college will approach each selected classes with the following statement)

First of all, I would like to thank (name of instructor) for giving me the opportunity to speak with you about participating in a research project here at this school.

My name is _____ and I'm a (affiliation with South). Today, the Office of Planning and Research will be conducting a student survey. This survey will be analyzing what types of activities best support student learning here at this community college. Portions of the survey will be used for research purposes. This survey is not an evaluation of your instructor, but rather an evaluation on the activities that occur **IN THIS CLASS** and **AT THIS SCHOOL**. Some of the activities will pertain to this class and some won't. So, be sure to read each question carefully before answering. It shouldn't take that long, roughly 10 minutes.

Any information collected from this survey will be fully protected in our office and your individual responses will not be shared with your instructor or researchers. Your paper survey will be shredded after your information is coded. Your participation in this study is completely voluntary and you may refuse to participate at any time. All participants must be at least 18 years of age to participate and if not, please opt out of this survey.

You may wonder why we ask for your name or student id. Remember, the purpose of this survey is to relate class activities to student achievement, so we'll follow group of student (not you individually) over time.

Once again, I would like to thank (name of instructor) allowing me to speak with you and we are confident your feedback will help future courses at South. If you have any questions, let me know.

Appendix D

Informed consent forms for the instructors doing an observation and an interview

University of Washington Consent Form

Does Course Design Impact Student Engagement and/or Student Outcomes at Community Colleges? An Empirical Test of a Web-Based, Student-Centered Learning Design Strategy.

Researcher: Larry Angel, doctoral student
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Faculty Advisor: Marge Plecki, Ph.D.
University of Washington College of Education
206-221-3430
mplecki@uw.edu

I am asking for you to be a participant in my research study at the University of Washington. The purpose of this form is to give you all the information you need to assist you in whether you want to be part of this study. I will be giving you information about the purpose of this research, procedures, potential risks, and benefits.

PURPOSE OF THE STUDY
This mixed method study will explore how a specific course design, Web-SCL model, may engage diverse learners which in turn, could improve student learning outcomes. This specific course design will couple web-based support tools with another type of student-centered learning activity (Web-SCL model). It is my belief that coupling these activities has the potential to impact student learning outcomes and engagement at community colleges.

PROCEDURES
If you choose to be part of this study, I will be seeking your participation in two ways: An observation and an interview. I would like for you to observe a class that possesses the Web-SCL model. The Office of Planning and Research at this community college will provide you with the observation form. After setting up an agreed time for the observation, you will observe the class. After the observation, complete the observation form and email your form with your comments to the appropriate representative in the Office of Planning and Research. This observation will be completely voluntary and any identifiers will be removed before analysis. The observation will be one class period, which is approximately one hour.

The observation will contain questions about student engagement and the use of technology in the classroom. For example, "Was the level of engagement more, less or the same compared to the average class at this community college?" "How did the instructor use technology to guide the class?" It will also contain a description along with the purposes of using the Web-SCL

model. Of course, there are many other questions, but this project is trying to figure out if this type of class structure has an impact on student outcomes and engagement.

After submitting your observations, you will be asked to participate in an interview about class structure. A representative from the Office of Planning and Research at this community college will set up an interview time and at the interview will take place in their office. The interview will be audiotaped and then transcribed. All identifiers will be removed before being analyzed. Like the observation, the interview is completely voluntary.

The interview will contain questions about your class structure and the benefits/concerns about the Web-SCL model. For example, "Discuss your class structure in your face-to-face classes: 100% lecture, 50% lecture/50% class activities, so forth… What are the main reasons why you set up your class this way? Do you change class structure depending on the type of class (ie – 200 level course versus developmental course)?", "What are the main benefits for using the Web-SCL model?", and "What concerns do you have when viewing the Web-SCL model? Of course, there are many other questions, but the researcher is trying to figure out the benefits and consequences of using this model from the instructors' point of view.

RISKS

Some observers and interviewees may feel that revealing their opinions on this class structure or any other type of class structure may expose them to professional risk. For this reason, all identifiers will be removed and coded by the Office of Planning and Research from this community college before any analysis will occur. The information generated from this observation and interview will not be shared with your current or previous employer, nor will the written report identify you or your comments in any way.

BENEFITS

The ultimate goal of this study is to investigate whether face-to-face "enhancement" impacts student learning outcomes and student engagement at community colleges. The results of this study may encourage further development of face-to-face "enhancement" at this community college. So while it may not impact you directly, it is simply investigating the possibilities of different class structures.

STATEMENT:
This study has been explained to me. If I have any questions, I can ask the researcher.

____ I give my permission for the researcher to use my comments from the observation form provided that all identifiers be removed before analysis. Comments will be pooled in a way that the researcher will not have the ability to link the comments to individuals.

____ I DO NOT give my permission for the researcher to use my comments from the observation form.

____ I give my permission for the researcher to use my interview from the audiotape provided that all identifiers be removed before analysis. All commentary will be pooled in a way that the researcher will not have the ability to link the comments to individuals.

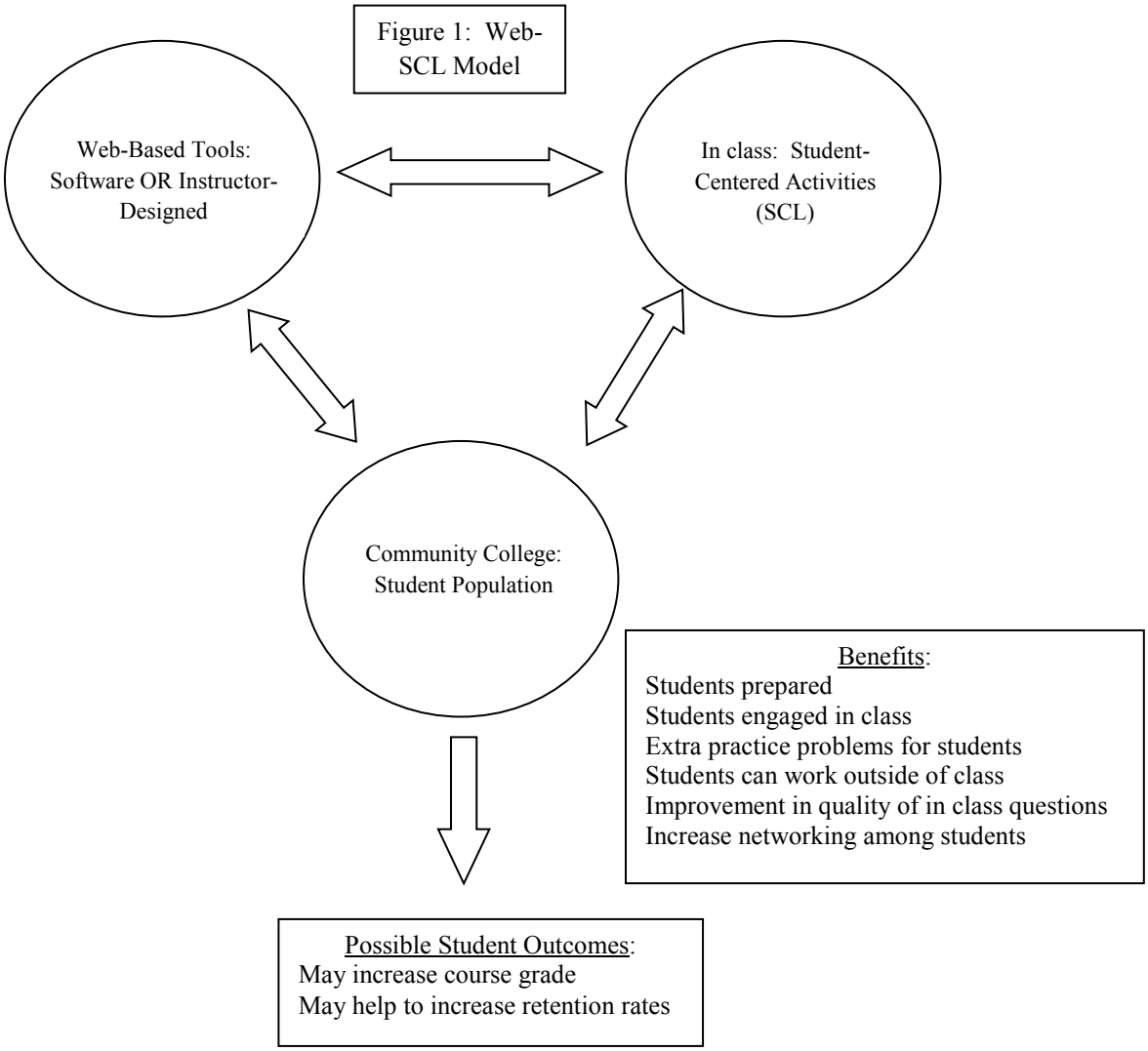
____ I DO NOT give my permission for the researcher to use my interview from the audiotape.

Signature of subject Print name Date

Copies to: Larry Angel, Researcher
Subject

Appendix E: What is the Web-SCL model? And, the Observation Questions

Figure 1 helps explain the conceptual picture of how web-based instructional tools and student-centered activities (SCL) may help to increase student outcomes.



The Web-SCL model couples the use of web-based instructional tools and student-centered learning activities (SCL) to help support and engage community college students. Instructors have the option of using software or developing their own web-based instructional tools. Some research has shown an improvement in learning outcomes after using the computer learning programs (Webassign, Hawkes, MathLab etc.). However, the software will be an additional cost to the student, so this

observation will focus on a course materials designed by an instructor to find an inexpensive substitute for the students.

These web-based instructional tools can be used for individual review and/or used for group study. All the lectures, group activity solutions, homework solutions, and old exams will be converted to electronic documents, which will then be made available through the instructor's website. It is important to note that these electronic documents need to be fully integrated into the classroom and not a static document where there is no time for review in class. These solutions will be designed to be a richer experience that simply providing the answers. The documents will come with a whole host of other useful information such as articles, past problems, helpful hints, commentary and videos to better support the learning experience. These web-based instructional tools could be critical for the student who has limited time at school and needs more direction outside the classroom.

There are numerous ways to set up the student centered learning activity in a class (cooperative, collaborative, so forth). In this class, a group of students (randomly assigned) will interact the day before your observation to produce an end product. The following day, the group leader will present the end product to the entire class, where you will evaluate the level of engagement of the class and the presenter. All of these in-class activities will be attempting to get the individual student to become more involved in the learning process. It is the hope of the researcher that these presenters will become the "Experts" in that specific topic. Many non-traditional students have very limited time for peer interaction. As a result, instructors may want to design assignments that give students the ability to interact with other students.

Part of the Web-SCL model goal is to strengthen the bonds between the students. As a result, they might feel stronger connections with their classmates and ultimately their school. This could potentially help persistence rates from quarter to quarter, which could then lead to higher transfer rates. Another important aspect of this project is to give students the proper support materials, so they have the opportunity to work on it individually or with other students. It is this coupling mechanism of using the web-based instructional tools and student centered learning activities that has the potential to better support and engage students at community colleges.

Part A:

Classroom Observation

1. Give a short description of the class activity.
    - How much time are the students leading the class? How much time is the instructor leading the class?

2. Give a description of the level of engagement. Use the traditional model of learning as your benchmark.
    - Was the level of engagement more, less or the same compared to the average class at this community college?
    - Were students learning from other students?

3. Give a description of the level of learning. Use the traditional model of learning as your benchmark.
    - When students asked questions, did the students move beyond the rudimentary questions?
    - In your opinion, did you view students becoming the "Expert"?

4. Use of technology:
    - How did the instructor use technology to guide the class?

5. Effectiveness of class activity:
    - Were there times the instructor successfully implementing the Web-SCL model?
    - Were there times the instructor had trouble implementing the Web-SCL model?

Part B:

Website Observation

6. Evaluating Website:
    - What does this instructor offer on the website?
    - Is this different than the traditional class? Why or why not?
    - Is the website straight-forward or difficult to navigate?

Appendix F: Interview Script and Interview Questions

Interviewer: Before we start the interview, I would like to remind you of the interview protocol. I'm going to read a small excerpt from the consent form. [Remind them of their rights as an interviewee]

"Some interviewees may feel that revealing their opinions on this class structure or any other type of class structure may expose them to professional risk. For this reason, all identifiers will be removed and coded by the Office of Planning and Research from this community college before any analysis will occur. The information generated from this interview will not be shared with your current or previous employer, nor will the written report identify you or your comments in any way. All information from this study will be confidential and your participation is purely voluntary."

[Send the interviewee their comments via email before the interview. Before starting the interview, give them a hard copy of their observation, just in case they forgot their copy. Confirm they have read their observation comments before starting the interview. If not, have them read their observation comments before starting the interview.]

1. After looking at your observation comments, do you have anything to add before we start this interview? (This question may be skipped if the interviewee has not completed an observation form).

2. Discuss the class structure in your face-to-face classes: 100% lecture, 50% lecture/50% class activities… What are the main reasons for setting up your face-to-face class this way? Do you change class structure depending on the type of class (ie – 200 level course versus developmental course)?

3. Some instructors use technology in their face-to-face courses such as their own website, Google Apps, and CANVAS. Discuss some of the benefits and problems facing an instructor who use these tools during lecture time.

4. Research has shown that technology can work on multiple levels: 1. It gives instructors structure during lecture. 2. It gives instructors the ability to work within new technology. 3. It gives students the ability to work in class, but outside of class as well giving students 24-access to course material. Which statements do you agree with? Which ones do you disagree with?

5. Some instructors argue that lecturing is a better use of class time than group activities. In your view, are the group activities during class time worth the tradeoff of lecturing? Why or why not?

6. In this research project, the Web-SCL model is described as a class structure in which it couples web-based support tools with student-centered learning activities to better support student engagement and student outcomes (persistence, transfer rates, and degree attainment). Do you believe that this class structure can have an impact on student engagement and student outcomes? Why or why not?

7. What suggestions would you give an incoming, new instructor about class structure for their face-to-face courses?

8. Has this research project influenced your thoughts about class structure (Positive, negative, neutral)?

9. Last question: Is there anything you would like to add to this interview?

Appendix G: Example Calendar for Web-SCL experimental design

Week 1	Monday	Tuesday	Wednesday	Thursday	Friday
Class	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr
9am: ECON&201	Intro./Syllabus	Intro./Syllabus	Chap 1	Chap 2	Chap 3
11am: ECON&202	Intro./Syllabus	Intro./Syllabus	Chap 1	Chap 2	Chap 3

Week 2	Monday	Tuesday	Wednesday	Thursday	Friday
Class	8-Apr	9-Apr	10-Apr	11-Apr	12-Apr
9am: ECON&201	Start GA1	GA1 Presents.	HW1 Presents.	Quiz 1 review	Chap 4
11am: ECON&202	Start GA1	GA1 Presents.	HW1 Presents.	Quiz 1 review	Chap 4

Week 3	Monday	Tuesday	Wednesday	Thursday	Friday
Class	15-Apr	16-Apr	17-Apr	18-Apr	19-Apr
9am: ECON&201	Chap 5	Chap 6	Start GA2	GA2 Presents.	HW2 Presents.
11am: ECON&202	Chap 5	Chap 6	Start GA2	GA2 Presents.	HW2 Presents.

Week 4	Monday	Tuesday	Wednesday	Thursday	Friday
Class	22-Apr	23-Apr	24-Apr	25-Apr	26-Apr
9am: ECON&201	Quiz 2 Review	Test 1 Review	Test 1 Review	Test 1	Chap 10
11am: ECON&202	Quiz 2 Review	Test 1 Review	Test 1 Review	Test 1	Chap 10

Week 5	Monday	Tuesday	Wednesday	Thursday	Friday
Class	29-Apr	30-Apr	1-May	2-May	3-May
9am: ECON&201	Chap 11	Chap 12	Start GA3	GA3 Presents.	HW3 Presents.
11am: ECON&202	Chap 11	Chap 12	Start GA3	GA3 Presents.	HW3 Presents.

Week 6	Monday	Tuesday	Wednesday	Thursday	Friday
Class	6-May	7-May	8-May	9-May	10-May
9am: ECON&201	Quiz 3 review	Chap 13	Chap 14	Start GA4	GA4 Presents.
11am: ECON&202	Quiz 3 review	Chap 13	Chap 14	Start GA4	GA4 Presents.

Week 7	Monday	Tuesday	Wednesday	Thursday	Friday
Class	13-May	14-May	15-May	16-May	17-May
9am: ECON&201	HW4 Presents.	Quiz 4 Review	Test 2 Review	Test 2 Review	Test 2
11am: ECON&202	HW4 Presents.	Quiz 4 Review	Test 2 Review	Test 2 Review	Test 2

Week 8	Monday	Tuesday	Wednesday	Thursday	Friday
Class	20-May	21-May	22-May	23-May	24-May
9am: ECON&201	Chap 15	Chap 16	Chap 17	Start GA5	GA5 Presents.
11am: ECON&202	Chap 15	Chap 16	Chap 17	Start GA5	GA5 Presents.

Week 9	Monday	Tuesday	Wednesday	Thursday	Friday
Class	27-May	28-May	29-May	30-May	31-May
9am: ECON&201	HW5 Presents.	Quiz 5 review	Chap 18	Chap 19	Start GA6
11am: ECON&202	HW5 Presents.	Quiz 5 review	Chap 18	Chap 19	Start GA6

Week 10	Monday	Tuesday	Wednesday	Thursday	Friday
Class	3-Jun	4-Jun	5-Jun	6-Jun	7-Jun
9am: ECON&201	GA6 Presents.	HW6 Presents.	Quiz 6 review	Test 3 Review	Test 3 Review
11am: ECON&202	GA6 Presents.	HW6 Presents.	Quiz 6 review	Test 3 Review	Test 3 Review

FINALS

9am: ECON&201	Mon., June 10th from 8am to 10am
11am: ECON&202	Tues., June 11th from 1030am to 1230pm